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Perspective

Issues in Evaluating Fish Consumption Rates for Native American Tribes

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The environmental health goals of many Native American tribes are to restore natural resources and ensure that they are safe to harvest and consume in traditional subsistence quantities. Therefore, it is important to tribes to accurately estimate risks incurred through the consumption of subsistence foods. This article explores problems in conventional fish consumption survey methods used in widely cited tribal fish consumption reports. The problems arise because of the following: (1) widely cited reports do not clearly state what they intend to do with the data supporting these reports, (2) data collection methods are incongruent with community norms and protocols, (3) data analysis methods omit or obscure the highest consumer subset of the population, (4) lack of understanding or recognition of tribal health co-risk factors, and (5) restrictive policies that do not allow inclusion of tribal values within state or federal actions. In particular, the data collection and analysis methods in current tribal fish consumption surveys result in the misunderstanding that tribal members are satisfied with eating lower contemporary amounts of fish and shellfish, rather than the subsistence amounts that their cultural heritage and aboriginal rights indicate. A community-based interview method developed in collaboration with and used by the Swinomish Tribe is suggested as a way to gather more accurate information on contemporary consumption rates. For traditional subsistence rates, a multidisciplinary reconstruction method is recommended.

KEY WORDS: Fish consumption; subsistence; survey methods; tribe

1. INTRODUCTION

Human health risk assessments are performed to determine the degree to which people may have an increased likelihood of illness or death due to exposure to chemical toxicants in media (air, water, soil, sediment) and/or other exposure pathways such as using materials for food, clothing, shelter, or other items. Regulatory applications of risk information include remediating contamination, setting water and air quality standards, registering pesticides, and many other actions. Risk assessment methods were developed to estimate the mean or reasonable maximum exposure or other percentile based on the general American population. More recently, vulnerable populations, such as children or subsistence populations, are sometimes considered and explicitly protected.

Disproportionate exposures to Native American[4] populations may thus occur as a result of inaccurate base rate or national average data used

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[4] The terms Native American, tribal community, tribe, tribal member, and Native are used interchangeably in this article to refer to the many and diverse American Indian and Native Alaskan peoples residing in the United States.

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in risk assessments. These data are the products of a number of methodological shortfalls, including: not clearly stating the intention for the use of the data collected such that data are then used inappropriately; data collection methods that are incongruent with community norms and protocols; and data analysis methods that omit or obscure the highest consumer or exposed subset of the population. Even when some of these shortfalls are addressed, current regulatory standards and policies do not have the flexibility to include data demonstrative of Native traditional knowledge[5] and values. Traditional knowledge involves more than numbers of species harvested or the frequency of eating certain species. It provides also the context needed to situate and interpret data in the entire process of obtaining nutritive and spiritually satisfying foods.

This article focuses on one specific dietary exposure pathway within a vulnerable population: fish consumption (including freshwater, estuarine and marine fish, and shellfish) in Native communities. Across the United States and beyond, consumption of contaminated fish raises serious concerns for all peoples, as demonstrated by the number of fish consumption advisories that exist in every state and in most major water bodies. Yet because these advisories are based on assumptions about the fish consumption rates of the general population, tribal members, who eat more fish than the general population, are less protected. In addition, determining appropriate and representative fish consumption rates is critical because of their key role in numerous regulations and decision-making procedures such as determining water quality standards or setting cleanup thresholds. This article discusses problems with conventional fish consumption survey methods often used for Native American populations, and describes how to study tribal fish consumption rates in a more culturally appropriate and therefore more accurate manner. An alternative survey approach is presented, one created and enacted by the Swinomish Indian Tribal Community, a federally recognized tribe with homelands in the Puget Sound region of Washington State.

[5]Traditional knowledge is defined here as "the information that people in a given community, based on experience and adaptation to a local culture and environment, have developed over time. Their traditional education processes were carefully constructed around observing natural processes, adapting modes of survival, obtaining sustenance from the plant and animal world, and using natural materials to make their tools and implements. All of this was made understandable through demonstration and observation accompanied by thoughtful stories in which the lessons were imbedded."[31]

2. FISH CONSUMPTION DEFAULT VALUES

The U.S. Environmental Protection Agency (USEPA) has prepared several guidance documents specifically for conducting fish consumption surveys[1,2] and evaluating general health risks at Superfund sites and in other situations.[3,4] These documents make various recommendations about default intake rates for water, fish, and other exposure pathways. For example, Chapter 10 of the USEPA *Exposure Factors Handbook*[4] includes recommendations for default fish ingestion rates for the general population, recreational marine anglers, recreational freshwater anglers, and Native Americans. For the general population, USEPA recommends using a mean per capita ingestion rate for all ages combined of 6.5 grams per day (gpd) for fresh water and estuarine finfish and shellfish, 14.1 gpd for marine fish, and 20.1 gpd for all fish.[6] For Native Americans, the fish consumption rate recommendations differ depending on the guidance document and the particular group being considered. USEPA and Oregon State have proposed using rates from the Columbia River Inter-Tribal Fish Commission (CRITFC) survey,[5] which cites a mean ingestion rate of 63.2 gpd and a 99th percentile of 389 gpd. The 2005 USEPA Combustion[6] guidance suggests using a general intake rate of 5.4 four-ounce meals per week (3.1 oz/d, or 87.4 gpd). Chapter 6 of this guidance (pages 6–16) notes that "populations such as Indian Tribes, Asian and Pacific Islanders, and some immigrant groups are known to have high local fish consumption rates," but does not make numerical recommendations.

For developing ambient water quality standards, a USEPA technical support document[7] makes reference to an "ideal" scenario of using fish consumption rates derived from the local populations who eat fish from the water body in question, and that those who eat the most fish are given "priority." When the situation is not ideal, and it rarely is, USEPA goes on to recommend consumption rates for the general population and sport anglers of 17.5 gpd, and for subsistence fishers a rate of 142.4 gpd. The

[6]Although these estimates have been revised in the USEPA report Estimated Per Capita Fish Consumption in the United States,[22] the numbers presented here are germane due to their continued widespread use in regulatory standards in most states, as described in more detail in the data presented here.

earlier final draft technical support document[8] recommended 86.3 gpd (the 99th percentile of national consumption by the general population) of freshwater and estuarine fish and shellfish for subsistence fishers, and the alternative default subsistence rate was 39 gpd (the 95th percentile of national consumption). None of these rates include marine species.[7] To provide additional protection from adverse effects when pregnant women are of particular concern, a default intake rate of 165.5 gpd specific to women of childbearing age is suggested for setting ambient water quality standards to protect against developmental effects.[7] The earlier technical support document recommended using 148.8 gpd.[8]

Even in light of the range of recommended fish consumption rates and associated guidance documents, many states still use the older 6.5 gpd rate in their water quality standards and have not promulgated higher consumption rates for waters used by women, children, or tribal members or other subsistence fishers.[8] When those groups are considered, the typical response is to recommend that those groups eat less fish, rather than imposing stricter standards on the waterway.

To add to the array of fish consumption rates, most states also have their own regulations and guidance documents containing a range of rates. Currently, the Washington State Department of Ecology is proposing changes to the Model Toxics Control Act (MTCA) Cleanup Regulation (Chapter 173–340 WAC),[9] which governs contaminant cleanups. The current guidance uses 54 gpd with a fish diet fraction of 0.5 obtained locally, for a total of 27 gpd, applied to all populations and all locations. The Department is proposing to replace this with a fish consumption rate of 57 gpd (derived using the 95th percentile of the Sechena *et al.* study of Asian and Pacific Islanders living around Puget Sound,[9] and a fish diet fraction of 1.0). The recommendation recognizes that "these values may not protect tribal fishers that consume fish" but does not provide numerical recommendations or describe situations where higher subsistence rates would apply.

3. BRIEF OVERVIEW OF TRIBAL CONTEXT

According to fish consumption surveys of several tribes in Washington State, tribal people currently eat more than 20 times the amount of fish compared to the average American.[5,10,11] Nevertheless, although the current tribal fish consumption rates are much higher than those of the average American, the average contemporary tribal rates are well below the traditional subsistence levels that are still followed by a subset of tribal members. Moreover, traditional subsistence levels are most often less than the subsistence heritage rates that inherent aboriginal and Treaty rights protect.[10] Using an average tribal fish consumption rate instead of a rate reflective of the subset of current traditional subsistence consumers, or even higher heritage rates, will result in lower estimates of health risks and in lesser degrees of health protection. Therefore, it is important to clarify the context in which the consumption rate will be used in order to ensure that the chosen rate is appropriate (e.g., current traditional subsistence rates to reflect current risks of fish consumption in assessments, heritage rates in water quality standards to protect natural resources as stipulated by Treaty and trust responsibilities).

Compounding this problem is the fact that protecting tribal health is not simply a matter of managing exposures to contaminants. The biophysical, mental, spiritual, social, and economic well-being of the individual, the community, and the environment are all equally important parts of tribal health.[12–16] For some tribes, to whom fish are more than simply a food source, contaminated fish adversely

[7]Note that the approach to considering marine versus freshwater and anadromous versus resident fish species, as well as freshwater or marine shellfish (and other aquatic species) is often unclear and confusing in regulatory standards. Similarly, the use of measured or modeled data is quite variable; for example, using modeled data to fill in the gaps in the existing data, or using existing data for anadromous species as a relative source contribution when setting standards for resident fish in water bodies where both are present.

[8]For example, Washington State's Water Quality Standards, Chapter 173-201A WAC, refers to the National Toxics Rule (http://www.epa.gov/waterscience/standards/rules/ntr.html#sectionF3) for protecting human health, which cites 6.5 grams per day.

[9]See http://www.ecy.wa.gov/programs/tcp/regs/reg_main.html; proposal to change rate is posted at http://www.ecy.wa.gov/programs/tcp/SAB/SAB_mtg_info/mtg_060915/02%20RecapAPIFishConsumptionRateDiscussions.pdf.

[10]Harris and Harper[21] refer to low (including the average), moderate (100 gpd to 1 pound per day), and high (heritage) consumption rates in Native American fishing communities. "Low" refers to the average, currently suppressed rates. "Moderate" may reflect the current traditional subsistence consumer rates or a subcategory of heritage/Treaty rates. Heritage is the preferred term for the subsistence rates once consumed by all tribal members because these rates continue to be modern and relevant, as protected by inherent aboriginal and Treaty rights.

Table I. Examples of the Range of Fish Consumption Rates in the United States

Amount Eaten (grams per day)	Rationale
6.5	Official USEPA Office of Water rate based on 1980 USEPA dietary survey based on the general U.S. population (roughly equivalent to one 8 oz fish meal per month)
17.5	USEPA Office of Water Quality proposed rate for the general population based on CSFII[a] national 90th percentile; recommended for ambient water quality standards[7]
48.6	USEPA and FDA recommendation to eat 12 oz fish per week
63.2	CRITFC[5] mean consumption rate (~1lb/ week)
142.4	USEPA[7] recommendation for subsistence fishers for developing water quality standards
165.5	USEPA[7] recommendation for women of childbearing age to protect against developmental defects
389	CRITFC[5] 99th percentile minus 4 to 13 "outliers"
454	1 pound per day, a commonly cited "traditional" rate
540	Harris and Harper[12] average rate for current traditional Confederated Tribes of the Umatilla Indian Reservation member subsistence use
620	Boldt[b] decision cited 500 lbs per capita on the Columbia River as the Treaty rate
1000	Walker[28,29] estimate of predam rates for Columbia Plateau Tribes

[a]1994–1996 and 1998 U.S. Department of Agriculture's Continuing Survey of Food Intakes by Individuals (CSFII); fish consumption rates include data from nonconsumers, and marine species were not included. Estimates are based on 2-day averages. Amount of consumed fish was converted to uncooked weights.
[b]*United States v. Washington*, 384 F. Supp. 312, 380 (W.D. Wash. February 12, 1974); *aff'd*, 520 F.2d 676 (9th Cir. 1976), *cert. denied*, 423 U.S. 1086 (1976), at note 151.

impact all of these facets of health. In these tribes, fish represent a cultural keystone species—species that have significant meaning and identity in tribal values and practices and as such are used in family and place names, educational stories, and ceremonies.[17] Impacts to cultural keystone species degrade overall cultural morale.[18,19] Therefore, degradation of traditional foods, for example, via contamination, directly impacts the physical health of those consuming the food and is regarded, equally, as an attack on beliefs and values through the "acknowledged relationship of the people with the land, air, water, and all forms of life found within the natural system."[11, as quoted in 20, p.46] None of these values tied to traditional knowledge are acknowledged or included in the current decision-making and regulatory settings.

4. EVALUATING CONTEMPORARY TRIBAL FISH CONSUMPTION RATES

4.1 Approach to Studying Fish Consumption Rates

National risk evaluations for toxics in fish use data representative of the general population, yet the fish consumption rates used are not protective of Native American populations. Table I illustrates the range in fish consumption rates from the general population, several Pacific Northwest Native American fish consumption surveys, and data of heritage rates (i.e., original subsistence rates that every member formerly consumed). All of the tribal consumption rates are well above the rates used to derive environmental standards.

Fish ingestion rates also vary among tribes. All of the tribal groups listed in Table I are from the Pacific Northwest, yet each tribe is unique; even neighboring tribes do not necessarily eat the same quantities or types of fish and shellfish. Thus, it is important to recognize that one tribe's fish consumption rate may not accurately represent any other tribe and that grouping tribes together may create a downward bias in the rates.

Within each tribe, additional fish consumption rate variation exists that may or may not be evident in conventional consumption survey reports. For example, the average CRITFC[5] contemporary consumption rate is 63.2 gpd and the 95th percentile is 170 gpd, as measured using conventional survey methods. However, within the Confederated Umatilla Tribes, one of the CRITFC member tribes, a subset of traditional consumers who adhere more closely to traditional subsistence practices such as harvesting and preparing their own food currently consume an average of approximately 540 gpd, illustrating that the reality of contemporary consumption is not captured by conventional survey methods.[12]

4.2. Contemporary Consumption Rates

Even though average contemporary tribal fish consumption rates are much higher than those of the

average American, current average tribal rates are nevertheless lower than (1) heritage rates, (2) subsistence rates eaten by a subset of tribal members even now, and (3) goals for recovering traditional healthy diets. Many Native people have been forced to reduce their intake below original subsistence levels, in essence *suppressing* their fish consumption rate.[21] There are several reasons for this suppression.

1. Treaty and aboriginal rights to access and harvest traditional foods are still hotly contested, with battles being fought across the country for recognition and protection of those rights. Many federal, state, local, and commercial entities still aggressively seek to diminish or extinguish tribal rights and culture.
2. People have less access to general and specifically inherited harvest sites due to loss of ownership, theft of land, and poorly scripted federal policies.
3. Fewer people have enough time to catch fully subsistent levels of seafood because they have been forced to assimilate into the dominant society's workforce and to share its economic beliefs. In many cases this assimilation is the unhappy result of decades of federal policies that deliberately tried to eradicate traditional tribal lifestyles, using such agents as missionaries and boarding schools, to obliterate native languages, religion, cultural practices, and connections to the land.
4. Tribal people are still harassed while participating in the harvest of traditional foods via verbal, physical, and legal threats by private citizens and public law enforcement authorities, and their gear is still being vandalized, stolen, or seized.
5. Aquatic species populations have been decimated or destroyed by dams and other development projects, commercial overfishing, invasive species, habitat fragmentation and loss, and many other causes.
6. Knowledge of contamination in areas traditionally harvested—learned through anecdotal, first-hand or visual data, and fish advisories—have influenced some native people to eat less subsistence seafood.

Despite these obstacles, many tribal people continue to rely on subsistence foods with seafood being a primary source, although they may not always mirror levels of historic consumption. Furthermore, some tribal people continue to harvest and eat fish and shellfish in areas where fish advisories have been issued. In many cases, people continue to eat fish they know are contaminated because upholding the traditional ways is paramount to cultural survival.[19,20] As a Board member from the Confederated Tribes of the Umatilla Indian Reservation has stated: "It's our food whether it's contaminated or not." Warnings about contaminants may also raise suspicions that the federal government is trying to scare or force tribes out of practicing their culture.[19] Over time, failure of state and federal agencies to protect tribal people tends to be interpreted as lack of caring at best, and deliberate poisoning at worst.

4.3. Specific Critiques of the Tribal Consumption Study Methods

As a result of the methodology typically used in consumption surveys, the majority of consumption rate data available for Native American communities are not representative of the true range of tribal consumption rates. Tribal fish consumption surveys from Washington State illustrate six common flaws in the survey and assessment process that have led to inaccurate data.

1. Widely cited reports do not clearly state what they intend to do with the data supporting these same reports. A clear purpose stating why the data are being collected guides the type of data collected. Consumption rate data differ dependent on whether the goal is to evaluate current risk levels, to use in a regulatory context with data usability criteria, to develop cleanup levels, or to develop water quality standards. If the study questions and data quality objectives are not clear, the results may be used in statistically inappropriate ways to address questions different from the ones that the authors intended.
2. Outlier data are often eliminated or recoded based on the assumption that the respondents are unaware of or mistaken about how much they eat. Yet, traditional subsistence consumers, who represent the highest reported rates, are acutely aware of how much subsistence food they eat and, conversely, how much they are currently prevented from eating. In the Tulalip and Squaxin Island fish consumption survey,[10] the highest reported rates were recoded to lower amounts because the reported rates were considered too high

to be "realistic." In the CRITFC survey,[5] the highest data points were simply eliminated.[11] The Suquamish study[11] assumed that the responses were all likely accurate and therefore were included in the analyses, although they were not evaluated as representing a separate subset of people.

3. A random sampling technique is employed in most of the surveys to capture a statistical mean. This is appropriate to answer some study questions; however, random sampling through the use of enrollment records may produce flawed results because many people, and especially traditional consumers and elders, are transient even within a reservation. They may live with relatives or friends and have no permanent address or phone number, or simply wish to remain invisible.[12] This may result in an effective oversampling of the low consumers, creating a downward bias.
4. Many fish consumption rates in government guidance documents include data from nonconsumers. Again, this may be appropriate for some study questions, but produces lower consumption rate averages and percentiles. For example, the USEPA estimated daily fish consumption, converted to uncooked weight, based on the U.S. Department of Agriculture's (USDA) combined 1994–1996 and 1998 Continuing Survey of Food Intakes by Individuals (CSFII) (Table II).[22] Data were presented for consumers and nonconsumers, referring to people who did or did not consume fish during the two-day survey period. USEPA[2] recommends that "[s]tates and Tribes need to ensure that the distribution is based on survey respondents who reported consuming fish because surveys based on both consumers and non-consumers typically result in median values of zero" if the survey is a dietary recall of only the previous one, two, or three days.
5. Dietary recall questionnaires for 24 or 48 hours are employed in fish consumption surveys. This means that the data likely reflect a single meal, which may not be appropriate for developing annual totals. Some parts of the American population eat fish on Fridays—what if a two-day dietary recall survey is administered on Thursday? Further, many native people follow seasonal consumption patterns. For example, the initial results from the Swinomish seafood diet interviews demonstrate that shrimp was one of several species that are primarily a seasonal food (Fig. 1 illustrates the annual Swinomish seafood cycle). Additionally, many tribal members reported eating several pounds of shrimp in one sitting because it was a treat to eat shrimp when it is in season. This also raises the matter of potential acute exposures.
6. Questionnaires may not collect accurate information from tribal members for a number of reasons. It has been confirmed that many nonrespondents from traditional fishing families said they declined to participate or

Table II. National Per-Capita Fish Consumption Summary Taken from "Uncooked Fish Consumption Estimates (Finfish and Shellfish) for Individuals Age 18 and Older" Table 4 from Section 5.1.1.1[22],[a]

Habitat	Statistic	Estimate (grams/person/day)
Freshwater/estuarine	Mean	7.50
	50th	0.00
	90th	17.37
	95th	49.59
	99th	143.35
Marine	Mean	12.41
	50th	0.00
	90th	48.92
	95th	80.68
	99th	150.77
All fish	Mean	19.91
	50th	0.00
	90th	74.79
	95th	111.35
	99th	215.70

[a]1994–1996 and 1998 U.S. Department of Agriculture's Continuing Survey of Food Intakes by Individuals (CSFII); fish consumption rates include data from nonconsumers, and marine species were not included. Estimates are based on 2-day averages. Amount of consumed fish was converted to uncooked weights.

[11]There is considerable confusion about how the CRITFC outliers were determined or what their values were, nor is there any explanation of which of these outliers were eliminated and which were included in the analyses. The report states that four outliers were excluded. However, the 4th highest datum point represents four respondents reporting equal values (486 gpd), thus either three outliers of the highest four data points (648, 778, and 972 gpd) were excluded, or a total of seven outliers were excluded if the four people reporting 486 gpd were also excluded. Confounding the confusion, other tables in the report state that up to 13 outliers were excluded. Yet another possibility is that there were four additional people who reported higher than 972 gpd rates and were excluded.

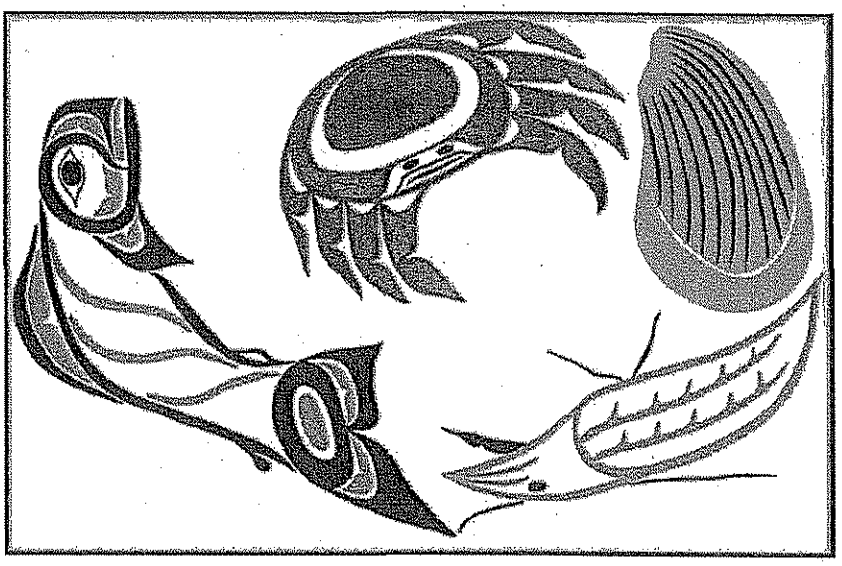

Fig. 1. The Swinomish Seafood Spiral by Swinomish Tribal member Kevin Paul. Mr. Paul, an accomplished carver and painter, painted the seasonal cycle of Swinomish seafood harvest depicting the importance of seafood in Swinomish cultural beliefs and practices. He pointed out that as the seasons flow from one to the next—interconnected and building on each other—the harvest practice spirals outward, collecting more wisdom.

may have given false information during the CRITFC study.[12] Respondents may be reluctant to provide honest answers because they do not want to be prosecuted if they say how much they eat or where they go to harvest (due to memories of personal or family arrests from historical "sting" operations). Tribal members may not respond well to demands for questionnaire data even if they are in their native language, particularly from outside entities and unfamiliar faces; decades of data appropriation and misuse have created a strong distrust of "Western" scientific research and government agencies.[23,24]

5. AN ALTERNATIVE TO FISH CONSUMPTION SURVEYS

5.1. The Swinomish Approach to Investigating Contemporary Consumption Rates

Conventional survey techniques are often not applicable in native communities. For example, oral interviews are recommended in lieu of written surveys because traditional knowledge transfer pathways are primarily oral. Yet simply converting the written questions to oral ones does not solve the problem; there is more to the process than making a few tribal-specific modifications to a conventional survey instrument or translating it into another language. When researchers try to include traditional knowledge in regulatory science, such as for use in a standardized risk assessment framework, they encounter difficulties because words, definitions, or ideas differ or do not exist in one or the other knowledge system.[25,26] These issues can be addressed, in part, by fostering a strong, communicative relationship, based on the principles of meaningful consultation, in which all players come to the table and have equal parts in the decision-making process.[12] Valid, repeatable, and defensible research methods can be created and agreed upon by all parties,[27] and the tribe(s) must be able to retain control over the data.[25] Scientifically sound "Rules of Evidence" must be followed: that data and conclusions can be cross-checked via multiple sources; that the methods are reliable and repeatable; and that each assumption is validated and uncertainty is addressed. Equally important, those asking the questions must establish cultural credibility by receiving true informed consent and being familiar with the community in order to understand the local knowledge system. More often than not, the most appropriate entities to carry out such work are the tribes themselves.

In 2002, the Swinomish Indian Tribal Community (Swinomish) initiated a study of bioaccumulative toxics in locally harvested species of clams and Dungeness crabs. For the risk assessments, Swinomish initially intended to use a combination of fish consumption rates from neighboring tribes: the Tulalip and Squaxin Island survey[10] and the Suquamish survey.[11] Once the project was underway, analyses of these tribal fish consumption surveys found that species eaten, preparation methods, and even harvesting seasons represented a few of the many differences between Swinomish and the other tribes.

Table III. Swinomish Seafood Diet Interview Template

- Species consumed currently and historically, changes, if any, and if so, why
- Perceptions of historic vs. current consumption rates, changes, if any, and if so, why
- Seasonal patterns of consumption
- Harvest, preparation, and preservation procedures used currently and historically, changes, if any, and if so, why (baked, smoked, canned, fried, etc.)
- Use of seafood currently and historically, changes, if any, and if so, why (e.g., ceremonial use, community gatherings, teething, educational purposes)
- Location and mode of acquiring food (e.g., gifted from relations and/or friends including the tribal distribution, purchased from docks, purchased at grocery store, restaurants)
- Specific changes in consumption over time (e.g., lost access to gathering sites due to property rights issues; lost access to/have refrained from gathering at sites due to contamination and resulting beach closures/bans; depletion of resources and/or resources habitat)
- Desire to eat more seafood/increase consumption if could?
- Questions to determine whether the interviewee might be considered a "traditional use" consumer, including but not limited to vessel owner/manager, holder of commercial license(s), cultural practices, religious affiliation, average number of community/social events attended over the year, number of meals eaten at community gatherings over the year, time spent fishing or clamming, etc.; asking other community members for who might be "traditional use" consumers also important for multiple lines of evidence
- Impressions of the health of seafood in Puget Sound in general and where obtained information, if have any (e.g., news reports, from friends, first-hand accounts, etc.); pollution perceptions: Has the perceived health of the seafood affected the decision to harvest and/or consume seafood?

Coupled with the desire to rectify some of the shortcomings of conventional surveys as described in this article, Swinomish decided to develop an alternative methodology, called "seafood diet interviews." The purpose of the seafood diet interviews is to develop a "fish basket" with amounts of various species of fish and shellfish that reflects traditional subsistence and average consumer rate data. These data are then coupled with consumption data of presuppression heritage rates, such as during the time when local Treaties were signed (see Section 5.2). The results are designed to evaluate risks for each diet: an average current diet, a current traditional subsistence diet, and a presuppression heritage diet, so that three questions could be answered: (1) What are the risks to people today with current, suppressed fish consumption rates? (2) What are the risks to people today who eat traditional subsistence diets with higher consumption rates? and (3) How do today's traditional subsistence rates compare to the heritage rates? These estimates may overlap, with some contemporary people eating at heritage rates. The Swinomish seafood diet interview methods are summarized below.

Swinomish established an advisory board of university and tribal experts to help guide the seafood diet interview process. A professional ethnographer trained Swinomish community members to conduct the interviews. The open-ended, oral interview questions (Table III) allowed for data collection in a manner much more amenable to determining fish consumption rates for a range of consumers, the traditional subsistence subset—the posited highest consumers. Conventional survey questionnaires ask numerically based, closed questions about portion size and number of servings within a specific timeframe, yet leave no room for other information. Important data and dialogue are lost, such as how seafood is obtained, preserved, and eaten, how portion size or number of servings has changed over time, whether the current quantity and frequency of fish consumption is at a desirable level, and if not, why the current rates are not desirable, what a desirable rate is, and why. Data elucidating the reasons driving current fish consumption levels and changes over time, as well as gauging the desired fish consumption levels, are key data required to accurately interpret tribal fish consumption rates for use in decision making.

5.2. Multidisciplinary Reconstruction of Heritage Rates

The original subsistence heritage rates that Native people formerly consumed are much higher than current fish consumption rates.[28,29] The heritage rates are part of Native culture and aboriginal rights, and often represent the rates that tribes desire to consume. Heritage rates reflect the goals for recovering traditional healthy diets. It is important to think of heritage rates not only as in the past, but also as future, desired rates for tribes, particularly in regulatory decision-making media. More to the point, when contemporary, suppressed rates are used in regulatory actions, such as remediating contamination or setting water quality standards, the result is a

maximum consumption value that may be safe to harvest and consume in perpetuity, effectively restricting tribes from ever achieving their desired traditional subsistence consumption rates in the future.

In order to determine the risks to people who may consume traditional subsistence diets with higher consumption rates, a different approach than the fish consumption survey is needed. Over the past decade, an approach that combines ethno-historical, nutritional, ecological, and biomedical information, and that follows scientific rules of evidence and rules of informed cultural consent and participation has been developed. These methods allow for reconstruction of original diets and lifestyles specific to ecological regions.[12] Calorically complete diets specific to individual eco-regions have been developed for several tribes, including fish intakes. Advisory boards of tribal and university experts in the regional ecological and anthropological literature are established for each case. This is a literature exercise, with tribal advice on which experts and literature reflect indigenous knowledge most accurately. This process provides accurate information on traditional subsistence intakes that complements the ethnographic and meaningful consultation methods for accurate contemporary intakes.

6. TYING IT ALL TOGETHER: THE BIGGER PICTURE OF RISK ASSESSMENT

The issue of fish consumption rates has been used here as one example where some of the current shortfalls in risk assessment can be recognized and amended. Many of the issues raised here are germane to more than determining fish consumption rates; in many cases Native American exposures and risks are distinct from those of the "average American."[30] Yet when tribes are considered as a single homogeneous vulnerable subpopulation outside of the normal distribution, then the traditional consumers within the tribal population are considered outliers and are underassessed or not included at all. The people who are not protected are the most likely to be at the highest risk. Although improvements to data collection and analyses methods have been recommended here, most of the current regulatory standards are not equipped to accommodate these changes. New policies and standards are needed to ensure the protection of vulnerable populations without imposing the burden of risk avoidance on those populations. It is unacceptable to protect the average person and expect the vulnerable groups to provide the additional needed protection themselves.

While the creation and use of more appropriate evaluation tools begin to address the many shortcomings in the current risk assessment framework for Native Americans, they do not resolve all the issues regarding the determination and protection of tribal health. Rather, a public health approach that includes all facets of health—physical, mental, environmental, cultural—comes closer to truly meeting the needs of Native communities. Until such a paradigm shift occurs, the recommendations made in this article are useful for determining contemporary, suppressed tribal fish consumption rates.

[12]The project, Regional Tribal Exposure Scenarios Based on Major Ecological Zones and Traditional Subsistence Lifestyles, provides more information (Grant Number 2000-STAR-J1-R831046). See http://www.hhs.oregonstate.edu/ph/tribal-grant/index.html.

DISCLAIMER

The material presented in this article represents the opinions of the authors and does not necessarily reflect official Tribal policies.

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COMPARATIVE STATEMENT OF NEW BUDGET AUTHORITY FY 2011

[Amounts in thousands]

	FY 2010 Enacted	FY 2011 Request	FY 2011 This Bill	This Bill vs Enacted	This Bill vs Request
TITLE I—DEPARTMENT OF COMMERCE					
International Trade Administration					
Operations and administration	456,204	543,704	514,204	+58,000	−29,500
Offsetting fee collections	−9,439	−9,439	−9,439		
Direct appropriation	446,765	534,265	504,765	+58,000	−29,500
Bureau of Industry and Security					
Operations and administration	85,575	81,106	78,295	−7,280	−2,811
CWC enforcement	14,767	32,000	31,680	+16,913	−320
Total, Bureau of Industry and Security	100,342	113,106	109,975	+9,633	−3,131
Economic Development Administration					
Economic development assistance programs	255,000	246,000	277,000	+22,000	+31,000
Emergency appropriations (Public Law 111–212)	54,000			−54,000	
Subtotal	309,000	246,000	277,000	−32,000	+31,000
Salaries and expenses	38,000	40,181	40,181	+2,181	
Total, Economic Development Administration	347,000	286,181	317,181	−29,819	+31,000
Minority business development	31,500	32,316	32,316	+816	
Economic and Statistical Analysis	97,255	113,200	110,000	+12,745	−3,200
Bureau of the Census					
Salaries and expenses	259,024	280,364	271,364	+12,340	−9,000
Periodic censuses and programs	7,065,707	986,359	964,059	−6,101,648	−22,300
Acquisition workforce capacity and capabilities		256			−256
Rescission (Public Law 111–224)	−129,000			+129,000	
Subtotal	6,936,707	986,615	964,059	−5,972,648	−22,556
Total, Bureau of the Census	7,195,731	1,266,979	1,235,423	−5,960,308	−31,556
National Telecommunications and Information Administration					
Salaries and expenses	19,999	21,825	41,568	+21,569	+19,743
Public telecommunications facilities, planning and construction	20,000		20,000		+20,000
Broadband technology opportunities program, administrative expenses		23,700			−23,700
Total, National Telecommunications and Information Administration	39,999	45,525	61,568	+21,569	+16,043
United States Patent and Trademark Office					
Current year fee funding	1,887,000	2,321,724	2,262,000	+375,000	−59,724
Offsetting fee collections	−1,887,000	−2,321,724	−2,262,000	−375,000	+59,724
Salaries and expenses (Public Law 111–224)	129,000			−129,000	
Total, Patent and Trademark Office	129,000			−129,000	
National Institute of Standards and Technology					
Scientific and technical research and services	515,000	584,500	541,246	+26,246	−43,254
(Transfer out)	(−9,000)	(−9,000)	(−9,000)		
Industrial technology services	194,600	209,600	204,454	+9,854	−5,146
Manufacturing Extension Partnerships	(124,700)	(129,700)	(124,700)		(−5,000)
Technology Innovation Program	(69,900)	(79,900)	(69,900)		(−10,000)
Baldridge Performance Excellence Program			(9,854)	(+9,854)	(+9,854)
Construction of research facilities	147,000	124,800	132,000	−15,000	+7,200
Working capital fund (by transfer)	(9,000)	(9,000)	(9,000)		
Total, National Institute of Standards and Technology	856,600	918,900	877,700	+21,100	−41,200
National Oceanic and Atmospheric Administration					
Operations, research, and facilities	3,305,178	3,301,173	3,475,460	+170,282	+174,287
Emergency appropriations (Public Law 111–212)	25,000			−25,000	
(by transfer)	(104,600)	(104,600)	(68,000)	(−36,600)	(−36,600)
Promote and Develop Fund (transfer out)	(−104,600)	(−104,600)	(−68,000)	(+36,600)	(+36,600)
Acquisition workforce capacity and capabilities		1,908			−1,908
Coastal zone management transfer	3,000		3,000		+3,000
Subtotal	3,333,178	3,303,081	3,478,460	+145,282	+175,379
Procurement, acquisition and construction	1,358,353	2,184,091	2,002,219	+643,866	−181,872
Rescission of emergency funding (Public Law 111–212)	−26,000			+26,000	
Subtotal	1,332,353	2,184,091	2,002,219	+669,866	−181,872
Pacific coastal salmon recovery	80,000	65,000	80,000		+15,000
Fisheries disaster relief (emergency) (Public Law 111–212)	26,000			−26,000	
Fishermen's contingency fund		350	250	+250	−100
Coastal zone management fund	−3,000	−1,000	−1,000	+2,000	
Fisheries finance program account	−6,000	−8,001	−8,001	−2,001	
Total, National Oceanic and Atmospheric Administration	4,762,531	5,543,521	5,551,928	+789,397	+8,407
Departmental Management					
Salaries and expenses	58,000	65,248	64,595	+6,595	−653
Acquisition workforce capacity and capabilities		1,378			−1,378
Subtotal	58,000	66,626	64,595	+6,595	−2,031
Renovation and modernization	22,500	17,487	5,000	−17,500	−12,487
Office of Inspector General	27,000	29,394	29,394	+2,394	
Total, Departmental Management	107,500	113,507	98,989	−8,511	−14,518
Total, title I, Department of Commerce	14,114,223	8,967,500	8,899,845	−5,214,378	−67,655
Appropriations	(14,164,223)	(8,967,500)	(8,899,845)	(−5,264,378)	(−67,655)
Rescissions	(−129,000)			(+129,000)	
Emergency appropriations	(105,000)			(−105,000)	
Rescissions of emergency funding	(−26,000)			(+26,000)	
(By transfer)	(113,600)	(113,600)	(77,000)	(−36,600)	(−36,600)
(Transfer out)	(−113,600)	(−113,600)	(−77,000)	(+36,600)	(+36,600)