

Health Consultation

F/V MAR-GUN GROUNDING

ST. GEORGE ISLAND, ALASKA

Prepared by the
Alaska Department of Health and Social Services

JULY 7, 2010

Prepared under a Cooperative Agreement with the
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

F/V MAR-GUN GROUNDING

ST. GEORGE ISLAND, ALASKA

Prepared By:

Alaska Department of Health and Social Services
Division of Public Health, Epidemiology Section
Environmental Public Health Program
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

SUMMARY

INTRODUCTION

The Environmental Public Health Program's (EPHP) top priority is to ensure that residents of St. George Island have sufficient information to safeguard their health. The Alaska Department of Environmental Conservation (DEC) asked EPHP to conduct this health consultation. The purpose of the consultation was to evaluate the public health risk of eating shellfish that may have come in contact with petroleum contaminants from a fishing vessel, the F/V Mar-Gun, that ran aground in March 2009. An unknown amount of diesel fuel spilled into the water and onto the beach. Shellfish are a subsistence resource for local residents.

CONCLUSIONS

EPHP concludes that eating shellfish (limpets, mussels, and sea urchins) harvested from the area of the oil spill is not expected to harm people's health as a result of petroleum contamination. However, harvesters should always be aware of the serious health risk of eating shellfish from unapproved beaches due to possible paralytic shellfish poisoning (PSP). PSP is a natural occurrence unrelated to the Mar-Gun grounding.

ADPH concludes that paralytic shellfish poisoning (PSP), a natural phenomenon unrelated to the *F/V Mar-Gun* grounding site, poses a serious health risk to shellfish consumers on St. George Island.

BASIS FOR DECISION

The petroleum contaminants (specifically polycyclic aromatic hydrocarbons, or PAHs) found in limpets, mussels and sea urchins were below levels of health concern, so eating them does not pose a cancer risk. The state has an ongoing advisory against the gathering and consumption of shellfish except at approved beaches. St. George Island has no approved beaches.

NEXT STEPS

To err on the side of safety, subsistence gatherers should avoid consumption of foods on which oil can be seen, smelled or tasted. Due to PSP concerns, St. George island residents should not eat shellfish from unapproved beaches.

EPHP will conduct the following outreach activities within three months of the release of this health consultation:

- Distribute this health consultation to all stakeholders;
- Conduct an informal needs assessment to identify what outreach and education efforts may be needed at this site;
- Conduct outreach and education activities as warranted by the needs assessment.

DEC will continue to issue periodic press releases to communicate their ongoing statewide advisory for PSP.

**FOR MORE
INFORMATION**

If you have concerns about the findings of this report, you should contact EPHP at (907) 269-8000. For information on the statewide advisory for PSP, contact DEC at (907) 269-7501. You can also call ATSDR at 1-800-CDC-INFO and ask for information on the F/V Mar-Gun grounding site.

Background and Statement of Issues

The 112-foot trawl vessel *F/V Mar-Gun* ran aground on the northern shoreline of St. George Island in the Pribilof Islands, Alaska in the early morning of Thursday, March 5, 2009. The Alaska Department of Environmental Conservation (ADEC), Situation Report No. 19 (ADEC, 2009a), states that an unknown amount of diesel fuel was released and that it was not believed to be a large amount. After the grounding, a shore-based lightering operation was initiated to remove the diesel fuel onboard plus other oils from the vessel.

A significant piece of the pollution threat was mitigated by the removal of nearly 19,000 gallons of mixed oils during the lightering operation. Approximately 700 gallons of diesel and 100 gallons of hydraulic oil remained on board to power the vessel generator in support of the vessel recovery operations. The final offload of fuel was conducted using a helicopter to lift filled oil drums, rather than pumping through transfer lines over the water to shore.¹

At the time of the *F/V Mar-Gun* grounding the potential for the incident to expose and contaminate subsistence foods in the vicinity of the grounding was considered. The ADEC, Situation Report No.14 (ADEC, 2009b), notes: “Shoreline Cleanup Assessment Technique (SCAT) operations were conducted on the afternoon of Sunday (March 8, 2009) during an extreme low tide with no sign of shoreline contamination observed.” The ADEC, Situation Report No. 19 (ADEC, 2009a), states that: “There have been no reports of impacted wildlife at this time.”

The site of the *F/V Mar-Gun* grounding, at Staraya Artil beach on the northern shoreline of St. George Island, is considered a subsistence food gathering location and the residents of the island expressed concerns about the potential for these resources to become contaminated and unfit for consumption due to the grounding. The spill response Unified Command of the *F/V Mar-Gun* grounding responded to these concerns immediately by posting a Subsistence Foods Consumption Safety Fact Sheet (ADEC, 2009c) for residents as a guide for subsistence users. A further investigation and analysis of potential subsistence impacts related to the *F/V Mar-Gun* grounding is the subject of this health consultation.

Representatives from the Native community, State of Alaska and federal agencies, and the Responsible Party (RP) formed a Subsistence Advisory Group to advise the spill response

¹ Cmdr. Joseph LoSciuto, deputy commander Sector Anchorage and the federal on-scene coordinator for the response, Unified Command Press Release dated March 23, 2009 (USCG, 2009)

Unified Command on subsistence issues, approve the subsistence foods sampling and analysis plan, and participate in the sampling specified by the plan². Members of this group are listed in Appendix A. The subsistence species sampled were mussels, limpets, and sea urchins depending upon their presence and availability at the sampling locations. Details regarding the sampling locations (Figure 1, *F/V Mar-Gun* grounding subsistence sample sites), sampling teams, timing of the sampling, and target species sampled are included in the *F/V Mar-Gun* Grounding, Subsistence Foods Sampling and Analysis Plan (Polaris Applied Sciences, 2009)³. Samples of the subsistence species were analyzed for polycyclic aromatic hydrocarbons (PAHs).⁴

Petroleum products can contain a mixture of hundreds of organic chemical compounds. Health concerns of exposure to oil from spills are mainly focused on polycyclic aromatic hydrocarbons (PAHs) due to the negative effects these chemical compounds can have on living things.⁵ Some PAHs have been classified as cancer causing (carcinogenic). In addition, PAHs are relatively resistant to break down in the environment (compared to other chemical compounds in oil) and can accumulate to some extent in animals in the food chain.⁶

Public Health Evaluation

The subsistence foods sampled in response to the *F/V Mar-Gun* grounding were evaluated to determine if eating the foods posed a risk to public health.⁷ Risk is defined here as the probability

² The plan was based on the sampling and analysis plan developed for the *M/V Selendang Ayu* oil spill on Unalaska Island on December 8, 2004 (Subsistence Core Group, 2005). The results of the *M/V Selendang Ayu* subsistence sampling program carried out in 2005 and an evaluation of potential public health impacts of consuming subsistence foods affected by the spill are found in a final report developed by the Alaska Division of Public Health (ADPH, 2006); and in a similar report issued for the results of subsistence sampling in 2006 by the U. S. Department of Health and Human Services, Agency for Toxic Substances and Disease Registry (ATSDR, 2008).

³ Samples of marine subsistence food resources were collected using tissue sampling methods found in the National Oceanic and Atmospheric Administration (NOAA) Natural Resource Damage Assessment (NRDA) protocols (NOAA, 1997); Puget Sound Water Quality Action Team protocols (PSWQAT, 1997); and in subsistence seafood studies conducted after the *Exxon Valdez* oil spill (Field, 1999).

⁴ The analysis was conducted using gas chromatography with mass spectrometry as per modified EPA method 8270C with PAHs plus alkylated homologs.

⁵ PAHs are found widely in the environment, and ingestion of food is the main source of PAH exposure for non-smokers of the general population. PAHs are present in cooked and smoked meats and fish, grain products, fruits, and vegetables. For smokers, smoking a pack of cigarettes a day approximately doubles PAH exposure (ATSDR, 1995).

⁶ Following the *F/V Margun* grounding, PAHs were measured in shellfish because they are non-mobile filter feeders with limited capacity to metabolize/excrete PAHs. Fish and marine mammals are much less helpful indicators of site-specific PAH contamination because they will avoid oiled areas, and they have the ability to metabolize and excrete PAHs rather than bio-accumulating them.

⁷ The risk to public health posed by subsistence foods sampled in response to the *F/V Margun* grounding was evaluated by the Alaska Division of Public Health (ADPH) in similar manner to the public health evaluations conducted for the *M/V Selendang Ayu* spill (ADPH, 2006; ATSDR, 2008).

or chance that a person will develop a disease due to exposure to a hazardous substance. The effects of exposure to any hazardous substance depend on the dose, the length of time you are exposed (duration of the exposure), how you are exposed, personal traits and habits, and whether other chemicals are present (ATSDR, 1995).

Exposure Pathways

Assessing exposure requires identifying pathways (e.g., water, food, soil, air) by which people can come in contact with chemicals in the environment – in this case, PAHs. This consult focuses on shellfish as the main route by which residents can be exposed to PAH contaminants from the ship grounding. An exposure pathway consists of the following five components: 1) a source of contamination, 2) a media, such as food, air or soil through which the contaminant is transported, 3) a point of exposure where people can contact the contaminant, 4) a route of exposure by which the contaminant enters or contacts the body, and 5) a receptor population. An exposure pathway is considered complete if all five elements are present and connected. If one of these elements is missing, then the pathway is considered incomplete, and human exposure is not possible. For residents who eat shellfish from the grounding area on St. George Island, all 5 components of the pathway are present, so the pathway is considered complete.

Evaluation of PAH dose

In this evaluation: the dose is a measure of exposure to PAHs relative to the body weight of the person exposed; the duration of the exposure is measured in years; the way people are exposed is through eating (ingesting) the subsistence foods identified (mussels, limpets, and sea urchins); the personal trait accounted for is the amount of subsistence foods consumed as measured in grams per day (g/day)⁸; and the likelihood of the PAH concentrations in the sampled subsistence foods to cause cancer (potency) is determined in relation to a known PAH carcinogen, benzo(a)pyrene (BaP).

There are more than one hundred PAH chemical compounds. BaP is thought to be one of the most potent carcinogens among the PAHs, and can be found in relatively high levels in the environment. One way to assess the carcinogenic potency of the PAH concentrations in the subsistence samples is by converting the PAH concentrations to BaP equivalents.⁹ This was done by multiplying the PAH concentrations in the subsistence samples by the BaP equivalency factors for PAHs in Table 1.¹⁰ For each sample, the carcinogenic potency of each PAH compound was expressed relative to BaP and then summed for an overall estimate of BaP-like activity. PAHs that were not detected were assigned a value of zero.

⁸ 1994 Alaska Department of Fish and Game (ADFG) seafood ingestion rates used in the ADPH (2006) health evaluation of subsistence foods collected in response to the *M/V Selendang Ayu* spill.

⁹ Each subsistence sample analyzed for PAH's was evaluated for its overall carcinogenic potency by calculating benzo (a) pyrene equivalents as done previously for the *M/V Selendang Ayu*, *Exxon Valdez*, *M/V Kuroshima*, and New Carissa (Coos Bay, Oregon) oil spills.

¹⁰ The California Environmental Protection Agency (CA EPA, 2002) has established BaP Potency Equivalency Factors for 21 PAHs/derivatives (6); the seven that were analyzed for in this project are shown in Table 1.

Table 1. Benzo(a)pyrene Potency Equivalency Factors for polycyclic aromatic hydrocarbons

Compound	BaP equivalent
Benzo(a)pyrene	1.0
Benz(a)anthracene	0.1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.1
Chrysene	0.01
Dibenzo(a,h)anthracene	1.0
Indeno[1,2,3-cd]pyrene	0.1

*Source: CA EPA, 2002

The risk that a certain concentration of carcinogenic PAHs (i.e., BaP equivalents) found in a subsistence food sample will have an adverse health effect is evaluated by establishing risk-based screening criteria for the subsistence foods. The risk-based screening criteria take into account variables such as the identity of the person eating the subsistence food (for example, adult or child), the amount of the food the person eats per day (consumption rate), the time over which the person will regularly consume the food (for example, months or years), the weight of the person, and other variables, all of which are important in making a determination of whether the subsistence foods sampled are reasonably safe to consume.

The risk-based screening criteria were calculated using the following formula and the standard assumptions in Table 2, as follows:

$$\text{Risk-based screening criteria } (\mu\text{g/kg}) = \text{RL} \times \text{BW} \times \text{AT} \times \text{CF}_1 \times \text{CF}_2 / (\text{SF} \times \text{ED} \times \text{CR})$$

Table 2. Input variables for risk-based screening criteria.

RL	Acceptable risk level ^a	1.0E-06	
BW	Body weight, adult ^b	70	kg
AT	Averaging time ^c	70	years
CF ₁	Conversion factor	1000	ug/mg
CF ₂	Conversion factor	1000	g/kg
SF	USEPA slope factor	7.3	(1/mg/kg-day)
ED	Exposure duration ^d	3	years
CR	Consumption rate	see Table 3	g/day

^aU.S. EPA's risk management range for excess cancer risk above background is one-in-one-million (10⁻⁶) to one-in-ten thousand (10⁻⁴) (7). 10⁻⁶ excess cancer risk equates to one excess cancer in a population of one million people. This is a theoretical estimate that is based on very conservative mathematical calculations. The true risk could be much lower, even zero. To put this in perspective, for the United States it is estimated that men have an almost 1 in 2 lifetime risk of developing cancer and females have about a 1 in 3 lifetime risk (8).

^bStandard default for adult body weight (7)

^cStandard default for life expectancy (7)

^dEstimated maximum residence time for oil (Bolger et al., 1996; Gilroy, 2000), estimated residence time for PAHs in bivalves is less than two weeks (Rantamaki, 1997).

The risk-based screening criterion (concentration) for a specific type of subsistence food is compared to the concentration of PAHs (i.e., BaP equivalents) detected in the sampled

subsistence food. If the concentration of carcinogenic PAHs (i.e., BaP equivalents) detected in the sampled subsistence food is lower than the risk-based screening concentration for that subsistence food, then the risk of developing cancer from the consumption of that subsistence food is negligible. If the concentration of carcinogenic PAHs (i.e., BaP equivalents) detected in the sampled subsistence food is higher than the risk-based screening concentration for that subsistence food then there may be a slight risk of cancer from the consumption of the subsistence food, and further evaluation is warranted.

A conservative approach was applied in selecting the consumption rates used in calculating the risk-based screening criteria for each subsistence food. Subsistence consumption data collected in surveys conducted by the Alaska Department of Fish and Game (ADF&G), Division of Subsistence in the Pribilof Islands and on Unalaska Island (ADF&G, 1994) was used to calculate the risk-based screening criteria in Table 3. The consumption rate for a particular subsistence food was based on the highest rate of consumption identified for that food on any of the three islands (St Paul, St George and Unalaska). The result is risk-based screening criteria (concentrations) that are more sensitive in identifying potential cancer risk than if lower consumption rates had been used. The outcome is risk-based screening criteria (concentrations) that are more protective of public health.

Table 3. 95th percent confidence intervals of mean ingestion rates (g/day) and risk-based screening criteria for evaluating *F/V Mar-Gun* subsistence samples.

Subsistence Resource	Ingestion rate (ADFG, 1994) (grams/day)	Risk-based Screening criteria (concentrations) (µg/kg wet weight)
Sea Urchin	8.24	27.2
Limpets	6.85	32.7
Mussels	11.9	18.8

Results and Discussion

Total BaP equivalents are shown for each subsistence sample taken of mussels, limpets, and sea urchins in Table 4. These values were compared to the corresponding risk-based screening concentration (criteria) for mussels, limpets, or sea urchins. For example, the BaP equivalent for mussel sample, STR-MUS-52209-A, is 0.5566 ug/kg. This is compared to the risk-based screening concentration for mussels, which is 18.8 ug/kg. The BaP equivalent for mussel sample STR-MUS-52209-A is below the risk-based screening concentration for mussels, which indicates that the mussels in the area sampled do not pose a cancer risk to subsistence consumers. None of the mussel, limpet or sea urchin samples had total BaP equivalency values that exceeded the corresponding risk-based screening concentrations for mussels, limpets or sea urchins. Therefore, the concentrations of PAHs (i.e., BaP equivalents) found in the subsistence food samples do not pose a risk to human health.

In a previous evaluation of subsistence resources following the *M/V Selendang Ayu* oil spill, eight of 10 composite blue mussel samples were positive for naturally occurring paralytic shellfish poisoning (PSP) toxins, and two samples from Skan Bay had PSP toxin concentrations greater than the level allowed for commercial sale. Due to PSP concerns, there is currently an ongoing advisory in the state against the gathering and consumption of shellfish except at approved beaches. **There are no approved beaches on St. George Island.** The Alaska Division of Public Health (ADPH) considers the health hazard from PSP to be much more serious than any health hazards associated with PAH exposure at the levels found in mussels, limpets, and sea urchins in the areas sampled on St. George Island.

Table 4. Total benzo(a)pyrene equivalents in subsistence resources on St. George Island, Alaska

<u>Collection Date</u>	<u>Location</u>	<u>Sample Type</u>	<u>Sample ID</u>	<u>Total benzo(a)pyrene equivalents</u>	<u>Risk-Based Screening concentration</u>
				<u>ug/kg wet weight</u>	
22-May-09	Staraya Artil beach	mussels	STR-MUS-52209-A	0.5566	18.8
22-May-09	Staraya Artil beach	mussels	STR-MUS-52209-B	0.7209	18.8
22-May-09	Staraya Artil beach	mussels	STR-MUS-52209-C	0.2441	18.8
22-May-09	Staraya Artil beach	limpets	STR-LIM-52209-A	0.0034	32.7
22-May-09	Staraya Artil beach	limpets	STR-LIM-52209-B	0.0073	32.7
22-May-09	Staraya Artil beach	limpets	STR-LIM-52209-C	0.0046	32.7
22-May-09	Staraya Artil beach	sea urchins	STR-URC-52209-A	0.1068	27.2
22-May-09	Staraya Artil beach	sea urchins	STR-URC-52209-B	0.0149	27.2
22-May-09	Staraya Artil beach	sea urchins	STR-URC-52209-C	0.0100	27.2
22-May-09	E. Village Cove	mussels	EVC-MUS-52209-A	0.0896	18.8
22-May-09	E. Village Cove	mussels	EVC-MUS-52209-B	0.1245	18.8
22-May-09	E. Village Cove	mussels	EVC-MUS-52209-C	0.1415	18.8
22-May-09	E. Village Cove	limpets	EVC-LIM-52209-A	0.0025	32.7
22-May-09	E. Village Cove	limpets	EVC-LIM-52209-B	0.0025	32.7
22-May-09	E. Village Cove	limpets	EVC-LIM-52209-C	0.0033	32.7
22-May-09	E. Village Cove	sea urchins	EVC-URC-52209-A	0.0025	27.2
22-May-09	E. Village Cove	sea urchins	EVC-URC-52209-B	0.3582	27.2
22-May-09	E. Village Cove	sea urchins	EVC-URC-52209-C	0.0044	27.2

Child Health Considerations

In communities faced with air, water, or food contamination, the many physical differences between children and adults demand special emphasis. Children could be at greater risk than are adults from certain kinds of exposure to hazardous substances. Children play outdoors and sometimes engage in hand-to-mouth behaviors that increase their exposure potential. Children are shorter than are adults; this means they breathe dust, soil, and vapors close to the ground. A child's lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Finally, children are dependent on adults for access to housing, access to medical care, and risk identification. Thus, adults need as much information as possible to make informed decisions regarding their children's health.

Paralytic shellfish poisoning can be harmful to a child's health, or even fatal. It is important for adults to teach children about the dangers of paralytic shellfish poisoning, and how important it is not to consume shellfish collected from unapproved beaches in Alaska.

Conclusions

1. ADPH concludes that eating shellfish (specifically limpets, mussels, and sea urchins) harvested from the Mar-Gun grounding site is not expected to harm people's health as a result of PAH contamination from the oil spill. The reason for this is because PAHs are not present in mussels, limpets, and sea urchins from sampled beaches on St. George Island at levels of health concern. PAH levels did not exceed risk-based screening values in any of the samples, so consumption of mussels, limpets, and sea urchins from these areas does not pose a cancer risk.
2. ADPH concludes that paralytic shellfish poisoning (PSP), a natural phenomenon unrelated to the *F/V Mar-Gun* grounding site, poses a serious health risk to shellfish consumers on St. George Island. The state has an ongoing statewide advisory for PSP, caused by a potentially deadly neurotoxin that cannot be smelled, tasted, or cooked out. Alaska does not certify recreational beaches for evidence of PSP toxin, and there are no approved beaches on St. George Island for the safe harvesting and consumption of shellfish.

Recommendations

1. In order to err on the side of safety, subsistence gatherers should avoid consumption of foods on which oil can be seen, smelled or tasted. This advice is similar to that given following the *Exxon Valdez*, *M/V Kuroshima*, and *M/V Selendang Ayu* oil spills and presents a common sense and conservative approach that is protective of public health.
2. No additional sampling of subsistence foods for PAH contamination related to the *F/V Mar-Gun* grounding is warranted or recommended.
3. Residents of St. George should adhere to the statewide advisory for paralytic shellfish poisoning, and they should not collect shellfish from beaches that have not been approved. **There are no approved beaches on St. George Island.**

Public Health Action Plan

Actions undertaken:

- State agencies, federal agencies and the Responsible Party created a unified incident command to oversee response to the *F/V Mar-Gun* grounding. Lightering operations removed nearly 19,000 gallons of mixed oils which significantly reduced the threat of pollution. An additional 700 gallons of diesel and 100 gallons of hydraulic oil used to power the vessel generator in support of the vessel recovery operations were offloaded using a helicopter to lift filled oil drums rather than pumping through transfer lines over the water to shore. Within days of the *F/V Mar-Gun* grounding Shoreline Cleanup Assessment Technique (SCAT) operations were conducted (the afternoon of Sunday March 8, 2009) during an extreme low tide with no sign of shoreline contamination observed.
- The unified command of the *F/V Mar-Gun* Grounding responded immediately to concerns expressed by St. George residents regarding the potential for subsistence resources to be contaminated and unfit for consumption due to the grounding by posting a Subsistence Foods Consumption Safety Fact Sheet (ADEC 2009c) for residents as a guide for subsistence users.
- A further investigation and analysis of subsistence foods (mussels, limpets, and sea urchins) sampled in areas potentially impacted by the *F/V Mar-Gun* grounding was conducted and is the subject of this health consultation.
- A follow-up fact sheet, issued on November 16, 2009, informed residents that the sampled subsistence foods had not been impacted by the oil spill from the *F/V Mar-Gun* grounding, and that the greater public health risk was the ongoing potential for PSP from eating shellfish collected at unapproved beaches.

Actions planned:

- ADPH will distribute this report to all stakeholders involved with and impacted by this site within three months of the public release of this document.
- ADPH will conduct an informal needs assessment to determine what outreach and communication efforts may be needed at this site. This will be accomplished by contacting community leaders, including representatives of the tribal government, to identify any ongoing health concerns related to the *F/V Mar-Gun* grounding and need for education about PSP. These contacts will occur within three months of this health consultation's release to the community.
- ADPH will conduct further health education activities if found to be warranted during the informal needs assessment.
- The Alaska Department of Environmental Conservation will continue to issue periodic press releases to communicate their ongoing statewide advisory for PSP, which warns the public not to collect shellfish from unapproved beaches. A statewide PSP advisory is issued statewide at least once per year in a press release, and additional targeted advisories are released as needed.

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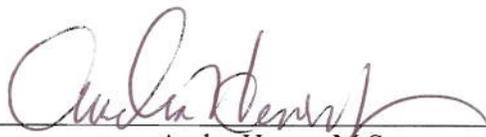
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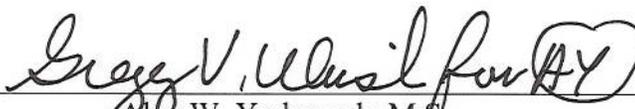
Certification

This Health Consultation (F/V Mar-Gun Grounding) was prepared by the Alaska Department of Health and Social Services under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodology and procedures existing at the time the health consultation were initiated. Editorial review was completed by the Cooperative Agreement partner.



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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.



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Appendix A Subsistence Advisory Group Members

The following individuals were members of the *F/V Mar-Gun* Subsistence Advisory Group:

Max Malavansky	St. George Island Traditional Council
Gary Folley	Alaska Department of Environmental Conservation (ADEC)
Young Ha	ADEC
Lori Verbrugge	Alaska Division of Public Health (ADPH)
Kent Sundseth	U.S. Fish and Wildlife Service (USFWS)
Ruth Yender	National Oceanic and Atmospheric Administration (NOAA)
Gary Mauseth	Polaris Applied Sciences (Polaris)
Jerry Erickson	Polaris Applied Sciences (Polaris)

