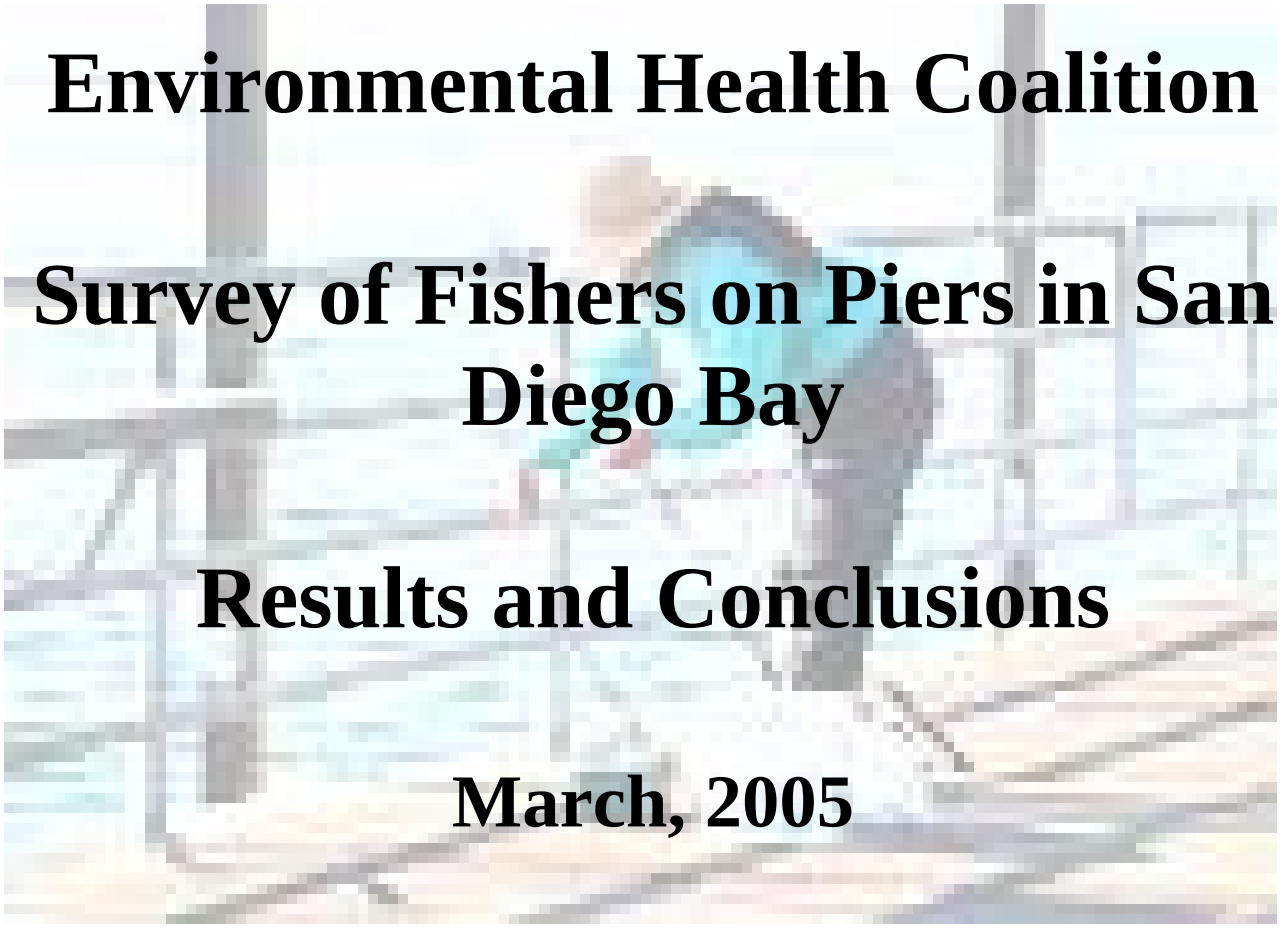

# Environmental Health Coalition

# Survey of Fishers on Piers in San Diego Bay

# Results and Conclusions

## March, 2005

***Executive Summary***

The study establishes that a significant subset of San Diego Bay fishers regularly catch and eat fish from the piers near contaminated areas of the Bay. Environmental Health Coalition (EHC), a nonprofit environmental justice organization, has long been concerned about contaminated sediments in San Diego Bay and the possibility that disproportionate health impacts of the contamination are borne by the low-income communities of color that catch and eat fish from the Bay. Previous studies of fish contamination in San Diego Bay did not adequately explore the fish consumption patterns of people who consume fish at subsistence-level rates and did not assess the health risks associated with consumption of portions of a fish other than the fillet. EHC conducted a survey of people fishing from piers near areas where contaminated sediments have been found in San Diego Bay. A total of 109 fishers were interviewed in English, Spanish, or Tagalog as appropriate, during the winter and spring of 2004. Piers surveyed included Convention Center pier (downtown), Pepper Park pier (National City), and the Chula Vista pier. 96% of the fishers (57% Latino, 39% Filipino) were people of color. 58% of the surveyed fishers fish at least once a week and 25% fish daily. Almost two thirds of the fishers eat their catch. 41% of the children of fishers eat the fish as well. Fish were prepared in a variety of methods including those that maximize exposure to contaminants. The survey group represents an opportunity sample of fishers from South Bay piers; it is not a randomized sample. The survey results demonstrate a compelling reason for environmental regulators to take swift and protective action to cleanup San Diego Bay's toxic sediments.

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Environmental Health Coalition is a private, non-profit organization founded in 1980 with offices in San Diego and Tijuana. EHC is dedicated to environmental and social justice. We believe that justice is achieved when empowered communities act together to make social change. We organize and advocate to protect public health and the environment threatened by toxic pollution. EHC supports efforts that create a just society and foster a healthy and sustainable quality of life.

# Introduction

Environmental Health Coalition's Clean Bay Campaign was established in 1987 in response to data that found high levels of dangerous chemicals in the shellfish of San Diego Bay. Since then multiple studies have documented elevated levels of toxic chemicals in fish and shellfish in the Bay. For almost two decades, EHC has advocated for the clean up of contaminated sediment sites in the Bay, for reevaluation of health risks of eating fish from the Bay, and for appropriate health warnings to advise community members of these risks.

As an environmental justice organization, EHC is very concerned about communities of color and low-income communities that rely on "subsistence fishing." While there is no standard definition of subsistence fishing, it can be generally used to describe local, non-commercial fishing oriented primarily for the procurement of fish for consumption by the fishers, their families, and community. To date, the limited studies of the health risks of eating Bay fish have suffered from significant flaws and data gaps and have not specifically addressed the risks to subsistence-level fishers. One study, the 1990 *San Diego Bay Fish Health Risk Study*, makes a passing reference to subsistence-level fishers stating that if fish (especially Barred or Spotted Sand Bass) were to be consumed at subsistence rates of 165 grams per day (5.8 oz) it"*…may present a potential adverse health risk to adult consumers….*"[i] This study also concluded that risks, even at their estimated average rates of 31.2 g/day (1.1 oz) *"could potentially be significant to an unborn child, through ingestion of contaminated fish by pregnant women, or to a young child.*[ii] However, generally when human health risk studies have been done for consumers of Bay fish, the methodologies used have consistently underestimated exposure rates and risks to frequent consumers.

Ecological and human health risks are a significant issue related to the clean up of San Diego Bay's contaminated sediments at commercial shipyards (NASSCO and Southwest Marine) and the Naval Station. EHC conducted this community survey in order to obtain basic information about fishing off piers near the shipyards and Navy base and in the south end of the bay to ensure the interests of this population were considered in the decision-making process.

## Methods

EHC surveyed a total of 109 people fishing from the Convention Center, Pepper Park, and Chula Vista fishing piers. A total of ten surveys were completed at the Convention Center pier, 79 at Pepper Park pier, and 20 at the Chula Vista pier during the winter and spring months of 2004. The questionnaire was developed by EHC staff and pilot-tested for clarity. An EHC community organizer administered the survey orally, along with associates who were fluent in Tagalog, Spanish, or English as required. Each survey took approximately 7-10 minutes to administer. Survey data was then entered into an Excel spreadsheet, and analysis was done using Statistical Package for the Social Sciences software, Version 9. The survey questionnaire is attached.

## Results

The survey population of 109 fishers was primarily people of Latino or Filipino descent, with smaller numbers of Native American, African American, and European Americans. Many surveyed fishers were from the South Bay area, including the Logan area of San Diego, National City, Chula Vista, Bonita, Spring Valley, and Tijuana. The survey group represents an opportunity sample of fishers from South Bay piers; it is not a randomized sample.

**Who is fishing? How often are they fishing? Where do they live?**
Of 109 fishers surveyed:

- 39% were Filipino
  - 58% fish daily or almost daily (4 to 7 times per week)
  - 40% of the Filipino fishers fish weekly
- 57% were Latino
  - 3% of Latino fishers fish daily or almost daily (4 to 7 times per week) and
  - 23% fish weekly
- 4% Other. (Other ethnic groups were too small to be tabulated separately)

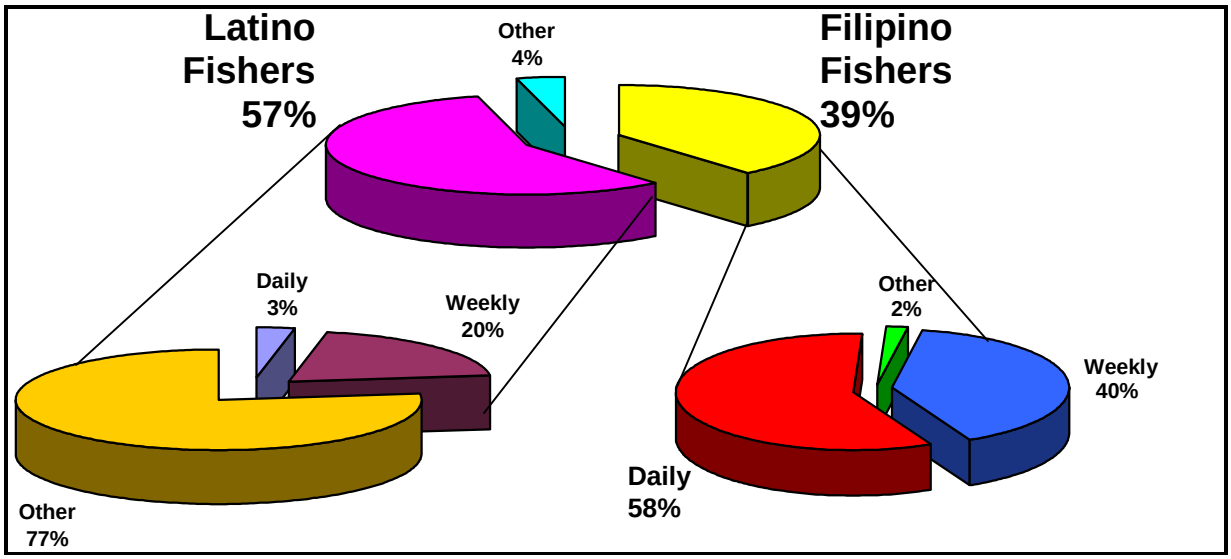
Of all of the fishers surveyed:

- 25% fish daily or almost daily (4 to 7 times a week)
- 31% fish weekly

Of all of the fishers surveyed:

- 87% of surveyed fishers supplied an address or zip code
  - 83% live in EHC target communities such as National City (59%), Barrio Logan (14%), and Western Chula Vista and Imperial Beach (10%)
- 7% live in Tijuana, Mexico

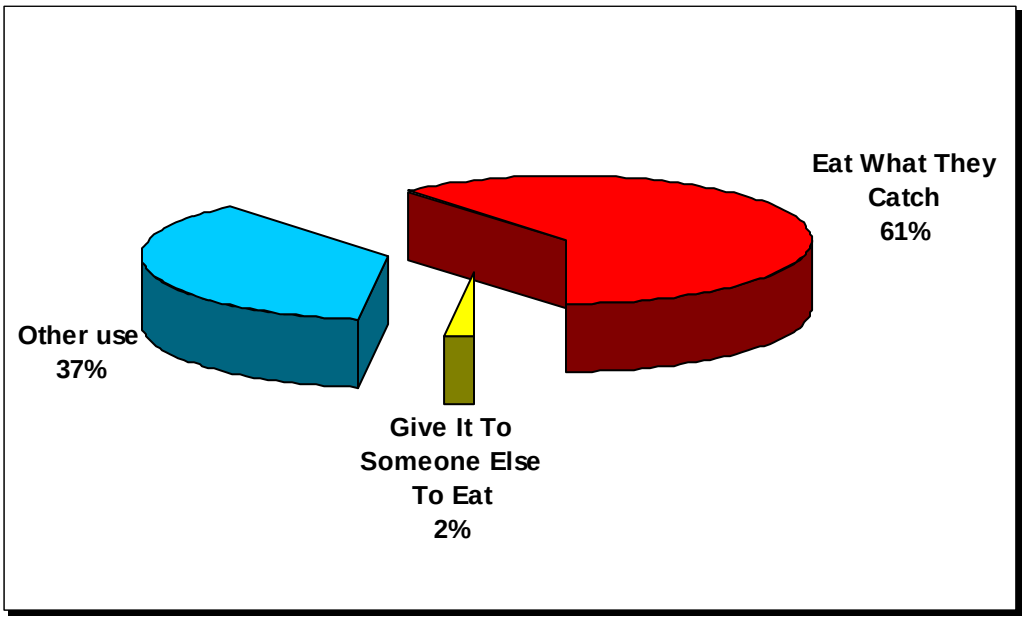
**FREQUENCY AND ETHNICITY**



**Are people eating the fish they catch?**

- 61% of fishers eat the fish they catch
- 2% give it away for someone else to eat
- 73% of fishers eat other types of seafood in addition to what they catch.

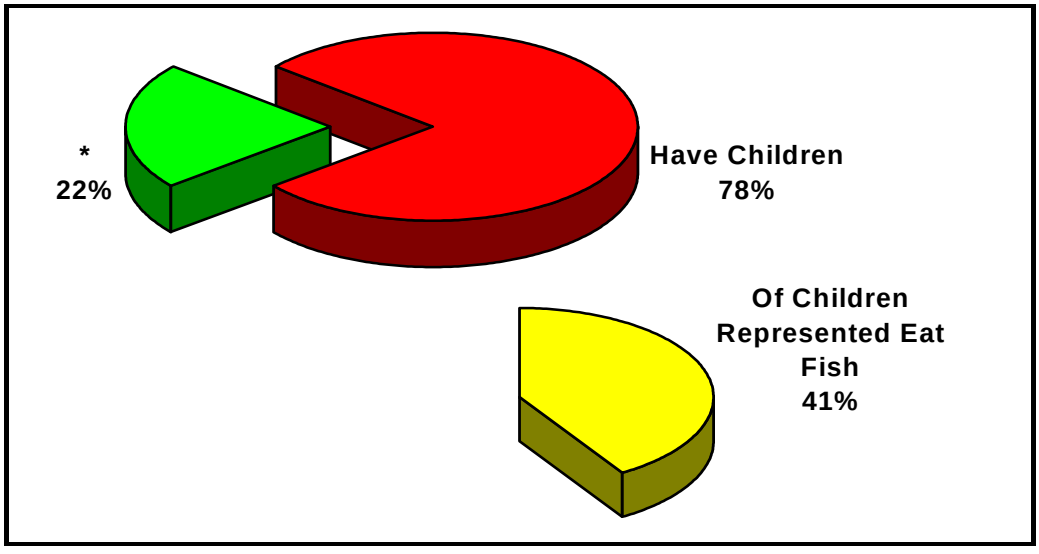
**CONSUMPTION**




**Do they have children and are they eating the fish?**

- 78% have children with an average of two.
- 41% of the 209 children represented in this survey eat fish caught from the Bay.

**PRESENCE OF CHILDREN AMONG PIER FISHERS**



## Discussion and Conclusions

Our survey group is a selective sample that is highly exposed to fish from near the shipyards, Naval Station, and the southern portion of San Diego Bay. It is not a representative sample of all San Diego Bay fishers or all South Bay residents. The survey assumed income based on place of residence and they appear to be engaged in subsistence fishing. The number of fishers found at the three piers establishes that subsistence pier fishing is a common practice and may be thought of as a subculture rather than an isolated hobby of a few individuals.

**Method of consumption can impact exposure rates**

It is well documented that the manner of food preparation and the consumption of different parts of a fish can contribute to increased exposure to contaminants in the fish.[iii] For example, stewing and frying are known to elevate exposure rates as opposed to broiling or grilling. While mercury does collect in the fillets or muscle tissue of fish, many contaminants collect in the fatty tissues like the skin and in organs. For this reason, people who consume whole fish, organs, or skin of the fish, can increase their exposure levels. Our survey also establishes that fish are not always filleted. 13% of our sample reported eating fish skin, among them people who fish frequently and who catch large amounts of fish. A health-conservative estimation of the exposure to fish contaminants must assume that whole fish is eaten. EHC's study supports the findings of the 1990 County Fish Health Risk Study that found that 40% of Filipinos and Asians consume the entire fish as compared to 5.6% of Caucasians.[iv]

**Common cultural practices for fish consumption[1]**

- *Fish is a traditional staple of a Filipino diet.*
- *Many traditional recipes call for steaming, stewing, or frying of the fish.*
- *Traditional consumption patterns include whole fish as opposed to fillets only.*
- *The Philippine Department of Science and Technology recommends when fish is consumed for protein, a normal adult needs three servings a day; babies 6 to 12 months need one serving a day (equivalent to a medium-size fish, 16 centimeters long).*

**Children, the unborn, and frequent consumers are at highest-risk**

Contamination in fish consumed by pregnant or breast-feeding women can put their children at higher risk to health impacts. Most at risk is the developing fetus. As reported by USEPA, new research has shown that "cord blood" (blood in the umbilical cord) concentrates mercury by 70% above the level in the maternal blood. This means that mercury concentrations in the mother's blood can be expected to be 70% higher in the fetus.[v] The EPA estimates that one in every six children born in the United States -about 630,000 children annually- is exposed in the womb to mercury levels that exceed the current safety level.[vi] This places children at risk for a loss of IQ, learning disabilities, and other cognitive impairments. Children are more susceptible to contaminants that affect the nervous system because their brains are developing. Scientists who study mercury are finding subtle damage to the brain at lower and lower levels of exposure.[vii] Another concern is that damage caused by mercury is permanent. PCBs have also been linked to developmental problems in children at very low exposures.[viii]

It has also been demonstrated that mercury exposures are higher among women who eat fish and higher among Asians and people of Pacific Islander background. Blood mercury concentrations were seven times higher among women who reported eating fish two or more times a week in the past 30 days compared to non-fish eaters.[ix]

This survey provides the first San Diego Bay-specific data on subsistence fishing. It confirms that estimates of the quantities of fish eaten by subsistence fishers in other places could also apply here. The frequency of fishing and fish eating in our survey population is very different than that of statistically average Americans and may reach the 161-165 grams per day (5.8 oz) level, which is a level of higher, or "subsistence" consumption.

**Cumulative Impacts, Exposures, and Risks should be considered in regulatory decisions**

Many of the surveyed fishers live in Barrio Logan, Sherman Heights, Logan Heights, National City, and Tijuana. These communities are low income and suffer from a disproportionate burden of toxic exposure. According to the 2000 Census, 35% of families in the Logan area of San Diego have incomes below the federal poverty level. In National City, 20% of families live below the federal poverty level. No comparable census numbers exist for Tijuana, however, we know that 67% of homes have dirt floors, 66% of homes do not have piped water,[x] and two adults employed full-time in the maquiladora industry cover only 2/3 of the basic needs of a family of four in Tijuana.[xi]

These communities are also the most heavily burdened with toxic exposures in the area. Among the co-risk factors of these communities, as detailed in other EHC research, are the highest lead contamination in housing stock, highest cancer, reproductive, respiratory risks from air contaminants, presence of toxic waste sites and toxic emitting industries, and high poverty rates. These co-exposure rates necessitate additional, more protective actions to respond to the high cumulative burdens of these community residents and should be reflected in regulatory findings and decision-making by local environmental regulators.

In conclusion, our survey provides evidence that a subpopulation of San Diego County residents engages in subsistence fishing off of piers near the shipyards and contaminated areas in San Diego Bay. Among this subpopulation are individuals who fish daily, who catch an average of 1.7 fish but have been recorded to catch up to 20 fish at a time, cook the fish and eat fish parts that maximize their exposure to contaminants, and who feed the fish caught in the Bay to their children and families. These results suggest that, at the high end of the exposure continuum, a subset of fishers and their children may be eating fish once to several times weekly, eating relatively large amounts, and eating other seafood as well. The results also suggest that the method of fish preparation can increase exposure. They also live in communities that already bear a disproportionate burden of toxic exposure.

**Recently adopted measures by State of California support action to protect impacted Communities such as those identified in this survey**

On February 16, 2005, the California Environmental Protection Agency (Cal EPA) Interagency Working Group, consisting of the Cal EPA Secretary and the heads of all Boards, Departments, and Offices, adopted guidelines that incorporate cumulative impacts assessment and precautionary approach methods to direct their work. This policy foundation is key to ensuring that disproportionately impacted communities, like those documented in the survey, are afforded equitable protection through the regulatory process. The newly adopted definitions that will be used to guide future work are:

**Precautionary Approach** means taking anticipatory action to protect public health or the environment if a reasonable threat of serious harm exists based upon the best available science and other relevant information, even if absolute and undisputed scientific evidence is not available to assess the exact nature and extent of risk.

**Cumulative Impacts** means exposures, public health or environmental effects from combined emissions and discharges, in a geographic area, including environmental pollution from all sources, whether single or multi-media, routinely, accidentally, or otherwise released. Impacts take into account sensitive populations and socioeconomic factors, where applicable and to the extent data are available.

## Environmental Health Coalition Recommendations

Several decisions will soon be made regarding sediment cleanup in San Diego Bay. Environmental justice demands that additional considerations are required in order to protect the communities that fish and consume fish from the Bay. All decisions made regarding cleanup, remediation, and permitting of additional discharges to the Bay must be made in the context of protecting the health of the most exposed and the most vulnerable communities.

As a result of this study, EHC proposes the following recommendations be pursued:

1. The Regional Water Quality Control Board should follow Cal EPA guidelines for precautionary approach and cumulative impacts and require clean up to background levels for remediation of toxic sediments in San Diego Bay at the commercial shipyards, NASSCO and Southwest Marine, and for cleanup efforts at Navy bases such as Naval Station.

2. The State Water Resources Control Board should adopt protective sediment quality objectives for all the sediments in the State.

3. The County Department of Health Services and the Port District should revise the Fish Consumption Warning for San Diego Bay based on higher consumption levels and update and replace fish warning signs to include Tagalog.

4. The Department of Toxic Substances Control in conjunction with the Office of Environmental Health Hazard Assessment should initiate an outreach and education program to educate fishers of the Bay of the risks of consuming Bay fish and some means to reduce them.

5. State and Federal regulators and the military should consider the environmental justice impacts in decision-making and implement precaution in budgeting, permitting, and regulatory decisions and ensure that communities that are disproportionately impacted receive quick, additional protection to off-set cumulative toxic burdens.

6. State and federal agencies with trust responsibilities for ecosystem and human health should be included in all decision-making and should actively participate in environmental and land use planning decisions that impact the safety of the food chain in San Diego Bay.

# ENDNOTES

[i] *San Diego Bay Health Risk Study*, County of San Diego, June 12, 1990; pg xxi
[ii] 1990 Health Risk Study, pg xxi
[iii] National Environmental Justice Advisory Committee (NEJAC), Fish Consumption and Environmental Justice Report, November 2002, page 34 and Memorandum from Robert K Brodberg, Ph.D., Senior Toxicologist, OEHHA to Tom Alo, San Diego Regional Water Quality Control Board, Review of the Exponent NASSCO and Southwest Marine Detailed Sediment Investigation; April 29, 2004, page 3.
[iv] 1990 Health Risk Study, page xix
[v] *Estimated Number of Newborns with In Utero Methylmercury Exposures*, slide in Methylmercury Epidemiology Update, presented by Kathryn Mahaffey, USEPA, National Forum on contaminants in Fish, San Diego, January 2004 http://www.epa.gov/waterscience/fish/forum/2004/presentations/monday/mahaffey.pdf
[vi] Mahaffey, USEPA and *Scientists worry that mercury dangers mimic deadly lead*, Joan Lowy, Scripps Howard News Service, January 26, 2005
[vii] Lowy, ibid, January 26, 2005
[viii] National Environmental Justice Advisory Committee (NEJAC), Fish Consumption and Environmental Justice Report, November 2002, page 73
[ix] EPA National Contaminants in Fish presentation, USEPA, report on the 1999-2000 NHANES Blood mercury study
[x] INEGI, XII censo general de población y vivienda, 2000. Found at http://www.ini.gob.mx/indica2000/mpo/bc4.htm. Encuesta Nacional sobre Desarrollo Institucional Municipal 2000, INEGI and INDESOL and North American Development Bank.
[xi] Ruth Rosenbaum, Making the Invisible Visible: A Study of the Purchasing Power of Maquila Workers in Mexico, CREA: Center for Reflection, Education, and Action, 2000.
[1] As reported by the Philippines Food and Nutrition Research Institute, and described by the Council of Philippine American Organizations of San Diego County and the Fish Consumption and Environmental Justice Report of the EPA's National Environmental Justice Advisory Council.

**SUMMARY OF SELECTED STUDIES AND ANALYSIS RELATED TO TOXIC CONTAMINATION IN SAN DIEGO BAY FISH AND SEDIMENTS AND HUMAN HEALTH RISKS**

**Detailed Sediment Investigation NASSCO and Southwest Marine Shipyards, Public Workshop presentation materials, Exponent Technical Report, Phase 2 Human Health Risk Assessment, November 14, 2003**

Tissue concentrations in fillets in fish examined in the study were as high as 400 ppb for PCBs. The Tissue Residue Guideline (TRG) is 20 ppb for PCBs. Mercury levels in lobster edible tissues were 521 ppb. Mercury levels in Spotted Sand Bass fillets (210-215 ppb) were close to the TRG of 300 ppb. In a detailed letter from the Office of Environmental Health Hazard Assessment (OEHHA) commenting on this Exponent Study, Dr. Robert Brodberg re-calculated the risks to fishers using the same data provided by Exponent but making more protective assumptions. The memo states, *"Some risks and hazards from this scenario are high and suggest that remediation is in order. Risks for some subsistence consumers might be three or more times higher than shown in my tables if they prepare and consume whole body fish."* Dr. Brodberg also noted that Exponent had failed to analyze health risks to subsistence fishers in or near the leaseholds. *(Memorandum from Robert K Brodberg, Ph.D., Senior Toxicologist, OEHHA to Tom Alo, San Diego Regional Water Quality Control Board, Review of the Exponent NASSCO and Southwest Marine Detailed Sediment Investigation; April 29, 2004.)*

***Necropsy and Histopathology of Spotted Sea Bass Sampled from San Diego Harbor*; Dr. Gary Marty, Included in the Exponent Detailed Sediment Investigation; September, 2003 and NOAA comment letter on this study.**

The comment letter submitted by NOAA on this study stated that the data showed a significant *"…contamination-associated effect that appears to moderately to severely affect approximately 12 to 20% of fish from inside the shipyard sites. Data indicate that fish collected from the reference site were only mildly affected."* Indicators of impaired reproduction were found to be higher inside the shipyard sites than those at the references. *"Approximately 5-12% of the collected fish were affected, and the only severe cases were seen in fish from inside the shipyard sites."* Liver, gonad, and kidney lesions were distinct enough to separate fish from the contaminated areas and the reference area. The letter also points out that, *"Based on NOAA's review of the histopathology report, it is clear that the authors of the Exponent report have been selective and have not fully reported Marty's findings and data from the appendices in Marty's report.* The letter goes on to detail numerous types of lesions found with higher scores at the 'inside' shipyard sites. It also calls into question the appropriateness of the reference site used for comparison. *(Letter from Denise Klimas, Coastal Resources Coordinator, NOAA to Mr. Tom Alo, Regional Water Quality Control Board, dated April 20, 2004.)*

**Human Health Risk Assessment for Mercury in Fish from Mission Bay and San Diego Bay, California, Master Thesis, Meredith F. Knobler, Summer, 1998**

Study documented elevated levels of mercury in San Diego Bay fish tissue at levels as high as 0.72 ppm (720 ppb). Both Barred and Spotted Sand Bass exceeded the TRG for mercury in samples found in San Diego Bay. Health hazard indices indicate that there may be a health risk due to consumption of fish from San Diego and Mission Bays, however, overall levels of mercury contamination were lower in fish from Mission Bay in this study.

**Chemistry, Toxicity, and Benthic Community Conditions in Sediments of the San Diego Bay region; September 1996, State Water Resources Control Board, et al.**

An extensive scientific assessment of San Diego Bay sediments found widespread contamination of the Bay sediments with mercury, copper, zinc, PAH, chlordane, and PCBs. Over 56% of the Bay sediment was estimated to be acutely toxic to amphipods (a marine organism). As much as 72% of the area negatively impacted development of larval sea urchins. San Diego Bay ranked 7$^{th}$ highest for PCB contamination in the county and compared to other West Coast bays, it had the highest contamination of metals and hydrocarbons and was most toxic in two out of three toxicity tests.

**Risk assessment for consumption of chemically contaminated shellfish from San Diego Bay, California, Jon A. Van Rhyn, Fall, 1995**
High potential cancer and health hazard risks were estimated for various shellfish contaminated with PCBs, Arsenic, TBT, Cadmium, Benzo (b) fluoranthene, Benzo [a] pyrene, and Benzo (a) anthracene at intermediate (1.0 g/day) or high (10 g/day) consumption rates.

**Chemical Contamination and Associated Fish Diseases in San Diego Bay, Bruce McCain et al., published in Environmental Science Technology, 1992**
This study found that mean concentrations of PCBs in liver tissue and of selected aromatic compounds (e.g. aromatic hydrocarbons) and their metabolites in bile were also significantly higher in white croaker, barred sand bass, and black croaker than non-urban sites. Established link between fish diseases and contaminated sediments in San Diego Bay. Found the prevalence of liver neoplasms in black croakers the highest reported for a west coast marine species outside of Puget Sound. Relatively high prevalence of fin erosion was found in black croakers and barred sand bass in the Bay. Study indicated that sites in south and central Bay are among the most polluted sites sampled so far in the Bay. Aromatic hydrocarbons have not declined in the Bay.

**Health risk assessment of consuming arsenic-containing fish from San Diego Bay, California, Unpublished master's thesis, San Diego State University, J.R. Smith, 1991.**
Investigated total arsenic exposures from fish collected within and outside the bay. Excess carcinogenic risks at high rates of consumption found to be as high 1.93 in a 100. These are very high estimated cancer risks.

**San Diego Bay Fish Health Risk Study, prepared by the San Diego County Department of Health Services, June 12, 1990**
Found elevated levels of mercury, arsenic, and PCBs in some Bay fish. PCBs were found at levels which represent a potential elevated cancer risk when consumption rates were estimated at only 1.1 oz a day. Mercury was estimated as a potential level of concern for unborn or young children at average consumption rates and for individuals who consume fish at higher rates. PCDD/PCDFs (dioxins) were found in round stingrays in level exceeding an acceptable health risk but the concern was dismissed since the species was assumed not to be consumed. However, 18 fishers in EHC's Pier Fishers survey reported that stingray were a fish they caught. Evidence of radiation was also found in some fish and further study was recommended. Study led to the posting of San Diego Bay to limit consumption of fish by sensitive populations.

**Coastal Environmental Quality in the United States, 1990, National Oceanic and Atmospheric Administration**
San Diego Bay sediment exhibited high concentrations of cadmium, copper, lead, mercury, silver, zinc, PCB, PAH and total chlordane. On the basis of this contamination, San Diego Bay was rated as one of the most contaminated urbanized coastal areas in the nation.