FISHERY DATA SERIES NO.2

# ALASKA STATEWIDE SPORT FISHERIES HARVEST REPORT



By: Michael J. Mills

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NOVEMBER 1987

Because of Alaska's vastness, meeting all these data requirements statewide by on-site creel censuses would be prohibitively expensive, thus an economical supplementary program has been developed. Described herein are results from the tenth year of that program, whose primary objective is to provide statewide estimates of effort and harvest for major Alaskan sport-caught species by area and fishery.

Species covered are listed in Table 2, Appendix A. Alaska sport fishing regulatory and management areas are delineated on the map in Figure 1, Appendix A.

## METHODS

The Alaska statewide sport fish harvest program combines postal surveys and creel censuses to obtain estimates of effort and harvest by fishery and by species. The postal surveys consist of repeated mailings of questionnaires to random samples of Alaska sport fishing license holders. Creel censuses consist of on-site interviews of random samples of sport fishermen. The postal surveys provide estimates for all fisheries, while creel censuses of major selected fisheries provide validity correction and check.

The 1986 harvest survey consisted of a mailing of 13,545 questionnaires, followed by two reminders to nonrespondents. Table 3 provides a summary of mailings and responses. Examples of the questionnaire and reminders are in Appendix B. Additional details regarding methods are described in Mills (1979) and Mills et al. (1986).

## RESULTS

The Alaska Sport Fish Harvest Survey indicated that 359,383 anglers took 1,650,299 household trips and fished 2,071,412 days to harvest 3,163,433 fish in 1986. These represent increases of 3% in anglers, 8% in trips, 7% in days and 1% in fish harvested compared to 1985, in which 348,767 anglers took 1,524,443 trips and fished 1,943,069 days to harvest 3,124,557 fish.

Of the 359,383 anglers who fished in 1986, 249,629 (69%) were Alaska residents while 109,754 (31%) were nonresidents. This represents a 4% increase in resident anglers and a 2% increase in nonresident anglers over 1985, in which 241,135 (69%) residents and 107,632 (31%) nonresidents fished. Since 1977, the first year of the survey, the annual increase in anglers has averaged 7%. The annual increase for resident anglers has averaged 6%. The annual increase in nonresident anglers has averaged 10%.

Of the 2,071,412 angler-days fished in 1986, 1,518,712 (73%) were expended in the Southcentral region of Alaska, 357,987 (17%) were expended in the Southeast region, and 194,713 (10%) were expended in the Arctic-Yukon-Kuskokwim region. The Cook Inlet area had 1,175,928 days (57%) of the State's total sport fishing. The Kenai Peninsula had 808,450

angler-days or 39% of the State total. The Kenai River alone had 335,051 angler-days, 16% of the State total. An estimated 637,794 days, 31% of all sport fishing, was in saltwater; 1,433,618 days, 69% of all sport fishing was in freshwater.

The 3,163,433 fish harvested in 1986 included 1,299,248 razor clams and 182,620 smelt. Of the remaining 1,681,565 harvested fish, 720,502 (43%) were sea-run salmon, 165,165 (10%) were Dolly Varden and Arctic char, 152,855 (9%) were rainbow trout, and 117,637 (7%) were Arctic grayling. Also harvested were 160,885 halibut, 101,258 rockfish, 46,182 landlocked salmon, 39,718 whitefish, 21,890 northern pike, 21,463 lake trout, 18,849 burbot, 16,230 cutthroat trout, 5,850 steelhead, 3,721 sheefish, and 526 brook trout. Chinook salmon, coho salmon, sockeye salmon, chum salmon, lake trout, northern pike, whitefish, halibut, rockfish and razor clam harvests were all-time record highs.

Except for razor clams, shell fisheries are not included in the 3,163,433 total fish harvest reported above. For the Kenai Peninsula, however, these fisheries were surveyed for king crab, dungeness crab, tanner crab, shrimp, and hardshell clams. Harvest and effort for these species are reported in Table 55.

The record 1986 total sea-run salmon harvest of 720,502 included 105,482 chinook, 255,887 coho, 186,448 sockeye, 145,960 pink, and 26,725 chum salmon. The marine salmon harvest total of 204,919 included 28,942 chinook, 88,309 coho, 6,711 sockeye, 71,942 pink, and 9,015 chum salmon. The freshwater total of 515,583 included 76,540 chinook, 167,578 coho, 179,737 sockeye, 74,018 pink, and 17,710 chum salmon. Regionally, 125,688 sea-run salmon were harvested in Southeast Alaska, 575,082 in Southcentral, and 19,732 in the Arctic-Yukon-Kuskokwim. The sport harvest of small chinook salmon state-wide totaled 17,186 and is included in the 105,482 reported above.

Harvest and effort for 1986 are tabulated by region, area, fishery, and species in Appendix A. Detailed tabulations for 1977 through 1985 may be found in Mills (1979, 1980, 1981a, 1981b, 1982, 1983, 1984, 1985, 1986).

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Thus, in the interest of economic efficiency, the statewide harvest program has replaced on-site creel censuses in several cases where creel censuses were not required for protective in-season management or ensuring

Table 1. List of Alaska Sport Fishing Regions and Areas.

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Regions

| | |
|---|---|
| I | Southeast Alaska |
| II | Southcentral Alaska |
| III | Arctic-Yukon-Kuskokwim |

Areas

Southeast Alaska

| | |
|---|---|
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| B | Prince of Wales |
| C | Petersburg-Wrangell |
| D | Sitka |
| E | Juneau |
| F | Haines-Skagway |
| G | Glacier Bay |
| H | Yakutat |

Southcentral Alaska

| | |
|---|---|
| I | Glennallen |
| J | Prince William Sound |
| K | Knik Arm Drainage |
| L | Anchorage |
| M | East Susitna Drainage |
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Arctic-Yukon-Kuskokwim

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| U | Tanana River Drainage |
| V | Interior Alaska |
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| Y | South Slope Brooks Range |
| Z | North Slope Brooks Range |

Table 2. List of Common Names, Scientific Names and Abbreviations.

| Common Name | Scientific Name | Abbreviation |
|---|---|---|
| Chinook salmon | Oncorhynchus tshawytscha (Walbaum) | KS |
| Small chinook salmon | Oncorhynchus tshawytscha (Walbaum) | KI |
| Coho salmon | Oncorhynchu kisutch (Walbaum) | SS |
| Landlocked salmon | | LL |
| coho | Oncorhynchus kisutch (Walbaum) | |
| chinook | Oncorhynchus tshawytscha (Walbaum) | |
| Sockeye salmon | Oncorhynchus nerka (Walbaum) | RS |
| Kokanee salmon | Oncorhynchus nerka (Walbaum) | KO |
| Pink salmon | Oncorhynchus gorbuscha (Walbaum) | PS |
| Chum salmon | Oncorhynchus keta (Walbaum) | CS |
| Steelhead | Salmo gairdneri Richardson | SH |
| Rainbow trout | Salmo gairdneri Richardson | RT |
| Cutthroat trout | Salmo clarki Richardson | CT |
| Brook trout | Salvelinus fontinalis (Mitchell) | BT |
| Lake trout | Salvelinus namaycush (Walbaum) | LT |
| Dolly Varden | Salvelinus malma (Walbaum) | DV |
| Arctic char | Salvelinus alpinus (Linnaeus) | AC |
| Arctic grayling | Thymallus arcticus (Pallas) | GR |
| Northern pike | Esox lucius Linnaeus | NP |
| Whitefish | Coregonus spp. and Prosopium spp. | WF |
| Burbot | Lota lota (Linnaeus) | BB |

Table 2. (cont.) List of Common Names, Scientific Names and Abbreviations.

| Common Name | Scientific Name | Abbreviation |
|---|---|---|
| Inconnu (Sheefish) | Stenodus leucichthys (Guldenstadt) | SF |
| Halibut | Hyppoglossus stenolepis Schmidt | HA |
| Rockfish | Sebastes spp. | RF |
| Smelt | Osmeridae | SM |
| Capelin | Mallotus villosus (Muller) | SM |
| King crab | Paralithodes camtschatica (Tilesius) | KC |
| Dungeness crab | Cancer magister Dana | DC |
| Tanner crab | Chionoecetes bairdi Rathbun | TC |
| Shrimp | Pandalidae | SHR |
| Razor clam | Siliqua patula Dixon | RCL |
| Hardshell clams | | HCL |
| Butter clam | Saxidomus giganteus Deshayes | |
| Littleneck clam | Venerupis staminea (Conrad) | |
| Cockle | Clinocardium nuttallii (Conrad) | |
| Gaper clam | Tresus capax (Gould) | |
| Eastern softshell clam | Mya arenaria (Linne) | |
| Truncated mya | Mya truncata (Linne) | |
| Alaska surf clam | Spisula polynyma Stimpson | |

Table 12. Southcentral Alaska Sport Fish Harvests by Species, 1977-1986.

| Species | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|
| Chinook Salmon | 25,112 | 26,415 | 34,009 | 24,155 | 35,822 | 46,266 | 57,094 | 61,141 | 63,173 | 80,071 |
| Sea-Run Coho Salmon | 67,866 | 81,990 | 93,234 | 127,958 | 95,376 | 136,153 | 87,935 | 166,688 | 137,671 | 188,872 |
| Landlocked Coho/ Chinook Salmon | 31,152 | 26,503 | 17,907 | 43,147 | 39,930 | 24,102 | 33,482 | 20,124 | 19,684 | 19,445 |
| Sockeye Salmon | 97,629 | 118,299 | 77,655 | 105,914 | 76,533 | 128,015 | 170,799 | 119,098 | 168,211 | 179,709 |
| Kokanee Salmon | 2,068 | 1,702 | 3,218 | 2,351 | 5,540 | 3,419 | 1,899 | 786 | 3,329 | 2,363 |
| Pink Salmon | 85,543 | 143,483 | 63,366 | 153,794 | 64,163 | 105,961 | 47,264 | 100,932 | 67,838 | 109,073 |
| Chum Salmon | 5,044 | 23,755 | 8,126 | 8,660 | 7,810 | 13,497 | 11,043 | 15,806 | 7,895 | 17,357 |
| Steelhead | 1,949 | 2,720 | 1,554 | 2,063 | 1,727 | 1,305 | 1,895 | 2,379 | 1,635 | 1,128 |
| Rainbow Trout | 80,354 | 107,243 | 129,815 | 126,686 | 149,460 | 142,579 | 141,663 | 140,868 | 153,352 | 114,837 |
| Cutthroat Trout | 1,912 | 957 | 1,491 | 939 | 886 | 654 | 1,824 | 2,542 | 915 | 1,620 |
| Brook Trout | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lake Trout | 15,200 | 10,910 | 13,876 | 15,752 | 15,495 | 15,423 | 16,210 | 13,301 | 13,119 | 18,213 |
| Dolly Varden/ Arctic Char | 79,405 | 102,107 | 160,029 | 130,009 | 149,543 | 115,832 | 151,503 | 133,089 | 108,822 | 93,653 |
| Arctic Grayling | 45,748 | 47,866 | 70,316 | 69,462 | 63,695 | 60,972 | 56,896 | 47,825 | 57,720 | 51,465 |
| Northern Pike | 321 | 767 | 762 | 1,358 | 1,411 | 1,707 | 2,642 | 4,424 | 2,240 | 2,894 |
| Whitefish | 2,594 | 4,231 | 3,534 | 3,221 | 3,802 | 2,558 | 3,784 | 4,806 | 9,337 | 7,914 |
| Burbot | 6,652 | 8,099 | 5,207 | 11,585 | 9,536 | 9,662 | 8,870 | 13,231 | 22,015 | 13,238 |
| Sheefish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Smelt | 335,657 | 209,011 | 198,197 | 313,271 | 293,029 | 210,998 | 298,148 | 370,653 | 314,615 | 173,204 |
| Halibut | 17,412 | 30,954 | 34,603 | 39,796 | 52,370 | 55,198 | 75,047 | 78,045 | 81,458 | 115,857 |
| Rockfish | 22,092 | 29,361 | 39,887 | 37,625 | 41,374 | 35,283 | 32,528 | 43,825 | 33,571 | 59,690 |
| Razor Clams | 951,386 | 971,535 | 1,045,576 | 860,461 | 907,874 | 1,070,953 | 1,177,960 | 1,194,932 | 1,194,830 | 1,290,826 |
| Other Fish | 54,311 | 44,224 | 42,451 | 40,341 | 37,343 | 41,817 | 31,390 | 17,519 | 36,919 | 67,875 |
| Total | 1,929,407 | 1,992,212 | 2,044,813 | 2,118,543 | 2,052,719 | 2,222,354 | 2,409,876 | 2,552,014 | 2,498,349 | 2,609,304 |

Table 48. Prince William Sound* Sport Fish Harvest and Effort by Fisheries and Species, 1986.

| | Anglers | Trips | Days Fished | KS | SS | RS | PS | CS | LT | DV AC | SH | RT | CT | GR | WF | SM | HA | RF | RCL | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SALTWATER: | | | | | | | | | | | | | | | | | | | | |
| Valdez Bay | 7,592 | 11,558 | 19,449 | 123 | 5,749 | 260 | 12,858 | 1,116 | 0 | 31 | 0 | 0 | 61 | 0 | 0 | 0 | 3,241 | 5,864 | 0 | 934 |
| Passage Canal (Whittier) | 4,438 | 6,510 | 9,556 | 11 | 1,437 | 1,193 | 1,437 | 596 | 0 | 291 | 0 | 0 | 0 | 0 | 0 | 0 | 1,040 | 1,620 | 0 | 2,278 |
| Orca Inlet | 1,081 | 2,232 | 2,721 | 11 | 474 | 153 | 290 | 15 | 0 | 138 | 0 | 0 | 15 | 0 | 0 | 0 | 596 | 145 | 489 | 876 |
| Boat - Other | 2,421 | 6,082 | 5,888 | 234 | 703 | 626 | 168 | 367 | 0 | 245 | 0 | 0 | 0 | 0 | 0 | 0 | 2,996 | 1,832 | 0 | 321 |
| Valdez Bay - Shoreline | 7,183 | 6,563 | 9,419 | 45 | 1,040 | 153 | 9,312 | 749 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 153 | 67 | 306 | 16,206 |
| Shoreline - Other | 2,536 | 4,061 | 4,648 | 11 | 2,476 | 61 | 718 | 15 | 0 | 31 | 15 | 0 | 61 | 0 | 0 | 0 | 305 | 234 | 6,254 | 700 |
| SALTWATER TOTAL | 22,718** | 37,006 | 51,681 | 435 | 11,879 | 2,446 | 24,783 | 2,858 | 0 | 736 | 15 | 0 | 137 | 0 | 0 | 15 | 8,331 | 9,762 | 7,049 | 21,315 |
| FRESHWATER: | | | | | | | | | | | | | | | | | | | | |
| Eyak River | 1,285 | 4,411 | 4,755 | 0 | 2,767 | 92 | 107 | 0 | 0 | 642 | 0 | 15 | 214 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Eshamy Creek and Lagoon | 1,022 | 558 | 1,022 | 0 | 76 | 612 | 260 | 0 | 0 | 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coghill River | 847 | 479 | 847 | 0 | 0 | 321 | 0 | 0 | 0 | 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Robe River | 818 | 1,674 | 1,712 | 0 | 0 | 0 | 0 | 0 | 0 | 4,449 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Streams | 1,574 | 2,069 | 2,351 | 0 | 1,116 | 1,178 | 122 | 0 | 0 | 733 | 0 | 0 | 337 | 31 | 15 | 0 | 0 | 0 | 0 | 0 |
| Lakes | 1,722 | 1,538 | 1,912 | 67 | 260 | 229 | 0 | 0 | 259 | 613 | 0 | 92 | 932 | 321 | 0 | 0 | 0 | 0 | 0 | 0 |
| FRESHWATER TOTAL | 5,869** | 10,729 | 12,599 | 67 | 4,219 | 2,432 | 489 | 0 | 259 | 6,559 | 0 | 107 | 1,483 | 352 | 15 | 0 | 0 | 0 | 0 | 0 |
| GRAND TOTAL | 26,689** | 47,735 | 64,280 | 502 | 16,098 | 4,878 | 25,272 | 2,858 | 259 | 7,295 | 15 | 107 | 1,620 | 352 | 15 | 15 | 8,331 | 9,762 | 7,049 | 21,315 |

*Prince William Sound (Area J): All Alaskan waters, including drainages, from and including Cape Suckling through Prince William Sound to Cape Puget, including all waters emptying into Port Bainbridge; and, that portion of the Copper River drainage downstream of a line between the south bank of Haley Creek and the south bank of Canyon Creek in Wood Canyon.

**Angler totals may not equal sum of sites due to some anglers fishing at more than one site.

Table 53. Kenai River* Sport Fish Freshwater Non-Guided Harvest and Effort by Fisheries and Species, 1986.

| | Anglers | Trips | Days Fished | KI** | KS | SS | RS | PS | CS | LT | DV AC | RT | GR | WF | NP | SM | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kenai River - (Cook Inlet to Soldotna Bridge) | 44,719 | 122,149 | 157,079 | 1,269 | 7,966 | 28,063 | 19,348 | 13,578 | 229 | 0 | 1,151 | 525 | 0 | 76 | 0 | 31,620 | 0 |
| Kenai River - (Soldotna Bridge to Moose River) | 19,023 | 37,525 | 58,433 | 275 | 1,407 | 7,217 | 13,578 | 2,752 | 107 | 0 | 771 | 168 | 0 | 0 | 0 | 1,147 | 0 |
| Kenai River - (Moose River to Skilak Outlet) | 16,543 | 44,475 | 48,969 | 61 | 535 | 8,287 | 11,391 | 2,018 | 138 | 659 | 1,798 | 770 | 0 | 489 | 0 | 0 | 0 |
| Kenai River - (Skilak Inlet to Kenai Lake) | 16,772 | 36,513 | 35,843 | 46 | 0 | 2,660 | 22,950 | 505 | 0 | 313 | 1,631 | 603 | 31 | 46 | 0 | 0 | 0 |
| TOTAL | 73,352*** | 240,662 | 300,324 | 1,651 | 9,908 | 46,227 | 67,267 | 18,853 | 474 | 972 | 5,351 | 2,066 | 31 | 611 | 0 | 32,767 | 0 |

*Kenai River (Area P): All main channel waters of the Kenai River downstream of Kenai Lake to Cook Inlet. Does not include Kenai Lake, Skilak Lake or any saltwater.

**King Salmon less than 20 inches.

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Table 54. Kenai River* Sport Fish Freshwater Guided Harvest and Effort by Fisheries and Species, 1986.

| | Anglers | Trips | Days Fished | KI** | KS | SS | RS | PS | CS | LT | DV AC | RT | GR | WF | NP | SM | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kenai River - (Cook Inlet to Soldotna Bridge) | 17,675 | 18,533 | 23,956 | 669 | 6,515 | 10,275 | 1,829 | 848 | 0 | 0 | 98 | 98 | 0 | 268 | 0 | 268 | 0 |
| Kenai River - (Soldotna Bridge to Moose River) | 5,443 | 4,953 | 5,443 | 0 | 1,562 | 3,119 | 268 | 0 | 89 | 0 | 0 | 0 | 89 | 0 | 0 | 89 | 0 |
| Kenai River - (Moose River to Skilak Outlet) | 2,202 | 2,115 | 2,202 | 0 | 134 | 61 | 2,142 | 223 | 0 | 0 | 130 | 131 | 0 | 45 | 0 | 0 | 0 |
| Kenai River - (Skilak Inlet to Kenai Lake) | 1,774 | 1,391 | 3,126 | 0 | 0 | 428 | 892 | 0 | 0 | 0 | 196 | 130 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 24,953*** | 26,992 | 34,727 | 669 | 8,211 | 13,883 | 5,131 | 1,071 | 89 | 0 | 424 | 359 | 89 | 313 | 0 | 357 | 0 |

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WAES
Larry Dugan

By: Michael J. Mills

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| chinook | Oncorhynchus tshawytscha (Walbaum) | |
| Sockeye salmon | Oncorhynchus nerka (Walbaum) | RS |
| Kokanee salmon | Oncorhynchus nerka (Walbaum) | KO |
| Pink salmon | Oncorhynchus gorbuscha (Walbaum) | PS |
| Chum salmon | Oncorhynchus keta (Walbaum) | CS |
| Steelhead | Salmo gairdneri Richardson | SH |
| Rainbow trout | Salmo gairdneri Richardson | RT |
| Cutthroat trout | Salmo clarki Richardson | CT |
| Brook trout | Salvelinus fontinalis (Mitchell) | BT |
| Lake trout | Salvelinus namaycush (Walbaum) | LT |
| Dolly Varden | Salvelinus malma (Walbaum) | DV |
| Arctic char | Salvelinus alpinus (Linnaeus) | AC |
| Arctic grayling | Thymallus arcticus (Pallas) | GR |
| Northern pike | Esox lucius Linnaeus | NP |
| Whitefish | Coregonus spp. and Prosopium spp. | WF |
| Burbot | Lota lota (Linnaeus) | BB |

Table 2. (cont.) List of Common Names, Scientific Names and Abbreviations.

| Common Name | Scientific Name | Abbreviation |
|---|---|---|
| Inconnu (Sheefish) | Stenodus leucichthys (Guldenstadt) | SF |
| Halibut | Hyppoglossus stenolepis Schmidt | HA |
| Rockfish | Sebastes spp. | RF |
| Smelt | Osmeridae | SM |
| Capelin | Mallotus villosus (Muller) | SM |
| King crab | Paralithodes camtschatica (Tilesius) | KC |
| Dungeness crab | Cancer magister Dana | DC |
| Tanner crab | Chionoecetes bairdi Rathbun | TC |
| Shrimp | Pandalidae | SHR |
| Razor clam | Siliqua patula Dixon | RCL |
| Hardshell clams | | HCL |
| Butter clam | Saxidomus giganteus Deshayes | |
| Littleneck clam | Venerupis staminea (Conrad) | |
| Cockle | Clinocardium nuttallii (Conrad) | |
| Gaper clam | Tresus capax (Gould) | |
| Eastern softshell clam | Mya arenaria (Linne) | |
| Truncated mya | Mya truncata (Linne) | |
| Alaska surf clam | Spisula polynyma Stimpson | |

Table 12. Southcentral Alaska Sport Fish Harvests by Species, 1977-1986.

| Species | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|---|---|---|---|---|
| Chinook Salmon | 25,112 | 26,415 | 34,009 | 24,155 | 35,822 | 46,266 | 57,094 | 61,141 | 63,173 | 80,071 |
| Sea-Run Coho Salmon | 67,866 | 81,990 | 93,234 | 127,958 | 95,376 | 136,153 | 87,935 | 166,688 | 137,671 | 188,872 |
| Landlocked Coho/ Chinook Salmon | 31,152 | 26,583 | 17,907 | 43,142 | 39,930 | 24,102 | 33,482 | 20,124 | 19,684 | 19,445 |
| Sockeye Salmon | 97,629 | 118,299 | 77,655 | 105,914 | 76,533 | 128,015 | 170,799 | 119,098 | 168,211 | 179,709 |
| Kokanee Salmon | 2,068 | 1,702 | 3,218 | 2,351 | 5,540 | 3,419 | 1,899 | 786 | 3,329 | 2,363 |
| Pink Salmon | 85,543 | 143,483 | 63,366 | 153,794 | 64,163 | 105,961 | 47,264 | 100,932 | 67,838 | 109,073 |
| Chum Salmon | 5,044 | 23,755 | 8,126 | 8,660 | 7,810 | 13,497 | 11,043 | 15,806 | 7,895 | 17,357 |
| Steelhead | 1,949 | 2,720 | 1,554 | 2,063 | 1,727 | 1,305 | 1,895 | 2,379 | 1,635 | 1,128 |
| Rainbow Trout | 80,354 | 107,243 | 129,815 | 126,686 | 149,460 | 142,579 | 141,663 | 140,868 | 153,352 | 114,837 |
| Cutthroat Trout | 1,912 | 957 | 1,491 | 939 | 886 | 654 | 1,824 | 2,542 | 915 | 1,620 |
| Brook Trout | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Lake Trout | 15,200 | 10,910 | 13,876 | 15,752 | 15,495 | 15,423 | 16,210 | 13,301 | 13,119 | 18,213 |
| Dolly Varden/ Arctic Char | 79,405 | 102,107 | 160,029 | 130,009 | 149,543 | 115,832 | 151,503 | 133,089 | 108,822 | 93,653 |
| Arctic Grayling | 45,748 | 47,866 | 70,316 | 69,462 | 63,695 | 60,972 | 56,896 | 47,825 | 57,720 | 51,465 |
| Northern Pike | 321 | 767 | 762 | 1,358 | 1,411 | 1,707 | 2,642 | 4,424 | 2,240 | 2,894 |
| Whitefish | 2,594 | 4,231 | 3,534 | 3,221 | 3,802 | 2,558 | 3,784 | 4,806 | 9,337 | 7,914 |
| Burbot | 6,652 | 8,099 | 5,207 | 11,585 | 9,536 | 9,662 | 8,870 | 13,231 | 22,015 | 13,238 |
| Sheefish | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Smelt | 335,657 | 209,011 | 198,197 | 313,271 | 293,029 | 210,998 | 298,148 | 370,653 | 314,615 | 173,204 |
| Halibut | 17,412 | 30,954 | 34,603 | 39,796 | 52,370 | 55,198 | 75,047 | 78,045 | 81,458 | 115,857 |
| Rockfish | 22,092 | 29,361 | 39,887 | 37,625 | 41,374 | 35,283 | 32,528 | 43,825 | 33,571 | 59,690 |
| Razor Clams | 951,386 | 971,535 | 1,045,576 | 860,461 | 907,874 | 1,070,953 | 1,177,960 | 1,194,932 | 1,194,830 | 1,290,826 |
| Other Fish | 54,311 | 44,224 | 42,451 | 40,341 | 37,343 | 41,817 | 31,390 | 17,519 | 36,919 | 67,875 |
| Total | 1,929,407 | 1,992,212 | 2,044,813 | 2,118,543 | 2,052,719 | 2,222,354 | 2,409,876 | 2,552,014 | 2,498,349 | 2,609,304 |

Table 48. Prince William Sound* Sport Fish Harvest and Effort by Fisheries and Species, 1986.

| | Anglers | Trips | Days Fished | KS | SS | RS | PS | CS | LT | DV AC | SH | RT | CT | GR | WF | SM | HA | RF | RCL | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SALTWATER: | | | | | | | | | | | | | | | | | | | | |
| Valdez Bay | 7,592 | 11,558 | 19,449 | 123 | 5,749 | 260 | 12,858 | 1,116 | 0 | 31 | 0 | 0 | 61 | 0 | 0 | 0 | 3,241 | 5,864 | 0 | 934 |
| Passage Canal (Whittier) | 4,438 | 6,510 | 9,556 | 11 | 1,437 | 1,193 | 1,437 | 596 | 0 | 291 | 0 | 0 | 0 | 0 | 0 | 0 | 1,040 | 1,620 | 0 | 2,278 |
| Orca Inlet | 1,081 | 2,232 | 2,721 | 11 | 474 | 153 | 290 | 15 | 0 | 138 | 0 | 0 | 15 | 0 | 0 | 0 | 596 | 145 | 489 | 876 |
| Boat - Other | 2,421 | 6,082 | 5,888 | 234 | 703 | 626 | 168 | 367 | 0 | 245 | 0 | 0 | 0 | 0 | 0 | 0 | 2,996 | 1,832 | 0 | 321 |
| Valdez Bay - Shoreline | 7,183 | 6,563 | 9,419 | 45 | 1,040 | 153 | 9,312 | 749 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 153 | 67 | 306 | 16,206 |
| Shoreline - Other | 2,536 | 4,061 | 4,648 | 11 | 2,476 | 61 | 718 | 15 | 0 | 31 | 15 | 0 | 61 | 0 | 0 | 0 | 305 | 234 | 6,254 | 700 |
| SALTWATER TOTAL | 22,718** | 37,006 | 51,681 | 435 | 11,879 | 2,446 | 24,783 | 2,858 | 0 | 736 | 15 | 0 | 137 | 0 | 0 | 15 | 8,331 | 9,762 | 7,049 | 21,315 |
| FRESHWATER: | | | | | | | | | | | | | | | | | | | | |
| Eyak River | 1,285 | 4,411 | 4,755 | 0 | 2,767 | 92 | 107 | 0 | 0 | 642 | 0 | 15 | 214 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Eshamy Creek and Lagoon | 1,022 | 558 | 1,022 | 0 | 76 | 612 | 260 | 0 | 0 | 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Coghill River | 847 | 479 | 847 | 0 | 0 | 321 | 0 | 0 | 0 | 61 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Robe River | 818 | 1,674 | 1,712 | 0 | 0 | 0 | 0 | 0 | 0 | 4,449 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Other Streams | 1,574 | 2,069 | 2,351 | 0 | 1,116 | 1,178 | 122 | 0 | 0 | 733 | 0 | 0 | 337 | 31 | 15 | 0 | 0 | 0 | 0 | 0 |
| Lakes | 1,722 | 1,538 | 1,912 | 67 | 260 | 229 | 0 | 0 | 259 | 613 | 0 | 92 | 932 | 321 | 0 | 0 | 0 | 0 | 0 | 0 |
| FRESHWATER TOTAL | 5,869** | 10,729 | 12,599 | 67 | 4,219 | 2,432 | 489 | 0 | 259 | 6,559 | 0 | 107 | 1,483 | 352 | 15 | 0 | 0 | 0 | 0 | 0 |
| GRAND TOTAL | 26,689** | 47,735 | 64,280 | 502 | 16,098 | 4,878 | 25,272 | 2,858 | 259 | 7,295 | 15 | 107 | 1,620 | 352 | 15 | 15 | 8,331 | 9,762 | 7,049 | 21,315 |

*Prince William Sound (Area J): All Alaskan waters, including drainages, from and including Cape Suckling through Prince William Sound to Cape Puget, including all waters emptying into Port Bainbridge; and, that portion of the Copper River drainage downstream of a line between the south bank of Haley Creek and the south bank of Canyon Creek in Wood Canyon.

**Angler totals may not equal sum of sites due to some anglers fishing at more than one site.

Table 53. Kenai River* Sport Fish Freshwater Non-Guided Harvest and Effort by Fisheries and Species, 1986.

| | Anglers | Trips | Days Fished | KI** | KS | SS | RS | PS | CS | LT | DV AC | RT | GR | WF | NP | SM | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kenai River - (Cook Inlet to Soldotna Bridge) | 44,719 | 122,149 | 157,079 | 1,269 | 7,966 | 28,063 | 19,348 | 13,578 | 229 | 0 | 1,151 | 525 | 0 | 76 | 0 | 31,620 | 0 |
| Kenai River - (Soldotna Bridge to Moose River) | 19,023 | 37,525 | 58,433 | 275 | 1,407 | 7,217 | 13,578 | 2,752 | 107 | 0 | 771 | 168 | 0 | 0 | 0 | 1,147 | 0 |
| Kenai River - (Moose River to Skilak Outlet) | 16,543 | 44,475 | 48,969 | 61 | 535 | 8,287 | 11,391 | 2,018 | 138 | 659 | 1,798 | 770 | 0 | 489 | 0 | 0 | 0 |
| Kenai River - (Skilak Inlet to Kenai Lake) | 16,772 | 36,513 | 35,843 | 46 | 0 | 2,660 | 22,950 | 505 | 0 | 313 | 1,631 | 603 | 31 | 46 | 0 | 0 | 0 |
| TOTAL | 73,352*** | 240,662 | 300,324 | 1,651 | 9,908 | 46,227 | 67,267 | 18,853 | 474 | 972 | 5,351 | 2,066 | 31 | 611 | 0 | 32,767 | 0 |

*Kenai River (Area P): All main channel waters of the Kenai River downstream of Kenai Lake to Cook Inlet. Does not include Kenai Lake, Skilak Lake or any saltwater.

**King Salmon less than 20 inches.

***Angler totals may not equal sum of sites due to some anglers fishing at more than one site.

Table 54. Kenai River* Sport Fish Freshwater Guided Harvest and Effort by Fisheries and Species, 1986.

| | Anglers | Trips | Days Fished | KI** | KS | SS | RS | PS | CS | LT | DV AC | RT | GR | WF | NP | SM | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kenai River - (Cook Inlet to Soldotna Bridge) | 17,675 | 18,533 | 23,956 | 669 | 6,515 | 10,275 | 1,829 | 848 | 0 | 0 | 98 | 98 | 0 | 268 | 0 | 268 | 0 |
| Kenai River - (Soldotna Bridge to Moose River) | 5,443 | 4,953 | 5,443 | 0 | 1,562 | 3,119 | 268 | 0 | 89 | 0 | 0 | 0 | 89 | 0 | 0 | 89 | 0 |
| Kenai River - (Moose River to Skilak Outlet) | 2,202 | 2,115 | 2,202 | 0 | 134 | 61 | 2,142 | 223 | 0 | 0 | 130 | 131 | 0 | 45 | 0 | 0 | 0 |
| Kenai River - (Skilak Inlet to Kenai Lake) | 1,774 | 1,391 | 3,126 | 0 | 0 | 428 | 892 | 0 | 0 | 0 | 196 | 130 | 0 | 0 | 0 | 0 | 0 |
| TOTAL | 24,953*** | 26,992 | 34,727 | 669 | 8,211 | 13,883 | 5,131 | 1,071 | 89 | 0 | 424 | 359 | 89 | 313 | 0 | 357 | 0 |

*Kenai River (Area P): All main channel waters of the Kenai River downstream of Kenai Lake to Cook Inlet. Does not include Kenai Lake, Skilak Lake or any saltwater.

**King Salmon less than 20 inches.

***Angler totals may not equal sum of sites due to some anglers fishing at more than one site.

# SOUTHCENTRAL ALASKA
# SPORT FISHING ECONOMIC STUDY

*JONES & STOKES ASSOCIATES, INC.*
*1725 - 23rd STREET, SUITE 100 / SACRAMENTO, CA 95816*

1987

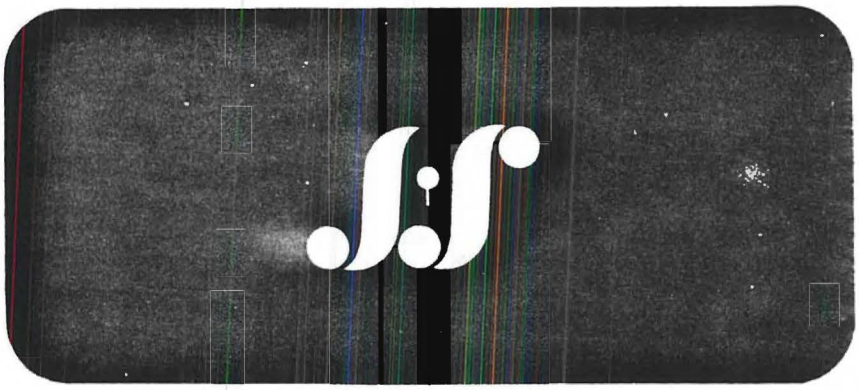


Table 4-1. Angler Expenditures and Net Willingness to Pay (WTP) Associated with Sport Fishing in Southcentral Alaska, by Activity and Fishery (Thousands of Dollars)

| | Resident Anglers | | Nonresident Anglers | | Total | |
|---|---|---|---|---|---|---|
| | Expenditures | Net WTP | Expenditures | Net WTP | Expenditures | Net WTP |
| ALL SOUTHCENTRAL SPORT FISHING | $74,163 | $246,391 | $52,892 | $30,385 | $127,055 | $276,776 |
| King salmon - all sites | 16,606 | 17,862 | 21,451 | 8,812 | 38,057 | 26,674 |
| Halibut - all sites | 12,615 | 21,626 | 6,031 | 3,526 | 18,646 | 25,152 |
| Razor clams - all sites | 1,025 | 1,757 | 945 | 268 | 1,970 | 2,025 |
| By Fishery: | | | | | | |
| Kenai River | | | | | | |
| All sport fishing | 18,932 | 15,241 | 19,029 | 8,011 | 37,961 | 23,252 |
| King salmon fishing (early run) | 4,186 | 4,038 | 6,148 | 2,916 | 10,334 | 6,954 |
| King salmon fishing (late run) | 3,184 | 2,477 | 5,142 | 2,444 | 8,326 | 4,921 |
| Silver salmon fishing (early run) | 2,848 | 2,541 | 1,068 | 466 | 3,916 | 3,007 |
| Silver salmon fishing (late run) | 2,020 | 1,645 | 2,619 | 1,139 | 4,639 | 2,784 |
| Red salmon fishing | 1,613 | 1,711 | 2,571 | 418 | 4,184 | 2,129 |
| Rainbow trout fishing | 1,989 | 688 | 486 | 125 | 2,475 | 813 |
| Russian River | | | | | | |
| Red salmon fishing (early run) | 2,804 | 2,130 | 1,361 | 640 | 4,165 | 2,770 |
| Red salmon fishing (late run) | 480 | 211 | 566 | 267 | 1,046 | 478 |
| Lower Streams in the Kenai Peninsula[1] | | | | | | |
| All fishing | 3,551 | 1,970 | 2,363 | 496 | 5,914 | 2,466 |
| King salmon fishing | 1,338 | 503 | 797 | 207 | 2,135 | 710 |
| Deep Creek Marine | | | | | | |
| King salmon fishing | 1,427 | 1,253 | 929 | 404 | 2,356 | 1,657 |
| Halibut fishing | 1,840 | 2,357 | 2,192 | 269 | 4,032 | 2,626 |
| Kachemak Bay - Halibut fishing | 5,818 | 5,364 | 2,902 | 2,709 | 8,720 | 8,073 |
| Resurrection Bay - Silver salmon fishing | 1,118 | 902 | 775 | 450 | 1,893 | 1,352 |
| Little Susitna River | | | | | | |
| King salmon fishing | 794 | 1,323 | 666 | 360 | 1,460 | 1,683 |
| Silver salmon fishing | 312 | 583 | 397 | 90 | 709 | 673 |
| West Side Cook Inlet/West Side Susitna Streams[2] | | | | | | |
| King salmon fishing | 2,480 | 1,180 | 2,569 | 585 | 5,049 | 1,765 |
| Silver salmon fishing | 278 | 458 | 363 | 269 | 641 | 727 |
| East Side Susitna Roadside Streams[3] | | | | | | |
| King salmon fishing | 435 | 576 | 507 | 134 | 942 | 710 |
| Silver salmon fishing | 161 | 726 | 195 | 45 | 356 | 771 |
| Gulkana River | | | | | | |
| All fishing | 1,102 | 1,834 | 412 | 107 | 1,514 | 1,941 |
| Grayling fishing | 370 | 346 | 81 | 5 | 451 | 351 |
| Lake Creek - all fishing | 541 | 852 | 322 | N/A | 863 | 852 |
| Kepler Lake Complex - Rainbow trout fishing | 162 | 1,700 | 2 | N/A | 164 | 1,700 |
| Lake Louise, Susitna, Tyone - Lake trout and burbot winter fishing | 66 | 186 | N/A | N/A | 66 | 186 |
| Anchorage Area Stocked Lakes - Rainbow trout and land-locked salmon fishing | 1,395 | 2,335 | 316 | 90 | 1,711 | 2,425 |
| Big Lake - Rainbow trout fishing | 214 | 1,431 | 40 | N/A | 254 | 1,431 |

[1] Includes Ninilchik River, Anchor River, and Deep Creek.
[2] Includes Deshka River/Kroto Creek, Alexander Creek, Talachulitna River, Chuitna River, and Theodore, Lewis, and Ivan Rivers.
[3] Includes Montana Creek, Caswell Creek, Willow and Little Willow Creeks.

N/A = No data available.

Table 4-2. Angler Spending in the Anchorage Area Associated with Sport Fishing in Southcentral Alaska (1986 $)

| Industry | Resident Anglers | Nonresident Anglers | Total Angler Spending |
|---|---|---|---|
| Fish Packing/Processing | $ 327,000 | $ NA | $ 327,000 |
| Boat Building/Repair | 6,707,000 | NA | 6,707,000 |
| Passenger Transportation | 2,403,000 | 1,445,000 | 3,848,000 |
| Retail Trade | 25,266,000 | 3,829,000 | 29,095,000 |
| Hotel/Lodging Places | 326,000 | 1,247,000 | 1,573,000 |
| Eating/Drinking Establishments | 1,595,000 | 911,000 | 2,506,000 |
| Guide Services | 218,000 | 125,000 | 343,000 |
| TOTAL | $36,842,000 | $7,557,000 | $44,399,000 |

NA = No data available but considered minor.

estimated at $44.4 million in 1986. More than 65 percent of all angler expenditures were made in the retail trade sector.

Total angler spending translates into direct employment of 781 people (equivalent to 376 full-time jobs) in the Anchorage area, as shown in Table 4-3. As would be expected, based on the relative amount of spending on retail goods, the majority of this employment is in the retail trade sector. A large amount of passenger transportation jobs is also supported by angler spending. This industry has more than double the employment of the boat building/repair industry, yet angler spending for passenger transportation is only 56 percent of the spending for boat building and repair. This indicates that the output per worker is greater in the boat building/repair industry than in the passenger transportation industry. (In fact, output per worker in the boat building/repair industry is almost four times greater than output per worker in the passenger transportation industry; see Chapter 8, Table 8-32).

Direct earnings attributed to the 781 direct jobs are equal to $7.5 million. Approximately 53 percent of this income, or $4 million, is earned by workers in the Anchorage retail trade sector.

Total production of goods and services (output), employment, and earnings in the Anchorage area from angler spending is shown in Table 4-4. More than $117.2 million in output is generated by angler expenditures. This output supports the equivalent of more than 1,400 full-time jobs in various industrial sectors. The majority of the output which is generated and jobs that are supported are in the trade sector (which includes both wholesale and retail trade).

## Kenai Peninsula

Angler spending in the Kenai Peninsula associated with sport fishing in southcentral Alaska is shown by industry in Table 4-5. This spending includes expenditures by both resident ($22.7 million) and nonresident ($9.1 million) anglers and is estimated at $31.8 million in 1986. In the Kenai Peninsula, more than 45 percent of all angler expenditures are made in the retail trade sector.

Total angler spending translates into direct employment of 886 people (equivalent to 375 full-time jobs) in the Kenai Peninsula, as shown in Table 4-6. The majority of this employment is in the guide services sector. Although there is a large amount of guide service employment, many of these jobs are seasonal and short in duration. (The average job length for guides in the Kenai Peninsula is less than 3 months; see Chapter 3, Table 3-20.) A large number of retail trade, hotel and lodging, and eating and drinking sector jobs is also generated by angler spending.

Table 4-3. Direct Jobs and Income in the Anchorage Area Supported by Angler Spending Associated with Sport Fishing in Southcentral Alaska

| Industry | Direct Employment (No. of Jobs) | Full-Time Equivalent Employment | Direct Earnings (1986 $) |
|---|---|---|---|
| Fish Packing/Processing | 20 | 9 | $ 172,000 |
| Boat Building/Repair | 66 | 28 | 706,000 |
| Passenger Transportation | 144 | 47 | 1,454,000 |
| Retail Trade | 385 | 202 | 3,991,000 |
| Hotel/Lodging Places | 81 | 30 | 545,000 |
| Eating/Drinking Establishments | 62 | 54 | 537,000 |
| Guide Services | 23 | 6 | 91,000 |
| TOTAL | 781 | 376 | $7,496,000 |

Table 4-4. Total Output, Employment and Income in the Anchorage Area Generated by Angler Spending Associated with Sport Fishing in Southcentral Alaska

| Industrial Sector | Total Output (1986 $) | Total Employment (full-time equivalents) | Total Earnings (1986 $) |
|---|---|---|---|
| Agricultural Services, Forestry, & Other | $ 773,000 | 12 | $ 61,000 |
| Mining | 1,612,000 | 5 | 295,000 |
| Construction | 1,269,000 | 13 | 587,000 |
| Manufacturing | 11,185,000 | 96 | 2,586,000 |
| Trans., Comm., & Utilities | 7,891,000 | 65 | 2,418,000 |
| Trade | 35,707,000 | 884 | 18,172,000 |
| Finance, Insurance & Real Estate | 10,581,000 | 70 | 1,877,000 |
| Services | 14,341,000 | 308 | 7,172,000 |
| Government | 425,000 | 10 | 309,000 |
| Households | 33,478,000 | NA | NA |
| TOTAL | $117,262,000 | 1,463 | $33,477,000 |

NA = Not applicable.

Table 4-5. Angler Spending on the Kenai Peninsula Associated with Sport Fishing in Southcentral Alaska (1986$)

| Industry | Resident Anglers | Nonresident Anglers | Total Angler Spending |
|---|---|---|---|
| Fish Packing/Processing | 256,000 | $ NA | $ 256,000 |
| Boat Building/Repair | 3,373,000 | NA | 3,373,000 |
| Passenger Transportation | 463,000 | 700,000 | 1,163,000 |
| Retail Trade | 11,693,000 | 2,830,000 | 14,523,000 |
| Hotel/Lodging Places | 1,407,000 | 1,616,000 | 3,023,000 |
| Eating/Drinking Establishments | 3,651,000 | 1,034,000 | 4,685,000 |
| Guide Services | 1,813,000 | 2,971,000 | 4,784,000 |
| TOTAL | $22,656,000 | $9,151,000 | $31,807,000 |

NA = No data available but considered minor.

Table 4-6. Direct Jobs and Income in the Kenai Peninsula Supported by Angler Spending Associated with Sport Fishing in Southcentral Alaska

| Industry | Direct Employment (No. of Jobs) | Full-Time Equivalent Employment | Direct Earnings (1986 $) |
|---|---|---|---|
| Fish Packing/Processing | 16 | 7 | $ 132,000 |
| Boat Building/Repair | 33 | 14 | 353,000 |
| Passenger Transportation | 43 | 14 | 431,000 |
| Retail Trade | 190 | 100 | 1,975,000 |
| Hotel/Lodging Places | 156 | 58 | 1,058,000 |
| Eating/Drinking Establishments | 117 | 102 | 1,009,000 |
| Guide Services | 331 | 80 | 1,286,000 |
| TOTAL | 886 | 375 | $6,244,000 |

Southcentral Alaska Nonresident Angler Spending Profile
Kenai River - lower (P-1)

| Expenses Category | Dollars Spent per Household Fishing Day |
|---|---|
| Package fishing tour | $ 55.26 |
| Guiding fees | 38.15 |
| Transportation within Alaska | 25.61 |
| Fishing-related clothing | 8.37 |
| Tackle/fishing gear/equipment rental | 12.57 |
| Food and beverages | 45.41 |
| Lodging/camping fees | 19.06 |
| Fish processing/packaging/bait | 7.19 |
| Other fishing-related expenses | 11.95 |
| Total | $223.57 |

* Sample size: 28

Note: Estimates calculated for each category using all reported values (including zeros) from the sample.

Southcentral Alaska Nonresident Angler Spending Profile
Kenai River - other (P-2, P-3, P-4)

| Expenses Category | Dollars Spent per Household Fishing Day |
|---|---|
| Package fishing tour | $ 46.79 |
| Guiding fees | 12.00 |
| Transportation within Alaska | 25.15 |
| Fishing-related clothing | 4.48 |
| Tackle/fishing gear/equipment rental | 8.09 |
| Food and beverages | 35.68 |
| Lodging/camping fees | 9.62 |
| Fish processing/packaging/bait | 8.87 |
| Other fishing-related expenses | 12.49 |
| Total | $163.17 |

* Sample size: 41

Note: Estimates calculated for each category using all reported values (including zeros) from the sample.

Southcentral Alaska Nonresident Angler Spending Profile
Russian River (P-7)

| Expenses Category | Dollars Spent per Household Fishing Day |
|---|---|
| Package fishing tour | 0 |
| Guiding fees | $ 7.18 |
| Transportation within Alaska | 16.84 |
| Fishing-related clothing | 3.19 |
| Tackle/fishing gear/equipment rental | 2.80 |
| Food and beverages | 7.99 |
| Lodging/camping fees | 2.82 |
| Fish processing/packaging/bait | 0.09 |
| Other fishing-related expenses | 0 |
| Total | $40.91 |

* Sample size: 6

Note: Estimates calculated for each category using all reported values (including zeros) from the sample.

Southcentral Alaska Nonresident Angler Spending Profile
Kenai Peninsula - other freshwater (P-5, P-6, P-8, P-12)

| Expenses Category | Dollars Spent per Household Fishing Day |
|---|---|
| Package fishing tour | $117.30 |
| Guiding fees | 0 |
| Transportation within Alaska | 23.61 |
| Fishing-related clothing | 12.71 |
| Tackle/fishing gear/equipment rental | 24.28 |
| Food and beverages | 19.17 |
| Lodging/camping fees | 13.85 |
| Fish processing/packaging/bait | 3.84 |
| Other fishing-related expenses | 2.99 |
| Total | $217.75 |

* Sample size: 12

Note: Estimates calculated for each category using all reported values (including zeros) from the sample.

Southcentral Alaska Nonresident Angler Spending Profile
Lower Kenai Peninsula Streams (P-9, P-10, P-11)

| Expenses Category | Dollars Spent per Household Fishing Day |
|---|---|
| Package fishing tour | $ 2.49 |
| Guiding fees | 2.09 |
| Transportation within Alaska | 26.72 |
| Fishing-related clothing | 8.30 |
| Tackle/fishing gear/equipment rental | 12.66 |
| Food and beverages | 18.04 |
| Lodging/camping fees | 14.08 |
| Fish processing/packaging/bait | 5.02 |
| Other fishing-related expenses | 0.65 |
| Total | $90.05 |

* Sample size: 17

Note: Estimates calculated for each category using all reported values (including zeros) from the sample.

Southcentral Alaska Nonresident Angler Spending Profile
Deep Creek Marine (P-13)

| Expenses Category | Dollars Spent per Household Fishing Day |
|---|---|
| Package fishing tour | $ 37.94 |
| Guiding fees | 15.04 |
| Transportation within Alaska | 10.71 |
| Fishing-related clothing | 5.33 |
| Tackle/fishing gear/equipment rental | 13.69 |
| Food and beverages | 31.98 |
| Lodging/camping fees | 10.00 |
| Fish processing/packaging/bait | 10.49 |
| Other fishing-related expenses | 0.34 |
| Total | $135.52 |

* Sample size: 9

Note: Estimates calculated for each category using all reported values (including zeros) from the sample.

Southcentral Alaska Nonresident Angler Spending Profile
Kachemak Bay (P-14)

| Expenses Category | Dollars Spent per Household Fishing Day |
|---|---|
| Package fishing tour | $ 49.74 |
| Guiding fees | 10.35 |
| Transportation within Alaska | 32.29 |
| Fishing-related clothing | 6.71 |
| Tackle/fishing gear/equipment rental | 10.05 |
| Food and beverages | 28.96 |
| Lodging/camping fees | 21.08 |
| Fish processing/packaging/bait | 9.60 |
| Other fishing-related expenses | 2.28 |
| Total | $171.06 |

* Sample size: 34

Note: Estimates calculated for each category using all reported values (including zeros) from the sample.

Southcentral Alaska Nonresident Angler Spending Profile
Resurrection Bay and other saltwater (P-15, P-18)

| Expenses Category | Dollars Spent per Household Fishing Day |
|---|---|
| Package fishing tour | $172.98 |
| Guiding fees | 6.15 |
| Transportation within Alaska | 12.72 |
| Fishing-related clothing | 20.85 |
| Tackle/fishing gear/equipment rental | 10.85 |
| Food and beverages | 60.08 |
| Lodging/camping fees | 30.99 |
| Fish processing/packaging/bait | 2.67 |
| Other fishing-related expenses | 12.82 |
| Total | $330.11 |

* Sample size: 13

Note: Estimates calculated for each category using all reported values (including zeros) from the sample.

# NOAA Technical Memorandum NMFS F/NWC-191

## Survey of Subsistence Fish and Shellfish for Exposure to Oil Spilled from the *Exxon Valdez* First Year: 1989



Usha Varanasi, Sin-Lam Chan, William D. MacLeod, John E. Stein, Donald W. Brown, Douglas G. Burrows, Karen L. Tilbury, John T. Landahl, Catherine A. Wigren, Tom Hom, Susan M. Pierce

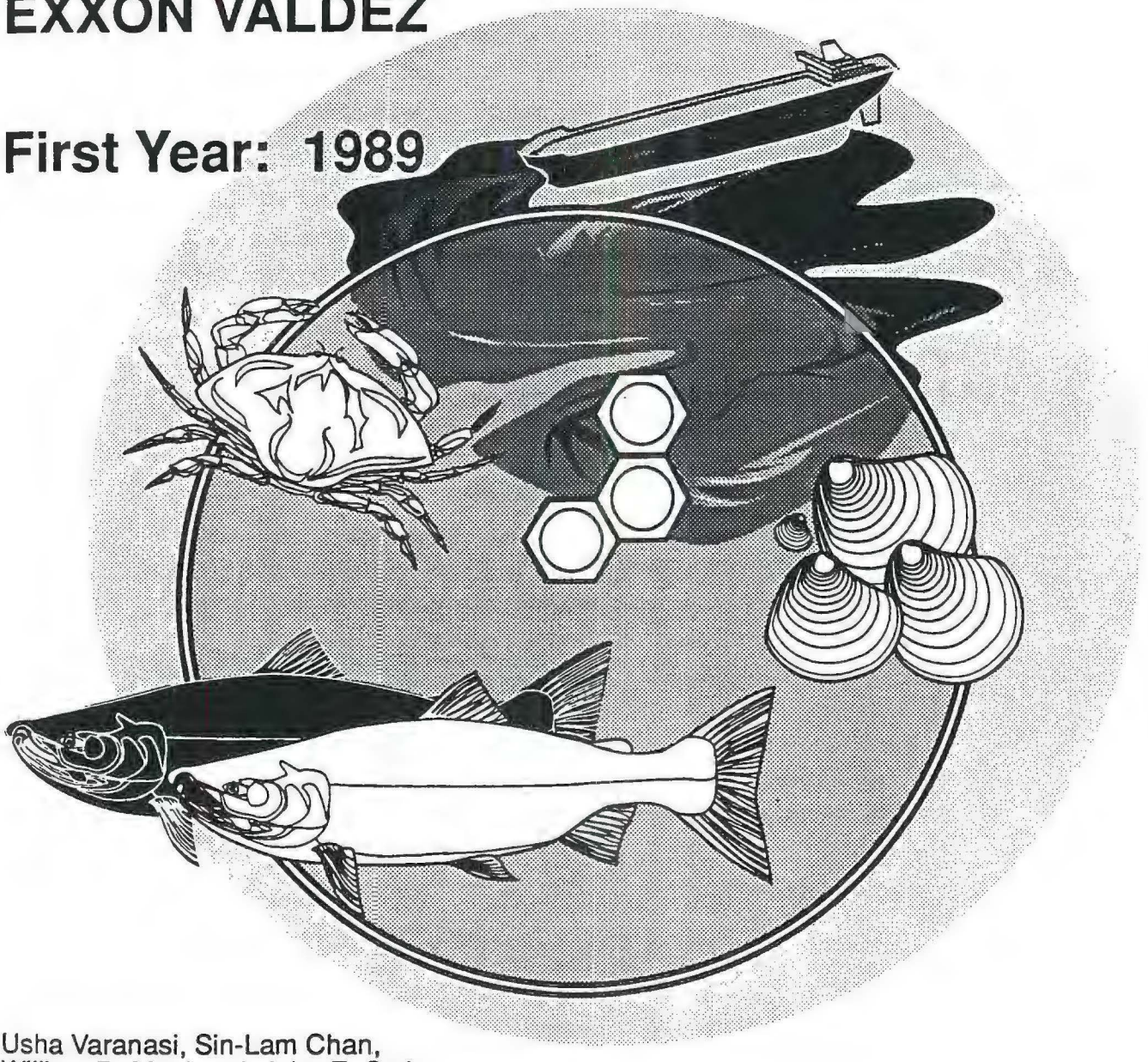
December 1990



**U.S. DEPARTMENT OF COMMERCE**
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

# Survey of Subsistence Fish and Shellfish for Exposure to Oil Spilled from the EXXON VALDEZ

## First Year: 1989



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National Marine Fisheries Service
National Oceanic and Atmospheric Administration
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December 1990

# ABSTRACT

More than 500 fish and shellfish samples collected from native Alaskan fishing grounds were analyzed for aromatic contaminants (ACs) from petroleum (alkylated and unsubstituted aromatic hydrocarbons with 2-7 benzenoid rings and dibenzothiophenes). Intertidal molluscs (mussels, clams, chitons, and snails) from Windy Bay, Kodiak (City), Chenega Bay, and Old Harbor consistently had more than 100 parts-per-billion (ppb) ACs, with levels in mussels from Windy Bay and Kodiak as high as 12,000 to 18,000 ppb. Levels of ACs in molluscs, crabs, and sea urchins from other villages were less than 10 ppb, a level comparable to that measured in shellfish from the designated reference area in Southeast Alaska near Angoon. Nonparametric statistics on 147 samples of molluscs showed that levels of ACs in molluscs from Windy Bay, Kodiak, and Chenega Bay were significantly higher ($p \leq 0.05$) than those in the Angoon molluscs sampled.

Of the 210 samples of edible flesh of fish analyzed in 1989, only two samples of pink salmon *(Onchorhynchus gorbuscha)* from Kodiak had AC levels that neared or exceeded 100 ppb. Another 11 samples of pink and coho salmon *(O. kisutch)* from Kodiak, Chenega Bay, Tatitlek, and Larsen Bay exceeded 10 ppb of total ACs. The levels in the edible flesh of salmon from other subsistence fishing areas and in bottomfish from all areas were generally comparable (less than 10 ppb) to the levels detected in the same or related species from the reference site, near Angoon. Two samples of smoked salmon, one from Old Harbor and one from Tatitlek, contained 8,200 and 22,000 ppb of ACs, respectively.

In an unofficial advisory opinion, the Food and Drug Administration has indicated that little risk is involved in the consumption of the non-smoked subsistence foods studied. The results to date provide important information on the level of contamination of subsistence fish and shellfish from fishing areas of native Alaskan villages in and near Prince William Sound and a reference database against which future temporal changes of petroleum derived ACs in the edible flesh of fish and shellfish can be evaluated.

CONTENTS

Appendices

# PREFACE

The Environmental Conservation (EC) Division of the Northwest Fisheries Center conducts investigations on the fate and effects of organic contaminants in the marine environment. Because we usually are dealing with trace levels of toxic chemicals, and because the chemical makeup of marine environments can be extemely complex, we need sensitive, reliable analytical methods to produce data with an appropriate level of confidence. Our analytical chemistry facility for trace organics was originally established in the mid-1970s to provide NOAA with advanced analytical capabilities that were not otherwise readily available. This resulted in the development of state-of-the-art analytical techniques to measure trace organics and their metabolites. Much of the analytical methodology needed for NOAA's environmental projects was developed over the past decade by the Division's researchers, with funding support coming from not only the National Marine Fisheries Service but also other NOAA elements such as the Outer Continental Shelf Environmental Assessment Program and the Marine Ecosystems Analysis Program.

During the last decade, the EC Division conducted thousands of sophisticated analyses of marine samples for trace levels of petroleum hydrocarbons and other organic chemical contaminants. Early success in studies conducted in Puget Sound and in the New York Bight laid the foundations for the Division's present prominent role in NOAA's long-term National Status and Trends Program in analyzing sediments and benthic fish from U.S. coastal waters for organic contaminants. At the same time, we have conducted interlaboratory comparisons for analyses of marine samples. Until 1980, comparisons of analytical results among experienced laboratories differed by as much as tenfold. We were asked to investigate ways to improve the intercomparability among such laboratories. Over the years, precision among experienced laboratories improved substantially to a range of 14-81% relative standard deviation. Moreover, in response to the need to analyze large numbers of environmental samples with greater speed, we replaced two lengthy manual

cleanup procedures with a single high performance liquid chromatography cutting cleanup time by 75% and solvent consumption by 50%. Division scientists also developed a method to test for petroleum exposure by rapidly screening fish bile for metabolites of aromatic compounds. These coordinated efforts have placed the EC Division in an excellent position to provide timely and quality analyses on subsistence samples related to the oi spilled from the *Exxon Valdez* in Prince William Sound.

# INTRODUCTION

The spreading of oil spilled from the *Exxon Valdez* on 24 March 1989 raised concerns among native Alaskans that their subsistence seafood could have been contaminated by petroleum hydrocarbons. In response, NOAA entered into a memorandum of understanding (MOU) with Exxon to analyze subsistence fish and shellfish from native Alaskan villages for aromatic contaminants (ACs) found in spilled oil. The ACs consist of the aromatic hydrocarbons and dibenzothiophenes listed in Table 1. This report discusses the levels of these chemicals found in fish and shellfish collected in July, August, and September 1989 (Cycles I, II, and III, respectively). Statistical interpretations are included. The subsistence fishing grounds sampled in this study appear in Figure 1.

Previous laboratory studies have shown that fish efficiently biotransform aromatic hydrocarbons to derivatives (metabolites) that are concentrated in bile for excretion (Statham et al. 1976, Varanasi and Gmur 1981, Stein et al. 1984, Varanasi et al. 1989a). This means that aromatic hydrocarbons may not readily accumulate in the edible flesh of fish. Thus, to monitor the exposure of fish to ACs, we developed a rapid, sensitive method to screen fish bile for presence of metabolites characteristic of petroleum ACs. This procedure utilizes high performance liquid chromatography (HPLC) with fluorescence detection (Krahn et al. 1984, 1986a). It has been employed previously in an oil spill on the Columbia River (Krahn et al. 1986b) to determine exposure of fish to ACs from petroleum.

The more specific analyses for individual ACs in tissues, which involve combined gas chromatography/mass spectrometry (GC/MS), are more costly than the screening of bile for ACs and their metabolites. Nevertheless, recent important improvements and automation of the extract cleanup procedure enable us now to provide high quality analytical data for AC levels in the edible flesh of fish and shellfish more quickly than before and with less labor (Krahn et al. 1988). These methods can also be used to detect sulfur-containing ACs, such as the dibenzothiophenes.

Statistical differences of AC levels in edible flesh or bile among sites were assessed using both parametric and nonparametric tests.

Table 1. Aromatic contaminants (ACs: aromatic hydrocarbons and dibenzothiophenes) determined in edible tissue in the Exxon/NOAA Subsistence Fish and Shellfish Study. Lower molecular weight ACs = LACs; higher molecular weight ACs = HACs.

| 2- to 3-Ring Aromatic Compounds (LACs) | 4- to 7-Ring Aromatic Compounds (HACs) |
|---|---|
| naphthalene (NPH) | fluoranthene |
| C1-naphthalenes | pyrene |
| C2-naphthalenes | C1-fluoranthenes/pyrenes |
| C3-naphthalenes | benz[a]anthracene |
| C4-naphthalenes | chrysene |
| acenaphthylene | C1-chrysenes/benz[a]anthracenes |
| acenaphthene | C2-chrysenes/benz[a]anthracenes |
| fluorene | C3-chrysenes/benz[a]anthracenes |
| C1-fluorenes | C4-chrysenes/benz[a]anthracenes |
| C2-fluorenes | benzo[b]fluoranthene |
| C3-fluorenes | benzo[k]fluoranthene |
| phenanthrene (PHN) | benzo[a]pyrene |
| C1-phenanthrenes/anthracenes | indeno[1,2,3-cd]pyrene |
| C2-phenanthrenes/anthracenes | dibenz[a,h]anthracene |
| C3-phenanthrenes/anthracenes | benzo[ghi]perylene |
| C4-phenanthrenes/anthracenes | |
| dibenzothiophene | |
| C1-dibenzothiophenes | |
| C2-dibenzothiophenes | |
| C3-dibenzothiophenes | |

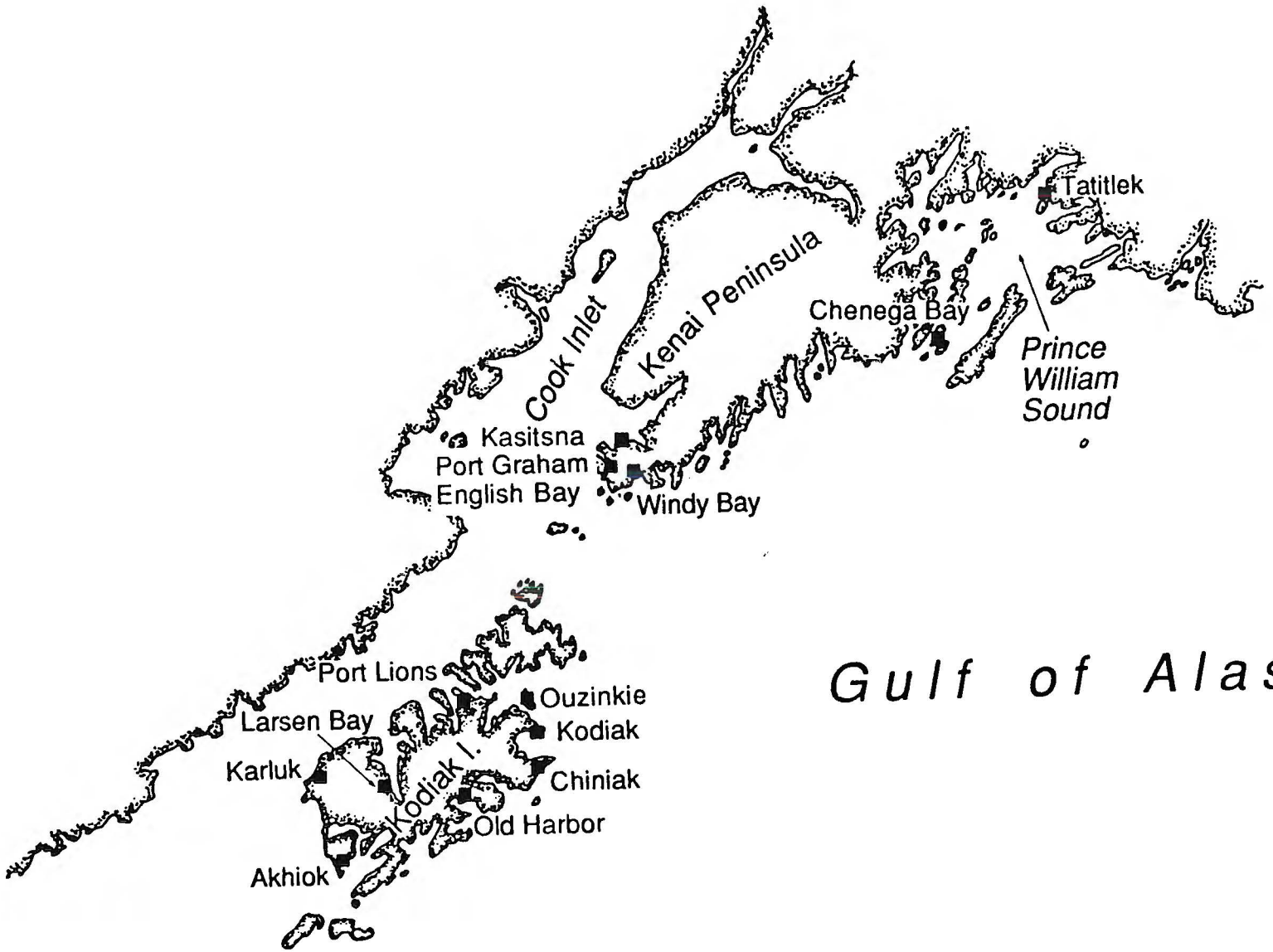


Figure 1. Native Alaskan fishing sites.

# EXPERIMENTAL METHODS

Details of protocols for the field sampling, chemical analyses, and statisti evaluation are outlined below. These protocols have also been briefly describe in the periodic reports (Varanasi et al. 1989b-e) issued throughout the study.

## Field Sample Collection

Under contract with Exxon, Dames and Moore biologists collected samples of fish (Table 2) and shellfish (Table 3) from subsistence fishing areas near native Alaskan villages (Fig. 1). Generally, at least two sites were sampled per village with assistance of NOAA or State of Alaska field biologists. Bile samples from these fish were usually screened for metabolites of ACs (see below) to indicate the priority by which samples of edible fish flesh should be subjected to a more detailed analysis; however, Cycle I sampling was completed before this protocol could be fully implemented. Otherwise, samples of bile and flesh were chilled in the field, frozen before shipment, and stored frozen in the laboratory until analyzed. Shellfish samples were composites of whole individual animals, while fish were sampled as individuals for shipment.

## Bile Analyses

Fish bile samples were analyzed for fluorescent ACs (FACs) by the metho of Krahn et al. (1986a) outlined below. Bile collected from the fish was stored a the laboratory at -80° C until analyzed.

### *Fluorescent Aromatic Contaminant Determinations*

The FACs in bile were analyzed on a Waters[1] high performance liquid chromatograph equipped with a Perkin-Elmer HC-ODS/ PAH column (0.26 X 25 cm), an automatic injector, and Perkin-Elmer model 40 fluorescence detector connected in series.

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[1] Reference to trade name does not imply endorsement by the National Marine Fisheries Service, NOAA.

Table 2. Fish: Species sampling log for subsistence studies, cycles I - III, 1989.

| Village, Sampling site | Code | *Species* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pink salmon | Coho salmon | Sockeye salmon | Chum salmon | Chinook salmon | Dolly Varden | Smoked salmon | Halibut | Yellowfin sole | Pacific cod | Rockfish | Irish lord |
| Windy Bay 1 | WNB 1 | | | | | | | | | | | | |
| Windy Bay 2 | WNB 2 | | | | | | | | | | | | |
| Kodiak (city) 1 | KOD 1 | | | | | | | | | | | 2 | |
| Kodiak (city) 2 | KOD 2 | | | | | | | | 2 | | | | |
| Kodiak (city) 3 | KOD 3 | | | | | | | | | | | | |
| Kodiak (city) 4 | KOD 4 | | | | | | | | | | | | |
| Kodiak (city) 5 | KOD 5 | 16 | | 1 | | | 2 | | | | | | |
| Kodiak (city) 6 | KOD 6 | | | | | | | | 3 | | | | |
| Chenega Bay 1 | CHE 1 | | | | | | | | | | | | |
| Chenega Bay 2 | CHE 2 | | | | | | | | 9 | | 6 | 4 | |
| Chenega Bay 3 | CHE 3 | 8 | | | | | | | | | | | |
| Chenega Bay 4 | CHE 4 | 18 | | | | | | | | | | | |
| Old Harbor 1 | OHA 1 | | | | | | | | 5 | | 2 | | |
| Old Harbor 2 | OHA 2 | 25 | | | | | 1 | | | | 1 | | |
| Old Harbor 3 | OHA 3 | | | | | | | | | | | | |
| Old Harbor 4 | OHA 4 | | | | | | | | | | | | |
| Old Harbor (smo. salm.) | OHASS | | | | | | | 1 | | | | | |
| Tatitlek 1 | TAT 1 | | | | | | | | | | | | |
| Tatitlek 2 | TAT 2 | 3 | | | | | | | | | | | |
| Tatitlek 3 | TAT 3 | 6 | | | | | | | | | | 1 | |
| Tatitlek 4 | TAT 4 | | | | | | | | 2 | | 2 | 1 | |
| Tatitlek 5 | TAT 5 | | | | | | | | | | | | |
| Tatitlek 6 | TAT 6 | | | | | | | | 2 | | | | |
| Tatitlek 7 | TAT 7 | | 18 | | | | | | | | | | |
| Tatitlek (smo. salm.) | TATSS | | | | | | | 1 | | | | | |
| Larsen Bay 1 | LAB 1 | | | | | | | | | | | | |
| Larsen Bay 2 | LAB 2 | | | | | | | | | | | | |
| Larsen Bay 3 | LAB 3 | | | | | | | | | | | | |
| Larsen Bay 4 | LAB 4 | | | | | | | | | | | | |
| Larsen Bay 5 | LAB 5 | | | | | | | | 1 | | | | |
| Larsen Bay 6 | LAB 6 | 3 | | 14 | 1 | | | | 4 | | 3 | | |
| Larsen Bay 7 | LAB 7 | 2 | | | | | | | | | | | |
| Larsen Bay 8 | LAB 8 | 15 | | | | | | | 4 | | | | |

Table 2 (continued). Fish: Species sampling log for subsistence studies, cycles I - III, 1989.

| Village, Sampling site | Code | *Species* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pink salmon | Coho salmon | Sockeye salmon | Chum salmon | Chinook salmon | Dolly Varden | Smoked salmon | Halibut | Yellowfin sole | Pacific cod | Rockfish | Irish lord |
| Ouzinkie 1 | OUZ 1 | 2 | | | | | | | 2 | | | | |
| Ouzinkie 2 | OUZ 2 | | | | | | | | | | | | |
| Ouzinkie 3 | OUZ 3 | | | | | | | | 8 | | | | |
| Ouzinkie 4 | OUZ 4 | | | | | | | | | | | | |
| Ouzinkie 5 | OUZ 5 | 20 | | | | | | | | | | | |
| Ouzinkie 6 | OUZ 6 | | 16 | | | | | | | | | | |
| Chiniak 1 | CHI 1 | | | | | | | | | | | | |
| Chiniak 2 | CHI 2 | | | | | | | | | | | | |
| Chiniak 3 | CHI 3 | | | | | | | | | | | | |
| Chiniak 4 | CHI 4 | | | | | | | | | | | 2 | |
| Chiniak 5 | CHI 5 | 12 | | 1 | 6 | | | | | | | | |
| Chiniak 6 | CHI 6 | | | | | | | | 3 | | | | |
| Chiniak 7 | CHI 7 | 12 | | | 2 | | | | | | | | |
| Akhiok 1 | AKH 1 | | | 2 | | | | | | | | | |
| Akhiok 2 | AKH 2 | | | | | | | | | | | | |
| Akhiok 3 | AKH 3 | | | | | | | | | | | | |
| Akhiok 4 | AKH 4 | 4 | 3 | | | | | | | | | | |
| Port Lions 1 | PTL 1 | | | | | | | | | | | | |
| Port Lions 2 | PTL 2 | | | | | | | | | | | | |
| Port Lions 3 | PTL 3 | 3 | 13 | | | | | | 3 | | | | |
| Port Lions 4 | PTL 4 | | | | | | | | | | | | |
| Port Lions 5 | PTL 5 | | | | | | | | | | | | |
| Port Lions 6 | PTL 6 | | | | | | | | 2 | 1 | | | |
| Port Lions 7 | PTL 7 | 18 | | | | | | | | | | | |
| Port Lions 8 | PTL 8 | | | | | | | | 4 | | | | |
| Port Gra./Eng. Bay 1 | PTG 1 | | | | | | | | | | | | |
| Port Gra./Eng. Bay 2 | PTG 2 | | | | | | | | 1 | | | | 2 |
| Port Gra./Eng. Bay 3 | PTG 3 | 13 | 4 | | | | | | | | | | |
| Port Gra./Eng. Bay 4 | PTG 4 | | | | | | | | | | | | |
| Port Gra./Eng. Bay 5 | PTG 5 | | | | | | | | 1 | | | | |
| Karluk 1 | KAR I | 2 | 5 | 4 | | | 2 | | | | | | |
| Karluk 2 | KAR 2 | | | | | | | | | | | | |
| Kasitsna 1 | KAS 1 | | | | | | | | | | | | |
| Angoon 1 | AGN 1 | | | | | | | | | | | | |
| Angoon 2 | AGN 2 | | | | | | | | | | | | |
| Angoon 3 | AGN 3 | 6 | 8 | | | 3 | | | 3 | | 2 | | |

Table 3. Shellfish: Species sampling log for subsistence studies, cycles I - III, 1989.

| Village Sampling site | Code | *Species* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mussels | Butter clams | Horse clams | Littleneck clams | Cockles | Chitons | Snails | Limpets | Urchins | Dungeness crab | Tanner crab | King crab |
| Windy Bay 1 | WNB 1 | 3 | | | | | 2 | 1 | | | | | |
| Windy Bay 2 | WNB 2 | | | | 1 | | | | | | | | |
| Kodiak City 1 | KOD 1 | | | | | | | | | | | | |
| Kodiak City 2 | KOD 2 | | | | | | | | | | | | |
| Kodiak City 3 | KOD 3 | 1 | 1 | | 2 | | 2 | | | | | | |
| Kodiak City 4 | KOD 4 | | | | | | | | | | 1 | | |
| Kodiak City 5 | KOD 5 | | | | | | | | | | 1 | | |
| Kodiak City 6 | KOD 6 | | | | | | | | | | | | |
| Chenega Bay 1 | CHE 1 | 6 | 2 | | | | | | | | | | |
| Chenega Bay 2 | CHE 2 | | | | | | | | | | | | |
| Chenega Bay 3 | CHE 3 | | | | | | | | | | | | |
| Chenega Bay 4 | CHE 4 | | | | | | | | | | | | |
| Old Harbor 1 | OHA 1 | | | | | | | | | | | | |
| Old Harbor 2 | OHA 2 | | | | | | | | | | | 2 | |
| Old Harbor 3 | OHA 3 | 1 | 5 | | 1 | | 3 | | | 1 | | | |
| Old Harbor 4 | OHA 4 | | 5 | | 1 | | | | | | | | |
| Tatitlek 1 | TAT 1 | 3 | | | | | | | | | | | |
| Tatitlek 2 | TAT 2 | | | | | | | | | | | | |
| Tatitlek 3 | TAT 3 | | | | | | | | | | | | |
| Tatitlek 4 | TAT 4 | | | | | | | | | | | | |
| Tatitlek 5 | TAT 5 | 6 | | | | | 2 | | | | | | |
| Tatitlek 6 | TAT 6 | | | | | | | | | | | | |
| Tatitlek 7 | TAT 7 | | | | | | | | | | | | |
| Larsen Bay 1 | LAB 1 | 1 | 3 | | | | 2 | | 1 | | | | |
| Larsen Bay 2 | LAB 2 | | 4 | | | | 1 | | | | | | |
| Larsen Bay 3 | LAB 3 | | | | | | | | | 1 | | | |
| Larsen Bay 4 | LAB 4 | | | | | | | 1 | | | 1 | 2 | 1 |
| Larsen Bay 5 | LAB 5 | | | | | | | | | | | | |
| Larsen Bay 6 | LAB 6 | | | | | | | | | | | | |
| Larsen Bay 7 | LAB 7 | | | | | | | | | | | | |
| Larsen Bay 8 | LAB 8 | | | | | | | | | | | | |

Table 3 (continued). Shellfish: Species sampling log for subsistence studies, cycles I - III, 1989.

| Village Sampling site | Code | *Species* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mussels | Butter clams | Horse clams | Littleneck clams | Cockles | Chitons | Snails | Limpets | Urchins | Dungeness crab | Tanner crab | King crab |
| Ouzinkie 1 | OUZ 1 | | | | | | | | | | | | |
| Ouzinkie 2 | OUZ 2 | 1 | 2 | | 2 | | 2 | | | | | | |
| Ouzinkie 3 | OUZ 3 | | 1 | | | | | | | | | | |
| Ouzinkie 4 | OUZ 4 | | 1 | | | | | | | | | | |
| Ouzinkie 5 | OUZ 5 | | | | | | | | | | | | |
| Ouzinkie 6 | OUZ 6 | | | | | | | | | | | | |
| Chiniak 1 | CHI 1 | 1 | 3 | | 2 | | | | | | | | |
| Chiniak 2 | CHI 2 | 1 | 4 | | 1 | 2 | 5 | 1 | | | | | |
| Chiniak 3 | CHI 3 | | | | | | | | | | 1 | | |
| Chiniak 4 | CHI 4 | | | | | | | | | | | | |
| Chiniak 5 | CHI 5 | | | | | | | | | | | | |
| Chiniak 6 | CHI 6 | | | | | | | | | | | | |
| Chiniak 7 | CHI 7 | | | | | | | | | | | | |
| Akhiok 1 | AKH 1 | | | | | | | | | | | | |
| Akhiok 2 | AKH 2 | 1 | 3 | | | | 1 | | | | | | |
| Akhiok 3 | AKH 3 | 1 | | | 1 | | | | | | | | |
| Akhiok 4 | AKH 4 | | | | | | | | | | | | |
| Port Lions 1 | PTL 1 | | 5 | | 2 | | 3 | 1 | | | | | |
| Port Lions 2 | PTL 2 | | 2 | | | | 2 | 1 | | | | | |
| Port Lions 3 | PTL 3 | | | | | | | | | | | | |
| Port Lions 4 | PTL 4 | | | | | | | | | | | 3 | 1 |
| Port Lions 5 | PTL 5 | | | | | | | | | | 1 | | |
| Port Lions 6 | PTL 6 | | | | | | | | | | | | |
| Port Lions 7 | PTL 7 | | | | | | | | | | | | |
| Port Lions 8 | PTL 8 | | | | | | | | | | | | |
| Port Gra./Eng. Bay 1 | PTG 1 | 7 | | | 1 | 1 | 3 | | | | | | |
| Port Gra./Eng. Bay 2 | PTG 2 | | | | | | | | | | | | |
| Port Gra./Eng. Bay 3 | PTG 3 | | | | | | | | | | | | |
| Port Gra./Eng. Bay 4 | PTG 4 | 4 | | | | | | 1 | | | | | |
| Port Gra./Eng. Bay 5 | PTG 5 | | | | | | | | | | | | |
| Karluk 1 | KAR 1 | 1 | | | | | 1 | | | | | | |
| Karluk 2 | KAR 2 | 3 | 1 | | | | 1 | | | | | | |
| Kasitsna 1 | KAS 1 | 2 | 1 | | | | 1 | | | | | | |
| Angoon 1 | AGN 1 | 2 | | | | | 2 | | | | | | |
| Angoon 2 | AGN 2 | | 1 | 1 | | | | | | | | | |
| Angoon 3 | AGN 3 | | | | | | | | | | | | |

Thawed bile was injected directly into the HPLC and eluted through the column using a linear gradient from 100% solvent A (water containing 5 ppm acetic acid) to 100% solvent B (pure methanol) during 15 minutes. The flow rate was 1.0 mL/min and the column temperature was 50°C. All solvents were degassed with helium.

The fluorescence responses were recorded at the wavelength pairs for NPH and PHN, prominent aromatic constituents of Prudhoe Bay crude oil (see Table 1). Fluorescence of NPH metabolites was monitored using excitation and emission wavelength pairs of 290 and 335 nm, respectively. Fluorescence of PHN metabolites was monitored using excitation and emission wavelength pairs of 260 and 380 nm, respectively.

The total integrated area from each detector was then converted to corresponding units of either NPH or PHN that would give the same integrated response. Results for FACs in bile are reported on the basis of bile volume and biliary protein (Fig. 2). The levels of protein in bile (Table 4) were determined by the method of Lowry et al. (1951) that measures the complex formed with phenol at 660 nm.

*Quality Assurance*

Quality assurance procedures included use of NPH and PHN calibration standards, a "bile pool" reference material, blank analyses, and replicate analyses to evaluate HPLC/UV fluorescence performance.

## Edible Flesh Analyses

Our laboratory procedures for the analysis of toxic organic contaminants (Krahn et al. 1988a, MacLeod et al. 1985) follow protocols established by the EC Division. A total of 365 analyses of edible flesh of fish and shellfish were performed for the ACs listed in Table 1. Summaries of the analytical protocols are given below (for further details, please consult the original publications). These protocols consist of four major steps: a) extraction; b) cleanup (by HPLC); c) analyte determination (by GC/MS); and d) quality assurance.

The results of the bile analyses were used to prioritize and composite fis samples whose edible flesh was to be analyzed by the more quantitative and cos GC/MS technique. Edible flesh samples from the same fish species were analy as individual samples or as composites according to the levels of FACs in bile. Thus, for a given species at a given site, flesh from fish showing relatively hig levels of bile FACs was analyzed either from individuals or composites of individuals with similarly high FACs levels. Samples of flesh from fish with relatively low levels of bile FACs were generally analyzed as composites.

*Extraction of Aromatic Contaminants*

Samples of edible flesh of fish or shellfish were extracted for ACs according to the procedures of Krahn et al. (1988a). A 3-g sample of flesh is added to a centrifuge tube containing sodium sulfate and methylene chloride. method internal standards (surrogates) for the ACs are added, and the mixture macerated with a Tekmar Tissumizer. The extract is filtered through a colum of silica and alumina, and the extract concentrated to 1 mL for cleanup by HPI

*Cleanup of Aromatic Contaminants*

The ACs were isolated on a high performance liquid chromatograph. A Spectra-Physics (Mountain View, CA) model 8800 HPLC was employed, equipped with an ultraviolet detector (254 nm) and an automatic injector. Tw 22.5 x 250-mm stainless-steel (preparatory size) columns containing Phenogel 100-Å size-exclusion packing (Phenomenex, Rancho Palos Verdes, CA) were used in series with a 2-µM Rheodyne model 7302 filter and a 7.8 x 50-mm gu column containing the same Phenogel packing. The HPLC precolumn and column were connected to a six-port valve that allows the guard column to be backflushed to remove extraneous materials after cleanup of a set of samples (n ~ 10).

Methylene chloride was used as the solvent and was pumped at a flow ra of 7 mL/min for 20 minutes at ambient temperature. The HPLC solvent was degassed by bubbling helium through the solvent. The helium was delivered v regulator equipped with a stainless-steel diaphragm and passed through an in-l charcoal filter (200-cc hydrocarbon trap, Alltech Assoc., Deerfield, IL) to

eliminate inadvertent contaminants which could be transferred to the HPLC solvent by the helium.

A 250-µL portion of a 1-mL extract was injected onto the HPLC column and the fraction containing the ACs was collected according to Krahn et al. (1988a). The solvent in the HPLC fraction was exchanged into hexane as the volume was reduced by evaporation to approximately 1 mL. Standards were then added for analysis by capillary column gas chromatography with mass spectrometric quantitation.

*Aromatic Contaminant Determinations by GC/MS*

The ACs were determined according to MacLeod et al. (1985) by GC/MS quantitation as outlined by Burrows et al. (1990). A 30-m x 0.25-mm DB-5 capilliary column (J & W Scientific) was used in a Hewlett-Packard model 5880 or 5890 gas chromatograph. The GC sample (3 µL) was injected splitless, and the split valve was opened after 18 seconds (split ratio of 20:1). The oven temperature of 50°C was held for 1 minute and then programmed to increase at 4°C/min to 170°C, then at 1°C/min to 210°C, and finally at 4°C/min. to 300°C, where the temperature was held for 10 minutes.

*Quality Assurance*

Quality assurance measures included analyses of method blanks, spiked blanks, and matrix spikes. Analyte recoveries were normalized through the use of internal standards. The recoveries of the following surrogates are reported as QA information: Naphthalene-d8, acenaphthene-d10, and benzo[*a*]pyrene-d12. Analyte concentrations are reported on the basis of the internal standards ("surrogates") added at the beginning of the sample extraction. The HPLC internal standard (used to determine the fraction of total sample extract that was used in the analysis for aromatic hydrocarbons) was phenanthrene-d10. Hexamethylbenzene was used as the GC internal standard to calculate the recoveries of the surrogates. The recovery for each surrogate standard was greater than 50%, but less than 130%, and the relative standard deviations (RSDs) for surrogate recoveries in a set of samples was less than 25%. When the recovery of any surrogate was outside these guidelines, corrective action was

taken, including instrument repair, inlet cleaning, column replacement, and/or reanalysis.

The GC calibration standards generally included all surrogates and analy of interest, except for some classes of alkylated aromatic hydrocarbons and dibenzothiophenes the corresponding unsubstituted compound was used to calculate the response factor. Graduated concentrations of GC-calibration-chec standards were used for multilevel response-factor determinations. A GC calibration standard was analyzed after every six samples to demonstrate the stability of the calibration. The GC/MS was considered "under control" when t response for each analyte or surrogate in a GC calibration standard was reproducible within ± 10% from analysis to analysis.

The detection limits generally were less than 1 ng/g (wet weight basis). A hyphen (-) is used in the data tables to indicate that the analyte was not detected. The range of detection limits is included in the explanatory notes for each appendix.

One method blank was analyzed with each sample set of approximately 10 samples. The aromatic hydrocarbons (except naphthalene) and dibenzothiophen in the blanks should not be present above the limit of detection. A matrix spike (containing 50-80 ng/g of each analyte) or a spiked blank (containing 40-70 ng/g of each analyte) was analyzed with each set of approximately 10 samples. The recoveries of analytes should be no less than 50%.

## Statistical Methods

The Kruskal-Wallis test nonparametric analysis of variance (Sokal and Rohlf 1981, Zar 1984) was used to test for differences among villages (sites). If the null hypothesis of no difference among villages (sites) was rejected at $\alpha = 0.05$, other nonparametric methods were used, specifically, to a) compare control results to other groups and b) ascertain differences among groups by multiple comparisons (Dunn 1964, Hollander and Wolfe 1973, and Zar 1984). The significance level was set at $\alpha = 0.05$.

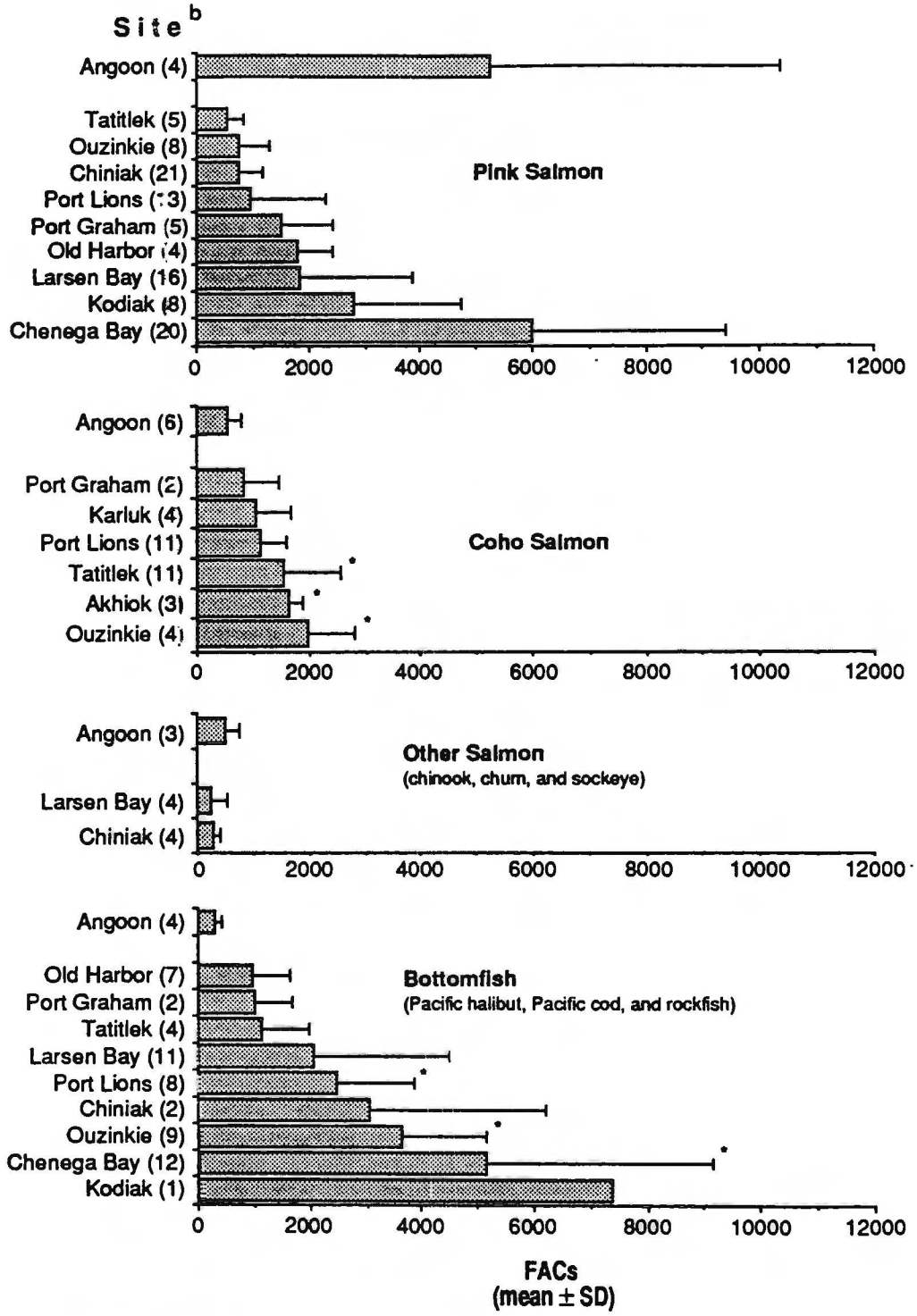
Because in many cases the sample sizes for individual species were too small (especially at Angoon) to permit strong statistical conclusions to be drawn, samples were grouped by taxonomic affiliation and habitat (viz., beach, midwater, or benthic) for purposes of statistical analyses. For example, it was necessary to combine data for all intertidal molluscs at each village to obtain a sample size suitable for statistical analyses. Combining species or taxa with similar biology and habitat also permitted inclusion of villages that would otherwise have been omitted from the comparisons because only one sample was available for a particular species or group.

## RESULTS AND DISCUSSION

### Fluorescent Aromatic Contaminants in Bile of Fish

Our laboratory studies (Varanasi and Gmur 1981, Stein et al. 1984, Varanasi et al. 1989a) with benthic fish exposed to naphthalene and benzo[a]pyrene (BaP) have shown that levels of metabolites of these ACs in bile can be substantially greater than those in edible flesh. Thus, even though the values for FACs in bile of field sampled fish may indicate exposure of fish to petroleum, the levels of aromatic hydrocarbons from petroleum in edible flesh of fish, if detectable, could remain low. The utility of the bile method is in quickly identifying those fish that are relatively unexposed to ACs and therefore of less immediate interest.

The results of the HPLC fluorescence analyses for FACs in bile, at the PHN wavelengths, are summarized in Figure 2 and Table 4. Presentation of results at NPH wavelengths is not necessary because of the strong statistical correlation between $FACs_{PHN}$ and $FACs_{NPH}$ ($r = 0.93$, $P \leq 0.0001$). In Figure 2 the concentrations of $FACs_{PHN}$ are reported on the basis of bile protein. Previous laboratory studies (Collier and Varanasi 1987) have shown marked increases in concentrations of protein in bile of nonfeeding fish compared to feeding fish. It was shown that the variation between levels of FACs in feeding and nonfeeding fish were greatly reduced when the differences in bile protein were taken into account. Hence, the reporting of $FACs_{PHN}$ levels on the basis of bile protein is appropriate in this study, because the salmon sampled were sexually mature and may not have been feeding.




[a] Fluorescent aromatic compounds (FACs) are reported in units of ng phenanthrene (PHN) equivalents per mg bile protein.
[b] Values in ( ) indicate number of samples analyzed.
* Significantly different from Angoon, the reference site, by nonparametric test ($P \leq 0.05$).

Figure 2. Results of HPLC analyses of bile of salmon and bottomfish for FACs $_{PHN}$.[a]

Table 4. Mean levels ± SD of fluorescent aromatic compounds (FACs) and protein in bile of salmon and bottomfish. The levels of FACs are reported as ng phenanthrene equivalents per gram bile.[a]

| Site | FACs (ng PHN eq./g bile) | Biliary protein (mg protein/g bile) |
|---|---|---|
| Pink Salmon | | |
| Angoon (4)[b] | 4,400 ± 4,900 | 2 ± 1 |
| Tatitlek (5) | 44,000 ± 40,000 | 64 ± 50 |
| Ouzinkie (6) | 7,800 ± 4,200 | 13 ± 7 |
| Chiniak (21) | 35,000 ± 28,000 | 42 ± 26 |
| Port Lions (16) | 23,000 ± 6,600 | 37 ± 15 |
| Port Graham (5) | 27,000 ± 19,000 | 21 ± 17 |
| Old Harbor (16) | 64,000 ± 25,000 | 40 ± 16 |
| Larsen Bay (16) | 56,000 ± 39,000 | 35 ± 17 |
| Kodiak (10) | 100,000 ± 8,000 | 30 ± 29 |
| Chenega Bay (22) | 180,000 ± 170,000 | 30 ± 17 |
| Coho Salmon | | |
| Angoon (6) | 1,700 ± 700 | 4 ± 2 |
| Port Graham (2) | 3,900 ± 3,300 | 4 ± 1 |
| Karluk (4) | 3,200 ± 2,300 | 4 ± 3 |
| Port Lions (11) | 5,900 ± 2,900 | 6 ± 4 |
| Tatitlek (11) | 19,000 ± 11,000 | 14 ± 6 |
| Akhiok (3) | 11,000 ± 8,000 | 7 ± 4 |
| Ouzinkie (4) | 22,000 ± 12,000 | 12 ± 6 |
| Other Salmon | | |
| Angoon (3) | 1,400 ± 400 | 3 ± 2 |
| Larsen Bay (7) | 2,400 ± 1,300 | 14 ± 7 |
| Chiniak (4) | 6,300 ± 5,200 | 23 ± 24 |
| Bottomfish | | |
| Angoon (4) | 1,000 ± 600 | 3 ± 1 |
| Old Harbor (7) | 4,800 ± 6,100 | 4 ± 4 |
| Port Graham (2) | 2,800 ± 2,400 | 4 ± 5 |
| Tatitlek (4) | 4,400 ± 1,100 | 5 ± 2 |
| Larsen Bay (11) | 3,500 ± 2,400 | 3 ± 2 |
| Port Lions (8) | 3,300 ± 1,700 | 2 ± 2 |
| Chiniak (2) | 4,300 ± 2,700 | 2 ± 1 |
| Ouzinkie (9) | 4,900 ± 2,300 | 2 ± 2 |
| Chenega Bay (12) | 19,000 ± 21,000 | 4 ± 4 |
| Kodiak (1) | 6,000 | 1 |

[a] Fluorescence response of bile is converted to an equivalent response of a phenanthrene standard.

[b] Number in ( ) indicate total samples analyzed.

The results from the present study showed that reporting the concentratio of FACs on the basis of bile protein appeared to account for large species differences in $FACs_{PHN}$ levels for fish from a village. For example, calculation the $FACs_{PHN}$ levels for pink salmon *(Oncorhynchus gorbuscha)* and bottomfish from Port Graham and English Bay on the basis of bile protein rather than on tl basis of bile volume reduced the difference between the levels from about tenfol to about 80 % (Table 4). This does not imply that the exposure to oil is similar for the two species, just that the level of FACs in bile appear similar. Numerous factors can affect tissue and fluid levels of contaminants; hence, dose-response studies with each species are required to validate comparisons between species.

As summarized in Figure 2, the levels of $FAC_{PHN}$ in bottomfish from Chenega Bay, Ouzinkie, and Port Lions were significantly different (higher) from the levels in bile of bottomfish from Angoon, the reference site. The level of $FACs_{PHN}$ in coho salmon *(O. kisutch)* from Ouzinkie, Akhiok, and Tatitlek were significantly higher than those in coho salmon from Angoon. For pink salmon, however, no significant differences were observed when compared to Angoon. The lack of statistically significant differences with respect to Angoon was due to a single pink salmon having a bile level of $FACs_{PHN}$ that was four- to twentyfold greater than the bile levels in the other three pink salmon from Angoon. What the finding of a high level of $FACs_{PHN}$ in the one pink salmon from Angoon Figure 2 means is not known. A larger sample size from the designated reference site or samples from another reference site will be needed for proper statistical evaluation of salmon exposure to ACs.

The results with bile suggest that a number of fish species from some sites were exposed to ACs. However, in subsequent analyses of the edible flesh, levels of total ACs in bottomfish never exceeded 1 ppb and were comparable to those from Angoon (Fig. 3), while in bile, mean levels of $FACs_{PHN}$ were up to 25 times greater than those from Angoon (Fig. 2). The results for pink and coho salmon (Fig. 3) also show low levels of total ACs in muscle (generally less than 7 ppb), while the level of $FACs_{PHN}$ (Fig. 2) ranged widely, from 80 to 17,000 ng PHN equivalents/mg bile protein. These results are consistent with the interpretation, based on laboratory studies, that efficient metabolizing of petroleum-derived ACs by the liver of fish greatly limits the accumulation of ACs in other tissues such as muscle (Varanasi et al., 1989a).

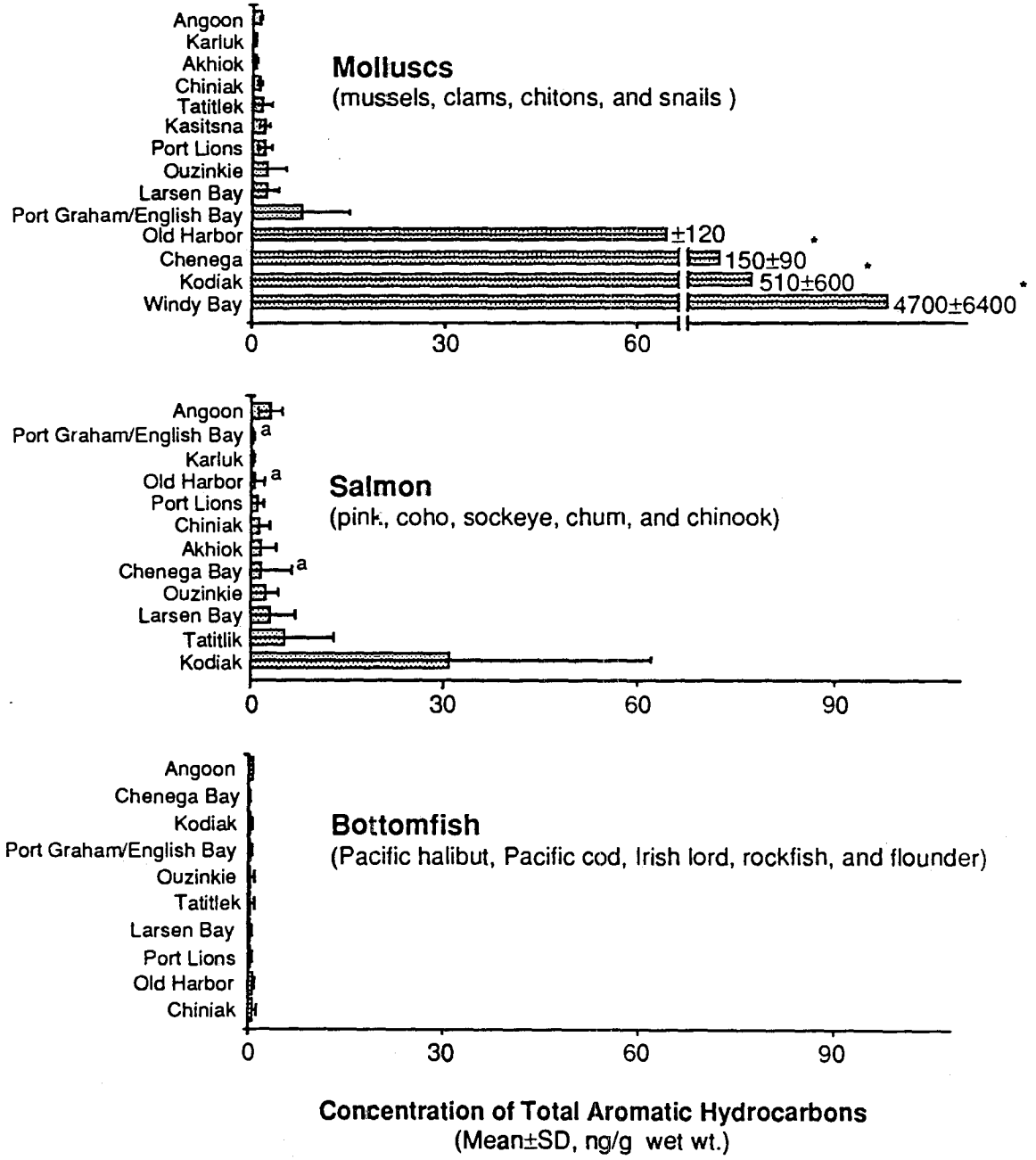



Figure 3. Results of GC/MS analyses of organic-solvent extracts of edible flesh of molluscs, salmon, and bottomfish for total aromatic hydrocarbons.

It should also be noted that when the levels of $FACs_{PHN}$ in bile of individu salmon were less than 1,000 ng PHN equivalents/mg bile protein, no pink or col salmon showed levels of total ACs exceeding 5 ppb. A few pink and coho salm had AC levels greater than 7 ppb; however, in these fish the levels of ACs in muscle were not directly related to levels of $FACs_{PHN}$ in bile, suggesting that a factor other than exposure was also affecting the tissue distribution of ACs in these few fish. Most of the salmon sampled in this study were near spawning. Previous studies (Varanasi et al. 1982; Reichert and Varanasi 1982) have shown that in marine bottomfish near spawning, aromatic hydrocarbons are not as effectively metabolized by the liver and that this can lead to some retention of unaltered aromatic hydrocarbons by tissues such as muscle.

## Aromatic Contaminants in Edible Flesh of Fish and Shellfish

All 548 samples of edible flesh from fish and shellfish received in 1989 ar included in the 365 analyses for the ACs reported herein. Summary results are presented for fish in Table 5 and for shellfish in Table 6. Included are results from comparison samples collected at Angoon, a designated reference site in Southeast Alaska. Results are also presented for a sample of smoked salmon eacl from Tatitlek and Old Harbor.

The data in Tables 5 and 6 have been summarized according to the low-molecular-weight ACs (LACs) and the high-molecular-weight ACs (HACs) listed in Table 1, following a practice we have established (Varanasi et al. 1988, 1989f) in the Benthic Surveillance Project of NOAA's National Status and Trends Program. This has the convenience of dividing the ACs approximately into (a) the more water-soluble and acutely toxic compounds, LACs, and (b) the less water-soluble and more chronically toxic compounds, HACs. The LACs are more prone to dissolution, evaporation, and bacterial degradation and, hence, their levels in the environment generally would decline as the spilled oil weathers. Moreover, LACs are more rapidly excreted from the body than are HACs, and LACs are known for their acute toxicity in experimental animals. The HACs, on the other hand, are more resistant to dissolution, evaporation and bacterial degradation and, hence, tend to persist in the environment. Carcinogens generally appear among the HACs.

Table 5. Fish: Sums of LACs / HACs (listed in Table 1) in edible flesh in ng/g (ppb) wet weight by GC/MS of extract; nd = not detected. Brackets indicate analyses of split samples. Reference values are listed under Angoon.

| Village: | Windy Bay | Kodiak Village | Chenega Bay | Old Harbor | Tatitlek | Larsen Bay | Ouzinkie | Chiniak | Akhiok | Port Lions | Port Graham/ English Bay | Karluk | Kasitsna | Angoon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Salmon:** | | | | | | | | | | | | | | |
| pink | | [110 / 12] [72 / 8] | 0.9 / nd | nd | 0.05 / nd | 2 / nd | nd | [2 / nd] [0.4 / nd] | 4 / 0.4 | nd | nd | nd | | 2 / nd |
| | | 54 / 5 | 20 / nd | 1 / nd | [nd] [nd] | [13 / 0.7] [12 / 0.2] | 1 / nd | 3 / 0.2 | 1 / 0.1 | 3 / 0.2 | 1 / nd | | | 2 / nd |
| | | 22 / 2 | nd | 2 / 0.1 | nd | 1 / nd | 3 / nd | 1 / nd | | 0.4 / nd | nd | | | |
| | | 6 / 0.2 | 0.3 / nd | 1 / nd | nd | 0.3 / nd | 5 / 0.5 | 2 / nd | | 0.5 / nd | nd | | | |
| | | [84 / 10] [22 / 3] | [2 / nd] [2 / nd] | 1 / nd | nd | 0.8 / nd | 1 / nd | 4 / 0.2 | | nd | nd | | | |
| | | 4 / 0.2 | 1 / nd | 4 / 0.3 | | 0.8 / nd | 1 / nd | 4 / 0.2 | | 1 / nd | nd | | | |
| | | 32 / 5 | 0.2 / nd | nd | | 0.5 / nd | 1 / nd | 0.3 / nd | | 0.3 / nd | nd | | | |
| | | [0.7 / nd] [0.5 / nd] | nd | nd | | nd | 1 / nd | 0.3 / nd | | 0.2 / nd | | | | |
| | | [1 / nd] [1 / nd] | 0.4 / nd | nd | | 0.2 / nd | 0.9 / nd | 0.3 / nd | | 0.9 / nd | | | | |
| | | [0.9 / nd] [3 / nd] | nd | nd | | 0.3 / nd | 1 / nd | 0.3 / nd | | 0.8 / nd | | | | |
| | | | nd | nd | | 1 / 0.1 | | nd | | | | | | |
| | | | nd | nd | | 0.2 / nd | | 0.3 / nd | | | | | | |
| | | | nd | nd | | 0.7 / nd | | | | | | | | |
| | | | 0.6 / nd | nd | | 0.7 / nd | | | | | | | | |
| | | | nd | nd | | | | | | | | | | |
| | | | 3 / nd | nd | | | | | | | | | | |
| | | | 1 / nd | 0.2 / nd | | | | | | | | | | |
| | | | 0.3 / nd | 0.2 / nd | | | | | | | | | | |
| | | | 0.8 / nd | | | | | | | | | | | |
| | | | 0.7 / nd | | | | | | | | | | | |

Table 5 (continued). Fish: sums of LACs / HACs (listed in Table 1) in edible flesh in ng/g (ppb) wet weight by GC/MS of extract; nd = not detected. Brackets indicate analyses of split samples. Reference values are listed under Angoon.

| Village: | Windy Bay | Kodiak Village | Chenega Bay | Old Harbor | Tatitlek | Larsen Bay | Ouzinkie | Chiniak | Akhiok | Port Lions | Port Graham/ English Bay | Karluk | Kasitsna | Angoon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Salmon:** coho | | | | | 14 / 1 | | 6 / 0.6 | | nd | 2 / nd | 1 / nd | 0.5 / nd | | 2 / nd |
| | | | | | 15 / 1 | | 0.8 / nd | | | 0.6 / nd | nd | 0.5 / nd | | 4 / nd |
| | | | | | 19 / 2 | | 2 / nd | | | 0.2 / nd | | | | 2 / nd |
| | | | | | 3 / 0.1 | | 0.6 / nd | | | 0.3 / nd | | | | |
| | | | | | 5 / 0.2 | | 0.6 / nd | | | 3 / 0.1 | | | | |
| | | | | | 3 / nd | | 4 / 0.2 | | | 2 / nd | | | | |
| | | | | | 3 / nd | | 2 / nd | | | | | | | |
| | | | | | | | 5 / 0.4 | | | | | | | |
| sockeye | | 11 / 0.5 | | | | 6 / 0.2 | | 1 / nd | nd | | | 0.2 / nd | | |
| | | | | | | 3 / nd | | | | | | 0.7 / nd | | |
| | | | | | | 2 / nd | | | | | | | | |
| | | | | | | 6 / 0.1 | | | | | | | | |
| | | | | | | 3 / nd | | | | | | | | |
| chum | | | | | | 1 / nd | | 5 / 0.2 | | | | | | |
| | | | | | | | | 0.8 / nd | | | | | | |
| | | | | | | | | 0.4 / nd | | | | | | |
| chinook | | | | | | | | | | | | | | 5 / 0.1 |
| smoked salmon | | | | [7100 / 650 7800 / 700] | [20000 / 3000 21000 / 1800] | | | | | | | | | |

Table 5 (continued). Fish: Sums of LACs / HACs (listed in Table 1) in edible flesh in ng/g (ppb) wet weight by GC/MS of extract; nd = not detected. Reference values are listed under Angoon.

| Village: | Windy Bay | Kodiak Village | Chenega Bay | Old Harbor | Tatitlek | Larsen Bay | Ouzinkie | Chiniak | Akhiok | Port Lions | Port Graham/ English Bay | Karluk | Kasitsna | Angoon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dolly Varden** | | 1 / nd | | 1 / nd | | | | | | | | 0.6 / nd | | |
| **Halibut** | | nd | nd | nd | nd | nd | nd | 0.8 / nd | | 0.3 / nd | nd | | | 0.4 / nd |
| | | 0.3 / nd | nd | 1 / nd | nd | 0.3 / nd | 0.2 / nd | 1 / nd | | nd | 0.2 / nd | | | |
| | | 0.9 / nd | nd | 0.8 / nd | | 0.7 / nd | 1 / 0.1 | | | 0.4 / nd | | | | |
| | | | 0.5 / nd | | | 0.5 / nd | nd | | | 0.6 / nd | | | | |
| | | | | | | 0.6 / nd | 0.3 / nd | | | | | | | |
| **Yellowfin Sole** | | | | | | | | | | 0.8 / nd | | | | |
| **Pacific Cod** | | | nd | nd | nd | 0.5 / nd | | | | | | | | 0.6 / nd |
| | | | nd | 0.7 / nd | | 0.3 / nd | | | | | | | | |
| | | | nd | | | | | | | | | | | |
| | | | 0.3 / nd | | | | | | | | | | | |
| **Rockfish** | | nd | nd | | 1 / nd | | | nd | | | | | | |
| | | | nd | | 0.6 / nd | | | | | | | | | |
| | | | nd | | | | | | | | | | | |
| **Irish Lord** | | | | | | | | | | | 0.6 / nd | | | |
| | | | | | | | | | | | 0.4 / nd | | | |

The tables in the Appendices contain more detailed information. Appendi A tabulates the summary results (LACs/HACs) according to village, sites, and species, including our laboratory sample numbers and composite sample information. Appendix B presents the complete set of analytical data for ACs from the edible flesh of all samples of fish (including the data for smoked salmc and the field collector's sample numbers). Appendix C contains analogous information for shellfish.

*Fish*

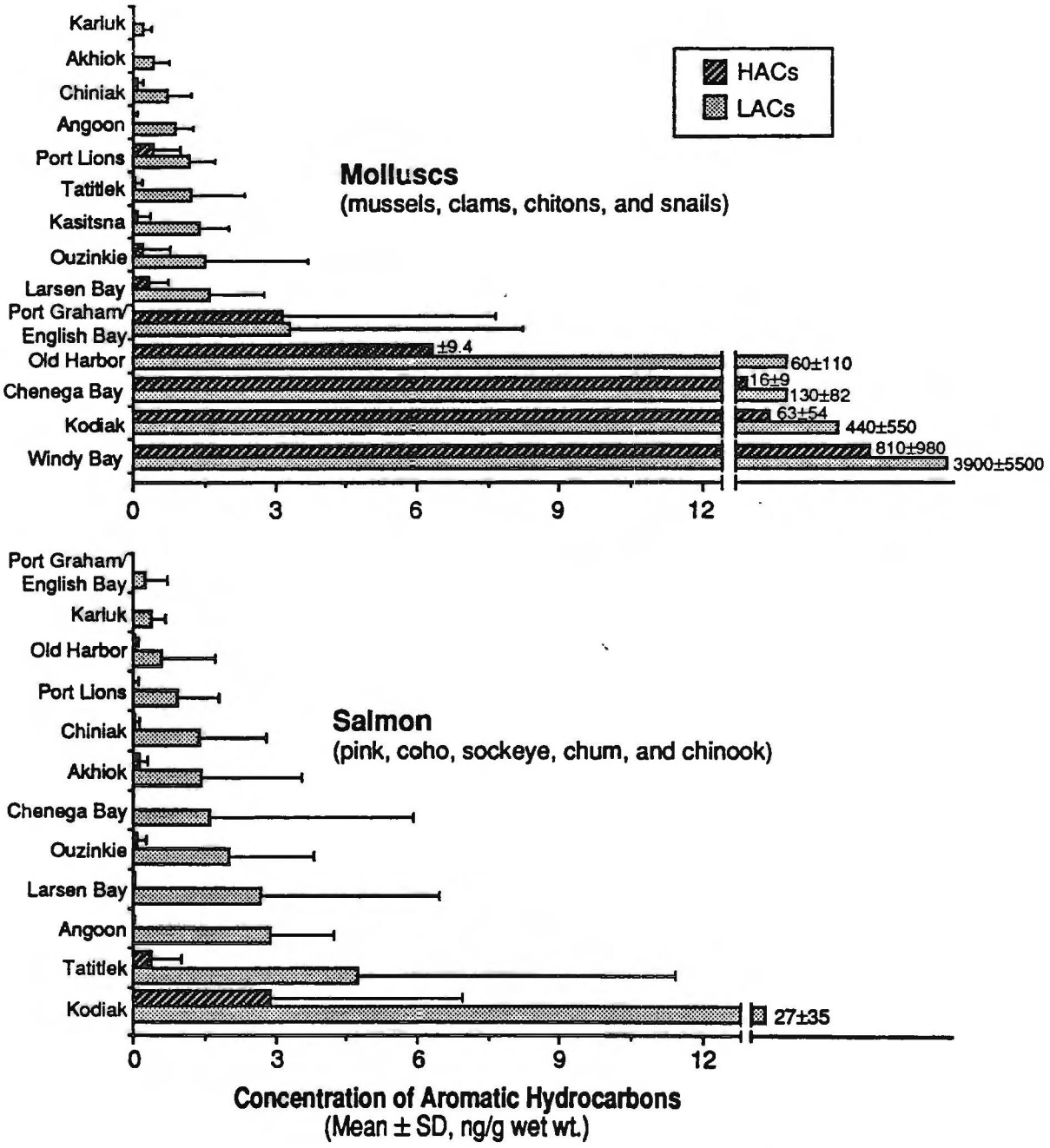
As there are significant differences in the rates of uptake, metabolism, excretion, and types of toxic effects exerted by various ACs, the fish data are al presented in Figure 4 to show the levels of LACs and HACs separately. The HACs are metabolized by fish to a greater extent than are the LACs and some HACs exert chronic toxic effects (e.g., carcinogenicity, tetratogenicity, and reproductive dysfunction) in experimental animals. To our knowledge, there a presently no established guidelines for acceptable levels of LACs or HACs in fo products.

Of the 208 samples of edible flesh of unsmoked fish analyzed in this first year, only two samples of pink salmon from the village of Kodiak had levels of ACs nearing or slightly exceeding 100 ppb. Eleven samples of pink, coho, and sockeye salmon *(O. nerka)* from Kodiak, Chenega Bay, Tatitlek, and Larsen Ba exceeded 10 ppb of ACs. The levels of ACs in the edible flesh of salmon from other subsistence fishing areas and bottomfish from all fishing areas were generally comparable (less than 10 ppb) to the levels detected in the same or related species from the reference site, Angoon.

Two samples of smoked salmon from Old Harbor and Tatitlek were analyzed in this study; they contained 7,500 and 20,000 ppb of LACs and 670 t 2,400 ppb HACs, respectively. The concentrations of benzo[a]pyrene, a carcinogenic HAC, in these samples were 6 ppb (Old Harbor) and 20 ppb (Tatitlek). More samples of smoked fish must be analyzed before proper comparisons can be drawn.

*Molluscs*

Analyses of molluscs (mussels, clams, chitons, and snails) from Windy B Kodiak (village), Chenega Bay, and Old Harbor showed consistent evidence of




* A chart for bottomfish is not presented because HACs in flesh of these species were not detected.

Figure 4. Results of GC/MS analyses of organic-solvent extracts of edible flesh of molluscs and salmon for HACs and LACs.*

exposures to ACs (tissue levels above 100 ppb). Mussels from Windy I Kodiak had AC levels as high as 12,000 to 18,000 ppb (Table 6). Othe levels of ACs in molluscs, crabs, and urchins from the other collection less than 10 ppb, a level comparable to that measured in shellfish collec the village of Angoon, a designated reference area in southeast Alaska.

Benzo[a]pyrene was detected in molluscs from Windy Bay and C Bay at levels of 0.1 to 7 ppb, but was not detected in fish.

*Statistical Results*

In addition to these qualitative interpretations of the AC data, stat analyses of the AC data were also conducted. The results of these analy revealed, however, that the sample sizes for individual species were ger small to draw strong statistical conclusions. This was especially eviden reference site, near Angoon, where the sample size was only 1 to 3 for species.

To increase our ability to draw statistical inferences from the data were grouped according to type (e.g., salmonids or bottomfish) or habi intertidal or benthic) as shown in Table 7. For example, combining dat intertidal molluscs increased the sample size (n = 147) to a reasonable v allowed inclusion of most villages in the statistical analyses. While grou different species and samples from different sampling stations is not ide an approach did enable certain general conclusions to be drawn, as is dis below.

Of the taxonomic groupings of species, the sample size was larges Pacific salmon, n = 164; this includes 6 samples from Angoon and 11 vi with 2 or more samples. Next in sampling size were the intertidal mollu n = 147, which includes 7 samples from Angoon and 13 villages with 2 samples. The statistical results have the greatest validity for these two g

Although it is often convenient to consider the LACs and the HAC separately, in this study the statistical conclusions for each of these categ were not different from those for all the ACs together. Hence, the conc

[redacted]

| Village: | Windy Bay | Kodiak Village | Chenega Bay | Old Harbor | Tatitlek | Larsen Bay | Ouzinkie | Chiniak | Akhiok | Port Lions | Port Graham/ English Bay | Karluk | Kaguyak | Angoon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Molluscs:** | | | | | | | | | | | | | | |
| mussels | 3300 / 440 | 1500 / 160 | 220 / 20 | nd | [nd<br>nd] | 1 / 0.3 | 0.9 / nd | nd | 0.3 / nd | | nd | nd | 1 / nd | 0.6 / nd |
| | 16000 / 2500 | | 160 / 22 | | 3 / 0.2 | | | nd | 0.4 / nd | | 4 / 0.4 | 0.4 / nd | 0.7 / nd | 1 / 0.1 |
| | 2400 / 550 | | 200 / 22 | | 3 / 0.1 | | | | | | 1 / nd | 0.3 / nd | | |
| | | | 190 / 26 | | 3 / 0.3 | | | | | | 1 / nd | 0.3 / nd | | |
| | | | 96 / 15 | | 0.8 / nd | | | | | | 2 / nd | | | |
| | | | | | 1 / nd | | | | | | 1 / nd | | | |
| | | | | | 0.9 / nd | | | | | | 2 / 0.2 | | | |
| | | | | | | | | | | | 5 / 12 | | | |
| | | | | | | | | | | | 4 / 9 | | | |
| | | | | | | | | | | | 2 / 3 | | | |
| clams | | | | | | | | | | | | | | |
| butter | | 410 / 50 | 37 / 5 | 2 / 0.6 | | 3 / 1 | nd | 1 / 0.1 | nd | 0.9 / 0.4 | | 0.3 / nd | 2 / 0.4 | 0.5 / nd |
| | | | 15 / 3 | 2 / 0.8 | | 0.5 / nd | 0.9 / nd | 0.2 / nd | 0.4 / nd | 1 / 0.2 | | | | |
| | | | | 0.7 / 0.3 | | 1 / nd | 7 / 2 | 0.6 / 0.3 | 0.3 / nd | 1 / 1 | | | | |
| | | | | 1 / 1 | | 2 / 0.1 | 3 / 0.5 | 0.3 / nd | | 1 / 1 | | | | |
| | | | | 0.3 / nd | | 4 / 0.8 | | 0.5 / nd | | 1 / 1 | | | | |
| | | | | 6 / 5 | | 1 / 0.2 | | 0.3 / nd | | 2 / 0.1 | | | | |
| | | | | 4 / 7 | | 4 / 0.8 | | 0.9 / nd | | 2 / 1 | | | | |
| | | | | 4 / 3 | | | | | | | | | | |
| | | | | [230 / 21<br>330 / 29] | | | | | | | | | | |
| | | | | 210 / 20 | | | | | | | | | | |
| horse | | | | | | | | | | | | | | [0.5 / nd<br>0.8 / nd] |

Table 6 (continued). Shellfish: Sums of LACs / HACs (listed in Table 1) in edible flesh in ng/g (ppb) wet weight by GC/MS of extract; nd = not detected. Brackets indicate duplicate samples. Reference values are listed under Angoon.

| Village: | Windy Bay | Kodiak Village | Chenega Bay | Old Harbor | Tatitlek | Larsen Bay | Ouzinkie | Chiniak | Akhiok | Port Lions | Port Graham/ English Bay | Karluk | Kasitsna | Angoon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Molluscs:** | | | | | | | | | | | | | | |
| clams | | | | | | | | | | | | | | |
| littleneck | 830 / 130 | 270 / 87 | | 2 / 0.7 | | | 1 / nd | 0.6 / 0.3 | [0.3 / nd] [0.7 / nd] | 2 / 1 | 20 / 9 | | | |
| | | 120 / 24 | | 200 / 19 | | | 0.6 / nd | 2 / 0.4 | | 1 / 1 | | | | |
| | | | | | | | | 1 / 0.1 | | | | | | |
| cockles | | | | | | | | 0.8 / 0.1 | | | 3 / 10 | | | |
| | | | | | | | | [0.7 / nd] [0.5 / nd] | | | | | | |
| chitons | 13 / 3 | 230 / 27 | | 2 / 0.1 | nd | 0.6 / 0.06 | 0.1 / nd | 1 / 0.1 | 1 / nd | 0.6 / nd | 0.7 / nd | 0.2 / nd | 2 / nd | 1 / nd |
| | 4000 / 1800 | 90 / 30 | | 0.9 / nd | 1 / nd | 0.9 / 0.6 | 0.5 / nd | 1 / 0.1 | | 2 / nd | 0.2 / nd | nd | | 1 / nd |
| | | | | 0.5 / nd | | 0.4 / nd | | 1 / 0.1 | | 1 / nd | 0.7 / nd | | | |
| | | | | | | | | 0.5 / nd | | [0.3 / nd] [0.4 / nd] | | | | |
| | | | | | | | | 0.1 / nd | | 1 / nd | | | | |
| snails | 620 / 160 | | | | | 1 / nd | | 1 / nd | | 0.8 / nd | 3 / 0.9 | | | |
| | | | | | | | | | | 0.9 / nd | | | | |
| limpets | | | | | | 2 / 0.1 | | | | | | | | |
| **Urchins** | | | | 5 / 2 | | 2 / 1 | | | | | | | | |
| **Crabs** | | | | | | | | | | | | | | |
| dungeness | | 0.2 / nd | | | | 0.1 / nd | | 0.1 / nd | | 0.1 / nd | | | | |
| | | 0.6 / nd | | | | | | | | | | | | |
| tanner | | | | 0.1 / nd | | 0.2 / nd | | | | 0.1 / nd | | | | |
| | | | | | | | | | | 0.7 / nd | | | | |
| king | | | | | | 2 / nd | | | | 3 / nd | | | | |

Table 7. Taxonomic/habitat groupings of samples for statistical analyses.

| |
|---|
| Bottomfish (benthic) --51 samples (2 from Angoon); villages with 2 or more samples |
| Pacific cod |
| Pacific halibut |
| Irish lord |
| rockfish |
| sole |
| Salmon (midwater) --164 samples (6 from Angoon); villages with 2 or more samples |
| Chinook salmon |
| Chum salmon |
| Coho salmon |
| Pink salmon |
| Sockeye salmon |
| Intertidal molluscs (beach)--147 samples (7 from Angoon); villages with 2 or more samples |
| Clams |
| Mussel |
| Limpets |
| Chiton |
| Snails |

are presented for total ACs. Thus, Figure 3 shows that the highest mean level ACs in molluscs (4,700 ppb) was substantially greater than the highest mean le in salmon (30 ppb) and bottomfish (0.7 ppb).

*Fish.* The levels of total ACs in edible flesh of salmon and bottomfish an results of statistical analyses are shown in Figure 3. In salmon and bottomfish, the levels of ACs in this study were not significantly different from the levels i fish from Angoon. However, the levels of ACs in salmon from the village of Kodiak were significantly different (higher) from those in salmon from Chene Bay, Old Harbor, and Port Graham and English Bay. The very low levels of ACs in the edible flesh of bottomfish did not warrant further statistical investigation. To date, only two samples of smoked salmon from Old Harbor a Tatitlek were analyzed in this study (see above). More samples of smoked fish must be analyzed before proper statistical comparisons can be drawn.

*Molluscs.* The levels of total ACs in edible flesh of intertidal molluscs and results of statistical analyses are also shown in Figure 3. The AC levels in molluscs from Windy Bay, Kodiak, and Chenega Bay were significantly higher than in those from Angoon. No other villages had significantly higher levels tha Angoon, not even Old Harbor, despite the three samples which had greater than 200 ppb of total ACs.

*Analytical Chemical Results According to Fishing Village (Site)*

Summary results for each subsistence fishing area are discussed with the sums of the LACs preceding those of the HACs.

*Windy Bay* --

*Fish.* None were collected at Windy Bay.

*Mussels.* In Cycles I and III, three samples from this area at the tip of the Kenai Peninsula showed the highest levels of ACs of any mussels evaluated in this study. The 2,400-16,000 ppb of LACS and 440-2,500 ppb of HACs are three to four orders of magnitude higher than the levels found in two samples from the designated reference site near Angoon in Southeast Alaska. The

Angoon reference data showed only 0.6-1 ppb of LACs and up to 0.1 ppb of HACs.

*Chitons.* In Cycle III, 4,000 ppb of LACs and 1,800 ppb of HACs were found in a composite sample, compared to the 1 ppb and none detected, respectively, found at Angoon (n = 2). In Cycle I, a sample showed 13 ppb of LACs and 3 ppb of HACs, respectively.

*Littleneck Clams (Protothaca staminea).* In Cycle I, 830 ppb of LACs and 130 ppb of HACs were found in a sample of littleneck clams. No littleneck clams were sampled at Angoon, but a sample of butter clams from there showed LAC and HAC levels of 0.5 ppb and none detected, respectively.

*Snails.* In Cycle I, 620 ppb of LACs and 160 ppb of HACs were found in a sample of snails. No snails were sampled at Angoon, but other molluscs there (n = 6) showed LAC and HAC levels of 0.5-1 ppb and up to 0.1 ppb, respectively.

*Kodiak Village* --

*Pink Salmon.* In seven samples, 4-110 ppb of LACs and 0.2-12 ppb of HACs were found in Cycle II. In Cycle III, the LAC and HAC levels found in three samples were 0.5-3 ppb and none detected, respectively, comparable to the LAC and HAC levels of 2 ppb and none detected, respectively, in pink salmon from Angoon (n = 2).

*Sockeye Salmon.* A sample showed 11 ppb of LACs, slightly higher than the 2-5 ppb of LACs (n = 6) in other species of salmon from Angoon. No sockeye salmon were collected at Angoon.

*Dolly Varden (Salvelinus malma).* A trace (1 ppb) of LACs was found in one sample. No Dolly Varden were collected at Angoon.

*Halibut (Hippoglossus stenolepis).* Trace levels of LACs (up to 0.9 ppb) in three samples, comparable to the 0.4 ppb found in halibut from Angoon.

*Rockfish.* No ACs were found in rockfish. No rockfish were collected at Angoon.

*Mussels.* In Cycle I, a sample contained 1,500 ppb of LACs and 160 ppb of HACs as compared to the two samples from Angoon, which had 0.6-1 ppb of LACs and up to 0.1 ppb of HACs.

*Butter Clams (Saxidomus giganteus).* In Cycle II, a sample contained 410 ppb of LACs and 50 ppb of HACs compared to the sample from Angoon, which had LAC and HAC levels of 0.5 ppb and none detected, respectively.

*Littleneck Clams.* In Cycle III, two samples contained 120-270 ppb of LACs and 24-87 ppb of HACs as compared to the other bivalves (mussels and butter clams, n = 3) from Angoon, which had 0.5-1 ppb of LACs and up to 0.1 ppb of HACs. No littleneck clams were collected at Angoon.

*Chitons.* In Cycle II, a sample contained 230 ppb of LACs and 27 ppb of HACs, whereas in Cycle III, another sample contained LAC and HAC levels of 90 ppb and 30 ppb, respectively. The two samples from Angoon contained 1 ppb LACs and no detectable HACs.

*Dungeness Crabs* (*Cancer magister*). Traces of LACs (0.2-0.6 ppb) were found in two samples. No reference samples were available from Angoon.

*Chenega Bay* --

*Pink Salmon.* A sample showed 20 ppb of LACs in Cycle II. The 19 other samples (Cycles II and III) showed only up to 3 ppb of LACs, which is quite comparable to the 2 ppb of LACs found in two samples from Angoon.

*Halibut, Pacific Cod* (*Gadus macrocephalus*) *and Rockfish.* Traces of LACs were detected, which were comparable to those from the Angoon reference area (0.4-0.6 ppb).

*Mussels.* Levels of ACs were fairly similar in five samples collected throughout all cycles (96-220 ppb of LACs and 15-26 ppb of HACs). Two

samples from Angoon contained LAC and HAC levels of 0.6-1 ppb and up to 0.1 ppb, respectively.

*Butter Clams.* In two samples, 15-37 ppb of LACs and 3-5 ppb of HACs were found, as compared to a sample from Angoon, which had LAC and HAC levels of 0.5 ppb and none detected, respectively.

*Old Harbor --*

*Pink Salmon.* Up to 4 ppb of LACs in 18 samples were comparable to two samples from Angoon (2 ppb).

*Smoked Salmon.* A sample of smoked salmon showed 7,100-7,800 ppb of LACs and 650-700 ppb of HACs, approximately three orders of magnitude greater than the unsmoked salmon.

*Halibut and Pacific Cod.* The levels of LACs found in halibut (up to 1 ppb, n = 3) and a Pacific cod (0.7 ppb) were similar to levels found in the same species from Angoon (LAC and HAC levels of 0.4 and 0.6 ppb, respectively).

*Butter Clams and Littleneck Clams.* Two samples from Cycle I had 2-4 ppb of LACs and 0.6-7 ppb of HACs, as compared to 0.5 ppb and none detected, respectively, from an Angoon sample. Four samples from Cycle II showed LAC and HAC levels of 2-6 ppb and 0.3-5 ppb, respectively. In Cycle III three samples from site 4 showed 210-280 ppb of LACs and 20-25 ppb of HACs, while one sample from site 3 had levels comparable to those from Angoon.

*Chitons.* A sample from Cycle I had 2 ppb of LACs and 0.1 ppb of HACs, whereas in Cycles II and III these LAC and HAC levels of were 0.5-0.9 ppb and none detected, respectively, (n = 2), which is comparable to Angoon (LAC and HAC levels of 1 ppb and none detected, respectively, n = 2).

*Tatitlek --*

*Pink Salmon.* In Cycles I and II, levels of ACs in pink salmon from Tatitlek were below the 2 ppb of LACs found in pink salmon from Angoon.

*Coho Salmon.* In Cycle III, seven samples showed 3-19 ppb of LAC and up to 2 ppb of HACs. Three of these samples had 14 ppb or more of ACs, compared to three samples from Angoon that had LAC and HAC levels of 2-4 ppb and none detected, respectively.

*Smoked Salmon.* A sample of smoked salmon showed 20,000-21,000 ppb of LACs and 1,800-3,000 ppb of HACs, some four orders of magnitude greater than the levels in unsmoked salmon.

*Mussels.* In Cycle II, the 3 ppb of LACs in three samples was slightly higher than the 0.6-1 ppb in two samples from Angoon. In Cycle III, the 0.8-1 ppb of LACs in three samples were comparable to those of the Angoon samples.

*Chitons.* Low levels of ACs in two samples (up to 1 ppb) were indistinguishable from those in Angoon samples.

*Larsen Bay --*

*Pink Salmon.* In Cycle I, 1-12 ppb of LACs and up to 0.4 ppb of HACs were found in two samples, compared to LAC and HAC levels of 2 ppb and none detected, respectively, in two samples from Angoon. In a Cycle II sample, values were comparable to those from Angoon (2 ppb, n = 2), while in Cycle III, levels of LACs (up to 1 ppb) in 11 samples were below those of Angoon.

*Sockeye Salmon.* In Cycle II, 1-6 ppb of LACs and up to 0.2 ppb of HACs were found in six samples, quite similar to the LAC and HAC levels of 2-5 ppb and up to 0.1, respectively, in other species of salmon from Angoon (n = 2). No sockeye salmon were collected at Angoon.

*Halibut and Pacific Cod.* The very low levels of ACs found were similar to those found in the same species from Angoon (up to 1 ppb).

*Butter Clams.* Levels of LACs (0.5-4 ppb) in seven samples of butter clams were comparable to those in a sample of butter clams from Angoon (0.5 ppb).

*Chitons, Snails, Limpets, Sea Urchins, and Crabs.* The low levels of ACs found were similar to, or slightly higher than, those found in some of these species at Angoon (up to 1 ppb).

*Ouzinkie --*

*Pink Salmon.* The 0.9-5 ppb of LACs in nine samples in Cycle II were comparable to, or slightly higher than, those in Angoon samples (2 ppb, n = 2).

*Coho Salmon.* In Cycle III, the 0.6-6 ppb of LACs in eight samples were comparable to the 2-4 ppb in Angoon samples (n = 3). Traces of HACs (0.2-0.6 ppb) were also detected in three samples, as compared to none detected in the Angoon samples (n = 3).

*Halibut.* Up to 1 ppb of ACs found in five samples were comparable to those in Angoon halibut (0.4-1 ppb).

*Butter Clams.* In four samples, the 0.9-7 ppb of LACs and up to 2 ppb of HACs were comparable to, or slightly higher than, those in Angoon samples (LAC and HAC levels of 0.5 ppb and none detected, respectively, n = 1).

*Mussels and Chitons.* Levels of ACs found in a sample each of mussels (0.9 ppb) and chitons (0.5 ppb) were comparable to those for Angoon (0.4-1 ppb).

*Chiniak --*

*Pink Salmon, Sockeye Salmon, Chum Salmon (O. keta), and Halibut.* The levels of LACs (0.4-4 ppb) in six samples of pink salmon and two of halibut (0.8-1 ppb) from Chiniak were comparable to those from the same species sampled at Angoon (2 ppb, n = 2 and 0.4 ppb, n = 1, respectively). Additionally, samples of sockeye salmon and chum salmon contained 0.8-5 ppb of the LACs, similar to the levels for pink salmon from Angoon (2 ppb, n = 2).

*Butter Clams, Littleneck Clams, Cockles, and Chitons.* The levels LACs (0.1-2 ppb) in 14 samples of such molluscs were comparable to those in similar mollusc samples from Angoon (0.5-1 ppb, n = 5). In addition, sample butter clams and littleneck clams had traces of HACs (0.3-0.4 ppb, n = 3), compared to none detected for Angoon.

*Akhiok* --

*Pink Salmon.* The 1-4 ppb of LACs and 0.1-0.4 ppb of HACs we comparable to those in samples from Angoon (LAC and HAC levels of 2 ppb a none detected, respectively, n = 2).

*Coho Salmon and Sockeye Salmon.* No ACs were found in sampl of either of these species at this site.

*Mussels, Butter Clams, Littleneck Clams, and Chitons.* Up to 1 pp of LACs in seven samples were comparable to the levels in such molluscs from Angoon (0.5-1 ppb, n = 5).

*Port Lions* --

*Pink Salmon.* In 10 samples from Port Lions , up to 3 ppb of LA and up to 0.2 ppb of HACs were comparable to those in samples from Angoon (LAC and HAC levels of 2 ppb and none detected, respectively, n = 2).

*Coho Salmon, Halibut, and Sole.* The 0.2-3 ppb of LACs in six samples of coho salmon, four samples of halibut and one sample of sole from Port Lions were comparable to the levels in these species from Angoon (0.4-4 ppb, n = 4).

*Crab, Butter Clams, Littleneck Clams, Chitons, and Snails.* The 0.4-3 ppb of ACs in these samples were comparable to those for samples from Angoon (0.5-1 ppb, n = 5).

*Port Graham and English Bay --*

*Pink Salmon.* Up to 1 ppb of ACs in seven samples were comparable to those in samples from Angoon (2 ppb, n = 2).

*Halibut.* The level of ACs in a sample was similar to that from Angoon (0.4 ppb; n = 1).

*Irish Lord.* The levels of ACs in two samples were not much different from those of other fish from Angoon. No Irish Lords were collected from Angoon.

*Mussels.* The 1-5 ppb of LACs in 10 samples were slightly elevated compared to Angoon (0.6-1 ppb, n = 2). The HACs (up to 12 ppb) were sometimes moderately elevated compared to Angoon mussels (up to 0.1 ppb, n = 2).

*Littleneck Clams and Cockles.* One sample of each showed moderately elevated levels of LACs (3-20 ppb) and HACs (9-10 ppb) compared to similar molluscs from Angoon (LAC and HAC levels of 0.5-1 ppb and up to 0.1 ppb, respectively, n = 6).

*Chitons.* Three samples showed 0.2-0.7 ppb of LACs, which is comparable to the LAC levels in samples from Angoon (1 ppb, n = 2).

*Snails.* A sample showed 3 ppb of LACs and 0.9 ppb of HACs, slightly elevated compared to other molluscs from Angoon (LAC and HAC levels of 0.5-1 ppb and up to 0.1 ppb, respectively, n = 6).

*Karluk --*

*Pink Salmon, Coho Salmon, Sockeye Salmon, Mussels, Butter Clams, and Chitons.* Very low levels of LACs (up to 0.7 ppb) were found, which were comparable to, or lower than the levels in these species from Angoon (up to 4 ppb, n = 10).

*Kasitsna* --

*Mussels.* Two samples from Kasitsna showed 0.7-1 ppb of 2-3 rin ACs, comparable to the 0.6-1 ppb found in Angoon mussels (n = 2).

*Butter Clams.* The level of LACs (2 ppb) in a sample was similar that in a sample from Angoon (0.5 ppb, n = 1).

*Chitons.* Levels of LACs (2 ppb) in a sample were similar to that i a sample from Angoon (1 ppb, n = 2).

## SUMMARY

After the *Exxon Valdez* oil spill in Prince William Sound, native Alaskan were concerned that their seafood could be contaminated by the oil. NOAA, wi funding from Exxon, analyzed edible flesh of fish and shellfish collected from 1 native subsistence fishing grounds. Flesh samples were subjected to extraction and GC/MS analysis for aromatic contaminants from petroleum, including alkylated and unsubstituted aromatic hydrocarbons with 2-7 benzenoid rings and related dibenzothiophenes (Table 1). The hundreds of analyses reported via memo in August, October, and November, 1989 are summarized herein.

Molluscs, mainly mussels, clams, chitons, and snails from Windy Bay, Kodiak, Chenega Bay, and Old Harbor showed consistent GC/MS evidence of exposure to ACs (tissue levels exceeded 100 ppb). Mussels from Windy Bay and Kodiak had the highest levels (1,700-18,000 ppb). Otherwise, levels of aromatic contaminants in molluscs, crabs, and urchins from other areas were generally les than 10 ppb. This is comparable to the levels found in shellfish collected near th village of Angoon, a designated reference area in southeast Alaska.

Generally, the edible flesh of fish analyzed contained relatively low levels of ACs. Three samples of pink salmon from the village of Kodiak averaged 60-100 ppb of ACs, while another eight samples of pink and coho salmon from Kodiak, Chenega Bay, Tatitlek, and Larsen Bay had 12-59 ppb of ACs. Otherwise, the AC levels in the flesh of salmon from other subsistence fishing areas and the bottomfish from all fishing areas were generally less than 7 ppb,

comparable to the levels detected in the same or related species from the reference site.

Statistical analyses of the data revealed that the sample sizes (n) for individual species were often too small to draw statistical distinctions with respect to the reference site, where n = 1-3 for any single species. To broaden the statistical base, samples were grouped by taxonomic affiliation (e.g., salmon or bottomfish) and habitat (e.g., intertidal or benthic). The combining of data for all intertidal molluscs increased the sample size to a reasonable value (n = 147) and had the added advantage of including most of the villages in the statistical analyses. The AC levels in edible flesh of molluscs from Windy Bay, Kodiak, and Chenega Bay were then found to be significantly different from those in molluscs from the reference site near Angoon. However, the AC levels in salmon and bottomfish were not significantly different from those in fish from Angoon. With greater sample numbers available, the AC levels in salmon from Kodiak were found to be significantly different (higher) from those in salmon from Chenega Bay, Old Harbor, and Port Graham and English Bay. The very low levels of ACs in the edible flesh of bottomfish did not warrant further statistical analysis.

As there are significant differences in the rates of uptake, metabolism, excretion, and types of toxic effects exerted by the various ACs measured, the data are also presented to show the levels of 2-3 ring aromatic hydrocarbons and dibenzothiophenes (LACs) separately from the levels of 4-7 ring aromatic hydrocarbons (HACs). The LACs are more prone to dissolution, evaporation, and bacterial degradation and hence, their levels in the environment generally would decline as the spilled oil weathers. The LACs, known for their acute toxicity in experimental animals, are also more rapidly excreted from the body than are HACs. Conversely, HACs are more resistant to dissolution, evaporation, and bacterial degradation. Hence, they tend to persist in the environment. The HACs are metabolized by fish to a greater extent than are the LACs and they have been shown to exert chronic toxicity in experimental animals (e.g., carcinogenicity, tetratogenicity, and reproductive dysfunction).

In this study, the levels of LACs in molluscs ranged from not detected to 16,000 ppb and levels of HACs ranged from not detected to 2,500 ppb. For fish

muscle, the levels of LACs ranged from not detected to 110 ppb, and levels of HACs ranged from not detected to 12 ppb. Benzo[a]pyrene, a carcinogenic HAC was detected in molluscs from Windy Bay and Chenega Bay at levels of 0.1 to 7 ppb, but was not detected in fish. Only two samples of smoked salmon from Old Harbor and Tatitlek were analyzed in this study; they contained 7,500 and 20,000 ppb of LACs and 670 to 2,400 ppb HACs, respectively. The concentrations of benzo[a]pyrene in these samples were 6 ppb (Old Harbor) and 20 ppb (Tatitlek). At present there are no national guidelines established for acceptable levels of aromatic contaminants in food products; however in an unofficial advisory opinion, the Food and Drug Administration has indicated that little additional risk is involved in the consumption of the nonsmoked subsistence foods harvested after the *Exxon Valdez* oil spill.[2]

The main use of the analyses of bile from fish was to assess exposure to ACs and prioritize the GC/MS analyses of the corresponding samples of edible flesh. For each species, edible flesh samples were analyzed as individual samples or as composite samples according to the levels of fluorescent aromatic compounds (FACs) in bile. Interesingly, unsubstituted ACs predominated in fish muscle,[3] which could be due to the more rapid metabolism of alkylated ACs than of unsubstituted ACs by fish liver. Conversely, molluscs which have little ability to metabolize ACs had both alkylated and unsubstituted ACs, and the pattern more closely resembled that of Prudhoe Bay crude oil.[3]

The results to date provide a) important information on the level of contamination of subsistence fish and shellfish from fishing areas of native Alaskan villages in and near Prince William Sound and b) a reference database against which future temporal changes of petroleum derived ACs in the edible flesh of fish and shellfish can be evaluated.

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2 FDA advisory opinion on the safety of aromatic hydrocarbon residues found in subsistence foods that were affected by the *Exxon Valdez* oil spill by the Center for Food Safety and Applied Nutrition's (CFSAN) Quantitative Risk Assessment Committee (QRAC). Guidelines (Report of August 9, 1990) transmitted to Chairman of Alaska Oil Spill Task Force, August 21, 1990, from Fred R. Shank, Director, CFSAN, Department of Health and Human Services, Food and Drug Administration, Washington, D.C. 20204.

3 GC/MS observations on sample extracts.

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# APPENDIX A

## SUMMARY OF CONCENTRATIONS: LACS/HACS, PLUS FIELD AND LABORATORY SAMPLE NUMBERS

Explanatory notes for Tables A-1 through A-26.

Results on sample extracts were determined by gas chromatography/mass spectrometry (GC/MS) using sequenced multiple ion detection.

Cycles I, II, and III refer to samples collected in July, August, and September 1989, respectively.

A hyphen (-) indicates that the analyte was not detected above the limit of detection which ranged from 0.02 to 1 ng/g (ppb) wet weight. This applies to individual contaminants, as well as groupings of contaminants (e.g., C2-phenanthrenes/anthracenes).

Low levels of naphthalene found were indistinguishable from those of blank analyses and were not included in the sums.

Table A-1. Windy Bay shellfish: Mussels and clams. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | Angoon | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 |
| Lab no. | 47 | 242 | 243 | 666 | 232 | 324 | 231 | 325 | 328 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 |
| Cycle No. | I | III | III | I | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | |
| mussels | 3300 / 440 | 16000 / 2500 * | 2400 / 550 | | 0.6 / - | 1 / 0.1 | | | |
| clams | | | | | | | | | |
| butter | | | | | | | 0.5 / - | | |
| horse | | | | | | | | 0.5 / - | 0.8 / - |
| littleneck | | | | 830 / 130 | | | | | |

* One of the mussels in this sample package had a black oil-like substance in it and no tissue. It was not included in the analysis. The remaining mussels from this package were used for the composite and were carefully dissected to avoid contamination from the one mussel.

Table A-1 (continued). Windy Bay shellfish: Chitons and snails. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab no. | 76 | 360 | 684 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | III | I | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | |
| mussels | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | |
| butter | | | | | | 0.5 / - | | | | |
| horse | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | 12 / 3 | 4000 / 1800 | | | | | | | 1 / - | 1 / - |
| snails | | | 620 / 160 | | | | | | | |

**Table A-2. Kodiak Village fish: Pink salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.**

| Site | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | Angoon 3 | 3 | 3 | 3 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 166 | 195 | 187 | 188 | 189 | 628 | 637 | 629 | 630 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | Split samples 1 | 1 | 1 | 3 | 2 | Split samples 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | II | II | II | II | II | II | II | II | II | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | | | |
| pink | 110 / 12 | 72 / 8 | 54 / 5 | 22 / 2 | 6 / 0.2 | 84 / 10 | 22 / 3 | 4 / 0.2 | 32 / 5 | 2 / - | 2 / - | | | | |
| coho | | | | | | | | | | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | | | | | | | 5 / 0.1 |

Table A-2 (continued). Kodiak Village fish: Pink salmon (continued), sockeye salmon, and Dolly Varden. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 488 | 489 | 490 | 492 | 539 | 540 | 194 | 94 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | Split samples 1 | 1 | Split samples 1 | 1 | Split samples 1 | 1 | 1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | III | III | III | III | III | III | II | I | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | | |
| pink | 0.7 / - | 0.5 / - | 1 / - | 1 / - | 0.9 / - | 3 / - | | | 2 / - | 2 / - | | | | |
| coho | | | | | | | | | | | 2 / - | 4 / - | 2 / - | |
| sockeye | | | | | | | 11 / 0.5 | | | | | | | |
| chinook | | | | | | | | | | | | | | 5 / 0.1 |
| **Dolly Varden** | | | | | | | | 1 / - | | | | | | |

Table A-2 (continued). Kodiak Village fish: Halibut and rockfish. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | Angoon | |
|---|---|---|---|---|---|---|---|
| Site | 2 | 6 | 6 | 1 | | 3 | 3 |
| Lab No. | 4 | 193 | 508 | 24 | | 228 | 322 |
| No. of field samples comprising lab sample | 2 | 2 | 1 | 2 | | 3 | 2 |
| Cycle No. | I | II | III | I | | II | II |
| **Halibut** | - / - | 0.3 / - | 0.9 / - | | | 0.4 / - | |
| **Pacific cod** | | | | | | | 0.6 / - |
| **Rockfish** | | | | - / - | | | |

Table A-3. Kodiak Village shellfish: Mussels, clams, chitons, and crabs. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 5 | Angoon 1 | 1 | 2 | 2 | 2 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 48 | 212 | 437 | 447 | 208 | 396 | 96 | 341 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | II | III | III | II | III | I | II | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | | | |
| mussels | 1500 / 160 | | | | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | | | | |
| butter | | 410 / 50 | | | | | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | | | | 0.5 / - | 0.8 / - | | |
| littleneck | | | 270 / 87 | 120 / 24 | | | | | | | | | | | |
| chitons | | | | | 230 / 27 | 90 / 30 | | | | | | | | 1 / - | 1 / - |
| **Crabs:** | | | | | | | | | | | | | | | |
| Dungeness | | | | | | | 0.2 / - | 0.6 / - | | | | | | | |

Table A-4. Chenega Bay fish: Pink salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | Angoon 3 | 3 | 3 | 3 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 137 | 138 | 152 | 452 | 453 | 456 | 454 | 455 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 2 | 3 | 3 | 1 | Split samples 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | II | II | II | III | III | III | III | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | | |
| pink | 0.9 / - | 20 / - | - / - | 0.3 / - | 2 / - | 2 / - | 1 / - | 0.2 / - | 2 / - | 2 / - | | | | |
| coho | | | | | | | | | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | | | | | | 5 / 0.1 |

Table A-4 (continued). Chenega Bay fish: Pink salmon (continued). Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | III | III | III | III | III | III | III | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | | |
| pink | -/- | 0.4/- | -/- | -/- | -/- | -/- | 0.6/- | -/- | 2/- | 2/- | | | | |
| coho | | | | | | | | | | | 2/- | 4/- | 2/- | |
| chinook | | | | | | | | | | | | | | 5/0.1 |

Table A-4 (continued). Chenega Bay fish: Pink salmon (continued). Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 4 | 4 | 4 | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 473 | 474 | 483 | 484 | 593 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 2 | 1 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | III | III | III | III | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | |
| pink | 3 / - | 1 / - | 0.3 / - | 0.8 / - | 0.7 / - | 2 / - | 2 / - | | | | |
| coho | | | | | | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | | | 5 / 0.1 |

Table A-4 (continued). Chenega Bay fish: Halibut, Pacific cod, and rockfish. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | | | | | Angoon | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| Lab No. | 28 | 130 | 131 | 485 | 23 | 149 | 151 | 487 | 42 | 150 | 157 | 228 | 322 |
| No. of field samples comprising lab sample | 2 | 2 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 1 | 1 | 3 | 2 |
| Cycle No. | I | II | II | III | I | II | II | III | I | II | II | II | II |
| **Hallbut** | -/- | -/- | -/- | 0.5/- | | | | | | | | 0.4/- | |
| **Pacific cod** | | | | | -/- | -/- | -/- | 0.3/- | | | | | 0.6/- |
| **Rockfish** | | | | | | | | | -/- | -/- | -/- | | |

**Table A-5. Chenega Bay shellfish: Mussels. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.**

| | | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 44 | 114 | 304 | 305 | 306 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | II | III | III | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | |
| mussels | 220 / 20 | 160 / 22 | 200 / 22 | 190 / 26 | 96 / 15 | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | |
| butter | | | | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | | | | | | | | | | | 1 / - | 1 / - |

Table A-5 (continued). Chenega Bay shellfish: Clams. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Angoon | | | |
| Site | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 664 | 665 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | I | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | |
| mussels | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | |
| butter | 37 / 5 | 15 / 3 | | | 0.5 / - | | | | |
| horse | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | | | | | | | | 1 / - | 1 / - |

Table A-6. Old Harbor fish: Pink salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 11 | 262 | 269 | 270 | 279 | 650 | 541 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 3 | 3 | 2 | 1 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | I | II | II | II | II | II | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | |
| pink | -/- | 1/- | 2/0.1 | 1/- | 1/- | 4/0.3 | -/- | 2/- | 2/- | | | | |
| coho | | | | | | | | | | 2/- | 4/- | 2/- | |
| chinook | | | | | | | | | | | | | 5/0.1 |

Table A-6 (continued). Old Harbor fish: Pink salmon (continued). Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 544 | 545 | 546 | 555 | 556 | 557 | 558 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | III | III | III | III | III | III | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | |
| pink | -/- | -/- | -/- | -/- | -/- | -/- | -/- | 2/- | 2/- | | | | |
| coho | | | | | | | | | | 2/- | 4/- | 2/- | |
| chinook | | | | | | | | | | | | | 5/0.1 |

Angoon

Table A-6 (continued). Old Harbor fish: Pink salmon (continued), Dolly Varden, and smoked salmon. Sums of the concentrations, ng/g (ppb) wet weight of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 559 | 573 | 598 | 599 | 241 | 244 | 703 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | III | III | III | III | 1 | 1 | 1 | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | |
| pink | -/- | -/- | 0.2/- | 0.2/- | | | | 2/- | 2/- | | | | |
| coho | | | | | | | | | | 2/- | 4/- | 2/- | |
| chinook | | | | | | | | | | | | | 5/0.1 |
| smoked salmon | | | | | 7100/ 650 | 7800/ 700 | | | | | | | |
| **Dolly Varden** | | | | | | | 1/- | | | | | | |

Table A-6 (continued). Old Harbor fish: Halibut and Pacific cod. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | Angoon | |
|---|---|---|---|---|---|---|---|
| Site | 1 | 1 | 1 | 1 | 2 | 3 | 3 |
| Lab No. | 40 | 283 | 707 | 26 | 524 | 228 | 322 |
| No. of field samples comprising lab sample | 1 | 3 | 1 | 2 | 1 | 3 | 2 |
| Cycle No. | I | II | II | I | III | II | II |
| **Halibut** | - / - | 1 / - | 0.8 / - | | | 0.4 / - | |
| **Pacific cod** | | | | - / - | 0.7 / - | | 0.6 / - |

Table A-7. Old Harbor shellfish: Mussels and clams. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 60 | 669 | 225 | 226 | 431 | 432 | 670 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | I | II | II | III | III | I | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | | |
| mussels | -/- | | | | | | | 0.6/- | 1/0.1 | | | | | |
| clams | | | | | | | | | | | | | | |
| butter | | 2/0.6 | 2/0.8 | 0.7/0.3 | 1/1 | 0.3/- | 4/7 | | | 0.5/- | | | | |
| horse | | | | | | | | | | | 0.5/- | 0.8/- | | |
| chitons | | | | | | | | | | | | | 1/- | 1/- |

Table A-7 (continued). Old Harbor shellfish: Clams (continued). Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 4 | 4 | 4 | 4 | 4 | Angoon 1 | 1 | 2 | 2 | 2 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 227 | 247 | 418 | 419 | 433 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | Split samples 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | II | II | III | III | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | |
| mussels | | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | |
| butter | 6 / 5 | 4 / 3 | 230 / 21 | 330 / 29 | 210 / 20 | | | 0.5 / - | | | | |
| horse | | | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | | | | | | | | | | | 1 / - | 1 / - |

Table A-7 (continued). Old Harbor shellfish: Clams (continued), chitons, urchins, and crabs. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 3 | 4 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 615 | 616 | 79 | 345 | 401 | 691 | 98 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | III | III | I | II | III | I | I | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | | |
| mussels | | | | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | | | |
| butter | | | | | | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | | | 0.5 / - | 0.8 / - | | |
| littleneck | 2 / 0.7 | 200 / 19 | | | | | | | | | | | 1 / - | 1 / - |
| chitons | | | 2 / 0.1 | 0.9 / - | 0.5 / - | | | | | | | | | |
| **Urchins** | | | | | | 5 / 2 | | | | | | | | |
| **Crabs:** | | | | | | | | | | | | | | |
| Tanner | | | | | | | 0.1 / - | | | | | | | |

Table A-8. Tatitlek fish: Pink salmon and coho salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 2 | 3 | 3 | 3 | 3 | 3 | 7 | 7 | 7 | Angoon 3 | 3 | 3 | 3 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 1 | 134 | 139 | 135 | 136 | 153 | 362 | 363 | 364 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 3 | Split samples 1 | 1 | 1 | 1 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | I | II | II | II | II | II | III | III | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | | | |
| pink | 0.05 / - | - / - | - / - | - / - | - / - | - / - | | | | 2 / - | 2 / - | | | | |
| coho | | | | | | | 14 / 1 | 15 / 1 | 19 / 2 | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | | | | | | | 5 / 0.1 |

Table A-8 (continued). Tatitlek fish: Coho salmon (continued) and smoked salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site; na = not applicable.

| | | | | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 7 | 7 | 7 | 7 | na | na | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 448 | 449 | 450 | 451 | 526 | 527 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 2 | 3 | 3 | 2 | na | na | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | III | III | III | III | na | na | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | |
| pink | | | | | | | 2 / - | 2 / - | | | | |
| coho | 3 / 0.1 | 5 / 0.2 | 3 / - | 3 / - | | | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | | | | 5 / 0.1 |
| smoked salmon | | | | | 20000 / 3000 | 21000 / 1800 | | | | | | |

Table A-8 (continued). Tatitlek fish: Halibut, Pacific cod, and rockfish. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | Angoon | |
|---|---|---|---|---|---|---|---|
| Site | 4 | 6 | 4 | 3 | 4 | 3 | 3 |
| Lab No. | 27 | 132 | 22 | 701 | 702 | 228 | 322 |
| No. of field samples comprising lab sample | 2 | 2 | 2 | 1 | 1 | 3 | 2 |
| Cycle No | I | II | I | I | I | II | II |
| **Halibut** | -/- | -/- | | | | 0.4/- | |
| **Pacific cod** | | | -/- | | | | 0.6/- |
| **Rockfish** | | | | 1/- | 0.6/- | | |

Table A-9. Tatitlek shellfish: Mussels. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 1 | 1 | 2 | 2 | | 1 | 1 |
| Lab No. | 43 | 66 | 111 | 112 | 113 | 307 | 308 | 309 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | Split samples 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | I | II | II | II | III | III | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | | | |
| mussels | -/- | -/- | 3/0.2 | 3/0.1 | 3/0.3 | 0.8/- | 1/- | 0.9/- | 0.6/- | 1/0.1 | | | | | |
| clams | | | | | | | | | | | | | | | |
| butter | | | | | | | | | | | 0.5/- | | | | |
| horse | | | | | | | | | | | | 0.5/- | 0.8/- | | |
| chitons | | | | | | | | | | | | | | 1/- | 1/- |

Table A-9 (continued). Tatitlek shellfish: Chitons. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Angoon | | | | | | | |
| Site | 5 | 5 | 1 | 1 | 2 | 2 | | 1 | 1 |
| Lab No. | 120 | 357 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | II | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | |
| mussels | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | |
| butter | | | | | 0.5 / - | | | | |
| horse | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | - / - | 1 / - | | | | | | 1 / - | 1 / - |

Table A-10. Larsen Bay fish: Pink salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 281 | 3 | 29 | 10 | 504 | 505 | 506 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 3 | Split samples 1 | 1 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | II | I | I | I | III | III | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | |
| pink | 2 / - | 13 / 0.7 | 12 / 0.2 | 1 / - | 0.3 / - | 0.8 / - | 0.8 / - | 2 / - | 2 / - | | | | |
| coho | | | | | | | | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | | | | | 5 / 0.1 |

Table A-10 (continued). Larsen Bay fish: Pink salmon (continued). Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | Angoon 3 | 3 | 3 | 3 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 507 | 543 | 581 | 582 | 594 | 595 | 596 | 597 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 1 | 1 | 3 | 3 | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | III | III | III | III | III | III | III | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | | |
| pink | 0.5 / - | - / - | 0.2 / - | 0.3 / - | 1 / 0.1 | 0.2 / - | 0.7 / - | 0.7 / - | 2 / - | 2 / - | | | | |
| coho | | | | | | | | | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | | | | | | 5 / 0.1 |

Table A-10 (continued). Larsen Bay fish: Sockeye salmon and chum salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 6 | 6 | 6 | 6 | 6 | 6 | Angoon 3 | 3 | 3 | 3 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 264 | 282 | 286 | 652 | 653 | 655 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 3 | 3 | 3 | 3 | 2 | 1 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | II | II | II | II | II | II | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | |
| pink | | | | | | | 2/- | 2/- | | | | |
| coho | | | | | | | | | 2/- | 4/- | 2/- | |
| sockeye | 6/0.2 | 3/- | 2/- | 6/0.1 | 3/- | | | | | | | |
| chum | | | | | | 1/- | | | | | | |
| chinook | | | | | | | | | | | | 5/0.1 |

Table A-10 (continued). Larsen Bay fish: Halibut and Pacific cod. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | Angoon | |
|---|---|---|---|---|---|---|---|---|---|
| Site | 5 | 6 | 6 | 8 | 8 | 6 | 6 | 3 | 3 |
| Lab No. | 41 | 284 | 708 | 520 | 521 | 704 | 285 | 228 | 322 |
| No. of field samples comprising lab sample | 1 | 3 | 1 | 2 | 2 | 1 | 2 | 3 | 2 |
| Cycle No. | I | II | II | III | III | I | II | II | II |
| **Halibut** | -/- | 0.3/- | 0.7/- | 0.5/- | 0.6/- | | | 0.4/- | |
| **Pacific cod** | | | | | | 0.5/- | 0.3/- | | 0.6/- |

Table A-11. Larsen Bay shellfish: Mussels and clams. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 61 | 673 | 416 | 435 | 682 | 249 | 250 | 260 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | I | III | III | I | II | II | II | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | | | |
| mussels | 1 / 0.3 | | | | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | | | | |
| butter | | 3 / 1 | 0.5 / - | 1 / - | 2 / 0.1 | 4 / 0.8 | 1 / 0.2 | 4 / 0.8 | | | 0.5 / - | | | | |
| horse | | | | | | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | | | | | | | | | | | | | | 1 / - | 1 / - |

Table A-11 (continued). Larsen Bay shellfish: Chitons. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 81 | 346 | 411 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | II | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | |
| mussels | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | |
| butter | | | | | | 0.5 / - | | | | |
| horse | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | 0.6 / 0.06 | 0.9 / 0.6 | 0.4 / - | | | | | | 1 / - | 1 / - |

Table A-11 (continued). Larsen Bay shellfish: Snails, limpets, urchins, and crabs. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Angoon | | | | | | | |
| Site | 4 | 1 | 3 | 4 | 4 | 4 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 686 | 690 | 692 | 99 | 100 | 689 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | I | I | I | I | I | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | |
| mussels | | | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | | |
| butter | | | | | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | | | | | | | | | | | | 1 / - | 1 / - |
| snails | 1 / - | | | | | | | | | | | | |
| limpets | | 2 / 0.1 | | | | | | | | | | | |
| **Urchins** | | | 2 / 1 | | | | | | | | | | |
| **Crabs:** | | | | | | | | | | | | | |
| Dungeness | | | | 0.1 / - | | | | | | | | | |
| Tanner | | | | | 0.2 / - | | | | | | | | |
| king | | | | | | 2 / - | | | | | | | |

Table A-12. Ouzinkie Fish: Pink salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 9 | 175 | 191 | 192 | 631 | 632 | 633 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | I | II | II | II | II | II | II | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | |
| pink | -/- | 1/- | 3/- | 5/0.5 | 1/- | 1/- | 1/- | 2/- | 2/- | | | | |
| coho | | | | | | | | | | 2/- | 4/- | 2/- | |
| chinook | | | | | | | | | | | | | 5/0.1 |

Table A-12 (continued). Ouzinkie fish: Pink salmon (continued) and coho salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | Angoon 3 | 3 | 3 | 3 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 634 | 635 | 636 | 528 | 542 | 563 | 574 | 575 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 2 | 2 | 2 | 1 | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | II | II | II | III | III | III | III | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | | |
| pink | 1 / - | 0.9 / - | 1 / - | | | | | | 2 / - | 2 / - | | | | |
| coho | | | | 6 / 0.6 | 0.8 / - | 2 / - | 0.6 / - | 0.6 / - | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | | | | | | 5 / 0.1 |

Table A-12 (continued). Ouzinkie fish: coho salmon (continued). Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 6 | 6 | 6 | Angoon 3 | 3 | 3 | 3 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 609 | 610 | 611 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | III | III | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | |
| pink | | | | 2 / - | 2 / - | | | | |
| coho | 4 / 0.2 | 2 / - | 5 / 0.4 | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | 5 / 0.1 |

Table A-12 (continued). Ouzinkie fish: Halibut. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | Angoon | |
|---|---|---|---|---|---|---|---|---|
| Site | 1 | 3 | 3 | 3 | 3 | | 3 | 3 |
| Lab No. | 8 | 171 | 172 | 510 | 519 | | 228 | 322 |
| No. of field samples comprising lab sample | 2 | 2 | 2 | 2 | 2 | | 3 | 2 |
| Cycle No. | I | II | II | III | III | | II | II |
| **Halibut** | - / - | 0.2 / - | 1 / 0.1 | - / - | 0.3 / - | | 0.4 / - | |
| **Pacific cod** | | | | | | | | 0.6 / - |

Table A-13. Ouzinkie shellfish: Mussels and clams. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 2 | 2 | 2 | 3 | 4 | 2 | 2 | Angoon 1 | 1 | 2 | 2 | 2 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 395 | 63 | 434 | 672 | 207 | 671 | 214 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | III | I | III | I | II | I | II | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | | |
| mussels | 0.9 / - | | | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | | | |
| butter | | - / - | 0.9 / - | 7 / 2 | 3 / 0.5 | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | | | 0.5 / - | 0.8 / - | | |
| littleneck | | | | | | 1 / - | 0.6 / - | | | | | | | |
| chitons | | | | | | | | | | | | | 1 / - | 1 / - |

Table A-13 (continued). Ouzinkie shellfish: Chitons. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Site | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 80 | 410 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | |
| mussels | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | |
| butter | | | | | 0.5 / - | | | | |
| horse | | | | | | 0.5 / - | 0.8 / - | | |
| littleneck | | | | | | | | | |
| chitons | 0.1 / - | 0.5 / - | | | | | | 1 / - | 1 / - |

Table A-14. Chiniak fish: Pink salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 7 | 7 | Angoon 3 | 3 | 3 | 3 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 261 | 288 | 265 | 266 | 287 | 648 | 649 | 501 | 502 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | Split samples 1 | 1 | 3 | 1 | 3 | 2 | 2 | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | II | II | II | II | II | II | II | III | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | | | |
| pink | 2 / - | 0.4 / - | 3 / 0.2 | 1 / - | 2 / - | 4 / 0.2 | 4 / 0.2 | 0.3 / - | 0.3 / - | 2 / - | 2 / - | | | | |
| coho | | | | | | | | | | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | | | | | | | 5 / 0.1 |

**Table A-14 (continued). Chiniak fish: Pink salmon (continued), sockeye salmon, and chum salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.**

| | | | | | | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 7 | 7 | 7 | 7 | 5 | 5 | 5 | 7 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 503 | 579 | 580 | 600 | 651 | 280 | 654 | 525 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 1 | 3 | 3 | 3 | 1 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | III | III | III | III | II | II | II | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | | |
| pink | 0.3 / - | 0.3 / - | - / - | 0.3 / - | | | | | 2 / - | 2 / - | | | | |
| coho | | | | | | | | | | | 2 / - | 4 / - | 2 / - | |
| sockeye | | | | | 1 / - | | | | | | | | | |
| chum | | | | | | 5 / 0.2 | 0.8 / - | 0.4 / - | | | | | | |
| chinook | | | | | | | | | | | | | | 5 / 0.1 |

Table A-14 (continued). Chiniak fish: Halibut and rockfish. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | Angoon | |
|---|---|---|---|---|---|---|
| Site | 6 | 6 | 4 | | 3 | 3 |
| Lab No. | 706 | 509 | 25 | | 228 | 322 |
| No. of field samples comprising lab sample | 1 | 2 | 2 | | 3 | 2 |
| Cycle No. | II | III | I | | II | II |
| **Halibut** | 0.8 / - | 1 / - | | | 0.4 / - | |
| **Pacific cod** | | | | | | 0.6 / - |
| **Rockfish** | | | - / - | | | |

Table A-15. Chiniak shellfish: Mussels and clams. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 57 | 58 | 667 | 413 | 428 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | I | I | III | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | |
| mussels | -/- | -/- | | | | 0.6/- | 1/0.1 | | | | | |
| clams | | | | | | | | | | | | |
| butter | | | 1/0.1 | 0.2/- | 0.6/0.3 | | | 0.5/- | | | | |
| horse | | | | | | | | | 0.5/- | 0.8/- | | |
| chitons | | | | | | | | | | | 1/- | 1/- |

Table A-15 (continued). Chiniak shellfish: Clams (continued). Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 668 | 223 | 415 | 429 | 246 | 613 | 614 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | II | III | III | II | III | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | | |
| mussels | | | | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | | | |
| butter | 0.3 / - | 0.5 / - | 0.3 / - | 0.9 / - | | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | | | 0.5 / - | 0.8 / - | | |
| littleneck | | | | | 0.6 / 0.3 | 2 / 0.4 | 1 / 0.1 | | | | | | | |
| chitons | | | | | | | | | | | | | 1 / - | 1 / - |

Table A-15 (continued). Chiniak shellfish: Clams (continued) and chitons. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 2 | 2 | 2 | 2 | 2 | 2 | Angoon 1 | 1 | 2 | 2 | 2 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 303 | 612 | 618 | 77 | 343 | 344 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | Split samples 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | II | III | III | I | II | II | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | |
| mussels | | | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | | |
| butter | | | | | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | | 0.5 / - | 0.8 / - | | |
| cockles | 0.8 / 0.1 | 0.7 / - | 0.5 / - | | | | | | | | | | |
| chitons | | | | 1 / 0.1 | 1 / 0.1 | 1 / 0.1 | | | | | | 1 / - | 1 / - |

Table A-15 (continued). Chiniak shellfish: Chitons (continued), snails, and crabs. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 2 | 2 | 2 | 3 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 397 | 398 | 685 | 97 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | III | III | I | I | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | |
| mussels | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | |
| butter | | | | | | | 0.5 / - | | | | |
| horse | | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | 0.5 / - | 0.1 / - | | | | | | | | | |
| snails | | | 1 / - | | | | | | | 1 / - | 1 / - |
| **Crabs:** | | | | | | | | | | | |
| Dungeness | | | | 0.1 / - | | | | | | | |

Table A-16. Akhiok fish: Pink salmon, coho salmon, and sockeye salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Site | 4 | 4 | 4 | 1 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 263 | 267 | 560 | 5 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 1 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | II | II | III | I | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | |
| pink | 4 / 0.4 | 1 / 0.1 | | | 2 / - | 2 / - | | | | |
| coho | | | - / - | | | | 2 / - | 4 / - | 2 / - | |
| sockeye | | | | - / - | | | | | | |
| chinook | | | | | | | | | | 5 / 0.1 |

Table A-17. Akhiok shellfish: Mussels, clams, and chitons. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 392 | 251 | 62 | 417 | 430 | 301 | 310 | 399 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | III | II | I | III | III | II | II | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | | | |
| mussels | 0.3 / - | 0.4 / - | | | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | | | | |
| butter | | | - / - | 0.4 / - | 0.3 / - | | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | | | | 0.5 / - | 0.8 / - | | |
| littleneck | | | | | | 0.3 / - | 0.7 / - | | | | | | | | |
| chitons | | | | | | | | 1 / - | | | | | | 1 / - | 1 / - |

Table A-18. Port Lions fish: Pink salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 3 | 3 | 7 | 7 | 7 | 7 | 7 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 6 | 169 | 167 | 168 | 173 | 174 | 190 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 2 | 1 | 1 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | I | II | II | II | II | II | II | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | |
| pink | - / - | 3 / 0.2 | 0.4 / - | 0.5 / - | - / - | 1 / - | 0.3 / - | 2 / - | 2 / - | | | | |
| coho | | | | | | | | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | | | | | 5 / 0.1 |

Table A-18 (continued). Port Lions fish: Pink salmon (continued) and coho salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 7 | 7 | 7 | 3 | 3 | 3 | Angoon 3 | 3 | 3 | 3 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 196 | 646 | 647 | 564 | 576 | 577 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | II | II | II | III | III | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | |
| pink | 0.2 / - | 0.9 / - | 0.8 / - | | | | 2 / - | 2 / - | | | | |
| coho | | | | 2 / - | 0.6 / - | 0.2 / - | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | | | | 5 / 0.1 |

Table A-18 (continued). Port Lions fish: Coho salmon (continued). Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Site | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 578 | 591 | 592 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | III | III | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | |
| pink | | | | 2 / - | 2 / - | | | | |
| coho | 0.3 / - | 3 / 0.1 | 2 / - | | | 2 / - | 4 / - | 2 / - | |
| chinook | | | | | | | | | 5 / 0.1 |

Table A-18 (continued). Port Lions fish: Halibut and yellowfin sole. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | Angoon | |
|---|---|---|---|---|---|---|---|---|
| Site | 3 | 6 | 8 | 8 | 6 | | 3 | 3 |
| Lab No. | 170 | 21 | 522 | 523 | 705 | | 228 | 322 |
| No. of field samples comprising lab sample | 3 | 2 | 2 | 2 | 1 | | 3 | 2 |
| Cycle No. | II | I | III | III | I | | II | II |
| **Halibut** | 0.3 / - | - / - | 0.4 / - | 0.6 / - | | | 0.4 / - | |
| **Yellowfin sole** | | | | | 0.8 / - | | | |
| **Pacific cod** | | | | | | | | 0.6 / - |

Table A-19. Port Lions shellfish: Clams. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 1 | 1 | 1 | 1 | Angoon 1 | 1 | 2 | 2 | 2 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 64 | 205 | 206 | 414 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | II | II | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | |
| mussels | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | |
| butter | 0.9 / 0.4 | 1 / 0.2 | 1 / 1 | 1 / 1 | | | 0.5 / - | | | | |
| horse | | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | | | | | | | | | | 1 / - | 1 / - |

Table A-19 (continued). Port Lions shellfish: Clams (continued). Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 436 | 65 | 211 | 213 | 617 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | III | I | II | II | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | |
| mussels | | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | |
| butter | 1 / 1 | 2 / 0.1 | 2 / 1 | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | 0.5 / - | 0.8 / - | | |
| littleneck | | | | 2 / 1 | 1 / 1 | | | | | | | |
| chitons | | | | | | | | | | | 1 / - | 1 / - |

Table A-19 (continued). Port Lions shellfish: Chitons. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 1 | 1 | 1 | 2 | 2 | 2 | Angoon 1 | 1 | 2 | 2 | 2 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 82 | 210 | 412 | 83 | 84 | 209 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | II | III | I | I | II | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | |
| mussels | | | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | | |
| butter | | | | | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | 0.6 / - | 2 / - | 1 / - | 0.3 / - | 0.4 / - | 1 / - | | | | | | 1 / - | 1 / - |

Table A-19 (continued). Port Lions shellfish: Snails. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 687 | 688 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | I | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | |
| mussels | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | |
| butter | | | | | 0.5 / - | | | | |
| horse | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | | | | | | | | 1 / - | 1 / - |
| snails | 0.8 / - | 0.9 / - | | | | | | | |

Table A-19 (continued). Port Lions shellfish: Crabs. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Angoon | | | | | | |
| Site | 5 | 4 | 4 | 4 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 102 | 101 | 491 | 342 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | I | III | II | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | |
| mussels | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | |
| butter | | | | | | | 0.5 / - | | | | |
| horse | | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | | | | | | | | | | 1 / - | 1 / - |
| **Crabs:** | | | | | | | | | | | |
| Dungeness | 0.1 / - | | | | | | | | | | |
| Tanner | | 0.1 / - | 0.7 / - | | | | | | | | |
| king | | | | 3 / - | | | | | | | |

Table A-20. Port Graham/English Bay fish: Pink salmon and coho salmon. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | Angoon 3 | 3 | 3 | 3 | 3 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 2 | 133 | 148 | 154 | 155 | 156 | 537 | 93 | 538 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | I | II | II | II | II | II | III | I | III | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | | | | |
| pink | -/- | 1/- | -/- | -/- | -/- | -/- | -/- | | | 2/- | 2/- | | | | |
| coho | | | | | | | | 1/- | -/- | | | 2/- | 4/- | 2/- | |
| chinook | | | | | | | | | | | | | | | 5/0.1 |

Table A-20 (continued). Port Graham/English Bay fish: Halibut and Irish lord. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | Angoon | |
|---|---|---|---|---|---|---|---|
| Site | 2 | 5 | 2 | 2 | | 3 | 3 |
| Lab No. | 39 | 486 | 709 | 710 | | 228 | 322 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | | 3 | 2 |
| Cycle No. | I | III | I | I | | II | II |
| **Halibut** | - / - | 0.2 / - | | | | 0.4 / - | |
| **Pacific cod** | | | | | | | 0.6 / - |
| **Irish lord** | | | 0.6 / - | 0.4 / - | | | |

Table A-21. Port Graham/English Bay shellfish: Mussels. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 45 | 115 | 116 | 337 | 338 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | II | II | III | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | |
| mussels | -/- | 4/0.4 | 1/- | 1/- | 2/- | 0.6/- | 1/0.1 | | | | | |
| clams | | | | | | | | | | | | |
| butter | | | | | | | | 0.5/- | | | | |
| horse | | | | | | | | | 0.5/- | 0.8/- | | |
| chitons | | | | | | | | | | | 1/- | 1/- |

Table A-21 (continued). Port Graham/English Bay shellfish: Mussels (continued). Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 4 | 4 | 4 | 4 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 339 | 46 | 117 | 118 | 119 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | III | I | II | II | II | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | |
| mussels | 1 / - | 2 / 0.2 | 5 / 12 | 4 / 9 | 2 / 3 | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | |
| butter | | | | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | | | | | | | | | | | 1 / - | 1 / - |

Table A-21 (continued). Port Graham/English Bay shellfish: Clams, chitons, and snails. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| Site | 1 | 1 | 1 | 1 | 1 | 4 | | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lab No. | 340 | 302 | 75 | 121 | 359 | 683 | | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | II | II | I | II | III | I | | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | | |
| mussels | | | | | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | | | |
| butter | | | | | | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | | | 0.5 / - | 0.8 / - | | |
| littleneck | 20 / 9 | | | | | | | | | | | | | |
| cockles | | 3 / 10 | | | | | | | | | | | | |
| chitons | | | 0.7 / - | 0.2 / - | 0.7 / - | | | | | | | | 1 / - | 1 / - |
| snails | | | | | | 3 / 0.9 | | | | | | | | |

Table A-22. Karluk fish: Pink salmon, coho salmon, sockeye salmon, and Dolly Varden. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | Angoon | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 1 | 1 | 1 | 2 | 1 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 7 | 561 | 562 | 20 | 268 | 95 | 229 | 320 | 230 | 319 | 323 | 321 |
| No. of field samples comprising lab sample | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| Cycle No. | I | III | III | I | II | I | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | | | | | |
| pink | -/- | | | | | | 2/- | 2/- | | | | |
| coho | | 0.5/- | 0.5/- | | | | | | 2/ - | 4/- | 2/- | |
| sockeye | | | | 0.2/- | 0.7/- | | | | | | | |
| chinook | | | | | | | | | | | | 5/0.1 |
| **Dolly Varden** | | | | | | 0.6/- | | | | | | |

Table A-23. Karluk shellfish: Mussels, clams, and chitons. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.

| | | | | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 59 | 245 | 393 | 394 | 224 | 78 | 400 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | I | II | III | III | II | I | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | | | | |
| mussels | - / - | 0.4 / - | 0.3 / - | 0.3 / - | | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | | | | |
| butter | | | | | 0.3 / - | | | | | 0.5 / - | | | | |
| horse | | | | | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | | | | | | 0.2 / - | - / - | | | | | | 1 / - | 1 / - |

Table A-24. **Kasitsna shellfish: Mussels, clams, and chitons. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh. Angoon = reference site.**

| | | | | | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Site | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 355 | 356 | 361 | 358 | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | III | III | III | III | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | | | | | |
| mussels | 1 / - | 0.7 / - | | | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | | | | | |
| butter | | | 2 / 0.4 | | | | 0.5 / - | | | | |
| horse | | | | | | | | 0.5 / - | 0.8 / - | | |
| chitons | | | | 2 / - | | | | | | 1 / - | 1 / - |

Table A-25. Angoon fish: Pink salmon, coho salmon, chinook salmon, halibut, and Pacific cod. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh.

| | Angoon | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Site | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lab No. | 229 | 320 | 230 | 319 | 323 | 321 | 228 | 322 |
| No. of field samples comprising lab sample | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 |
| Cycle No. | II | II | II | II | II | II | II | II |
| **Salmon:** | | | | | | | | |
| pink | 2 / - | 2 / - | | | | | | |
| coho | | | 2 / - | 4 / - | 2 / - | | | |
| chinook | | | | | | 5 / 0.1 | | |
| **Halibut** | | | | | | | 0.4 / - | |
| **Pacific cod** | | | | | | | | 0.6 / - |

Table A-26. Angoon shellfish: Mussels, clams, and chitons. Sums of the concentrations, ng/g (ppb) wet weight, of aromatic contaminants listed in Table 1 (LAC / HAC) in edible flesh.

| | Angoon | | | | | | |
|---|---|---|---|---|---|---|---|
| Site | 1 | 1 | 2 | 2 | 2 | 1 | 1 |
| Lab No. | 232 | 324 | 231 | 325 | 328 | 326 | 327 |
| No. of field samples comprising lab sample | 1 | 1 | 1 | Split samples 1 | 1 | 1 | 1 |
| Cycle No. | II | II | II | II | II | II | II |
| **Molluscs:** | | | | | | | |
| mussels | 0.6 / - | 1 / 0.1 | | | | | |
| clams | | | | | | | |
| butter | | | 0.5 / - | | | | |
| horse | | | | 0.5 / - | 0.8 / - | | |
| chitons | | | | | | 1 / - | 1 / - |

# APPENDIX B

# CONCENTRATIONS OF INDIVIDUAL AROMATIC CONTAMINANTS IN FISH

Explanatory Notes for Tables B-1 through B-15.

Naphthalene-d8 was the internal standard for naphthalene through C4-naphthalenes. Acenaphthene-d10 was the internal standard for acenaphthylene through C1-fluoranthenes/pyrene. Benzo[a]pyrene-d12 was the internal standard for benz[a]anthracene through benzo[ghi]perylene. Percent recoveries for the internal standards (surrogates) averaged 91%, RSD = 19%, n = 662. Percent recoveries of the surrogates include split or duplicate samples.

Results on sample extracts were determined by gas chromatography/mass spectrometry (GC/MS), using sequenced multiple ion detection.

A hyphen (-) indicates that the analyte was not detected above the limit of detection which ranged from 0.02 to 1 ng/g (ppb) wet weight. This applies to individual contaminants, as well as groupings of contaminants (e.g., C2-phenanthrenes/anthracenes).

Low levels of naphthalene found (a) were indistinguishable from those of blank analyses and are unlikely to indicate exposure to petroleum in the absence of 1- and 2-methylnaphthalene.

Table B-1. Pink salmon. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh .

| ACs | Village: | | | | | | | <- Kodiak -> | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | KOD5 | KOD5 | KOD5 | KOD5 | KOD5 | KOD5 | KOD5 | KOD5 | KOD5 | KOD5 | KOD5 | KOD5 | KOD5 | KOD5 |
| | Cycle: | II | II | II | II | II | II | II | II | II | III | III | III | III | III | III |
| | D & M no.: | 214 | 214 | 219 | 209 | 206 | 207 | 207 | 210 | 222 | 496 | 496 | 497 | 497 | 498 | 498 |
| | | >Split samples< | | | 215 | 217 | 208 | 208 | 213 | 218 | >Split samples< | | >Split samples< | | >Split samples< | |
| | | | | | 216 | | >Split samples< | | | | | | | | | |
| | Lab no.: | 166 | 195 | 187 | 188 | 189 | 628 | 637 | 629 | 630 | 488 | 489 | 490 | 492 | 539 | 540 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 7 | 5 | 3 | 2 | 0.6 | 4 | 0.9 | 0.2 | 1 | - | - | - | - | - | - |
| C2-naphthalenes | | 14 | 10 | 6 | 1 | - | 8 | 0.7 | - | 0.9 | - | - | - | - | - | - |
| C3-naphthalenes | | 9 | 6 | 6 | 1 | 0.5 | 8 | 0.5 | - | 0.7 | - | - | - | - | - | - |
| C4-naphthalenes | | 0.1 | 0.1 | 0.2 | - | - | 0.3 | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | 14 | 9 | 6 | 4 | 0.2 | 9 | 3 | - | 5 | - | - | - | - | - | - |
| fluorene | | 15 | 10 | 7 | 3 | 1 | 12 | 3 | - | 5 | - | - | - | - | - | - |
| C1-fluorenes | | 3 | 2 | 2 | 0.3 | 0.3 | 4 | 0.5 | - | 0.5 | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | 0.3 | - | - |
| phenanthrene | | 37 | 24 | 18 | 10 | 3 | 30 | 12 | 4 | 17 | 0.7 | 0.5 | 1 | 0.7 | 0.9 | 3 |
| C1-phenanthrenes/anthracenes | | 3 | 1 | 2 | 0.2 | - | 3 | 0.4 | - | 0.3 | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | 5 | 4 | 3 | 1 | 0.5 | 5 | 1 | 0.2 | 2 | - | - | - | - | - | - |
| C1-dibenzothiophenes | | 1 | 0.6 | 1 | - | - | 1 | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **110** | **72** | **54** | **22** | **6** | **84** | **22** | **4** | **32** | **0.7** | **0.5** | **1** | **1** | **0.9** | **3** |
| fluoranthene | | 12 | 8 | 5 | 2 | 0.2 | 10 | 3 | 0.2 | 5 | - | - | - | - | - | - |
| pyrene | | 0.3 | - | - | - | - | 0.1 | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | **12** | **8** | **5** | **2** | **0.2** | **10** | **3** | **0.2** | **5** | **-** | **-** | **-** | **-** | **-** | **-** |
| sample weight, grams: | | 5.10 | 5.25 | 5.00 | 5.11 | 5.40 | 5.03 | 5.07 | 5.17 | 5.36 | 5.38 | 5.33 | 5.35 | 5.40 | 5.04 | 5.34 |

Table B-2. Pink salmon. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | <- Chenega Bay -> | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | CHE3 | CHE3 | CHE3 | CHE4 | CHE4 | CHE4 | CHE4 | CHE4 | CHE4 | CHE4 | CHE4 | CHE4 | CHE4 | CHE4 | CHE4 | CHE4 | CHE4 | CHE4 |
| | Cycle: | II | II | II | III | III | III | III | III | III | III | III | III | III | III | III | III | III | III |
| | D & M no.: | 142 | 145 | 143 | 462 | 464 | 464 | 442 | 443 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 460 | 461 | 463 |
| | | 144 | 146 | 141 | | >Split samples< | | | | | | | | | | | | | |
| | | | 147 | 140 | | | | | | | | | | | | | | | |
| | Lab no.: | 137 | 138 | 152 | 452 | 453 | 456 | 454 | 455 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 0.4 | 3 | - | - | 0.1 | 0.2 | 0.2 | - | - | - | - | - | - | - | - | - | - | - |
| C2-naphthalenes | | - | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | 0.06 | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | 0.5 | 5 | - | 0.3 | 2 | 2 | 0.9 | 0.2 | - | 0.4 | - | - | - | - | 0.6 | - | 3 | 1 |
| C1-phenanthrenes/anthracenes | | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **0.9** | **20** | **-** | **0.3** | **2** | **2** | **1** | **0.2** | **-** | **0.4** | **-** | **-** | **-** | **-** | **0.6** | **-** | **3** | **1** |
| fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Table B-3. Pink salmon. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | <- Chenega Bay -> | | | <- Old Harbor -> | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | CHE4 | CHE4 | CHE4 | OHA2 | OHA2 | OHA2 | OHA2 | OHA2 | OHA2 | OHA2 | OHA2 | OHA2 | OHA2 | OHA2 | OHA2 | OHA2 | OHA2 | OHA2 |
| | Cycle: | III | III | III | I | II | II | II | II | II | III | III | III | III | III | III | III | III | III |
| | D & M no.: | 465 | 466 | 444 | 117 | 326 | 327 | 328 | 333 | 331 | 617 | 616 | 622 | 623 | 624 | 625 | 626 | 627 | 628 |
| | | | 467 | | | | | 329 | 334 | 332 | | | | | | | | | |
| | | | | | | | | 330 | 335 | | | | | | | | | | |
| | Lab no.: | 483 | 484 | 593 | 11 | 262 | 269 | 270 | 279 | 650 | 541 | 544 | 545 | 546 | 555 | 556 | 557 | 558 | 559 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | - | - | 0.3 | - | 0.5 | 1 | 0.4 | 0.3 | 1 | - | - | - | - | - | - | - | - | - |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | 0.1 | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | 0.2 | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | 0.3 | 0.8 | 0.4 | - | 0.6 | 1 | 1 | 0.8 | 3 | - | - | - | - | - | - | - | - | - |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | 0.2 | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **0.3** | **0.8** | **0.7** | **-** | **1** | **2** | **1** | **1** | **4** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| fluoranthene | | - | - | - | - | - | 0.1 | - | - | 0.3 | - | - | - | - | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | **-** | **-** | **-** | **-** | **-** | **0.1** | **-** | **-** | **0.3** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |
| **sample weight, grams:** | | 5.13 | 5.42 | 5.17 | 3.10 | 5.38 | 5.11 | 4.77 | 5.52 | 5.14 | 5.48 | 5.56 | 5.39 | 5.11 | 5.34 | 5.11 | 5.31 | 5.30 | 5.23 |

Table B-4. Pink salmon. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | <- Old Harbor -> | | | <- Tatitlek -> | | | | | | <- Larsen Bay -> | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | OHA2 | OHA2 | OHA2 | TAT2 | TAT3 | TAT3 | TAT3 | TAT3 | TAT3 | LAB6 | LAB7 | LAB7 | LAB7 | LAB8 | LAB8 | LAB8 | LAB8 | LAB8 |
| | Cycle: | III | III | III | I | II | II | II | II | II | II | I | I | I | III | III | III | III | III |
| | D & M no.: | 618 | 629 | 620 | 4 | 153 | 153 | 155 | 162 | 150 | 299 | 106 | 107 | 107 | 590 | 592 | 597 | 598 | 596 |
| | | 619 | | 621 | 5 | >Split samples< | | | | 151 | 312 | | >Split samples< | | | | | | |
| | | | | | 6 | | | | | 161 | 301 | | | | | | | | |
| | Lab no.: | 573 | 598 | 599 | 1 | 134 | 139 | 135 | 136 | 153 | 281 | 10 | 3 | 29 | 504 | 505 | 506 | 507 | 543 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | - | - | - | - | - | - | - | - | - | 0.4 | - | - | - | - | - | - | - | - |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | 1 | 0.1 | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - | - | 1 | 0.3 | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | - | 0.2 | 0.2 | 0.05 | - | - | - | - | - | 2 | 1 | 11 | 12 | 0.3 | 0.8 | 0.8 | 0.5 | - |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | - | 0.2 | 0.2 | 0.05 | - | - | - | - | - | 2 | 1 | 13 | 12 | 0.3 | 0.8 | 0.8 | 0.5 | - |
| fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | 0.7 | 0.2 | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | |
| benzo[ghi]perylene | | - | - | - | - | - | - | | | | | | | | | | | | |

5.40 5.20 4.47 4.62 3.47 3.00 4.01 5.40 5.28 5.35 5.27 5.32

Table B-5. Pink salmon. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| | Village: | <- Larsen Bay -> | | | | | | <- Ouzinkie -> | | | | | | | | | | <- Akhiok -> | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | LAB8 | LAB8 | LAB8 | LAB8 | LAB8 | LAB8 | OUZ1 | OUZ5 | OUZ5 | OUZ5 | OUZ5 | OUZ5 | OUZ5 | OUZ5 | OUZ5 | OUZ5 | AKH4 | AKH4 |
| | Cycle: | III | III | III | III | III | III | I | II | II | II | II | II | II | II | II | II | II | II |
| | D & M no.: | 591 | 595 | 599 | 604 | 601 | 594 | 57 | 254 | 263 | 258 | 265 | 272 | 274 | 260 | 262 | 256 | 357 | 282 |
| | | 593 | 600 | | | | | 58 | 257 | 264 | 259 | 271 | 273 | 275 | 261 | 255 | 269 | | 356 |
| ACs | | 602 | 603 | | | | | | 270 | | 268 | | | | | | | | 283 |
| | Lab no.: | 581 | 582 | 594 | 595 | 596 | 597 | 9 | 175 | 191 | 192 | 631 | 632 | 633 | 634 | 635 | 636 | 263 | 267 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | - | - | - | - | 0.2 | 0.2 | - | 0.2 | 0.8 | 0.3 | - | - | - | - | - | - | 1 | 0.2 |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | 0.3 | 0.3 | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | 0.09 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.2 | - |
| fluorene | | - | - | - | - | - | - | - | - | 0.1 | 0.4 | - | - | - | - | - | - | 0.3 | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | 0.2 | 0.3 | 0.9 | 0.2 | 0.5 | 0.5 | - | 1 | 2 | 4 | 1 | 1 | 1 | 1 | 0.9 | 1 | 3 | 1 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | 0.2 | 0.2 | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **0.2** | **0.3** | **1** | **0.2** | **0.7** | **0.7** | **-** | **1** | **3** | **5** | **1** | **1** | **1** | **1** | **0.9** | **1** | **4** | **1** |
| fluoranthene | | - | - | 0.1 | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | 0.4 | 0.1 |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | - | - | 0.1 | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | 0.4 | 0.1 |
| sample weight, grams: | | 5.34 | 5.33 | 5.17 | 5.28 | 5.24 | 5.34 | 3.23 | 4.72 | 5.21 | 4.73 | 5.03 | 5.04 | 5.11 | 5.16 | 5.13 | 5.03 | 5.23 | 5.78 |

Table B-6. Pink salmon. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | | | | | <- Chiniak -> | | | | | | | | <- Port Lions -> | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | CHI5 | CHI5 | CHI5 | CHI5 | CHI5 | CHI5 | CHI5 | CHI7 | CHI7 | CHI7 | CHI7 | CHI7 | CHI7 | PTL3 | PTL3 | PTL7 | PTL7 | PTL7 |
| | Cycle: | II | II | II | II | II | II | II | III | III | III | III | III | III | I | II | II | II | II |
| | D & M no.: | 338 | 338 | 339 | 346 | 340 | 344 | 352 | 509 | 502 | 505 | 500 | 504 | 511 | 69 | 234 | 242 | 286 | 241 |
| | | >Split samples< | | 343 | | 341 | 342 | 349 | | | | 501 | 508 | 506 | 70 | | | 287 | |
| | | | | 345 | | 348 | | | | | | 507 | 516 | 517 | | | | 289 | |
| | Lab no.: | 261 | 288 | 265 | 266 | 287 | 648 | 649 | 501 | 502 | 503 | 579 | 580 | 600 | 6 | 169 | 167 | 168 | 173 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 1 | 0.1 | 0.5 | 0.5 | 0.6 | 0.8 | 0.7 | - | - | - | - | - | - | - | 0.4 | 0.2 | 0.1 | - |
| C2-naphthalenes | | - | - | 0.1 | - | - | 0.1 | 0.1 | - | - | - | - | - | - | - | 0.04 | - | - | - |
| C3-naphthalenes | | - | - | 0.1 | - | - | 0.1 | 0.1 | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | 0.2 | - | - | 0.1 | 0.2 | - | - | - | - | - | - | - | 0.2 | - | - | - |
| C1-fluorenes | | - | - | 0.1 | - | - | 0.2 | 0.2 | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | 0.6 | 0.3 | 2 | 0.6 | 1 | 2 | 2 | 0.3 | 0.3 | 0.3 | 0.3 | - | 0.3 | - | 2 | 0.2 | 0.4 | - |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | 0.1 | - | - | 0.2 | 0.2 | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **2** | **0.4** | **3** | **1** | **2** | **4** | **4** | **0.3** | **0.3** | **0.3** | **0.3** | **-** | **0.3** | **-** | **3** | **0.4** | **0.5** | **-** |
| fluoranthene | | - | - | 0.2 | - | - | 0.2 | 0.2 | - | - | - | - | - | - | - | 0.2 | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | | | | | |
| benzo[ghi]perylene | | - | - | - | - | | | | | | | | | | | | | | |

5.09 5.. 4.91 5.01 5.00 5.27 5.38 5.23 5.31 5.17 5.11 5.36 3.06 5.56 5.21 5.82 5.35

Table B-7. Pink salmon. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| | Village: | <- Port Lions -> | | | | | <- Port Graham/ English Bay -> | | | | | | | Karluk | <-Angoon -> | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | PTL7 | PTL7 | PTL7 | PTL7 | PTL7 | PTG3 | PTG3 | PTG3 | PTG3 | PTG3 | PTG3 | PTG3 | KAR1 | AGN3 | AGN3 |
| | Cycle: | II | II | II | II | II | I | II | II | II | II | II | III | I | II | II |
| | D & M no.: | 243 | 240 | 246 | 239 | 288 | 31 | 135 | 128 | 127 | 130 | 134 | 480 | 84 | 187 | 180 |
| | | 284 | 244 | 247 | 285 | 291 | | | | 129 | 133 | 131 | 479 | 83 | 188 | 190 |
| ACs | | 290 | 245 | 248 | | | | | | | | 132 | 485 | | 189 | 185 |
| | Lab no.: | 174 | 190 | 196 | 646 | 647 | 2 | 133 | 148 | 154 | 155 | 156 | 537 | 7 | 229 | 320 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 0.2 | - | - | 0.5 | 0.3 | - | - | - | - | - | - | - | - | 1 | 0.9 |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.09 | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | 1 | 0.3 | 0.2 | 0.4 | 0.5 | - | 1 | - | - | - | - | - | - | 1 | 1 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | 1 | 0.3 | 0.2 | 0.9 | 0.8 | - | 1 | - | - | - | - | - | - | 2 | 2 |
| fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| sample weight, grams: | | 5.24 | 5.14 | 5.51 | 5.01 | 5.05 | 3.20 | 5.04 | 4.53 | 4.41 | 4.46 | 4.87 | 5.40 | 3.43 | 5.58 | 5.37 |

Table B-8. Coho salmon. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | <- Tatitlek -> | | | | | | | <- Ouzinkie -> | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | TAT7 | TAT7 | TAT7 | TAT7 | TAT7 | TAT7 | TAT7 | OUZ6 | OUZ6 | OUZ6 | OUZ6 | OUZ6 | OUZ6 | OUZ6 | OUZ6 |
| | Cycle: | III | III | III | III | III | III | III | III | III | III | III | III | III | III | III |
| | D & M no.: | 434 | 425 | 430 | 440 | 431 | 436 | 424 | 201 | 455 | 202 | 361 | 456 | 200 | 360 | 454 |
| | | 437 | 426 | 432 | 441 | 433 | 438 | 429 | | | 452 | 362 | 457 | 203 | 453 | 459 |
| | | 439 | 428 | | | 435 | 427 | | | | | 363 | 458 | | | |
| | Lab no.: | 362 | 363 | 364 | 448 | 449 | 450 | 451 | 528 | 542 | 563 | 574 | 575 | 609 | 610 | 611 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 2 | 2 | 2 | 0.3 | 0.7 | 0.2 | 0.2 | 0.4 | - | 0.5 | - | - | 1 | 0.7 | 0.9 |
| C2-naphthalenes | | 2 | 2 | 3 | - | 0.2 | - | 2 | - | - | - | - | - | 0.4 | - | - |
| C3-naphthalenes | | 2 | 1 | 2 | - | 0.2 | - | - | - | - | - | - | - | 0.2 | - | - |
| C4-naphthalenes | | - | - | 0.1 | - | - | 0.2 | - | 0.7 | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | 1 | 0.9 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | 1 | 1 | 2 | - | 0.2 | - | - | - | - | - | - | - | 0.3 | - | - |
| C1-fluorenes | | 0.3 | 0.3 | 0.4 | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | 0.3 | - | - | - | - | 0.3 | 0.2 | 0.6 |
| phenanthrene | | 4 | 5 | 6 | 2 | 3 | 2 | 1 | 3 | 0.8 | 1 | 0.6 | 0.6 | 2 | 1 | 3 |
| C1-phenanthrenes/anthracenes | | 0.2 | 0.4 | 0.6 | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | 0.3 | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | 0.7 | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | 1 | 2 | 2 | 0.4 | 1 | 0.3 | - | - | - | - | - | - | 0.3 | - | 0.2 |
| C1-dibenzothiophenes | | 0.1 | 0.09 | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | 0.4 | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **14** | **15** | **19** | **3** | **5** | **3** | **3** | **6** | **0.8** | **2** | **0.6** | **0.6** | **4** | **2** | **5** |
| fluoranthene | | 1 | 1 | 2 | 0.1 | 0.2 | - | - | - | - | - | - | - | 0.2 | - | 0.4 |
| pyrene | | 0.1 | - | 0.3 | - | - | - | - | 0.6 | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | | | | |
| dibenz[a,h]anthracene | | - | - | - | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| sample weight, grams: | 4.74 | 5.28 | 5.25 | 4.90 | 5.22 | 5.07 | 5.11 | 5.34 | 5.38 | 5.28 | 5.33 | 5.28 | 5.22 | 5.47 | 5.18 |

Table B-9. Coho salmon. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| | Village: | | | <- Port Lions -> | | | | Port Gra./Eng.Bay | | <- Karluk -> | | Akhiok | <- Angoon -> | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | PTL3 | PTL3 | PTL3 | PTL3 | PTL3 | PTL3 | PTG3 | PTG3 | KAR1 | KAR1 | AKH4 | AGN3 | AGN3 | AGN3 |
| | Cycle: | III | III | III | III | III | III | I | III | III | III | III | II | II | II |
| | D & M no.: | 572 | 574 | 573 | 579 | 520 | 523 | 30 | 481 | 372 | 374 | 381 | 181 | 177 | 193 |
| | | 578 | 521 | 575 | 577 | 522 | 580 | | 482 | 373 | 375 | 382 | 182 | 178 | 192 |
| ACs | | | | 576 | | | | | 483 | | 376 | 383 | 184 | 186 | |
| | Lab no.: | 564 | 576 | 577 | 578 | 591 | 60-592 | 60-93 | 60-538 | 60-561 | 60-562 | 560 | 60-230 | 60-319 | 60-323 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 0.8 | 0.09 | - | - | 0.8 | 0.6 | 0.5 | - | - | 0.2 | - | 1 | 2 | 1 |
| C2-naphthalenes | | - | - | - | - | 0.1 | - | - | - | - | - | - | 0.2 | 0.7 | 0.2 |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | 0.1 | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - | - | - | 0.1 | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | 1 | 0.6 | 0.2 | 0.3 | 2 | 1 | 0.7 | - | 0.5 | 0.3 | - | 1 | 1 | 1 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | 0.1 | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | 2 | 0.6 | 0.2 | 0.3 | 3 | 2 | 1 | - | 0.5 | 0.5 | - | 2 | 4 | 2 |
| fluoranthene | | - | - | - | - | 0.1 | - | - | - | - | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | - | - | - | - | 0.1 | - | - | - | - | - | - | - | - | - |
| sample weight, grams: | | 5.26 | 5.45 | 5.49 | 5.10 | 5.35 | 5.03 | 4.99 | 5.16 | 5.13 | 5.15 | 5.17 | 5.09 | 5.54 | 4.85 |

Table B-10. Sockeye salmon. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| | Village: | Kodiak | <- Larsen Bay -> | | | | | Chiniak | Akhiok | <- Karluk -> | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | KOD5 | LAB6 | LAB6 | LAB6 | LAB6 | LAB6 | CHI5 | AKH1 | KAR1 | KAR1 |
| | Cycle: | II | II | II | II | II | II | II | I | I | II |
| | D & M no.: | 211 | 296 | 298 | 309 | 307 | 295 | 347 | 91 | 86 | 280 |
| | | | 297 | 304 | 311 | 308 | 300 | | 92 | 87 | 281 |
| ACs | | | 302 | 306 | 303 | 305 | | | | | |
| | Lab no.: | 194 | 264 | 282 | 286 | 652 | 653 | 651 | 5 | 20 | 268 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 0.9 | 2 | 0.6 | 0.7 | 2 | 0.9 | 0.5 | - | - | 0.3 |
| C2-naphthalenes | | 0.9 | 0.7 | 0.1 | - | 0.5 | - | - | - | - | - |
| C3-naphthalenes | | 1 | 0.1 | - | - | 0.06 | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | 0.2 | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | 0.8 | - | - | - | - | - | - | - | - | - |
| fluorene | | 2 | 0.8 | 0.3 | 0.2 | 0.5 | - | - | - | - | - |
| C1-fluorenes | | 0.4 | - | - | - | 0.2 | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | 4 | 2 | 2 | 1 | 2 | 2 | 0.7 | - | - | 0.4 |
| C1-phenanthrenes/anthracenes | | 0.1 | 0.1 | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | 1 | 0.7 | 0.4 | 0.1 | 0.6 | 0.2 | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **11** | **6** | **3** | **2** | **6** | **3** | **1** | **-** | **0.2** | **0.7** |
| fluoranthene | | 0.5 | 0.2 | - | - | 0.1 | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | |
| benzo[ghi]perylene | | | | | | | | | | | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| sample weight, grams: | 5.44 | 5.99 | 4.57 | 4.99 | 5.13 | 5.10 | 5.05 | 3.36 | 2.96 | 5.29 | | | |

Table B-11. Chum salmon, chinook salmon, Dolly Varden and smoked salmon. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| | Fish: | <- Chum -> | | | | Chinook | <- Dolly Varden -> | | | <- Smoked salmon -> | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Village: | Larsen Bay | <-Chiniak-> | | | Angoon | Kodiak | Karluk | <-Old Harbor-> | | | <-Tatitlek-> | |
| | Site: | LAB6 | CHI5 | CHI5 | CHI7 | AGN3 | KOD5 | KAR1 | OHA2 | OHA | OHA | TAT | TAT |
| | Cycle: | II | II | II | III | II | I | I | I | >split samples< | | | |
| | D & M no.: | 310 | 350 | 351 | 503 | 191 | 46 | 81 | 111 | | | | |
| | | | 355 | 336 | 510 | 194 | 56 | 82 | | | | | |
| ACs | | | 353 | 354 | | 183 | | | | | | | |
| | Lab no.: | 655 | 280 | 654 | 525 | 321 | 94 | 95 | 703 | 241 | 244 | 526 | 527 |
| naphthalene | | a | a | a | a | a | a | a | a | 450 | 510 | 1200 | 1200 |
| C1-naphthalenes | | 0.3 | 1 | 0.3 | - | 2 | 0.4 | 0.2 | 0.7 | 320 | 400 | 800 | 950 |
| C2-naphthalenes | | - | 0.4 | - | - | 0.8 | 0.07 | - | - | 410 | 530 | 930 | 1500 |
| C3-naphthalenes | | - | 0.3 | - | - | 0.08 | - | - | - | 510 | 610 | 770 | 1400 |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | 380 | 370 | 650 | 1200 |
| acenaphthylene | | - | - | - | - | - | - | - | - | 580 | 640 | 3000 | 3400 |
| acenaphthene | | - | - | - | - | - | - | - | - | 75 | 91 | 280 | 280 |
| fluorene | | - | 0.6 | - | - | 0.3 | - | - | - | 410 | 450 | 1800 | 2100 |
| C1-fluorenes | | - | - | - | - | - | - | - | - | 340 | 380 | 940 | 1000 |
| C2-fluorenes | | - | - | - | - | - | - | - | - | 740 | 780 | 1700 | 1400 |
| C3-fluorenes | | - | - | - | - | - | - | - | - | 210 | 190 | 260 | 130 |
| phenanthrene | | 1 | 2 | 0.5 | 0.4 | 2 | 0.7 | 0.4 | 0.7 | 1800 | 1800 | 5100 | 4600 |
| C1-phenanthrenes/anthracenes | | - | 0.07 | - | - | - | - | - | - | 560 | 610 | 1800 | 1400 |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | 230 | 250 | 710 | 370 |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | 87 | 94 | 220 | 110 |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | 2 | 2 | 4 | 0.9 |
| dibenzothiophene | | - | 0.3 | - | - | - | - | - | - | 14 | 14 | 44 | 39 |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | 11 | 13 | 23 | 26 |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | 6 | 10 | 10 | 11 |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | 0.3 | 7 | 4 | 3 |
| **Sum of LACs** | | **1** | **5** | **0.8** | **0.4** | **5** | **1** | **0.6** | **1** | **7100** | **7800** | **20000** | **21000** |
| fluoranthene | | - | 0.2 | - | - | 0.1 | - | - | - | 280 | 310 | 1400 | 820 |
| pyrene | | - | - | - | - | - | - | - | - | 200 | 210 | 1000 | 590 |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | 97 | 100 | 440 | 250 |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | 13 | 14 | 45 | 32 |
| chrysene | | - | - | - | - | - | - | - | - | 23 | 24 | 41 | 29 |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | 8 | 11 | 7 | 5 |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | 1 | 0.5 | 0.7 |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | 0.3 | 0.3 |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | 6 | 7 | 16 | 12 |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | 6 | 6 | 21 | 16 |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | 7 | 6 | 20 | 17 |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | 3 | 4 | 9 | 8 |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | 0.2 | 0.6 | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | 3 | 3 | 8 | 7 |
| **Sum of HACs** | | **-** | **0.2** | **-** | **-** | **0.1** | **-** | **-** | **-** | **650** | **700** | **3000** | **1800** |
| sample weight, grams: | | 5.08 | 5.23 | 5.10 | 5.26 | 5.17 | 5.28 | 5.24 | 5.29 | 4.83 | 5.23 | 2.09 | 2.19 |

Table B-12. Halibut. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | <- Kodiak -> | | | <- Chenega Bay -> | | | <- Old Harbor -> | | | | <- Tatitlek -> | | <- Larsen Bay -> | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | KOD2 | KOD6 | KOD6 | CHE2 | CHE2 | CHE2 | CHE2 | OHA1 | OHA1 | OHA1 | TAT4 | TAT6 | LAB5 | LAB6 | LAB6 | LAB8 | LAB8 |
| | Cycle: | I | II | III | I | II | II | III | I | II | II | I | II | I | II | II | III | III |
| | D & M no.: | 49 | 220 | 499 | 19 | 169 | 171 | 472 | 120 | 323 | 322 | 27 | 148 | 104 | 292 | 251 | 605 | 607 |
| | | 50 | 221 | | 18 | 170 | 94 | 473 | | 324 | | 28 | 149 | | 293 | | 606 | 608 |
| | | | | | | | | 474 | | 325 | | | | | 294 | | | |
| | Lab no.: | 4 | 193 | 508 | 28 | 130 | 131 | 485 | 40 | 283 | 707 | 27 | 132 | 41 | 284 | 708 | 520 | 521 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | - | 0.1 | 0.3 | - | - | - | - | - | 0.3 | 0.3 | - | - | - | 0.1 | 0.2 | 0.2 | 0.2 |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | - | 0.2 | 0.6 | - | - | - | 0.5 | - | 0.9 | 0.5 | - | - | - | 0.2 | 0.5 | 0.3 | 0.4 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | - | 0.3 | 0.9 | - | - | - | 0.5 | - | 1 | 0.8 | - | - | - | 0.3 | 0.7 | 0.5 | 0.6 |
| fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Table B-13. Halibut. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | <- Ouzinkie -> | | | | | <- Chiniak -> | | <- Pt. Lions -> | | | | Pt. Gra./ Eng. Bay | | Angoon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | OUZ1 | OUZ3 | OUZ3 | OUZ3 | OUZ3 | CHI6 | CHI6 | PTL3 | PTL6 | PTL8 | PTL8 | PTG2 | PTG5 | AGN3 |
| | Cycle: | I | II | II | III | III | II | III | II | I | III | III | I | III | II |
| | D & M no.: | 90 | 266 | 276 | 364 | 366 | 337 | 512 | 236 | 75 | 582 | 584 | 23 | 484 | 196 |
| | | 85 | 267 | 277 | 365 | 367 | | 513 | 237 | 76 | 583 | 585 | | | 197 |
| | | | | | | | | | 238 | | | | | | 179 |
| | Lab no.: | 8 | 171 | 172 | 510 | 519 | 706 | 509 | 170 | 21 | 522 | 523 | 39 | 486 | 228 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | - | 0.07 | 0.6 | - | - | 0.4 | 0.2 | 0.1 | - | - | - | - | - | 0.2 |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | 0.5 | - | - | - | - | - | - | - |
| phenanthrene | | - | 0.1 | 0.5 | - | 0.3 | 0.4 | 0.6 | 0.2 | - | 0.4 | 0.6 | - | 0.2 | 0.2 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | - | 0.2 | 1 | - | 0.3 | 0.8 | 1 | 0.3 | - | 0.4 | 0.6 | - | 0.2 | 0.4 |
| fluoranthene | | - | - | 0.1 | - | - | - | - | - | - | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | - | - | 0.1 | - | - | - | - | - | - | - | - | - | - | - |
| sample weight, grams: | | 3.22 | 6.13 | 5.63 | 5.07 | 5.29 | 5.13 | 5.08 | 5.51 | 4.68 | 5.22 | 5.20 | 4.61 | 5.54 | 4.97 |

Table B-14. Pacific Cod. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | <-Chenega Bay-> | | | | Old Harbor | | Tatitlek | Larsen Bay | | Angoon |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | CHE2 | CHE2 | CHE2 | CHE2 | OHA1 | OHA2 | TAT4 | LAB6 | LAB6 | AGN3 |
| | Cycle: | I | II | II | III | I | III | I | I | II | II |
| | D & M no.: | 014 | 166 | 165 | 471 | 108 | 631 | 025 | 105 | 249 | 195 |
| | | 015 | | | | 112 | | 026 | | 250 | 198 |
| | | 013 | | | | | | | | | |
| | Lab no.: | 23 | 149 | 151 | 487 | 26 | 524 | 22 | 704 | 285 | 322 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | - | - | - | - | - | - | - | 0.2 | 0.1 | 0.2 |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | - | - | - | 0.3 | - | 0.7 | - | 0.3 | 0.2 | 0.4 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | - | - | - | 0.3 | - | 0.7 | - | 0.5 | 0.3 | 0.6 |
| fluoranthene | | - | - | - | - | - | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | - | - | - | - | - | - | - | - | - | - |
| sample weight, grams: | | 2.82 | 4.52 | | | | | | | | |

Table B-15. Rockfish, Irish Lord and Yellowfin Sole. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Fish: | <- Rockfish -> | | | | | | | <- Irish Lord -> | | Yf. Sole |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Village: | Kodiak | <-Chenega Bay-> | | | <-Tatitlek-> | | Chiniak | Port Graham/ English Bay | | Pt. Lions |
| | Site: | KOD1 | CHE2 | CHE2 | CHE2 | TAT3 | TAT4 | CHI4 | PTG2 | PTG2 | PTL6 |
| | Cycle: | I | I | II | II | I | I | I | I | I | I |
| | D & M no.: | 047 | 016 | 168 | 167 | 007 | 008 | 044 | 029 | 024 | 074 |
| | | 048 | 017 | | | | | 045 | | | |
| | Lab no.: | 24 | 42 | 150 | 157 | 701 | 702 | 25 | 709 | 710 | 705 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | - | - | - | - | 0.4 | 0.3 | - | 0.2 | 0.2 | 0.4 |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | - | - | - | - | 0.7 | 0.3 | - | 0.4 | 0.2 | 0.4 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | - | - | - | - | 1 | 0.6 | - | 0.6 | 0.4 | 0.8 |
| fluoranthene | | - | - | - | - | - | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | - | - | - | - | - | - | - | - | - | - |
| sample weight, grams: | | 4.01 | 4.68 | 4.56 | 4.70 | 5.27 | 5.19 | 4.26 | 5.33 | 5.23 | 5.33 |

# APPENDIX C

## CONCENTRATIONS OF INDIVIDUAL AROMATIC CONTAMINANTS IN SHELLFISH

Explanatory Notes for Tables C-1 through C-12.

Naphthalene-d8 was the internal standard for naphthalene through C4-naphthalenes. Acenaphthene-d10 was the internal standard for acenaphthylene through C1-fluoranthenes/pyrene. Benzo[a]pyrene-d12 was the internal standard for benz[a]anthracene through benzo[ghi]perylene. Percent recoveries for the internal standards (surrogates) averaged 88%, RSD = 15%, n = 452. Percent recoveries of the surrogates include split or duplicate samples.

Results on sample extracts were determined by gas chromatography/mass spectrometry (GC/MS), using sequenced multiple ion detection.

A hyphen (-) indicates that the analyte was not detected above the limit of detection which ranged from 0.02 to 1 ng/g (ppb) wet weight. This applies to individual contaminants, as well as groupings of contaminants (e.g., C2-phenanthrenes/anthracenes).

Low levels of naphthalene (a) found were indistinguishable from those of blank analyses and are unlikely to indicate exposure to petroleum in the absence of 1- and 2-methylnaphthalene.

Table C-1. Mussels. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | <-Windy Bay-> | | | Kodiak | | <-Chenega Bay-> | | | | <-Port Graham/English Bay-> | | | | | | | | | | Lars. B. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | WNB1 | WNB1 | WNB1 | KOD3 | CHE1 | CHE1 | CHE1 | CHE1 | CHE1 | PTG1 | PTG4 | PTG1 | PTG1 | PTG4 | PTG4 | PTG4 | PTG1 | PTG1 | PTG1 | LAB1 |
| | Cycle: | I | III | III | I | I | II | III | III | III | I | I | II | II | II | II | II | III | III | III | I |
| | D & M no.: | 036 | 490 | 491 | 051 | 009 010 | 164 | 468 | 469 | 470 | 020 021 | 033 | 126 | 125 | 121 | 122 | 123 | 476 | 477 | 478 | 077 |
| | Lab no.: | 47 | 242 | 243 | 48 | 44 | 114 | 304 | 305 | 306 | 45 | 46 | 115 | 116 | 117 | 118 | 119 | 337 | 338 | 339 | 61 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | - | 16 | 0.3 | - | - | 0.7 | 0.5 | 0.2 | 0.5 | - | - | 0.3 | 0.1 | 0.2 | 0.3 | 0.09 | 0.7 | 0.7 | 0.5 | - |
| C2-naphthalenes | | 0.3 | 120 | 1 | 4 | - | 0.2 | 0.2 | 0.1 | 0.1 | - | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | 54 | 340 | 14 | 41 | 0.5 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | 34 | 560 | 46 | 85 | 1 | 4 | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | 0.07 | - | - | - | 1 | - | - | - | - | - | 1 | - | - | - | - | - | - | - | - |
| acenaphthene | | - | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | 14 | 0.4 | 2 | - | 0.5 | 0.2 | 0.1 | 0.3 | - | - | - | - | 0.1 | - | - | - | - | - | - |
| C1-fluorenes | | 10 | 88 | 7 | 27 | 0.2 | 1 | 1 | 1 | 0.9 | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | 81 | 600 | 54 | 110 | 3 | 4 | 4 | 3 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | 78 | 180 | 31 | 73 | 0.2 | 0.4 | 0.6 | 2 | 0.7 | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | 17 | 72 | 6 | 34 | 5 | 7 | 5 | 4 | 4 | - | 2 | 3 | 0.9 | 4 | 3 | 2 | 0.7 | 0.8 | 0.7 | 1 |
| C1-phenanthrenes/anthracenes | | 140 | 560 | 63 | 140 | 18 | 12 | 10 | 9 | 7 | - | - | - | - | 0.2 | 0.3 | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | 540 | 2400 | 330 | 250 | 52 | 29 | 22 | 23 | 15 | - | - | - | - | 0.09 | 0.1 | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | 740 | 3700 | 630 | 150 | 46 | 29 | 22 | 23 | 14 | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | 160 | 980 | 200 | 5 | 0.5 | 4 | 3 | 6 | 2 | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | 11 | 70 | 4 | 14 | 0.5 | 1 | 3 | 2 | 1 | - | - | - | - | 0.1 | - | - | - | - | - | - |
| C1-dibenzothiophenes | | 100 | 420 | 48 | 99 | 10 | 8 | 14 | 11 | 5 | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | 510 | 2300 | 310 | 270 | 40 | 26 | 49 | 42 | 18 | - | - | - | - | - | - | - | - | - | - | 0.1 |
| C3-dibenzothiophenes | | 780 | 3500 | 620 | 230 | 47 | 33 | 56 | 56 | 21 | - | - | - | - | - | - | - | - | - | - | 0.06 |
| **Sum of LACs** | | 3300 | 16000 | 2400 | 1500 | 220 | 160 | 200 | 190 | 96 | - | 2 | 4 | 1 | 5 | 4 | 2 | 1 | 2 | 1 | 1 |
| fluoranthene | | 13 | 47 | 8 | 57 | 5 | 6 | 8 | 7 | 6 | - | 0.07 | 0.4 | - | 6 | 4 | 2 | - | - | - | 0.3 |
| pyrene | | 9 | 56 | 7 | 25 | 2 | 3 | 5 | 4 | 3 | - | 0.1 | - | - | 2 | 2 | 0.5 | - | - | - | - |
| C1-fluoranthenes/pyrenes | | 68 | 450 | 60 | 14 | 0.4 | 1 | 3 | 3 | 1 | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | 0.7 | 10 | 2 | 6 | - | 0.8 | 1 | 1 | 0.9 | - | - | - | - | 0.5 | 0.1 | - | - | - | - | - |
| chrysene | | 110 | 380 | 73 | 19 | 8 | 4 | 3 | 4 | 2 | - | - | - | - | 2 | 2 | 0.3 | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | 160 | 520 | 160 | - | 5 | 3 | 1 | 3 | 0.8 | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | 68 | 600 | 160 | - | - | 1 | 0.1 | 1 | 0.05 | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | 0.2 | 270 | 52 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | 58 | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | 8 | 62 | 15 | 5 | 0.1 | 2 | 1 | 2 | 1 | - | - | - | - | 1 | 0.4 | 0.2 | - | - | - | - |
| benzo[k]fluoranthene | | - | 56 | 0.9 | 37 | - | 1 | 0.3 | 0.7 | 0.3 | - | - | - | - | 0.6 | 0.1 | - | - | - | - | - |
| benzo[a]pyrene | | - | 7 | 2 | - | - | - | 0.09 | 0.2 | 0.1 | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | 5 | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | 17 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | 440 | 2500 | 550 | 160 | 20 | 22 | 22 | 26 | 15 | - | 0.2 | 0.4 | - | 12 | 9 | 3 | - | - | - | 0.3 |
| sample weight, grams: | | 4.58 | 4.93 | 5.19 | 5.31 | 5.05 | 4.61 | 4.83 | 5.19 | 4.49 | 4.78 | 4.72 | 2.92 | 3.77 | 5.45 | 5.17 | 5.33 | 5.30 | 5.13 | 5.35 | 5.09 |

Table C-2. Mussels. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | <-Tatitlek-> | | | | | | | | Old H | Ouz. | <-Chiniak-> | | | <-Karluk-> | | | Akhiok | | Kasitsna | | Angoon | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | TAT1 | TAT1 | TAT5 | TAT5 | TAT5 | TAT5 | TAT5 | TAT5 | OHA3 | OUZ2 | CHI1 | CHI2 | KAR1 | KAR2 | KAR2 | KAR2 | AKH2 | AKH3 | KAS1 | KAS1 | AGN1 | AGN1 |
| | Site: | I | I | II | II | II | III | III | III | I | III | I | I | I | II | III | III | III | II | III | III | II | II |
| | Cycle: | 001 | 001 | 156 | 157 | 158 | 420 | 421 | 422 | 119 | 089 | 054 | 040 | 079 | 278 | 368 | 369 | 380 | 359 | 487 | 488 | 173 | 174 |
| | D & M no.: | 002 | 002 | | | | | | | | | | | | | | | | | | | | |
| | | >duplicate< | | | | | | | | | | | | | | | | | | | | | |
| | Lab no.: | 43 | 66 | 111 | 112 | 113 | 307 | 308 | 309 | 60 | 395 | 57 | 58 | 59 | 245 | 393 | 394 | 392 | 251 | 355 | 356 | 232 | 324 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | - | - | 0.2 | 0.2 | 0.2 | 0.2 | 0.4 | 0.1 | - | 0.2 | - | - | - | 0.2 | 0.1 | - | - | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | 0.5 | 0.6 | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | - | - | 2 | 2 | 2 | 0.6 | 0.7 | 0.8 | - | 0.7 | - | - | - | 0.2 | 0.2 | 0.3 | 0.3 | 0.2 | 0.8 | 0.4 | 0.3 | 0.7 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | - | - | 3 | 3 | 3 | 0.8 | 1 | 0.9 | - | 0.9 | - | - | - | 0.4 | 0.3 | 0.3 | 0.3 | 0.4 | 1 | 0.7 | 0.6 | 1 |
| fluoranthene | | - | - | 0.2 | 0.1 | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.1 |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | - | - | 0.2 | 0.1 | 0.3 | - | - | - | | | | | | | | | | | | | | |

Table C-3. Butter clams. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | Kodiak | Chenega Bay | | <- Old Harbor -> | | | | | | | | | | | Angoon |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | KOD3 | CHE1 | CHE1 | OHA3 | OHA3 | OHA3 | OHA3 | OHA3 | OHA4 | OHA4 | OHA4 | OHA4 | OHA4 | OHA4 | AGN2 |
| | Cycle: | II | I | I | I | II | II | III | III | II | I | II | III | III | III | II |
| | D & M no.: | 205 | 011 | 012 | 110 | 318 | 319 | 614 | 613 | 320 | 114 | 321 | 609 | 609 | 610 | 176 |
| | | | | | | | | | | | | | | >duplicate< | | |
| | Lab no.: | 212 | 664 | 665 | 669 | 225 | 226 | 431 | 432 | 227 | 670 | 247 | 418 | 419 | 433 | 231 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 1 | 0.7 | 0.4 | 0.6 | 0.2 | 0.2 | 0.3 | - | 0.2 | 0.1 | 0.4 | 0.2 | 0.4 | 0.4 | 0.2 |
| C2-naphthalenes | | 4 | 0.6 | - | - | - | - | - | - | - | - | - | 2 | 3 | 0.9 | - |
| C3-naphthalenes | | 24 | 2 | 0.07 | - | - | - | - | - | - | - | - | 26 | 33 | 16 | - |
| C4-naphthalenes | | 40 | 0.8 | 0.06 | - | - | - | - | - | - | - | - | 23 | 39 | 21 | - |
| acenaphthylene | | 0.06 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | 0.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | 2 | - | - | - | - | - | - | - | - | - | - | 0.8 | 1 | 0.3 | - |
| C1-fluorenes | | 8 | - | 0.1 | - | - | - | - | - | - | - | - | 9 | 11 | 3 | - |
| C2-fluorenes | | 28 | 0.1 | - | - | - | - | - | - | - | - | - | 9 | 19 | 14 | - |
| C3-fluorenes | | 8 | 0.8 | 0.5 | - | - | - | - | - | - | - | - | - | 1 | 3 | - |
| phenanthrene | | 16 | 3 | 2 | 1 | 0.9 | 0.5 | 1 | 0.3 | 2 | 3 | 2 | 16 | 19 | 13 | 0.3 |
| C1-phenanthrenes/anthracenes | | 32 | 7 | 3 | - | 0.3 | - | - | - | 2 | 1 | 1 | 37 | 46 | 36 | - |
| C2-phenanthrenes/anthracenes | | 45 | 10 | 4 | - | 0.1 | - | - | - | 0.8 | 0.3 | 0.4 | 32 | 44 | 40 | - |
| C3-phenanthrenes/anthracenes | | 22 | 2 | 0.1 | - | - | - | - | - | - | - | - | 5 | 13 | 15 | - |
| C4-phenanthrenes/anthracenes | | 42 | - | - | - | - | - | - | - | - | - | - | - | 0.05 | - | - |
| dibenzothiophene | | 5 | 1 | 0.2 | - | - | - | - | - | - | - | - | - | 3 | 4 | - |
| C1-dibenzothiophenes | | 66 | 2 | 0.8 | - | - | - | - | - | 0.3 | - | 0.2 | 23 | 30 | - | - |
| C2-dibenzothiophenes | | 41 | 7 | 3 | - | - | - | - | - | 0.3 | 0.1 | 0.1 | 33 | 47 | 25 | - |
| C3-dibenzothiophenes | | 28 | - | 1 | - | - | - | - | - | - | - | - | 10 | 22 | 22 | - |
| **Sum of LACs** | | 410 | 37 | 15 | 2 | 2 | 0.7 | 1 | 0.3 | 6 | 4 | 4 | 230 | 330 | 210 | 0.5 |
| fluoranthene | | 27 | 3 | 2 | 0.6 | 0.7 | 0.3 | 0.9 | - | 3 | 5 | 2 | 12 | 15 | 10 | - |
| pyrene | | 14 | 1 | 1 | - | 0.1 | - | 0.2 | - | 2 | 2 | 1 | 8 | 10 | 7 | - |
| C1-fluoranthenes/pyrenes | | 4 | - | - | - | - | - | - | - | - | - | - | 0.3 | 2 | 1 | - |
| benz[a]anthracene | | 0.8 | - | - | - | - | - | - | - | 0.1 | - | - | - | 0.4 | 0.5 | - |
| chrysene | | 3 | 0.6 | 0.3 | - | - | - | - | - | 0.2 | 0.1 | 0.1 | 0.5 | 1 | 1 | - |
| C1-chrysenes/benz[a]anthracenes | | 0.04 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | 0.7 | - | - | - | - | - | - | - | - | - | - | - | 0.2 | 0.5 | - |
| benzo[k]fluoranthene | | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | 0.2 | - |
| benzo[a]pyrene | | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | 50 | 5 | 3 | 0.6 | 0.8 | 0.3 | 1 | - | 5 | 7 | 3 | 21 | 29 | 20 | - |
| sample weight, grams: | | 5.11 | 5.07 | 5.02 | 5.03 | 5.07 | 5.04 | 5.26 | 5.31 | 5.20 | 5.05 | 5.52 | 5.00 | 5.65 | 5.38 | 5.09 |

Table C-4. Butter clams. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| | Village: | <- Larsen Bay -> | | | | | | | <- Ouzinkie -> | | | | <- Akhiok -> | | | | Karluk |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | LAB1 | LAB1 | LAB1 | LAB2 | LAB2 | LAB2 | LAB2 | OUZ2 | OUZ2 | OUZ3 | OUZ4 | AKH2 | AKH2 | AKH2 | AKH2 | KAR2 |
| | Cycle: | I | III | III | I | II | II | II | I | III | I | II | I | III | III | III | II |
| | D & M no.: | 096 | 586 | 587 | 097 | 315 | 316 | 314 | 059 | 088 | 062 | 253 | 093 | 377 | 378 | | 279 |
| **ACs** | Lab no.: | 673 | 416 | 435 | 682 | 249 | 250 | 260 | 63 | 434 | 672 | 207 | 62 | 417 | 430 | | 224 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | | a |
| C1-naphthalenes | | 0.3 | - | 0.3 | 0.9 | 0.3 | 0.2 | 0.7 | - | 0.2 | 0.2 | 0.4 | - | - | 0.1 | | 0.1 |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| phenanthrene | | 2 | 0.5 | 0.7 | 1 | 1 | 0.8 | 2 | - | 0.7 | 2 | 1 | - | 0.4 | 0.2 | | 0.2 |
| C1-phenanthrenes/anthracenes | | 0.3 | - | - | - | 2 | - | 0.6 | - | - | 1 | 0.7 | - | - | - | | - |
| C2-phenanthrenes/anthracenes | | 0.3 | - | - | - | 0.5 | - | 0.3 | - | - | 2 | 0.4 | - | - | - | | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | 0.3 | - | - | - | - | | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | 0.1 | 0.1 | - | - | - | | - |
| C2-dibenzothiophenes | | - | - | - | - | 0.1 | - | - | - | - | 1 | - | - | - | - | | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | 0.4 | - | - | - | - | | - |
| **Sum of LACs** | | **3** | **0.5** | **1** | **2** | **4** | **1** | **4** | **-** | **0.9** | **7** | **3** | **-** | **0.4** | **0.3** | | **0.3** |
| fluoranthene | | 1 | - | - | 0.1 | 0.7 | 0.2 | 0.7 | - | - | 1 | 0.5 | - | - | - | | - |
| pyrene | | 0.3 | - | - | - | 0.1 | - | 0.1 | - | - | 0.5 | - | - | - | - | | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | | - |
| **Sum of HACs** | | 1 | - | - | 0.1 | 0.8 | 0.2 | 0.8 | | | | | | | | | |

Table C-5. Butter clams. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| | Village: | <- Chiniak -> | | | | | | | <- Pt. Lions -> | | | | | | | Kasitsna |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | CHI1 | CHI1 | CHI1 | CHI2 | CHI2 | CHI2 | CHI2 | PTL1 | PTL1 | PTL1 | PTL1 | PTL1 | PTL2 | PTL2 | KAS1 |
| | Cycle: | I | III | III | I | II | III | III | I | II | II | III | III | I | II | III |
| | D & M no.: | 053 | 632 | 633 | 041 | 226 | 636 | 637 | 063 | 229 | 230 | 514 | 515 | 066 | 232 | 489 |
| ACs | Lab no.: | 667 | 413 | 428 | 668 | 223 | 415 | 429 | 64 | 205 | 206 | 414 | 436 | 65 | 211 | 361 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 0.5 | - | 0.1 | - | - | - | 0.6 | - | 0.3 | 0.3 | - | 0.3 | - | 0.3 | 0.4 |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | 0.6 | 0.2 | 0.5 | 0.3 | 0.5 | 0.3 | 0.3 | 0.9 | 0.7 | 1 | 1 | 1 | 2 | 2 | 1 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | 0.07 | - | - | - | 0.09 | 0.4 |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.4 |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **1** | **0.2** | **0.6** | **0.3** | **0.5** | **0.3** | **0.9** | **0.9** | **1** | **1** | **1** | **1** | **2** | **2** | **2** |
| fluoranthene | | 0.1 | - | 0.3 | - | - | - | - | 0.4 | 0.2 | 1 | 1 | 1 | 0.1 | 1 | 0.3 |
| pyrene | | - | - | - | - | - | - | - | - | - | 0.3 | - | - | - | 0.2 | 0.09 |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | **0.1** | **-** | **0.3** | **-** | **-** | **-** | **-** | **0.4** | **0.2** | **1** | **1** | **1** | **0.1** | **1** | **0.4** |
| sample weight, grams: | | 5.08 | 5.98 | 5.26 | 5.07 | 5.06 | 5.53 | 5.26 | 5.28 | 6.00 | 5.17 | 5.54 | 5.43 | 5.19 | 5.12 | 5.34 |

Table C-6. Littleneck clams. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | Windy Bay | Kodiak | | Old Harbor | | Ouzinkie | | <-Chiniak-> | | | Akhiok | | Port Lions | | PG/EB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | WNB2 | KOD3 | KOD3 | OHA3 | OHA4 | OUZ2 | OUZ2 | CHI1 | CHI1 | CHI2 | AKH3 | AKH3 | PTL1 | PTL1 | PTG1 |
| | Cycle: | I | III | III | III | III | I | II | II | III | III | II | II | II | III | II |
| | D & M no.: | 038 | 494 | 495 | 615 | 611 | 060 | 252 | 227 | 634 | 639 | 358 | 358 | 231 | 519 | 137 |
| | | | | | | | | | | | | >duplicate< | | | | |
| | Lab no.: | 666 | 437 | 447 | 615 | 616 | 671 | 214 | 246 | 613 | 614 | 301 | 310 | 213 | 617 | 340 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 0.7 | 0.9 | - | 0.5 | 0.2 | 0.3 | 0.2 | 0.2 | 0.1 | 0.3 | - | 0.2 | 0.2 | 0.2 | 0.6 |
| C2-naphthalenes | | 0.8 | 2 | - | - | 0.9 | - | - | - | - | - | - | - | - | - | 0.1 |
| C3-naphthalenes | | 7 | 14 | 4 | - | 17 | - | - | - | - | - | - | - | - | - | 0.2 |
| C4-naphthalenes | | 13 | 22 | 6 | - | 16 | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | 0.2 | 1 | - | - | 0.4 | - | - | - | - | - | - | - | - | - | 0.1 |
| C1-fluorenes | | 4 | 6 | 3 | - | 8 | - | - | - | - | - | - | - | - | - | 0.09 |
| C2-fluorenes | | 19 | 18 | 6 | - | 9 | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | 6 | 9 | 2 | 0.4 | 3 | - | - | - | 1 | 0.3 | - | - | - | - | - |
| phenanthrene | | 7 | 8 | 4 | 1 | 15 | 0.7 | 0.4 | 0.4 | 0.8 | 0.5 | 0.3 | 0.5 | 1 | 1 | 5 |
| C1-phenanthrenes/anthracenes | | 43 | 28 | 14 | - | 34 | - | - | - | - | - | - | - | 0.3 | - | 6 |
| C2-phenanthrenes/anthracenes | | 130 | 42 | 22 | - | 32 | - | - | - | - | - | - | - | 0.3 | - | 3 |
| C3-phenanthrenes/anthracenes | | 180 | 20 | 8 | - | 9 | - | - | - | - | - | - | - | - | - | 3 |
| C4-phenanthrenes/anthracenes | | 45 | 0.9 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | 5 | 4 | 2 | - | 8 | - | - | - | - | - | - | - | - | - | 0.4 |
| C1-dibenzothiophenes | | 27 | 17 | 9 | - | 21 | - | - | - | - | - | - | - | - | - | 1 |
| C2-dibenzothiophenes | | 120 | 44 | 24 | - | 18 | - | - | - | - | - | - | - | - | - | 0.08 |
| C3-dibenzothiophenes | | 220 | 31 | 15 | - | 10 | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **830** | **270** | **120** | **2** | **200** | **1** | **0.6** | **0.6** | **2** | **1** | **0.3** | **0.7** | **2** | **1** | **20** |
| fluoranthene | | 4 | 23 | 15 | 0.7 | 11 | - | - | 0.3 | 0.4 | 0.1 | - | - | 1 | 0.9 | 6 |
| pyrene | | 3 | 11 | 7 | - | 7 | - | - | - | - | - | - | - | 0.1 | 0.1 | 2 |
| C1-fluoranthenes/pyrenes | | 20 | 51 | 0.9 | - | 0.5 | - | - | - | - | - | - | - | - | - | 0.08 |
| benz[a]anthracene | | 0.3 | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - | 0.3 |
| chrysene | | 24 | 2 | 0.8 | - | 0.3 | - | - | - | - | - | - | - | - | - | 0.6 |
| C1-chrysenes/benz[a]anthracenes | | 32 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | 32 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | 11 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | 2 | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | **130** | **87** | **24** | **0.7** | **19** | **-** | **-** | **0.3** | **0.4** | **0.1** | | | | | |

Table C-7. Cockles and horse clams. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Mollusc: | Cockle | | | | Horse Clam | |
|---|---|---|---|---|---|---|---|
| | Village: | <- Chiniak -> | | | PG/EB | <- Angoon -> | |
| | Site: | CHI2 | CHI2 | CHI2 | PTG1 | AGN2 | AGN2 |
| | Cycle: | II | III | III | II | II | II |
| | D & M no.: | 224 | 638 | 638 | 136 | 175 | 175 |
| | | | | >duplicate< | | >duplicate< | |
| | Lab no.: | 60-303 | 60-612 | 60-618 | 60-302 | 325 | 328 |
| naphthalene | | a | a | a | a | a | a |
| C1-naphthalenes | | 0.2 | - | 0.1 | 0.2 | 0.2 | 0.4 |
| C2-naphthalenes | | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - |
| C3-fluorenes | | - | 0.3 | - | - | - | - |
| phenanthrene | | 0.6 | 0.4 | 0.4 | 3 | 0.3 | 0.4 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - |
| **Sum of LACs** | | **0.8** | **0.7** | **0.5** | **3** | **0.5** | **0.8** |
| fluoranthene | | 0.1 | - | - | 5 | - | - |
| pyrene | | - | - | - | 3 | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | 0.5 | - | - |
| chrysene | | - | - | - | 1 | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | 0.3 | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - |
| **Sum of HACs** | | **0.1** | **-** | **-** | **10** | **-** | **-** |
| sample weight, grams: | | 5.42 | 5.26 | 5.49 | 5.03 | 5.32 | 5.64 |

Table C-8. Chitons. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | Windy Bay | | Kodiak | | <- Old Harbor -> | | | Tatitlek | | <- Larsen Bay -> | | | Ouzinkie | | Akhiok | Karluk | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | WNB1 | WNB1 | KOD3 | KOD3 | OHA3 | OHA3 | OHA3 | TAT5 | TAT5 | LAB1 | LAB1 | LAB2 | OUZ2 | OUZ2 | AKH2 | KAR1 | KAR2 |
| | Cycle: | I | III | II | III | I | II | III | II | III | I | II | III | I | III | III | I | III |
| | D & M no.: | 35 | 492 | 204 | 493 | 109 | 317 | 612 | 159 | 423 | 78 | 313 | 589 | 61 | 199 | 379 | 80 | 370 |
| | Lab no.: | 76 | 360 | 208 | 396 | 79 | 345 | 401 | 120 | 357 | 81 | 346 | 411 | 80 | 410 | 399 | 78 | 400 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 0.4 | 0.6 | 3 | 1 | 0.5 | 0.3 | - | - | 0.8 | 0.2 | 0.2 | - | - | 0.2 | 0.4 | 0.1 | - |
| C2-naphthalenes | | 0.04 | 0.2 | 4 | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | 3 | 14 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | 0.02 | 43 | 27 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | 0.2 | 3 | 0.3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | 0.03 | 4 | 9 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | 2 | 98 | 45 | 7 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | 77 | 12 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | 2 | 5 | 14 | 13 | 0.9 | 0.6 | 0.5 | - | 0.4 | 0.4 | 0.7 | 0.4 | 0.1 | 0.3 | 0.7 | 0.1 | - |
| C1-phenanthrenes/anthracenes | | 1 | 38 | 30 | 34 | 0.02 | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | 2 | 380 | 21 | 14 | 1 | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | 3 | 1000 | 19 | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | 0.4 | 310 | 2 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | 0.3 | 3 | 3 | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | 0.1 | 25 | 6 | 1 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | 0.7 | 580 | 11 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | 0.9 | 1400 | 9 | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **13** | **4000** | **230** | **90** | **2** | **0.9** | **0.5** | **-** | **1** | **0.6** | **0.9** | **0.4** | **0.1** | **0.5** | **1** | **0.2** | **-** |
| fluoranthene | | 0.04 | 11 | 11 | 7 | 0.05 | - | - | - | - | 0.05 | 0.4 | - | - | - | - | - | - |
| pyrene | | - | 22 | 0.4 | 7 | 0.03 | - | - | - | - | 0.01 | 0.2 | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | 0.6 | 220 | 9 | 13 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | 5 | 0.8 | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | 1 | 220 | 4 | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | 0.6 | 370 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | 1 | 400 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | 0.02 | 230 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | 270 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | 41 | 0.8 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | 3 | 0.5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | 6 | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | 3 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | 19 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | **3** | **1800** | **27** | **30** | **0.1** | | | | | | | | | | | | |

Table C-9. Chitons. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | <- Chiniak -> | | | | | <- Port Lions -> | | | | | | Pt. Gra./Eng. Bay | | | Kasits. | Angoon | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Site: | CHI2 | CHI2 | CHI2 | CHI2 | CHI2 | PTL1 | PTL1 | PTL1 | PTL2 | PTL2 | PTL2 | PTG1 | PTG1 | PTG1 | KAS1 | AGN1 | AGN1 |
| | Cycle: | I | II | II | III | III | I | II | III | I | I | II | I | II | III | III | II | II |
| | D & M no.: | 43 | 225 | 223 | 635 | 640 | 64 | 228 | 518 | 68 | 68 | 233 | 22 | 124 | 475 | 486 | 163 | 172 |
| | | | | | | | | | | | >duplicate< | | | | | | | |
| | Lab no.: | 77 | 343 | 344 | 397 | 398 | 82 | 210 | 412 | 83 | 84 | 209 | 75 | 121 | 359 | 358 | 326 | 327 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 0.2 | 0.3 | 0.6 | - | - | 0.2 | 1 | 0.4 | 0.1 | 0.1 | 0.7 | 0.3 | - | 0.4 | 0.8 | 0.6 | 0.8 |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 0.07 | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | 1 | 0.7 | 0.6 | 0.5 | 0.1 | 0.4 | 0.7 | 0.7 | 0.2 | 0.3 | 0.6 | 0.4 | 0.2 | 0.3 | 0.7 | 0.7 | 0.6 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | 1 | 1 | 1 | 0.5 | 0.1 | 0.6 | 2 | 1 | 0.3 | 0.4 | 1 | 0.7 | 0.2 | 0.7 | 2 | 1 | 1 |
| fluoranthene | | 0.1 | 0.08 | 0.09 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pyrene | | 0.04 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | 0.1 | 0.1 | 0.1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| sample weight, grams: | | 5.01 | 5.30 | 5.37 | 5.41 | 5.31 | 5.03 | 5.03 | 5.18 | 5.10 | 5.42 | 5.33 | 5.19 | 5.12 | 5.09 | 5.50 | 5.28 | 5.32 |

Table C-10. Snails and limpets. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Mollusc: | <- Snails -> | | | | | | Limpets |
|---|---|---|---|---|---|---|---|---|
| | Village: | Windy Bay | Chiniak | <- Port Lions -> | | Port Graham | <- Larsen Bay -> | |
| | Site: | WNB1 | CHI2 | PTL1 | PTL2 | PTG4 | LAB4 | LAB1 |
| | Cycle: | I | I | I | I | I | I | I |
| | D & M no.: | 37 | 39 | 65 | 67 | 34 | 101 | 95 |
| | Lab no.: | 684 | 685 | 687 | 688 | 683 | 686 | 690 |
| naphthalene | | a | a | a | a | a | a | a |
| C1 naphthalenes | | 1 | 0.8 | 0.3 | 0.5 | 1 | 0.5 | 0.9 |
| C2-naphthalenes | | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - | - |
| C4-naphthalenes | | 3 | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - |
| C1-fluorenes | | 0.3 | - | - | - | - | - | - |
| C2-fluorenes | | 16 | - | - | - | - | - | - |
| C3-fluorenes | | 13 | - | - | - | - | - | - |
| phenanthrene | | 6 | 0.6 | 0.5 | 0.4 | 2 | 0.8 | 0.6 |
| C1-phenanthrenes/anthracenes | | 11 | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | 99 | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | 170 | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | 40 | - | - | - | - | - | - |
| dibenzothiophene | | 0.06 | - | - | - | - | - | - |
| C1-dibenzothiophenes | | 2 | - | - | - | - | - | - |
| C2-dibenzothiophenes | | 54 | - | - | - | - | - | - |
| C3-dibenzothiophenes | | 210 | - | - | - | - | - | - |
| **Sum of LACs** | | 620 | 1 | 0.8 | 0.9 | 3 | 1 | 2 |
| fluoranthene | | 1 | - | - | - | 0.6 | - | 0.1 |
| pyrene | | 2 | - | - | - | 0.2 | - | - |
| C1-fluoranthenes/pyrenes | | 13 | - | - | - | - | - | - |
| benz[a]anthracene | | 0.5 | - | - | - | - | - | - |
| chrysene | | 39 | - | - | - | 0.07 | - | - |
| C1-chrysenes/benz[a]anthracenes | | 54 | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | 38 | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | 10 | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | 0.9 | - | - | - | - | - | - |
| benzo[b]fluoranthene | | 2 | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | 0.1 | - | - | - | - | - | - |

Table C-11. Dungeness crab, Tanner crab and king crab. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| | Crab: | <- Dungeness -> | | | | | <- Tanner -> | | | | <- King -> | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Village: | <-Kodiak-> | | Larsen Bay | Chiniak | Port Lions | Old Harbor | Larsen Bay | <-Port Lions-> | | Larsen Bay | Port Lions |
| | Site: | KOD4 | KOD5 | LAB4 | CHI3 | PTL5 | OHA2 | LAB4 | PTL4 | PTL4 | LAB4 | PTL4 |
| | Cycle: | I | II | I | I | I | I | I | I | III | I | II |
| | D & M no.: | 52 | 212 | 103 | 55 | 73 | 115 | 99 | 71 | 581 | 102 | 235 |
| | | | | | | | 116 | 100 | 72 | | | |
| ACs | Lab no.: | 96 | 341 | 99 | 97 | 102 | 98 | 100 | 101 | 491 | 689 | 342 |
| naphthalene | | a | a | a | a | a | a | a | a | a | a | a |
| C1-naphthalenes | | 0.1 | 0.2 | - | - | - | 0.08 | 0.1 | - | - | 0.8 | 1 |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | 0.08 | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | 0.5 |
| fluorene | | - | - | - | - | - | - | - | - | - | - | 0.2 |
| C1-fluorenes | | - | - | - | - | - | - | | | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | 0.3 | - | - |
| phenanthrene | | 0.09 | 0.3 | 0.08 | 0.1 | 0.09 | 0.05 | 0.1 | 0.07 | 0.4 | 0.9 | 1 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **0.2** | **0.6** | **0.1** | **0.1** | **0.1** | **0.1** | **0.2** | **0.1** | **0.7** | **2** | **3** |
| fluoranthene | | - | - | - | - | - | - | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | - | - | - | - | - | - | - | - | - | - | - |
| sample weight, grams: | | 5.13 | 5.38 | 5.18 | 5.25 | 4.91 | 5.95 | 5.11 | 5.53 | 5.53 | 5.00 | 5.31 |

Table C-12. Urchins. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in edible flesh.

| ACs | Village: | Old Harbor | Larsen Bay |
|---|---|---|---|
| | Site: | OHA3 | LAB3 |
| | Cycle: | I | I |
| | D & M no.: | 113 | 98 |
| | Lab no.: | 691 | 692 |
| naphthalene | | a | a |
| C1-naphthalenes | | 2 | 0.7 |
| C2-naphthalenes | | 0.3 | - |
| C3-naphthalenes | | - | - |
| C4-naphthalenes | | - | - |
| acenaphthylene | | - | - |
| acenaphthene | | - | - |
| fluorene | | - | - |
| C1-fluorenes | | - | - |
| C2-fluorenes | | - | - |
| C3-fluorenes | | - | - |
| phenanthrene | | 2 | 1 |
| C1-phenanthrenes/anthracenes | | 0.9 | - |
| C2-phenanthrenes/anthracenes | | 0.2 | - |
| C3-phenanthrenes/anthracenes | | - | - |
| C4-phenanthrenes/anthracenes | | - | - |
| dibenzothiophene | | - | - |
| C1-dibenzothiophenes | | - | - |
| C2-dibenzothiophenes | | - | - |
| C3-dibenzothiophenes | | - | - |
| **Sum of LACs** | | 5 | 2 |
| fluoranthene | | 0.9 | 0.8 |
| pyrene | | 0.8 | 0.3 |
| C1-fluoranthenes/pyrenes | | - | - |
| benz[a]anthracene | | - | - |
| chrysene | | 0.1 | - |
| C1-chrysenes/benz[a]anthracenes | | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - |
| benzo[b]fluoranthene | | 0.3 | - |
| benzo[k]fluoranthene | | - | - |
| benzo[a]pyrene | | - | - |
| indeno[1,2,3-cd]pyrene | | - | - |
| dibenz[a,h]anthracene | | - | - |
| benzo[ghi]perylene | | - | - |

# APPENDIX D

# QUALITY ASSURANCE FOR INDIVIDUAL AROMATIC CONTAMINANTS IN FISH AND SHELLFISH

## Quality Assurance for Individual Aromatic Contaminants in Fish and Shellfish: Matrix Spikes, Spiked Blanks, and Method Blanks

For each set of 10 samples, a method blank and a matrix spike or a metho spiked blank were analyzed for selected aromatic contaminants (ACs) in Table 1.

### Matrix Spikes

Thirty-one matrix spikes were analyzed for this project. The results are summarized in Table D-1. Mean percent recoveries for the ACs ranged from 79 to 110% and the relative standard deviations (RSDs) ranged from 7 to 34%.

### Spiked Blanks

Spiked method blanks were analyzed with 6 sets of samples (Table D-2). Mean percent recoveries for the ACs ranged from 95 to 120% and the RSDs ranged from 2 to 19%.

### Method Blanks

Thirty-seven method blanks were analyzed (Tables D-3a,b). Naphthalene was present in each method blank at about 1 ppb (1 ng/g). The source of the naphthalene appeared to be the dichloromethane solvent, despite the dichloromethane being the highest grade available. Traces of methylnaphthalenes and phenanthrene were also found in some method blanks.

Explanatory Notes for Tables D-1 through D-3a,b.

Naphthalene-d8 was the internal standard for naphthalene through C4-naphthalenes. Acenaphthene-d10 was the internal standard for acenaphthylene through C1-fluoranthenes/pyrene. Benzo[a]pyrene-d12 was the internal standard for benz[a]anthracene through benzo[ghi]perylene. Percent recoveries for the internal standards (surrogates) averaged 87%, RSD = 15%, n = 216.

Results on sample extracts were determined by gas chromatography/mass spectrometry (GC/MS) using sequenced multiple ion detection.

A hyphen (-) indicates that the analyte was not detected above the limit of detection which ranged from 0.02 to 1 ng/g (ppb) wet weight. This applies to individual contaminants, as well as groupings of contaminants (e.g., C 2-phenanthrenes/anthracenes).

The matrix spike values are the percent recoveries of analytes added to a sample comparable to the type of tissue being analyzed. The matrix spike was then analyzed as a sample.

The spiked blank values are the percent recoveries of analytes added to a method blank and analyzed as a sample.

The relative standard deviation (RSD) is the standard deviation divided by the mean and expressed as a percent.

Table D-1. Matrix spikes. Percent recoveries of aromatic contaminants (ACs) in matrix spikes (n=31).

| ACs | mean % | RSD % | Amount spiked ng/g |
|---|---|---|---|
| naphthalene | 100 | 7 | 65 |
| acenaphthylene | 93 | 15 | 70 |
| acenaphthene | 93 | 10 | 63 |
| fluorene | 97 | 12 | 69 |
| phenanthrene | 106 | 13 | 68 |
| dibenzothiophene | 104 | 14 | 120 |
| benz[a]anthracene | 97 | 22 | 58 |
| chrysene | 101 | 18 | 68 |
| benzo[b]fluoranthene | 91 | 16 | 66 |
| benzo[k]fluoranthene | 86 | 12 | 65 |
| benzo[a]pyrene | 88 | 12 | 59 |
| indeno[1,2,3-cd]pyrene | 82 | 24 | 54 |
| dibenz[a,h]anthracene | 84 | 34 | 43 |
| benzo[ghi]perylene | 79 | 19 | 56 |

Table D-2. Spiked blanks. Percent recoveries of aromatic contaminants (ACs) in spiked blanks (n=6).

| ACs | mean % | RSD % | Amount spiked ng/g |
|---|---|---|---|
| naphthalene | 102 | 4 | 65 |
| acenaphthylene | 95 | 7 | 63 |
| acenaphthene | 98 | 2 | 69 |
| fluorene | 98 | 4 | 66 |
| phenanthrene | 103 | 6 | 68 |
| dibenzothiophene | 109 | 7 | 120 |
| benz[a]anthracene | 124 | 18 | 58 |
| chrysene | 113 | 9 | 68 |
| benzo[b]fluoranthene | 110 | 16 | 66 |
| benzo[k]fluoranthene | 111 | 12 | 65 |
| benzo[a]pyrene | 96 | 4 | 59 |
| indeno[1,2,3-cd]pyrene | 109 | 15 | 54 |
| dibenz[a,h]anthracene | 115 | 19 | 43 |
| benzo[ghi]perylene | 103 | 13 | 56 |

Table D-3a. Method blanks. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in method blanks.

| ACs | Lab no.: | 32 | 50 | 68 | 86 | 104 | 123 | 141 | 159 | 177 | 198 | 216 | 234 | 253 | 272 | 290 | 312 | 348 | 403 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| naphthalene | | 2 | - | - | 1 | 0.9 | 1 | 0.7 | 2 | 0.9 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 0.9 |
| C1-naphthalenes | | - | - | - | 0.04 | - | - | - | 0.2 | - | - | 0.1 | - | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | - |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | - | - | - | 0.02 | - | - | - | 0.1 | - | - | 0.08 | - | - | 0.2 | 0.08 | 0.1 | 0.09 | - |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **2** | **-** | **-** | **1** | **0.9** | **1** | **0.7** | **2** | **0.9** | **1** | **2** | **1** | **1** | **1** | **1** | **1** | **1** | **0.9** |
| fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Table D-3b. Method blanks. Concentrations, ng/g (ppb) wet weight, of aromatic contaminants (ACs) in method blanks.

| ACs | Lab no.: | 366 | 421 | 439 | 458 | 476 | 494 | 512 | 530 | 548 | 566 | 584 | 602 | 620 | 639 | 657 | 675 | 694 | 712 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| naphthalene | | 1 | 0.9 | 1 | 1 | 0.9 | 1 | 1 | 2 | 1 | 2 | 0.9 | 1 | 2 | 1 | 2 | 2 | 3 | 3 |
| C1-naphthalenes | | - | - | - | - | - | - | - | 0.1 | - | 0.3 | - | - | - | - | - | 1 | 0.3 | 0.3 |
| C2-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-naphthalenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-naphthalenes | | - | - | - | - | - | - | - | 0.2 | - | - | - | - | - | - | - | - | - | - |
| acenaphthylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| acenaphthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| fluorene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-fluorenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-fluorenes | | - | - | - | - | - | 0.2 | - | - | - | - | - | - | - | - | - | - | - | - |
| phenanthrene | | 0.1 | - | - | - | - | 0.2 | 0.1 | 0.5 | - | 0.3 | - | - | - | - | - | 0.5 | 0.1 | 0.2 |
| C1-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 1 | - | 1 |
| C2-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-phenanthrenes/anthracenes | | - | - | - | - | - | - | 0.2 | 0.2 | - | - | - | - | - | - | - | - | - | - |
| C4-phenanthrenes/anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenzothiophene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-dibenzothiophenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of LACs** | | **1** | **0.9** | **1** | **1** | **0.9** | **1** | **1** | **3** | **1** | **3** | **0.9** | **1** | **2** | **1** | **2** | **4** | **3** | **4** |
| fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-fluoranthenes/pyrenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benz[a]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| chrysene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C1-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C2-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C3-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| C4-chrysenes/benz[a]anthracenes | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[b]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[k]fluoranthene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[a]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| indeno[1,2,3-cd]pyrene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| dibenz[a,h]anthracene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| benzo[ghi]perylene | | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **Sum of HACs** | | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** | **-** |