2006

# Oil spill

Aquaculture Department, Southeast Asian Fisheries Development Center

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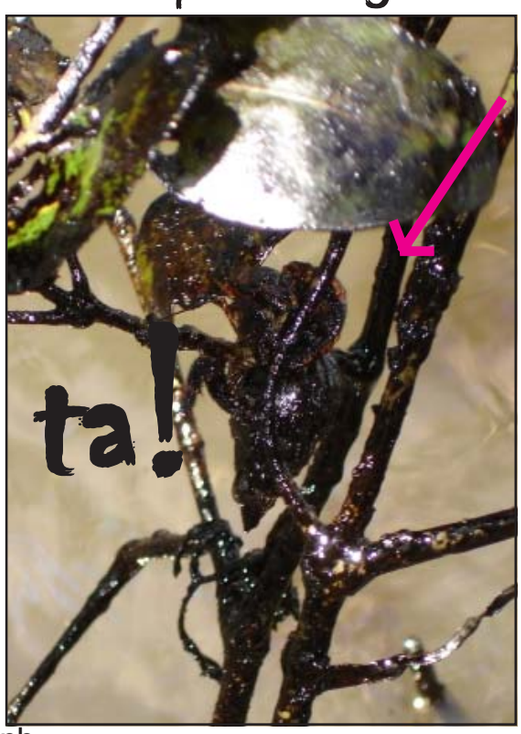
# Oil spill

## HALIT ANG OIL SPILL SA BAYBAYON: DUNANG MANGGAD KAG IKAAYONG LAWAS hibaluon kun ngaa

Ang dunang manggad sang kadagatan ginabug-usan sang mga tanom kag kasapatan, kag sang baybayon nga nagapalibot sa ila kag nagaserbe nga ila puloy-an. Kun ang ini nga puloy-an mahalitan tungod sa kahimu-an sang tawo ukon tungod man sa mga natural nga kalamidad, ang mga nagapuyo sa amo nga puloy-an mahalitan man.

## pero nagahimakas nga mabuhi lumos sa oil



Subong, ang kadagatan nga nagapalibot sa isla sang Guimaras kag sa kaingod nga mga isla nagapangatubang sang isa ka kalamidad dulot sang pagtagas sang krudo sa nalunod nga barko sadtong ika-11 sang Agosto 2006. Ini nga krudo padayon nga nagalapta sa kadagatan kag ini ginapatihan nga magahalit sang mga tanom kag kasapatan nga iya maduktan.

## buligan ta!

SEAFDEC/AQD is organizing monthly clean-up efforts. To join, call our numbers above or email: aqdchief@aqd.seafdec.org.ph

# paano makahalit ang kontaminado nga isda sa ikaayong lawas



**sa food chain through bioaccumulation**

makahili-lo ang isda kung makaon sang tawo

mas mabaskug ang hilo halin sa isda nga nakakaon sang kontaminado nga isda

pinakamabaskug ang epekto sang hilo kun makaon sang tawo ang daku nga isda nga nakakaon sang mga gagmay nga isda nga kontaminado

MANGROVES

SEAGRASSES

CORAL REEFS

TIDAL FLAT

BEACH

M. SMITH

# halit sa aton nga dunang manggad sa dagat

madula ang puluy-an sang mga itlog kag buto sang mga isda kag iban nga mga sapat

madula-an man sila sang kalan-on para sa ila nga pagdaku kag

sa madugay, madula ang mga isda nga aton palangabuhian

CONCEPT BY M.R. LUHAN, N.S. SUMAGAYSAY-CHAVOSO
PHOTOS ON PAGE 1 BY N.S. CHAVOSO, M. CASTANOS

**SEAFDEC/AQD volunteers to clean-up**

# San Roque, Nueva Valencia

27 August 2006

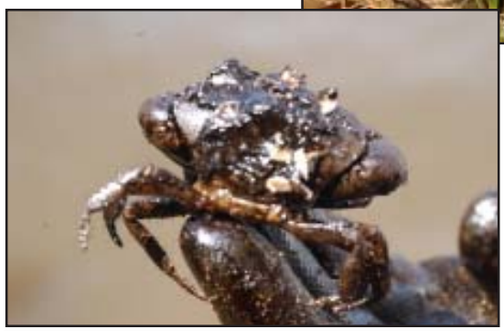
Led by the SEAFDEC/AQD Chief Dr. Joebert Toledo (at left), 45 volunteers composed of AQD employees with their family and friends helped the local residents clean-up a patch of mangroves in San Roque, Nueva Valencia. The barangay was a 2-hour road trip south of Guimaras island's main landing port of Jordan. The volunteers collected sackfuls of oil-drenched debris; wiped down mangrove roots, leaves, and pneumatophores; and scooped up oil slick that accumulated in small, shallow pools. The volunteers, dressed in protective gear of boots-gloves-mask, only quit at high tide.

The plastic-lined sacks used to collect debris were donated by AQD (250), U.P. Aquaculture Society Inc. (250), Dr. ND Salayo (50), and Ms. MRJ Luhan (50). The latter coordinated the volunteer effort. The National Disaster Coordinating Council provided the truck which brought the volunteers to the site. The AQD contingent was the first group of volunteers to reach San Roque because of the bad, unpaved road.

"My sincere thanks to all those who shared their time, talent or treasure," Dr. Toledo said afterwards, "and took the risk in the clean up. AQD is proud of you!"

It must be noted that AQD has a facility ~ Igang Marine Substation ~ in Nueva Valencia which is directly threatened by the oil spill should the water current turn the wrong way. The station has breeding stocks of milkfish and groupers that are decades-old, and is the site of a mariculture park. Precautionary measures ~ i.e. placement of a boom at the entrance of the Igang cove ~ have been taken.

In addition, AQD's seawater supply to its Dumangas Brackishwater Station and Tigbauan Main Station in Iloilo is derived from Panay Gulf. Most of AQD's R&D, including biotechnology, are done in these stations in Iloilo.



PHOTOS BY I. TENDENCIA

these children of San Roque should have inherited a pristine island

volunteers clean-up with local residents

# San Roque, Nueva Valencia

27 August 2006



**LEAVING ILOILO** past 7 in the morning, the AQD volunteers took the ferry and rode a dumptruck to San Roque, arriving past 9. After putting on protective gear (above), they joined the locals who were already hard at work (above right). Some 50 locals are being paid daily by Petron to clean-up their barangay, and all were provided with protective gears, sacks, and soft cloth to wipe-off attached crude oil

**WORK STARTED** immediately. Volunteers and locals collected oil-soaked debris and put these in plastic-lined, double-tied sacks until the tide came up nearing noon (lower left photos)

**SOME ORGANISMS** found temporary shelter high up in the leaves or clung to branches of mangroves out of the oil line, others remained stuck and covered in oil

PHOTOS BY M. CASTANOS, I. TENDENCIA

volunteers clean-up with local residents

# San Roque, Nueva Valencia

27 August 2006

**WHEN THE TIDE CAME IN** the debris-filled sacks were carried and temporarily stored way out of the water line. The Guimaras provincial government is negotiating the transport of collected crude out of the island. Lunchtime, and the volunteers called it a day well spent!

**MANGROVES** were wiped down: leaves, branchlets, roots, pneumatophores (below)

PHOTOS BY M. CASTANOS, I. TENDENCIA

*AQD officials talked with a kagawad after the clean-up: Igang Marine Substation Head Albert Gaitan, AQD Chief Dr. Joebert Toledo, and Training-Information Division Head Renato Agbayani*


*Clean-up coordinator Ma. Rovilla Luhan and Technology Verification-Commercialization Division Head Dr. Neila Chavoso*

SELECTED READINGS

# Health, social, economic, ecosystem

## OIL SPILL AFTERMATH

1

*From the* **Journal of Traumatic Stress**, volume 13, number 1, pages 23-39, published January 2000

*Authored by* Catalina M. Arata, J. Steven Picou, G. David Johnson and T. Scott McNally of the Department of Psychology and the Department of Sociology and Anthropology, University of South Alabama, USA

*Title of article* Coping with technological disaster: an application of the conservation of resources model to the Exxon Valdez oil spill

### What the authors say

One hundred twenty-five commercial fishers in Cordova, Alaska, completed a mailed survey regarding current mental health functioning 6 years after the *Exxon Valdez* oil spill. Economic and social impacts of the oil spill and coping and psychological functioning (modified Coping Strategies Scales, Symptom Checklist 90-R) were measured. Multiple regression was used to test the utility of the Conservation of Resources stress model for explaining observed psychological symptoms. **Current symptoms of depression, anxiety, and Posttraumatic Stress Disorder were associated with conditions of resource loss and avoidant coping strategies.** The Conservation of Resources model provided a framework for explaining psychological impacts of the oil spill. Future research is needed to identify factors related to recovery.

2

*From* **Social Forces**, volume 82, number 4, pages 1493-1522, published June 2004 by the University of North Carolina Press

*Authored by* J. Steven Picou

*Title of article* Disaster, litigation, and the corrosive community

### What the author says

Disaster researchers have debated the utility of distinguishing "natural" from "technological" catastrophes. We suggest that litigation serves as a source of chronic stress for victims of human-caused disasters involved in court deliberations for damages. Data from the Exxon Valdez oil spill are used to evaluate a social structural model of disaster impacts three and one-half years after the event. **Results suggest that the status of litigant and litigation stress serve as prominent sources of perceived community damage and event-related psychological stress. We conclude that litigation is a critical characteristic of technological disasters that precludes timely community recovery and promotes chronic social and psychological impacts.** [Suggestions for alternatives to litigation are provided by the author.]

3

*From* **Environment, Science and Technology**, volume 38, number 1, pages 19 -25, published in 2004

*Authored by* Jeffrey W. Short, Mandy R. Lindeberg, Patricia M. Harris, Jacek M. Maselko, Jerome J. Pella, and Stanley D. Rice of the Auke Bay Laboratory, Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA, Juneau, Alaska

*Title of article* Estimate of oil persisting on the beaches of Prince William Sound 12 years after the Exxon Valdez oil spill

### What the authors say

We estimated the amount of oil remaining in Prince William Sound, Alaska, 12 yr after the 1989 *Exxon Valdez* spill to assess its importance as a long-term reservoir of toxic hydrocarbons. We found oil on 78 of 91 beaches randomly selected according to their oiling history. Surface oiling was recorded for randomly placed quadrats, which were then excavated and examined for subsurface oil. The cumulative area of beach contaminated by surface or subsurface oil was estimated at 11.3 ha. Surface oil varied little with tide height, but subsurface oil was more prevalent at the middle tide heights. The mass of remaining subsurface oil is conservatively estimated at 55 600 kg. Analysis of terpanes indicated that over 90% of the surface oil and all of the subsurface oil was from the *Exxon Valdez* and that Monterey Formation oil deposited after the 1964 Alaska earthquake accounted for the remaining surface oil. **These results indicate that oil from the *Exxon Valdez* remains by far the largest reservoir of biologically available polycyclic aromatic hydrocarbons on beaches impacted by the spill and that biota dependent on these beaches risk continued exposure.**

4

*From the* **Journal of Epidemiology and Community Health**, volume 53, pages 306-310, published in 1999

*Authored by* RA Lyons, JM Temple, D Evans, DL Fone and SR Palmer of the University of Wales, Swansea, Great Britain

*Title of article* Acute health effects of the Sea Empress oil spill

### What the authors say

STUDY OBJECTIVE: To investigate whether residents in the vicinity of the Sea Empress tanker spill suffered an increase in self reported physical and psychological symptoms, which might be attributable to exposure to crude oil. DESIGN: Retrospective cohort study; postal questionnaire including demographic details, a symptom checklist, beliefs about health effects of oil and the Hospital Anxiety and Depression and SF-36 mental health scales. SETTING: Populations living in four coastal towns on the exposed south Pembrokeshire coast and two control towns on the unexposed north coast. PATIENTS: 539 exposed and 550 unexposed people sampled at random from the family health services authority age-sex register who completed questionnaires. MAIN RESULTS: Adjusted odds ratios for self reported physical symptoms; scores on the Hospital Anxiety and Depression and SF-36 mental health scales, in 1089 people who responded out of a possible 1585 (69%). **CONCLUSIONS: Living in areas exposed to the crude oil spillage was significantly associated with higher anxiety and depression scores, worse mental health; and self reported headache** (odds ratio = 2.35, 95% CI 1.56, 3.55), **sore eyes** (odds ratio = 1.96, 95% CI 1.06, 3.62), **and sore throat** (odds ratio = 1.70, 95% CI 1.12,

2.60) **after adjusting for age, sex, smoking status, anxiety, and the belief that oil had affected health. People living in exposed areas reported higher rates of physical and psychological symptoms than control areas. Symptoms significantly associated with exposure after adjustment for anxiety and health beliefs were those expected from the known toxicological effect of oil, suggesting a direct health effect on the exposed population.**

5

*From* **Environmental Research**, volume 81, number 3, pages 185-194, published October 1999

*Authored by* A. Morita, Y. Kusaka, Y. Deguchi, A. Moriuchi, Y. Nakanaga, M. Iki, S. Miyazaki, K. Kawahara of the Department of Environmental Health, Fukui Medical School, Yoshida-gun, Japan. akemi@med.kindai.ac.jp

*Title of article* Acute health problems among the people engaged in the cleanup of the Nakhodka oil spill

## What the authors say

To determine if the Nakhodka oil spill and subsequent cleanup efforts had any health effects on the residents along the oil-contaminated coast, we investigated the health status of Anto residents who resided nearest to the coast where the bow ran aground. Two hundred eighty-two men and women involved in the cleanup activities between January 7 and January 20 were interviewed and examined by public health nurses to determine whether they suffered physical symptoms after exposure to the oil spill. Urine examinations for hydrocarbon toxicological markers were performed on 97 residents. The average number of days worked on cleanup activities was 4.7 days for men and 4.3 for women. Seventeen percent of the subjects had worked on cleanup activities for more than 10 days. Protective equipment was used against direct exposure to oil during the cleanup jobs and consisted of gloves used by almost 100% of the subjects and masks used by 87.1% of women and by only 35.4% of men. Glasses were worn by less than 30% of the subjects. Many symptoms emerged after the beginning of cleanup activities. The principal symptoms included low back pain and leg pain, headache, and symptoms of eyes and throat. Among the subjects undergoing urine tests, only three people showed a higher level of hippuric acid, although they returned to normal in the second examination. **Accordingly, the exposure to the oil and the subsequent cleanup efforts were suggested to inflict acute health problems on local residents.**

6

*From the* **Central European Journal of Public Health**, volume 3, number 3, pages 142-145, published August 1995

*Authored by* L. Attias, AR Bucchi, F. Maranghi, S. Holt, I. Marcello, GA Zapponi of the National Health Institute, Rome, Italy

*Title of article*: Crude oil spill in sea water: an assessment of the risk for bathers correlated to benzo(a)pyrene exposure

## What the authors say

In the spring of 1991, there was a shipwreck of the oil tanker "Haven" off the Ligurian coast of Italy. This resulted in the spillage of a very large amount of crude oil, some of which was burned off by fire. The accident caused several serious problems (sea and air pollution, damage to the marine fauna, risk of human exposure, etc.). In this context, an assessment was carried out at the Istituto Superior di Sanita with the aim of determining any possible risks to humans which might derive from bathing activities during the following summer season. The whole evaluation carried out after the accident demonstrated that the impacts induced were not serious enough to require bathing restrictions in the coastal areas involved. **Assuming a benzo(a)pyrene (BaP) concentration in sea water of 1 microgram/m3 cancer risk is in the order of 10(-8) and in the case of 10-kg child, a 10(-6) risk level correspond to about 0.18 microgram/l of BaP in sea water.**

7

*From* **Current Sociology**, volume 45, number 3, pages 19-39, published in 1997 by the International Sociological Association

*Authored by* William R. Freudenburg

*Title of work*: Contamination, corrosion and the social order: an overview

## What the author say

**The social impacts of technological disasters are more severe than those of natural disasters.** Three factors are involved in explaining this disparity. First, many of the most severe impacts are associated not with simple physical destruction, but with *the ambiguity of harm.* **Many of the most disturbing forms of technological contamination cannot be detected by the naked eye or by the other unaided senses; many cannot be assessed after the fact even with sophisticated equipment; and many can never be said definitively to have ended, or for that matter, not to have ended.** Second, unlike natural disasters - which often lead to the emergence of a 'therapeutic' community, with an outpouring of spontaneous as well as official assistance to victims - technological disasters tend to be **followed by the emergence of *corrosive communities*, often characterized by lawyers who act to limit the potential liability of their clients, but whose net effect is often to blame the victims, to divide the community and to delay or to prevent the start of recovery. Finally, technological disasters can create widespread *sociocultural disruption and concerns over recurrences*, raising disturbing questions about the trustworthiness of societal institutions on which we all depend.**

8

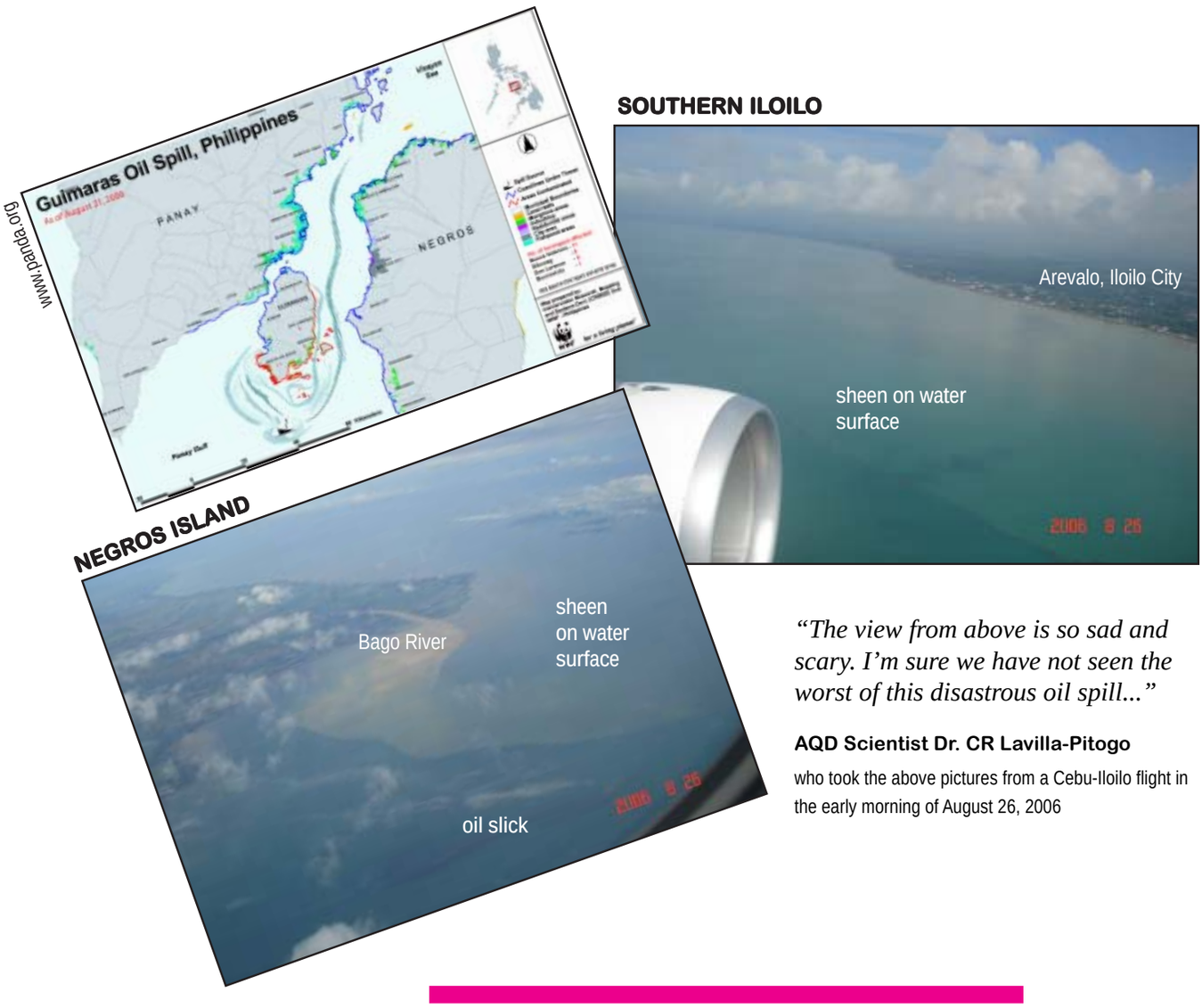
*From* **Advances in Marine Biology**, volume 39, pages 3-84, published in 2000

*Authored by* CH Peterson

*Title of article*: The Exxon Valdez oil spill in Alaska: acute, indirect and chronic effects on the ecosystem

## What the author say

Following the oil spill in Prince William Sound, Alaska, in **1989,** effects were observed across a wide range of **habitats and species.** The data allow us to evaluate direct and indirect links between shoreline habitats and the coastal ecosystem in general. The intertidal zone suffered from direct oiling and clean-up treatments such as pressurized hot water, resulting in freeing of bare space on rocks and reductions in fucoid algal cover. Grazing limpets, periwinkles, mussels and barnacles were killed or removed. Subsequent indirect effects included colonization of the upper shore by ephemeral algae and an opportunistic barnacle and, in some regions, spread of Fucus gardneri into the lower shore where it inhibited return of red algae. **The loss of habitat provided by the Fucus canopy slowed recovery on high shores, and lowered abundance of associated invertebrates**. Abundance of sediment infauna declined and densities of clams were reduced directly. **Their recovery was still incomplete by 1997** on oiled and treated shores where fine sediments had been washed down slope during treatment. **Impacts in subtidal habitats were less intense than in the intertidal zone. Kelps were reduced in 1989 but recovered rapidly through**




*"The view from above is so sad and scary. I'm sure we have not seen the worst of this disastrous oil spill..."*

**AQD Scientist Dr. CR Lavilla-Pitogo**

who took the above pictures from a Cebu-Iloilo flight in the early morning of August 26, 2006

**re-colonization by 1990.** Abundances of a dominant crab and seastar were reduced greatly, with recovery of the more mobile species, the crab, occurring by 1991. **For about 4 years, there was reduced eelgrass density and hence less habitat for associated animals.** Abundance of several toxin-sensitive **amphipods** declined dramatically and **had not recovered by 1995.** In general, however, many subtidal infaunal invertebrates increased in abundance, especially oligochaetes and surface deposit-feeding polychaetes. This may have resulted from increases in sediment **hydrocarbon-degrading bacteria,** but may also reflect reduction of predators.

Along northern Knight Island, where sea otter populations had not recovered by 1997, green sea-urchins were larger, compared with those in un-oiled parts of Montague Island. This initial response from reduced predation by sea otters, if sustained, could lead to additional indirect effects of the spill. Scavenging terrestrial birds, such as bald eagles and northwestern crows, suffered direct mortality as adults and reproductive losses, although eagles recovered rapidly. Numbers of intertidal benthic fishes were 40% lower on oiled than on un-oiled shores in 1990, but recovery was underway by 1991.

**Small benthic fishes living in eelgrass showed sensitivity to hydrocarbon contamination until at least 1996,** as evidenced by hemosiderosis in liver tissues and P450 1A enzyme induction. Oiling of **intertidal spawning habitats affected breeding** of herring and pink salmon. Pink salmon, and possibly Dolly Varden char and cut-throat trout, showed slower growth when foraging on oiled shorelines as older juveniles and adults, which for pink salmon implies lower survival.

The pigeon guillemots that suffered from the oil spill showed reduced feeding on sand eels and capelin, which may also have been affected by the spill, and this may have contributed to failure of guillemot recovery.

There was an analogous failure of harbor seals to recover. Sea otters declined by approximately 50%, and juvenile survival was depressed on oiled shores for at least four winters. Both black oystercatchers, shorebirds that feed on intertidal invertebrates, and also harlequin ducks showed reduced abundance on oiled shores that persisted for years after the spill.

Oystercatchers consumed oiled mussels from beds where contamination by only partially weathered oil persisted until at least 1994, with a resulting impact on productivity of chicks. A high over-winter mortality of adult harlequin ducks continued in 1995-96, 1996-97 and 1997-98. Delays in the recovery of avian and mammalian predators of fishes and invertebrates through chronic and indirect effects occurred long after the initial impacts of the spill.

**Such delayed effects are not usually incorporated into ecotoxicity risk assessments which thus substantially underestimate impacts of a spill.** Detection of delayed impacts requires rigorous long-term field sampling, so as to observe the dynamics of recovery processes.

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