

Chemical Burdens in Fish from Western and Alaskan National Parks
Compared to Human and Wildlife Health Consumption Thresholds

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Introduction

Contaminant concentrations in fish are relevant to human and wildlife health. Semi-volatile organic compounds (SOCs) including pesticides, industrial by-products such as polychlorinated biphenyls (PCBs), and combustion by-products like polycyclic aromatic hydrocarbons (PAHs), magnify within food chains and are known to cause potential health risks such as mortality, chronic disease, and cancer (Ackerman *et al.* 2008). Reproductive abnormalities can also result in individual organisms, bringing about possible ecosystem-level impacts (Schwindt *et al.* 2009).

SOCs selectively deposit from the atmosphere at higher rates in cold, high-elevation and high-latitude sites, posing an increased risk to the ecosystem. The Western Airborne Contaminants Assessment Project (WACAP) demonstrated the accumulation of contaminants in fish across high-elevation and high-latitude national parks in the western U.S. and Alaska, and assessed ecological risks these contaminants may pose. The concentration of some contaminants in some fish exceeded thresholds established for human and wildlife health (Ackerman *et al.* 2008, Landers *et al.* 2008, Landers *et al.* 2010, Schwindt *et al.* 2009).

One method by which SOCs impact an organism is through their role as endocrine disruptors. Several airborne contaminants, including pesticides (DDTs, chlordanes, endosulfans) and PCBs, can act as endocrine disruptors. Endocrine disruption can impair the reproductive system, among other bodily functions, and may result in intersex (the presence of both male and female reproductive structures in the same fish). WACAP identified intersex fish with frequencies of 9–33 percent in Rocky Mountain and Glacier national parks (Landers *et al.* 2008, Landers *et al.* 2010, Schwindt *et al.* 2009). The weight of evidence for reproductive disruption in these national park ecosystems was substantial, but because the sample size was small, WACAP neither established the extent of the problem nor the correlation between fish reproductive effects and contaminant concentrations.

National parks preserve natural resources and are often considered to be among the most pristine ecosystems in the U.S. It is important to assess contaminant concentrations in fish as the National Park Service is mandated to protect national parks and associated resources, in an unimpaired condition, for future generations. This report summarizes a screening assessment of chemical burdens in fish from five western U.S. and Alaskan national parks and compares those contaminant concentrations to human and wildlife health thresholds. Intersex findings for individual fish are also presented. This project was conducted in collaboration with Oregon State University (OSU) researchers Dr. Carl Schreck and Dr. Michael Kent, and additional results on fish histology (health and condition) from these and other western U.S. national parks may be reported in separate papers.

Study Design

The purpose of this study was to analyze the concentration of airborne contaminants from fifty-three fish (*Salmonid* spp., male and female) in five U.S. national parks throughout the western U.S. and Alaska: Great Sand Dunes (GRSD), Lassen Volcanic (LAVO), Rocky Mountain (ROMO), Wrangell-St. Elias (WRST), and Yosemite (YOSE). The research stems from WACAP findings and was conducted, in part, to gain an understanding of fish contaminant burdens across national parks in the western U.S. and Alaska, and to fill data gaps from parks that did not participate in WACAP. The presence or absence of intersex in each fish was determined by OSU (Drs. Schreck, Kent) with methods consistent to Schwindt *et al.* 2009.

Waterbodies within selected parks were remote, high elevation, and removed from anthropogenic influence (e.g., roads, latrines, developed areas) to isolate the contribution of contaminant loading by atmospheric deposition. *Salmonids* were targeted so to reduce variables associated with life history and trophic status of widely varying types of fish.

Measurement of SOC in Fish

The fifty-three fish were selected and analyzed for SOC based on their gender, evidence of reproductive abnormalities (intersex), and length (age). These fifty-three fish are listed in Table 1. Fish were selected for SOC analysis in consultation with the project PI Dr. Carl Schreck and co-PI Dr. Michael Kent of OSU, as well as Tamara Blett and Colleen Flanagan of NPS. Whole fish homogenate was prepared, extracted, and analyzed following the method described in Ackerman *et al.* 2008 for a wide-range of pesticides, PAHs, and PCBs. Pesticides included both current-use pesticides (CUPs) and historic-use pesticides (HUPs, legacy contaminants now banned in North America). These SOC are listed in Table 2 and are the same SOC measured in fish collected for the WACAP study (Landers *et al.* 2008; Landers *et al.* 2010). (Polybrominated diphenyl ethers, PBDEs, were not analyzed in this study, however.) Only samples with pesticide concentrations above the estimated detection limits (consistent with Ackerman *et al.* 2008) are shown in the figures.

Results

SOC Concentrations in Fish by Park

Figure 1 shows the fish SOC concentrations by park. The pesticides that were measured in >75% of the fish samples included p,p'-dichlorodiphenylethane (p,p'-DDE), hexachlorobenzene (HCB), chlorpyrifos, mirex, Σ chlordanes (*cis*-chlordanes, *trans*-chlordanes, *cis*-nonachlor, and *trans*-nonachlor), dacthal and endosulfan sulfate (Figure 1). The highest p,p'-DDE, HCB, chlorpyrifos, and mirex concentrations were measured at Mildred Lake in YOSE, Tanada Lake in WRST, Ypsilon Lake in ROMO, and Summit Lake in LAVO, respectively (Figure 1). Alpha-hexachlorocyclohexane (α -HCH) was measured in 70% of the fish samples, with significantly higher concentrations at both Tanada and Copper Lake in WRST (Figure 1). Gamma-hexachlorocyclohexane (γ -HCH) was measured in 5% of the fish

samples, with significantly higher concentrations in Copper Lake (WRST) and Spirit Lake in ROMO (Figure 1).

SOC Concentrations in Fish by Lake and Sex within Parks

Figures 2–6 show the fish SOC concentrations by lake and fish sex, within each park. Fish from all ROMO, LAVO, and YOSE lakes had p,p'-DDE in the highest concentrations (Figures 2, 4 and 5), while fish from the lakes in WRST and GRSD had p,p'-DDE and methoxychlor in the highest, and approximately equal, concentrations (Figures 3 and 6).

No significant difference existed between male and female fish SOC concentrations or male and intersex fish SOC concentrations on an individual park basis (Tukey-Kramer Honestly Significant Test). Because the number of intersex fish measured in each park was relatively small, we pooled the male and intersex data for all parks to determine if there was a statistical difference in the concentrations of endocrine disrupting SOC (endosulfan sulfate, cis-nonachlor, sum of DDTs, and the sum of PCBs) (Figure 7) (Schwindt *et al.* 2009). No statistical difference in the endosulfan sulfate, cis-nonachlor, sum of DDTs, and the sum of PCBs concentrations of male and intersex fish was observed.

Comparison to WACAP Fish SOC Concentrations

Figures 8a–l shows the fish pesticide concentrations measured in this study (ROMO, YOSE, LAVO, WRST and GRSD) along with the fish pesticide concentrations measured in WACAP (SEKI, ROMO, MORA, OLYM, GLAC, DENA, GAAR, and NOAT) (Ackerman *et al.* 2008, Landers *et al.* 2008; also see map, Appendix A and defined park abbreviations, Appendix B). Fish HCB concentrations were highest in Tanada Lake in WRST, followed by Oldman Lake in GLAC, and Copper Lake in WRST (Figure 8a). Fish p,p'-DDE concentrations were highest in Oldman Lake in GLAC, followed by Mildred Lake in YOSE,

and Pear and Emerald Lakes in SEKI (Figure 8k). Fish α -HCH, γ -HCH, dacthal, chlorpyrifos, dieldrin, endosulfans, mirex, heptachlor epoxide, chlordanes, and methoxychlor concentrations were lower or comparable to the corresponding WACAP fish concentrations (Figures 8b–j, l).

Comparison of Fish SOC Concentrations to Human Health Thresholds

Similar to Ackerman *et al.* 2008, contaminant health thresholds for humans were adopted from the U.S. Environmental Protection Agency (EPA) to evaluate non-cancer and cancer contaminant health thresholds for recreational or subsistence fish consumption. These data are shown in Figure 8 and in Tables 3 and 4. No fish SOC concentration in any park exceeded the threshold for recreational fish consumption (Table 3). However, all lakes in this study except for Dream Lake in ROMO, Lone Pine Lake in ROMO, and Ypsilon Lake in ROMO had dieldrin concentrations in fish that exceeded the guideline for subsistence fish consumption (Table 4). In addition, Mildred Lake in YOSE and Ypsilon Lake in ROMO had p,p'-DDE concentrations in fish that exceeded the guideline for subsistence fish consumption (Table 4). No other pesticides measured exceeded their corresponding subsistence fish consumption health threshold (Table 4). Concentrations of PCBs in fish were not compared to human health thresholds.

Comparison of Fish SOC Concentrations to Wildlife Health Thresholds

Similar to Ackerman *et al.* 2008, contaminant health thresholds for piscivorous wildlife (kingfisher, mink, and river otter) were derived from EPA nonlethal reproductive and developmental wildlife health end points as indicators of a negative effect. The data for chlordanes, dieldrin, and p,p'-DDE are shown in Figures 9a–c and in Table 5. No individual fish exceeded the dieldrin wildlife thresholds (Figure 9b). However, one individual fish

exceeded the chlordane threshold for kingfisher at Nanita Lake in ROMO (Figure 9a), and the lake-average fish exceeded the p,p'-DDE threshold for kingfisher at Mildred Lake in YOSE (Figure 9c). Established wildlife contaminant health thresholds for the remaining historic-use pesticides and for the current-use pesticides have not been developed. Concentrations of PCBs in fish were not compared to wildlife health thresholds.

Park Summaries

Information below provides park-by-park overviews of the current data, particularly in reference to Figure 8, concentrations of SOCs (pesticides) in fish compared to human health consumption thresholds. These bulleted summaries are categorized by current-use pesticides and historic-use pesticides. Intersex findings as presented in Table 1 are also summarized below. The map (Appendix A) illustrates the relative location of the national parks studied, and other parks discussed below.

Great Sand Dunes (GRSD)

Thirty-two fish were sampled from Sand Creek in Great Sand Dunes National Park & Preserve (Colorado); eight of those fish were analyzed for chemistry. Contaminant concentrations in Great Sand Dunes fish are relatively consistent with results in fish from other parks in the Rockies, including Glacier and Rocky Mountain. Fish from the park had p,p'-DDE and methoxychlor in the highest, and approximately equal, concentrations.

- Historic-use Pesticides (HUPs):
 - Mid to high- concentrations of HUPs in GRSD fish were detected upon comparison to the other lakes/parks throughout the west and AK. Those HUPs particularly include: HCB, chlordanes, dieldrin, mirex, and DDE. The concentrations of HUPs in fish from parks in the Rockies exceed concentrations in

fish from parks more removed from agricultural areas (AK parks and parks in the Pacific NW).

- The concentration of dieldrin in three of eight fish sampled at GRSD exceeded the human health threshold for subsistence fish consumption (19 meals of 8 oz. fish per month), but not the recreational fish consumption threshold (2.3 meals of 8 oz. fish per month).
- The concentrations of chlordanes, dieldrin, and DDE in fish at GRSD did not exceed wildlife health thresholds established for kingfisher, mink, and river otter.
- Current-use Pesticides (CUPs):
 - The concentrations of CUPs chlorpyrifos, dacthal, endosulfans, and methoxychlor in GRSD fish appeared mid to high-range when compared to all other lakes/parks throughout the west and AK.
 - Methoxychlor concentrations in fish at GRSD ranked among the highest as compared to all other lakes/parks throughout the west and AK.
 - CUP concentrations in GRSD fish did not exceed human health thresholds for recreational or subsistence fish consumption. Wildlife health thresholds are unknown.
- Intersex Fish:
 - Of the eight fish subsample at Great Sand Dunes, no intersex fish were detected.

Lassen Volcanic (LAVO)

Thirty-eight fish were sampled from Summit Lake in Lassen Volcanic National Park (California); eight of those fish were analyzed for chemistry. Contaminant concentrations in Lassen Volcanic fish are relatively consistent with results in fish from other Sierra Nevada-

Southern Cascades parks, including Sequoia-Kings Canyon and Yosemite. Fish from the park had p,p'-DDE in the highest concentrations.

- Historic-use Pesticides (HUPs):
 - Mid to high- concentrations of HUPs in LAVO fish were detected upon comparison to the other lakes/parks throughout the west and AK. Those HUPs particularly include: HCB, α -HCH, chlordanes, dieldrin, mirex, and p,p'-DDE. The concentrations of HUPs in fish in Sierra Nevada-Southern Cascade parks exceed concentrations in parks more removed from agricultural areas (AK parks and parks in the Pacific NW).
 - Mirex concentrations in fish at LAVO ranked highest as compared to all other lakes/parks throughout the west and AK.
 - The concentration of dieldrin in one fish of eight sampled at LAVO exceeded the human health threshold for subsistence fish consumption (19 meals of 8 oz. fish per month), but not the recreational fish consumption threshold (2.3 meals of 8 oz. fish per month).
 - The concentrations of chlordanes, dieldrin, and DDE in fish at LAVO did not exceed wildlife health thresholds established for kingfisher, mink, and river otter.
- Current-use Pesticides (CUPs):
 - The concentrations of CUPs chlorpyrifos, dacthal, endosulfans, and methoxychlor in LAVO fish appeared mid to high-range when compared to all other lakes/parks throughout the west and AK.
 - CUP concentrations in LAVO fish did not exceed human health thresholds for recreational or subsistence fish consumption. Wildlife health thresholds are unknown.

- Intersex Fish:
 - Of the eight fish subsample at Lassen Volcanic, no intersex fish were detected.

Rocky Mountain (ROMO)

Of the approximately 78 fish sampled from seven lakes in Rocky Mountain National Park (Colorado) between 2005–2006 and 2008–2009, 15 of those fish were analyzed for chemistry. Contaminant concentrations in fish samples from Rocky Mountain analyzed according to the current study (i.e., Haynach Lake, Lake Haiyaha, Lone Pine Lake, Nanita Lake, Spirit Lake, and Ypsilon Lake) are relatively consistent with results in fish from other parks/lakes in the Rockies, including Great Sand Dunes, Glacier, and the ROMO lakes sampled as part of WACAP (Mills Lake, Lone Pine Lake). Fish from the park had p,p'-DDE in the highest concentrations.

- Historic-use Pesticides (HUPs):
 - Mid to high- concentrations of HUPs in ROMO fish were detected upon comparison to the other lakes/parks throughout the west and AK. Those HUPs particularly include: HCB, chlordanes, dieldrin, mirex, and p,p'-DDE. The concentrations of HUPs in fish from parks in the Rockies exceed concentrations in fish from parks more removed from agricultural areas (AK parks and parks in the Pacific NW).
 - The concentration of dieldrin in nine fish of 15 sampled at ROMO exceeded the human health threshold for subsistence fish consumption (19 meals of 8 oz. fish per month) (-Haynach, -Hiayaha, -Nanita, -Spirit). The concentration of p,p'-DDE in one fish of 15 sampled at ROMO also exceeded the human health threshold for subsistence fish consumption (-Ypsilon). Dieldrin and p,p'-DDE

concentrations in fish did not exceed recreational fish consumption thresholds (2.3 meals of 8 oz. fish per month).

- The concentration of chlordane in one individual fish exceeded the kingfisher health threshold at Nanita Lake in ROMO. The concentrations of dieldrin and p,p'-DDE in fish at ROMO did not exceed wildlife health thresholds established for kingfisher, mink, and river otter.
- Current-use Pesticides (CUPs):
 - The concentrations of CUPs, specifically dacthal and endosulfans, in ROMO fish appeared mid to high-range when compared to all other lakes/parks throughout the west and AK.
 - The lake average endosulfan concentration in fish at ROMO -Haynach ranked highest in comparison to all other lakes/parks throughout the west and AK. The concentration of chlorpyrifos in an individual fish at ROMO -Ypsilon ranked among the highest detected.
 - The concentration of γ -HCH in an individual fish at Spirit Lake in ROMO was significantly higher than the concentrations of γ -HCH in fish from remaining parks (with the exception of Copper Lake in WRST).
 - CUP concentrations in ROMO fish did not exceed human health thresholds for recreational or subsistence fish consumption. Wildlife health thresholds are unknown.
- Intersex Fish:
 - Of the 15 fish subsample at Rocky Mountain, seven fish exhibited intersex. Four of those 15 fish were collected in 2008–2009 for this current study. Two male fish of those four samples at Rocky Mountain (-Nanita, -Ypsilon) exhibited intersex. The other 11 of those 15 fish were collected in 2005–2006 as part of the WACAP

study, interpreted and reported in Schwindt *et al.* 2009, Landers *et al.* 2010, and Landers *et al.* 2008. Five male fish of those 11 samples at Rocky Mountain (-Dream, -Haynach, -Haiyaha, -Lone Pine, -Spirit) exhibited intersex.

Wrangell-St. Elias (WRST)

A total of 49 fish were sampled from two lakes (Copper Lake, Tanada Lake) at Wrangell-St. Elias National Park & Preserve (Alaska); 12 of those fish were analyzed for chemistry. In general, contaminant concentrations in Wrangell-St. Elias fish were comparable to the Alaska parks sampled as part of WACAP (Noatak, Gates of the Arctic, Denali). Fish from the park had p,p'-DDE and methoxychlor in the highest, and approximately equal, concentrations.

- Historic-use Pesticides (HUPs):
 - Lake average concentrations of HUPs in WRST fish were higher than in fish from other AK parks. Those HUPs particularly include: p,p'-DDE, chlordanes, HCB, dieldrin, α -HCH, and heptachlor epoxide. The concentrations of HUPs in fish in AK parks were exceeded by those parks closest in proximity to agricultural areas, and followed by parks in the Pacific NW.
 - The lake-average concentration of α -HCH and HCB in WRST -Tanada fish was higher than all other lakes/parks throughout the west and AK. Concentrations in WRST -Copper fish were also elevated in comparison.
 - The lake-average dieldrin concentration in WRST -Tanada and -Copper fish exceeded the human health threshold for subsistence fish consumption (19 meals of 8 oz. fish per month), but not the recreational fish consumption threshold (2.3 meals of 8 oz. fish per month).

- The concentrations of chlordanes, dieldrin, and p,p'-DDE in fish at WRST did not exceed wildlife health thresholds established for kingfisher, mink, and river otter.
- Current-use Pesticides (CUPs):
 - The lake-average concentration of methoxychlor in WRST -Copper fish was higher than all other lakes/parks throughout the west and AK. The concentration in WRST -Tanada fish was also elevated in comparison.
 - The concentration of γ -HCH in an individual fish at Copper Lake in WRST was significantly higher than the concentrations of γ -HCH in fish from remaining parks (with the exception of Spirit Lake in ROMO).
 - The concentrations of CUPs like endosulfan, dacthal, and chlorpyrifos in WRST fish appeared around low to mid-range when compared to all other lakes/parks throughout the west and AK.
 - CUP concentrations in WRST fish did not exceed human health thresholds for recreational or subsistence fish consumption. Wildlife health thresholds are unknown.
- Intersex Fish:
 - Of the 10 fish subsample at Wrangell-St. Elias, no intersex fish were detected.

Yosemite (YOSE)

Thirty-eight fish were sampled from Mildred Lake in Yosemite National Park (California); 10 of those fish were analyzed for chemistry. Contaminant concentrations in Yosemite fish are relatively consistent with results in fish from other Sierra Nevada-Southern Cascades parks, including Lassen Volcanic and Sequoia-Kings Canyon. Fish from the park had p,p'-DDE in the highest concentrations.

- Historic-use Pesticides (HUPs):

- Mid to high- concentrations of HUPs in YOSE fish were detected upon comparison to the other lakes/parks throughout the west and AK. Those HUPs particularly include: HCB, α -HCH, chlordanes, dieldrin, and p,p'-DDE. The concentrations of HUPs in fish in Sierra Nevada-Southern Cascade parks exceed concentrations in parks more removed from agricultural areas (AK parks and parks in the Pacific NW).
- Chlordanes and p,p'-DDE concentrations in fish at YOSE ranked among the highest as compared to all other lakes/parks throughout the west and AK.
- The lake-average dieldrin and p,p'-DDE concentrations in YOSE fish exceeded the human health threshold for subsistence fish consumption (19 meals of 8 oz. fish per month). Dieldrin and p,p'-DDE concentrations in fish did not exceed recreational fish consumption thresholds (2.3 meals of 8 oz. fish per month).
- The lake-average concentration of p,p'-DDE in fish at Mildred Lake in YOSE exceeded the kingfisher health threshold. The concentrations of chlordanes and dieldrin in fish at YOSE did not exceed wildlife health thresholds established for kingfisher, mink, and river otter.
- Current-use Pesticides (CUPs):
 - The concentrations of CUPs chlorpyrifos, dacthal, endosulfans, and methoxychlor in YOSE fish appeared mid to high-range when compared to all other lakes/parks throughout the west and AK.
 - CUP concentrations in YOSE fish did not exceed human health thresholds for recreational or subsistence fish consumption. Wildlife health thresholds are unknown.
- Intersex Fish:
 - Of the 10 fish subsample at Yosemite, one male intersex fish was detected.

Figures

Figure 1. Mean SOC concentrations in fish (ng/g lipid) by park and lake. Bars represent standard error.

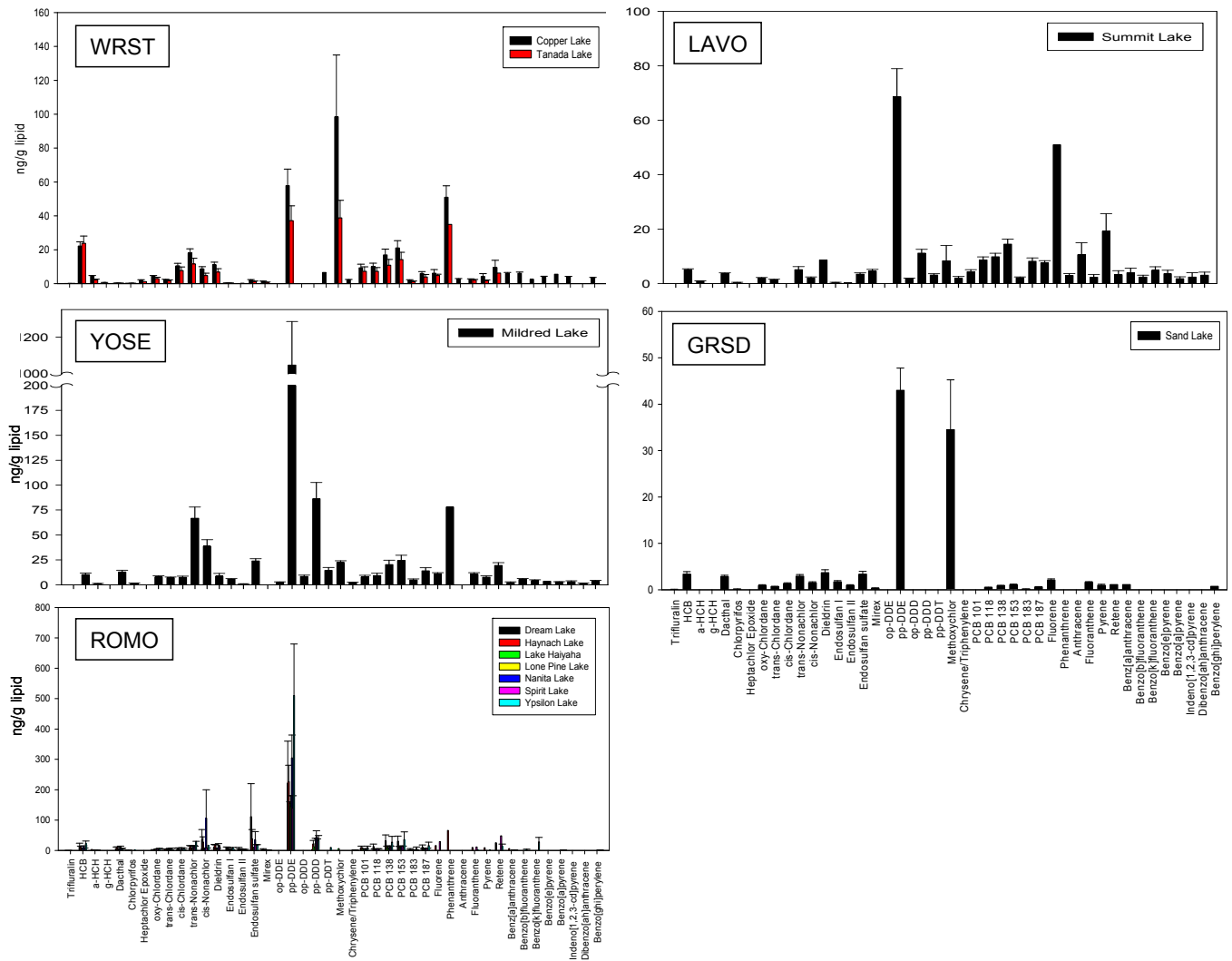


Figure 2. SOC concentrations (ng/g lipid) in female, male, and intersex fish from ROMO.

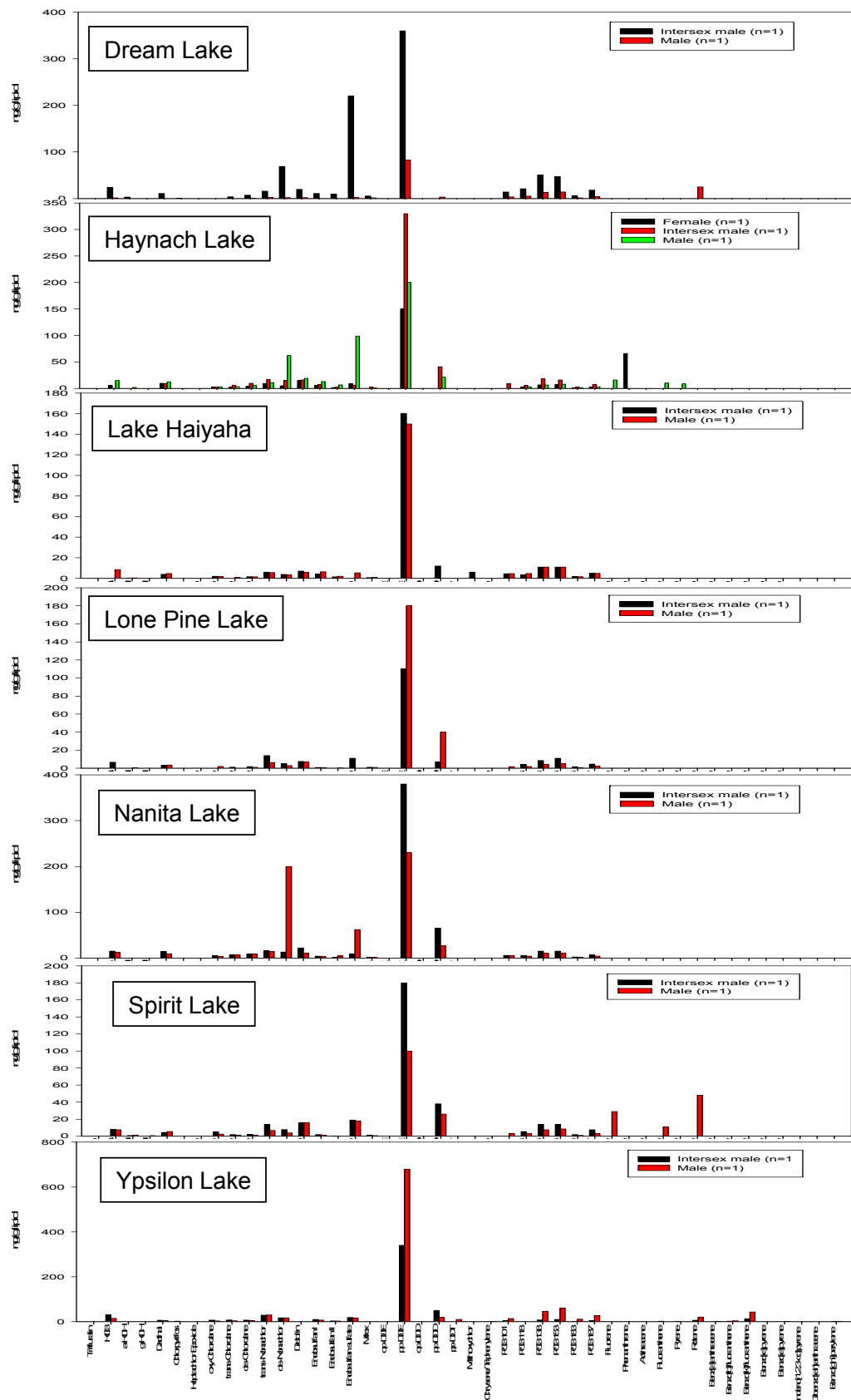


Figure 3. Mean ($\pm$ se) SOC concentrations (ng/g lipid) in female, male, and intersex fish from WRST.

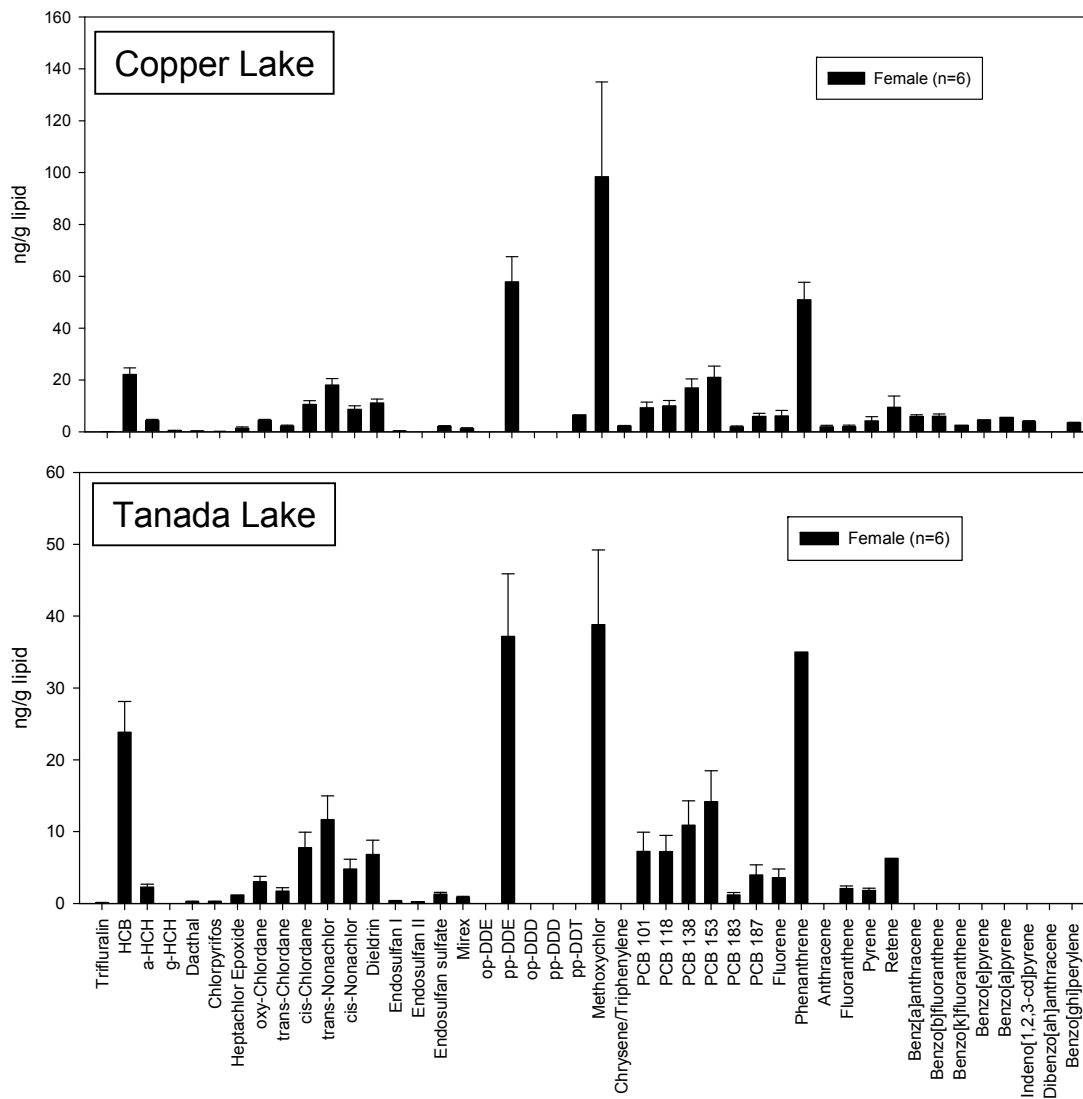


Figure 4. Mean ($\pm$ se) SOC concentrations (ng/g lipid) in female and male fish from LAVO.

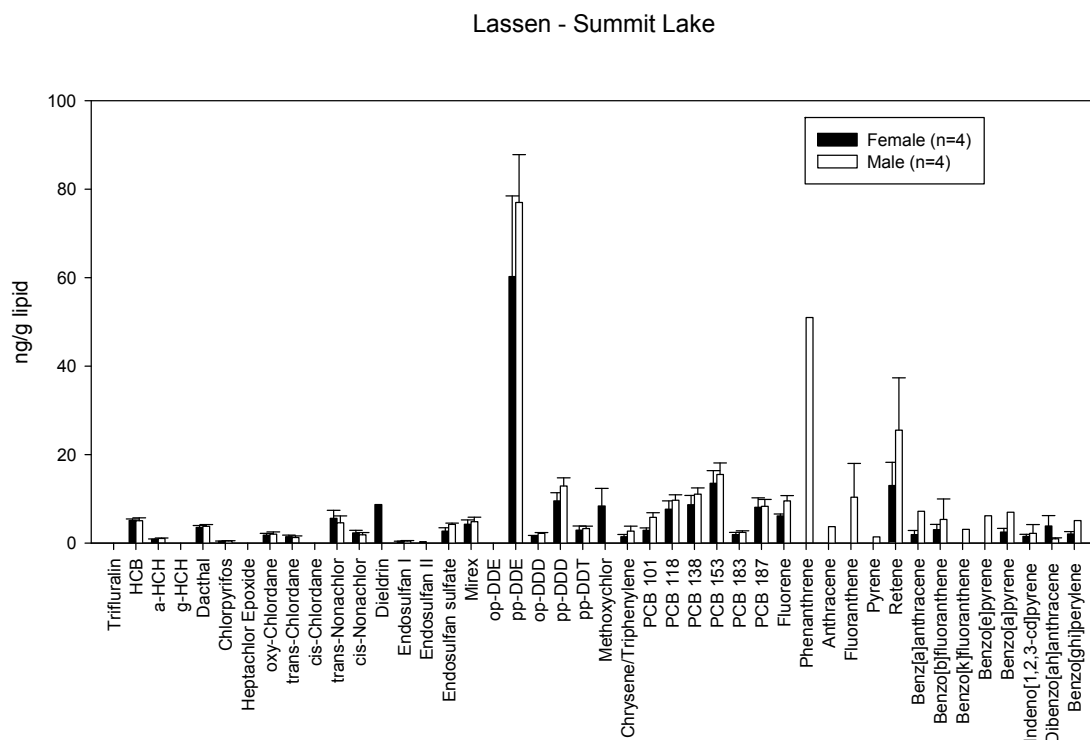


Figure 5. Mean ($\pm$ se) SOC concentrations in female, male, and intersex fish from YOSE.

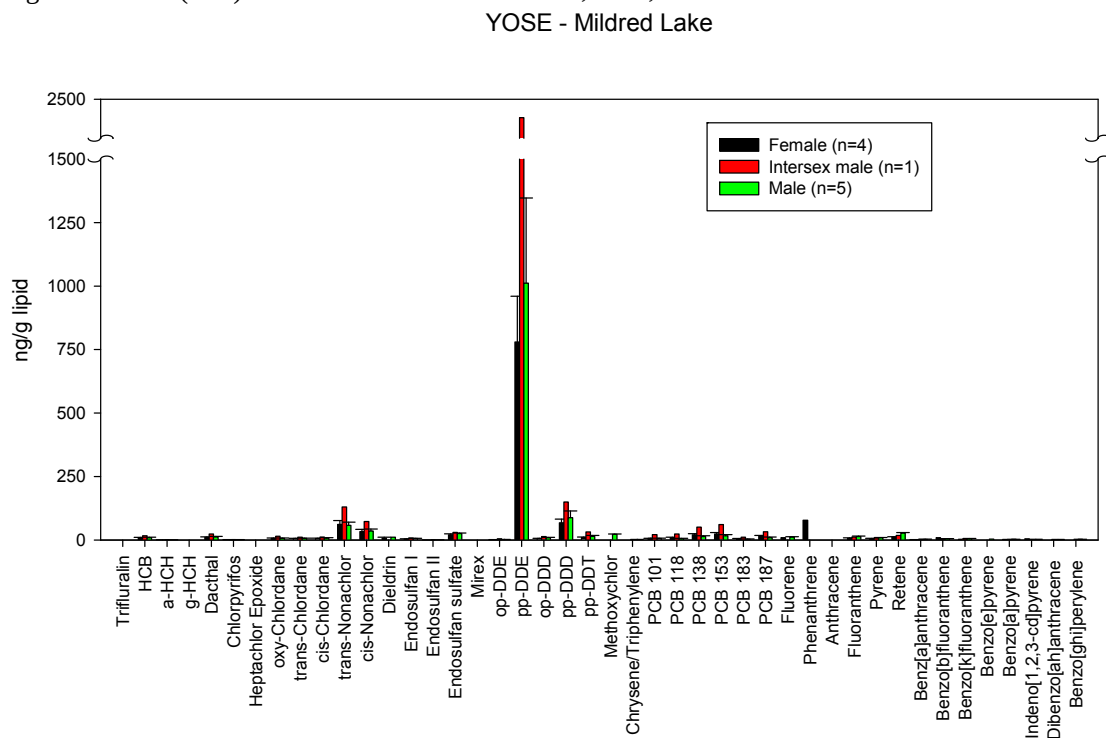


Figure 6. Mean ($\pm$ se) SOC concentrations female fish from GRSD.
Great Sand Dunes - Sand Lake

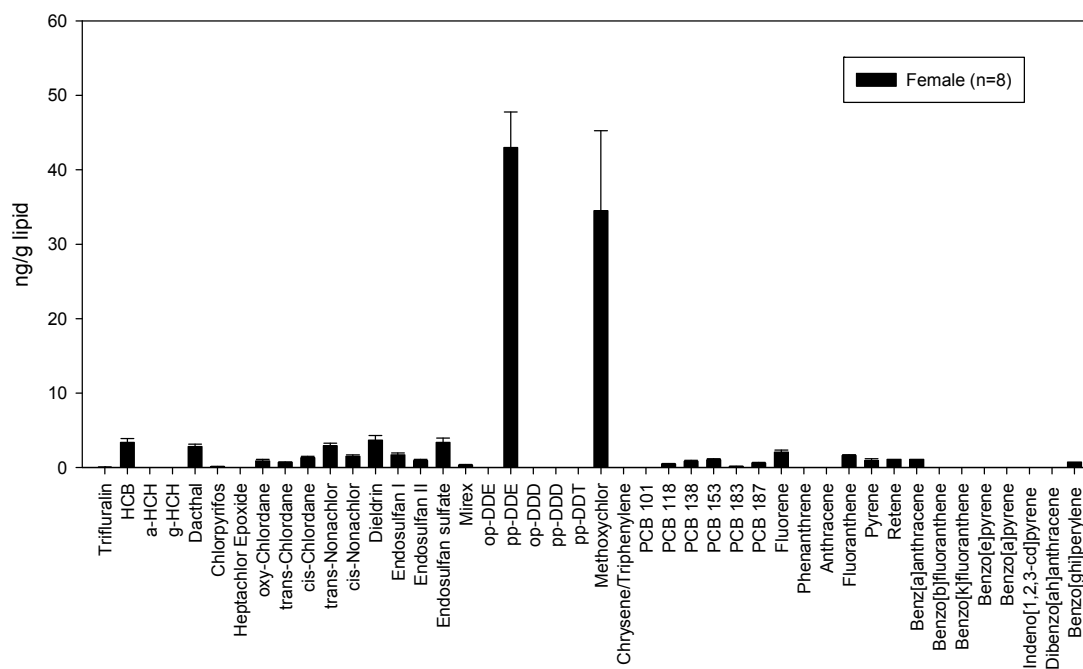
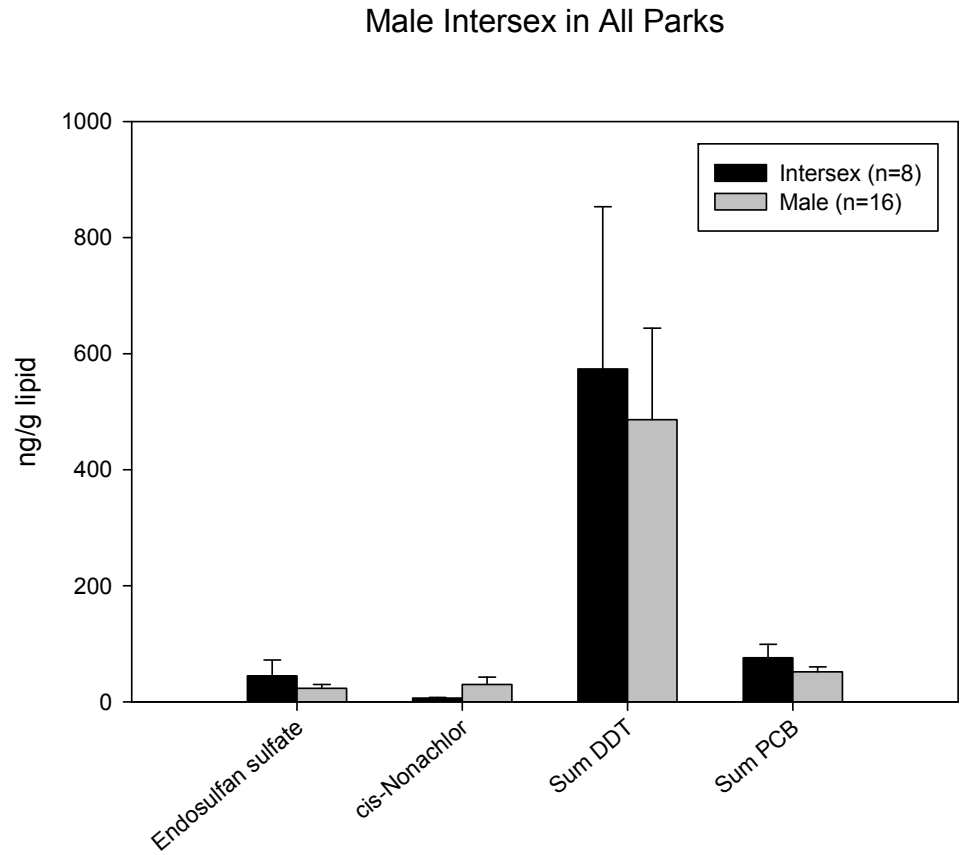
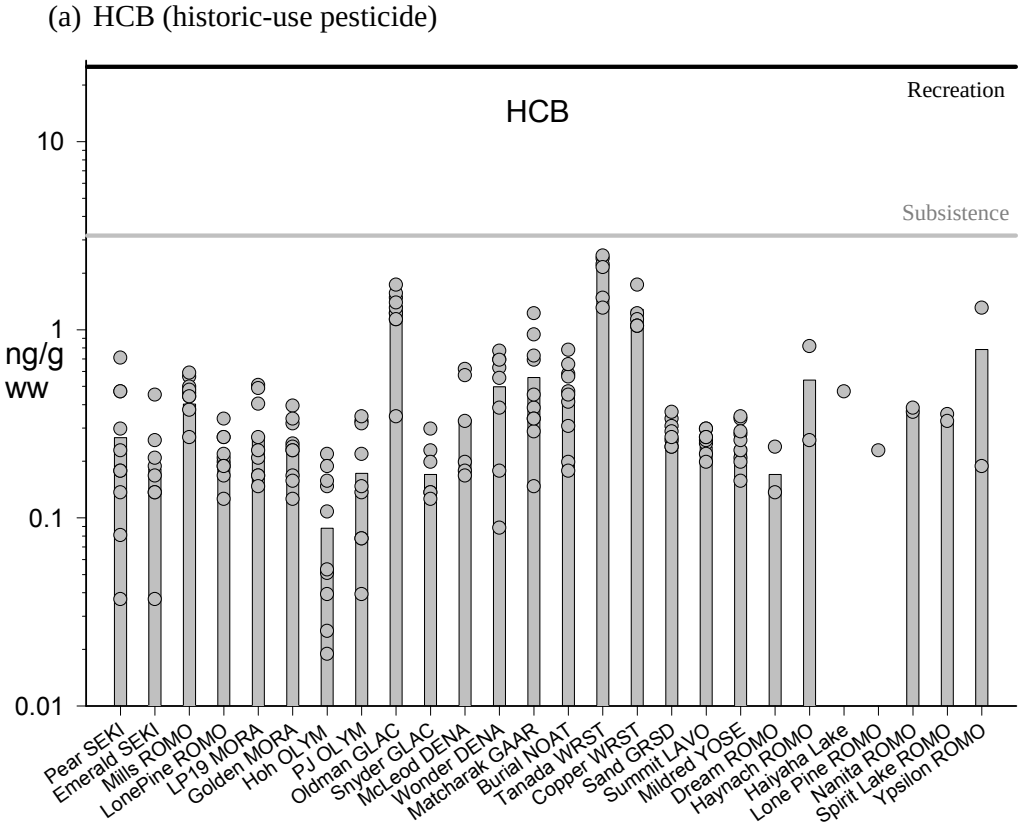


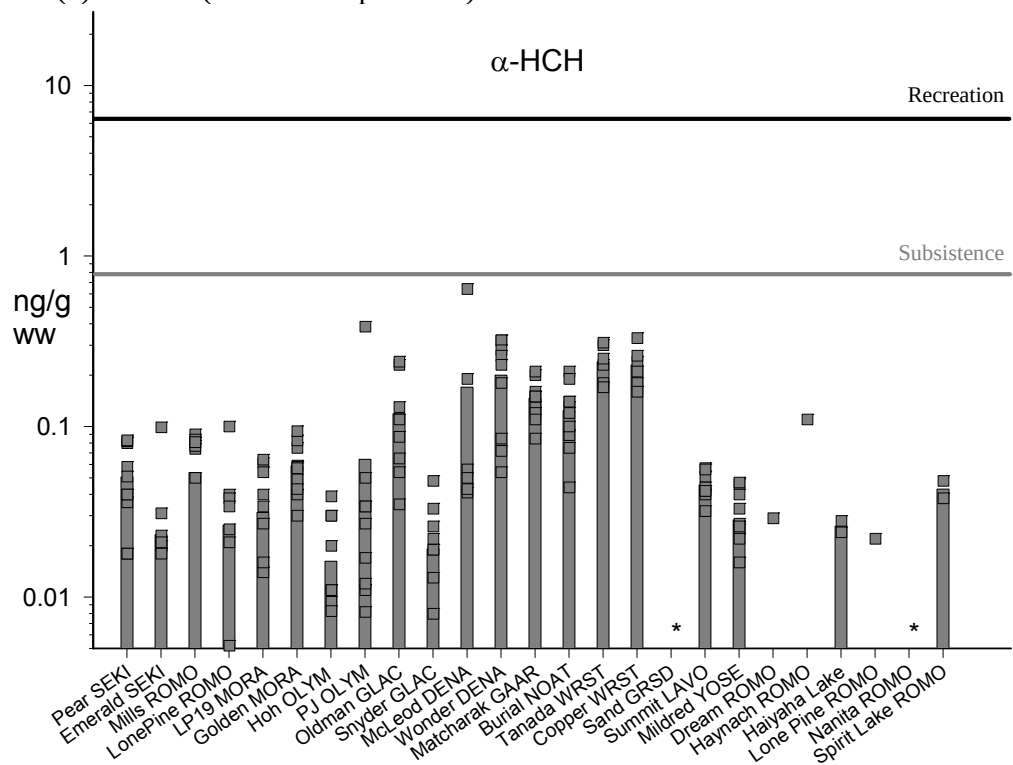
Figure 7. Mean ($\pm$ se) concentrations (ng/g lipid) of potential endocrine disrupting SOC's in male and intersex fish from all parks.



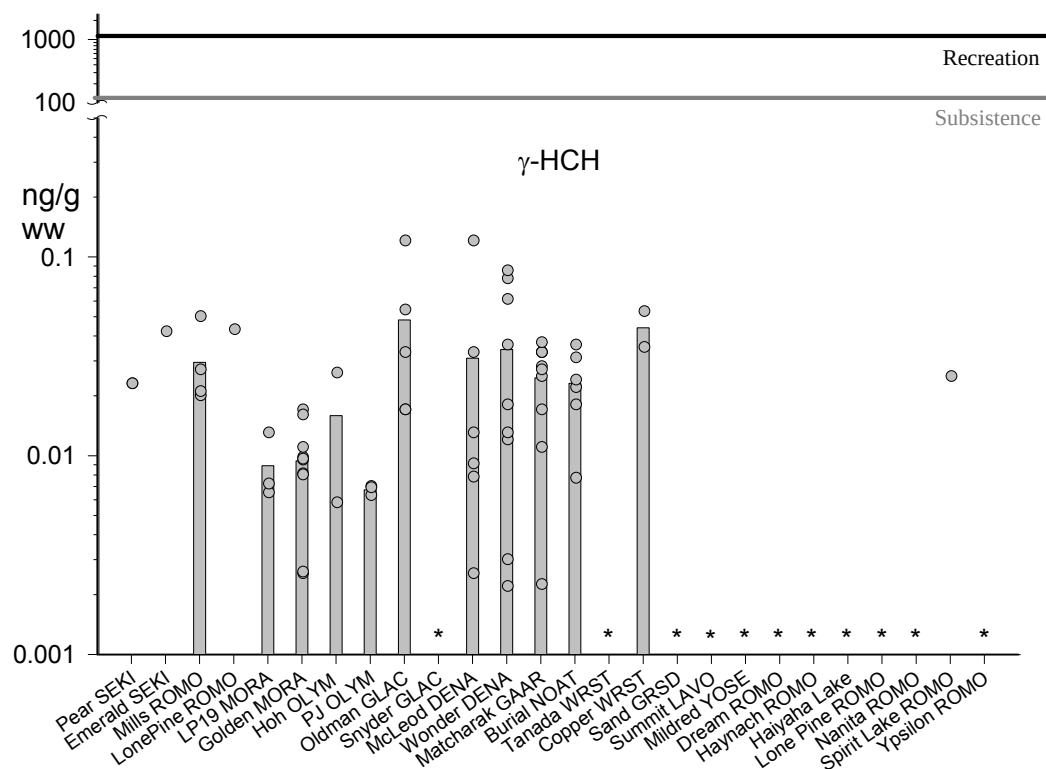
Figures 8a–l. Concentrations of SOC in fish compared to human health consumption thresholds. Top of bar indicates the mean concentration and the circles represent the concentrations of individual fish. Results include findings from both WACAP (Pear SEKI to Burial NOAT) and the current study (Tanada WRST to Ypsilon ROMO). Map in Appendix A identifies site location and list in Appendix B defines park abbreviations.



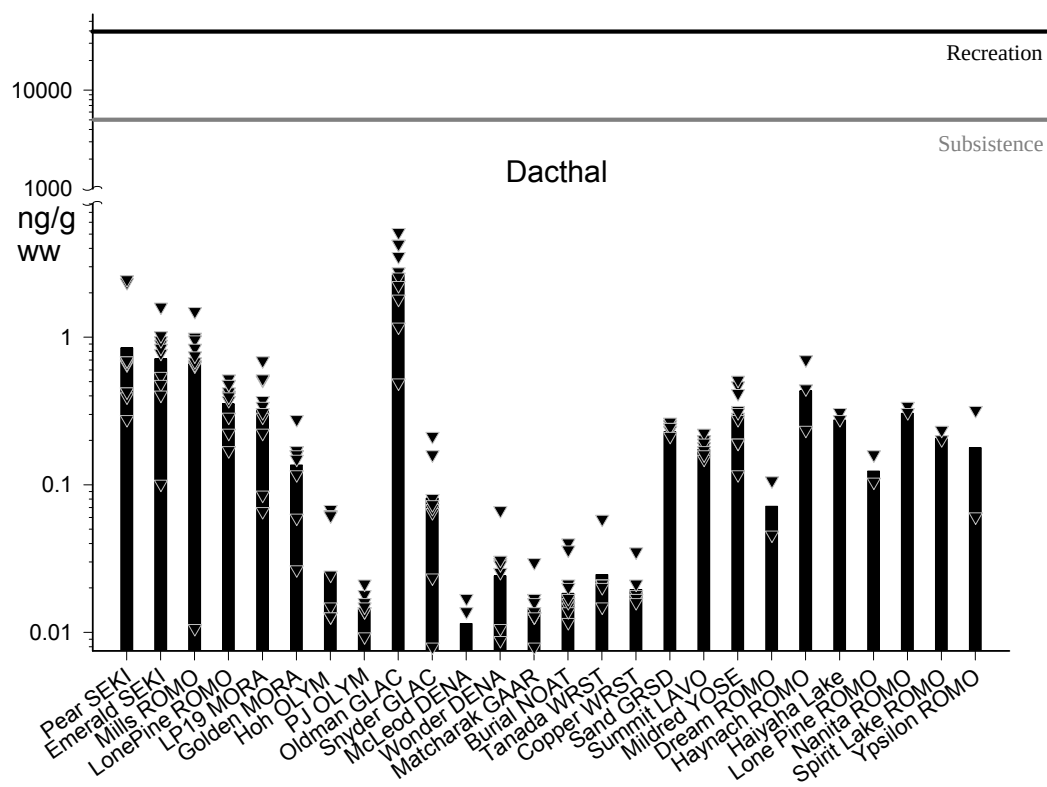
(b) α -HCH (historic-use pesticide)



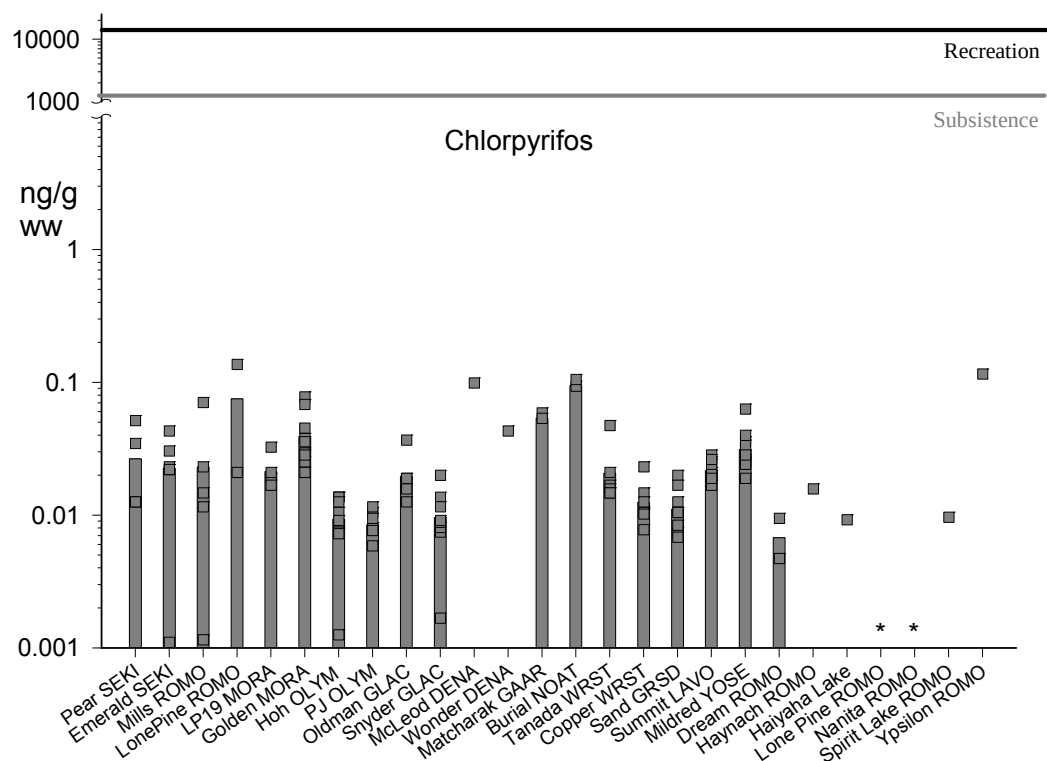
(c) γ -HCH (i.e., lindane; current-use pesticide)



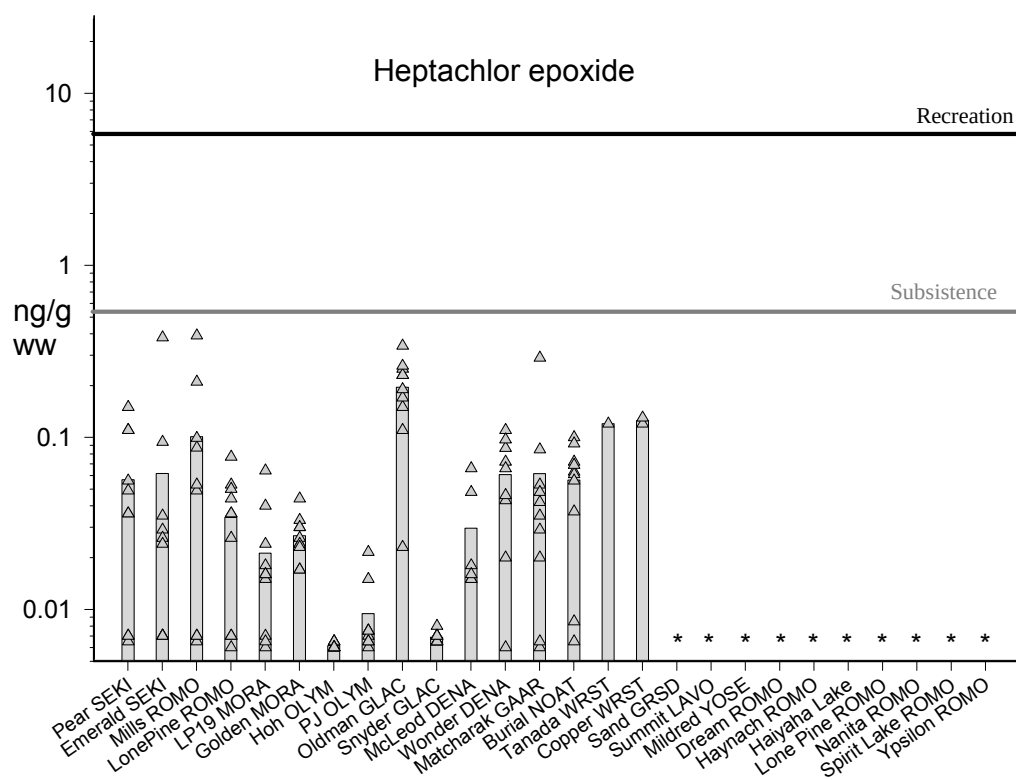
(d) Dacthal (current-use pesticide)



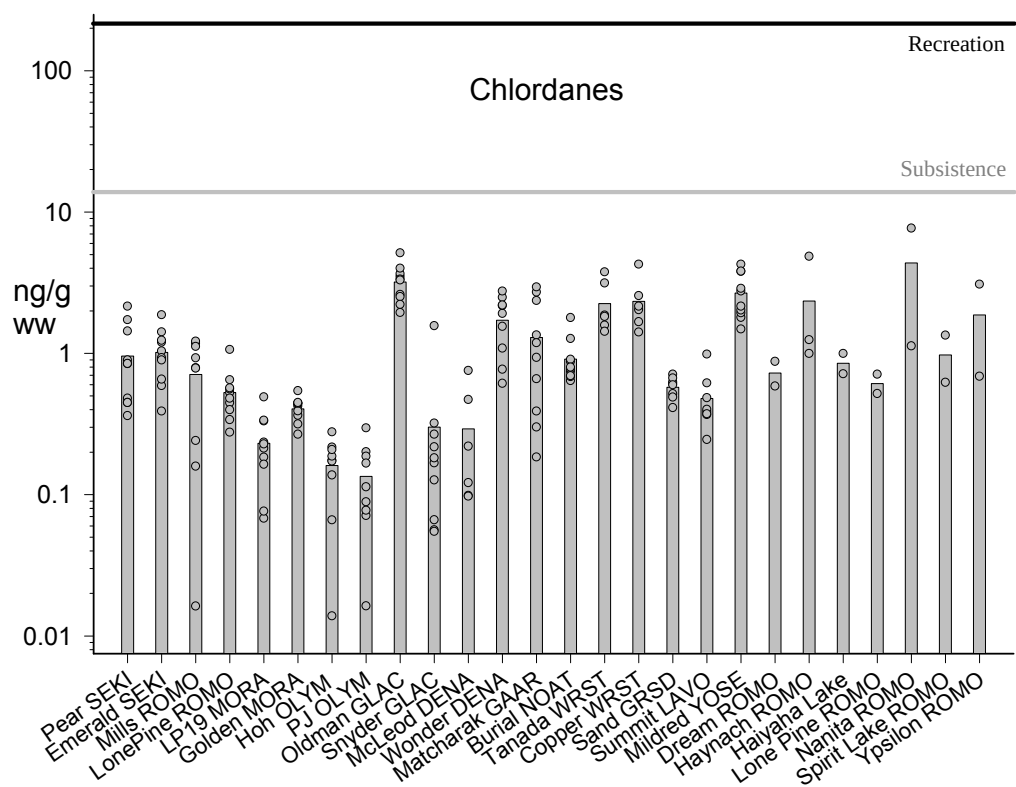
(e) Chlorpyrifos (current-use pesticide)



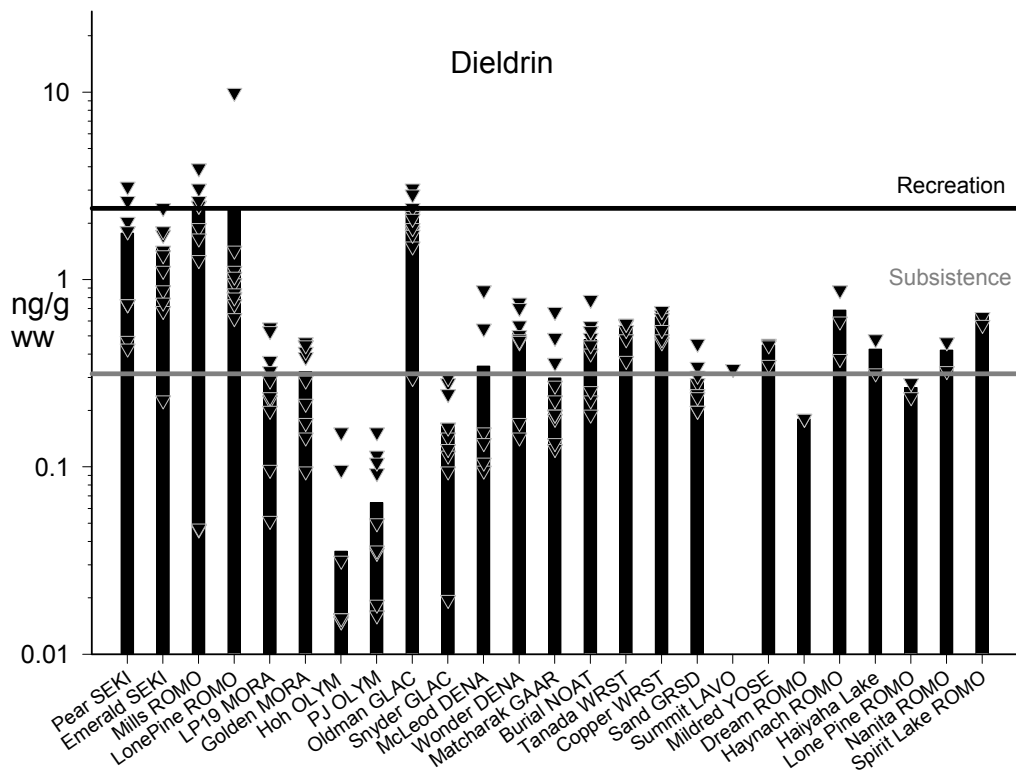
(f) Heptachlor epoxide (historic-use pesticide)



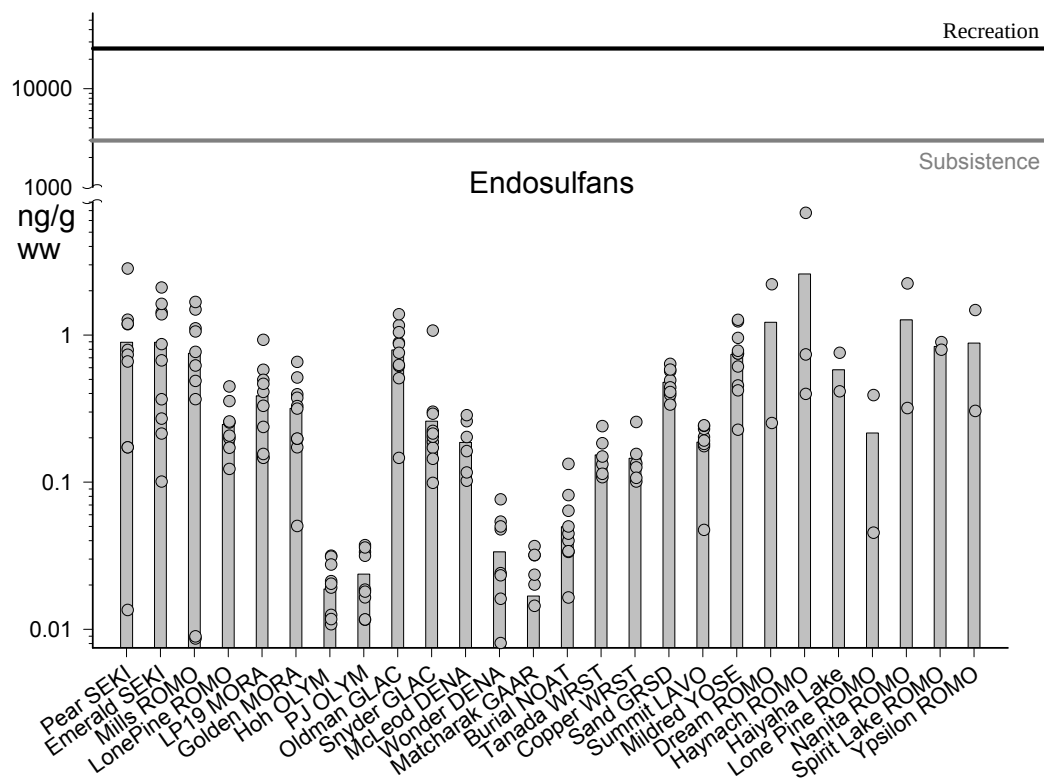
(g) Chlordanes (historic-use pesticide)



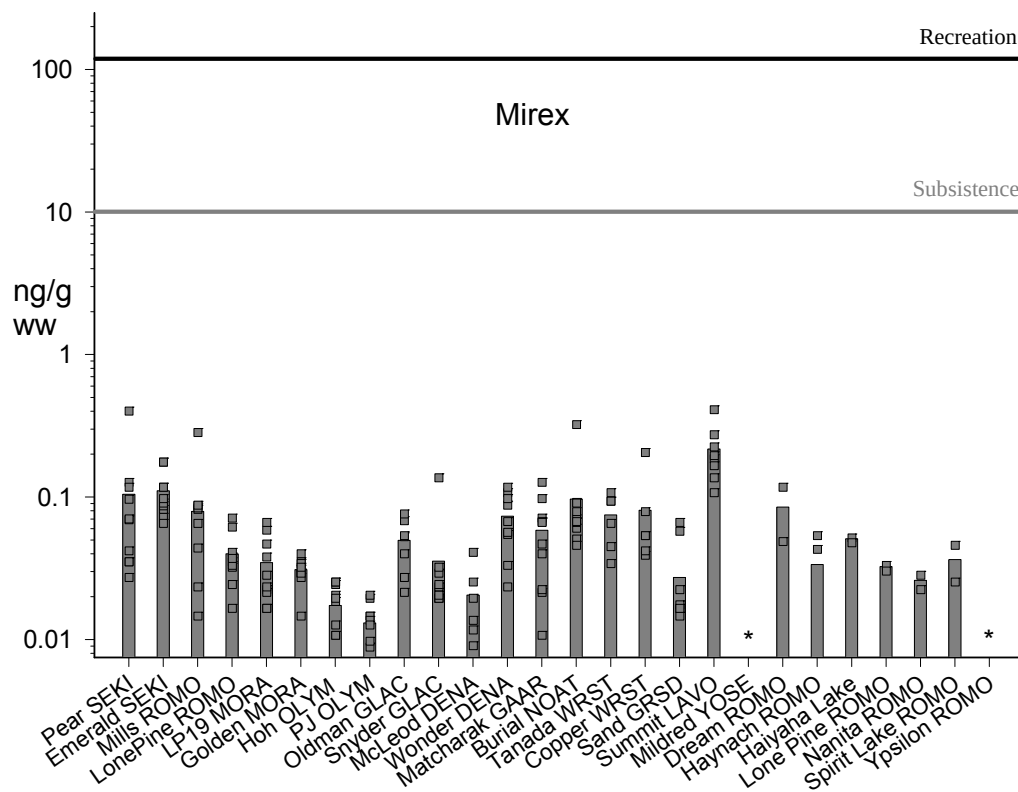
(h) Dieldrin (historic-use pesticide)



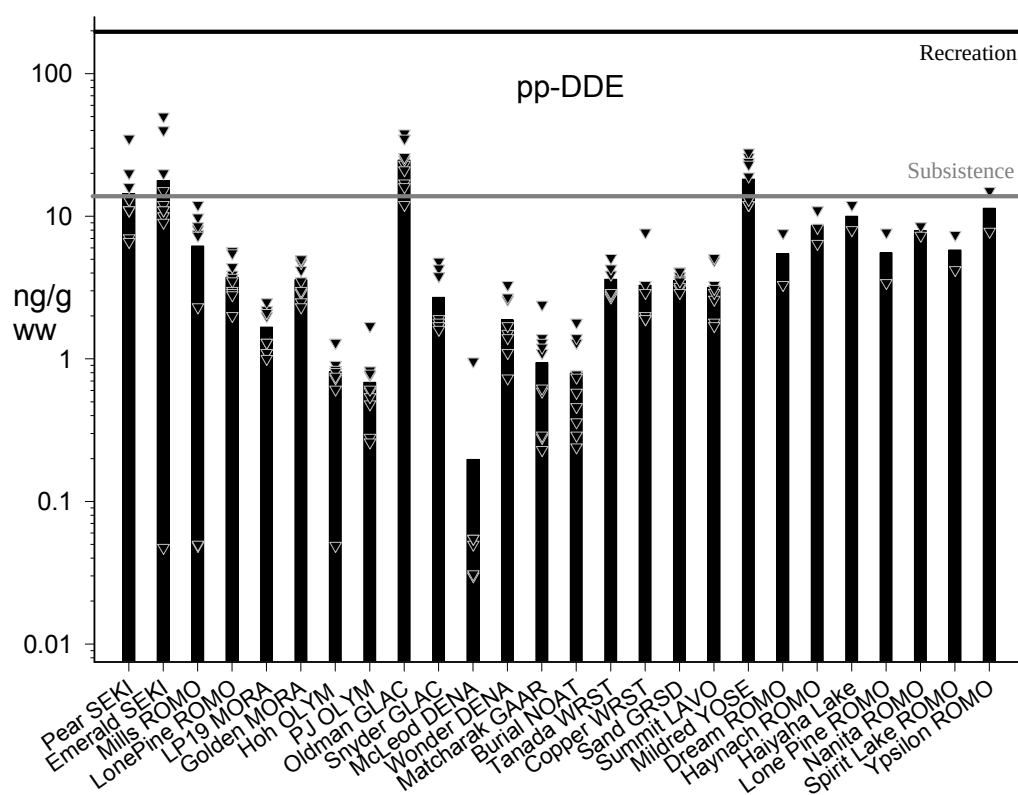
(i) Endosulfans (current-use pesticide, recently banned in the U.S.)



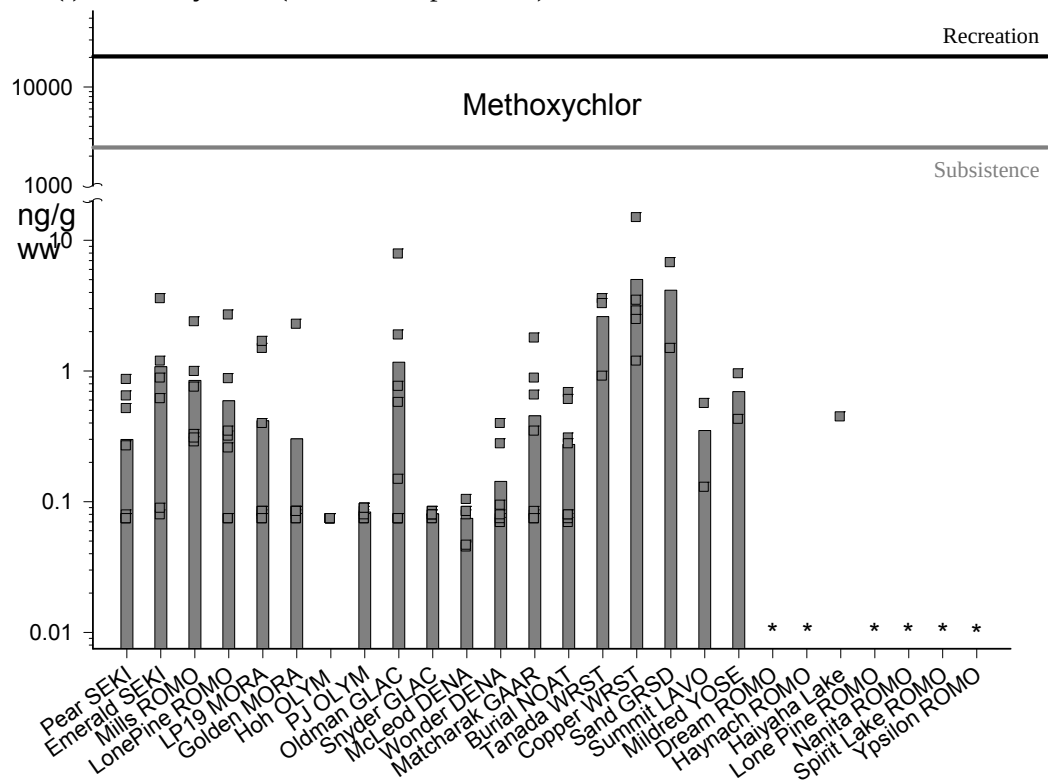
(j) Mirex (historic-use pesticide)



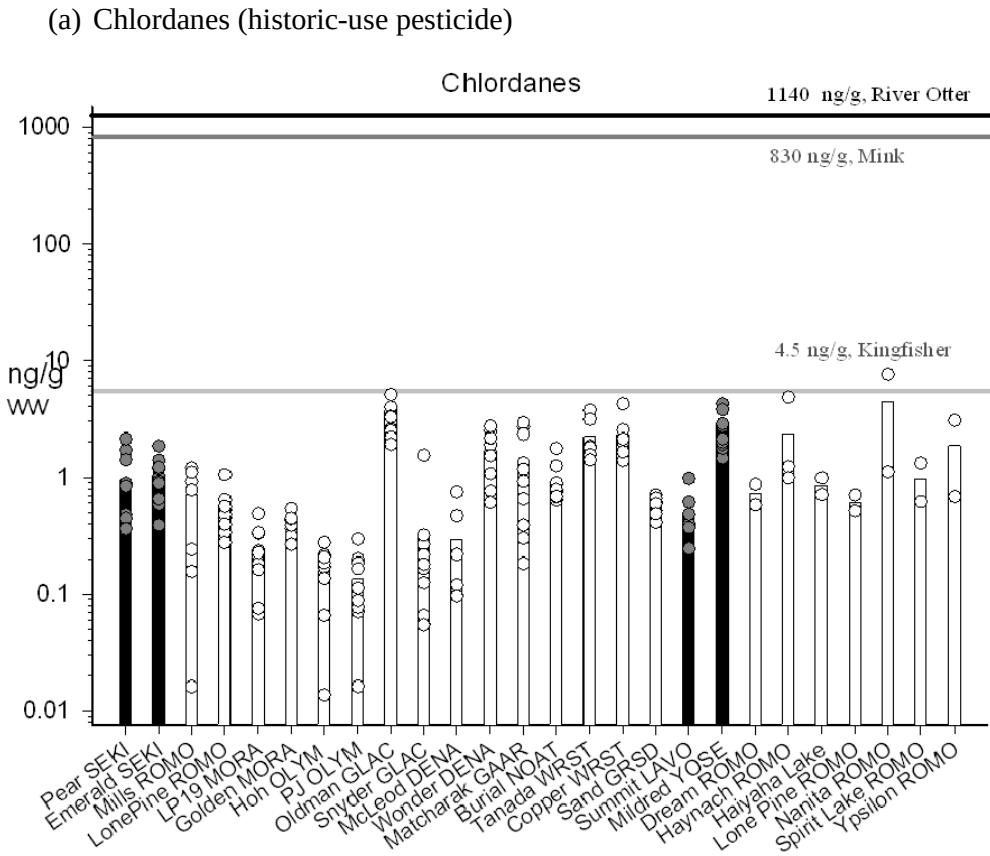
(k) p,p'-DDE (historic-use pesticide)



(l) Methoxychlor (current-use pesticide)

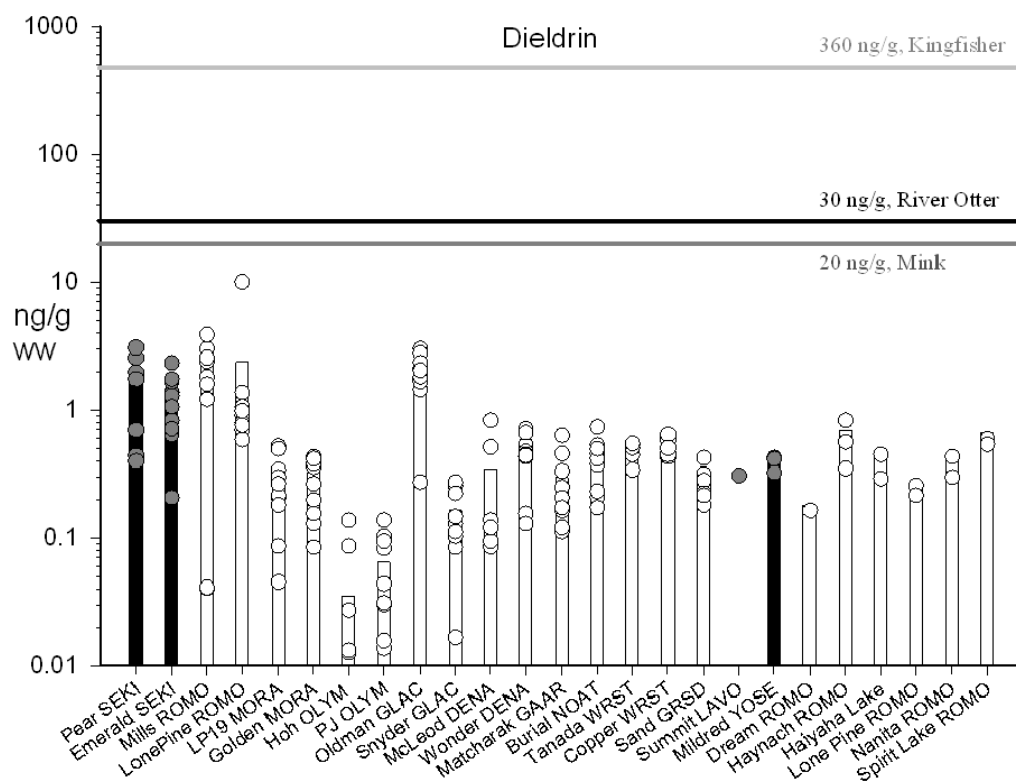


Figures 9a–c. Concentrations of HUPs (historic-use pesticides; chlordanes, dieldrin, DDE) in fish compared to piscivorous wildlife health thresholds for kingfisher, mink, and river otter (Simonich and Nanus 2012). Top of bar indicates the mean concentration and the circles represent the concentrations of individual fish. Results include findings from both WACAP (Pear SEKI to Burial NOAT) and the current study (Tanada WRST to Ypsilon ROMO). Map in Appendix A identifies site location and list in Appendix B defines park abbreviations.



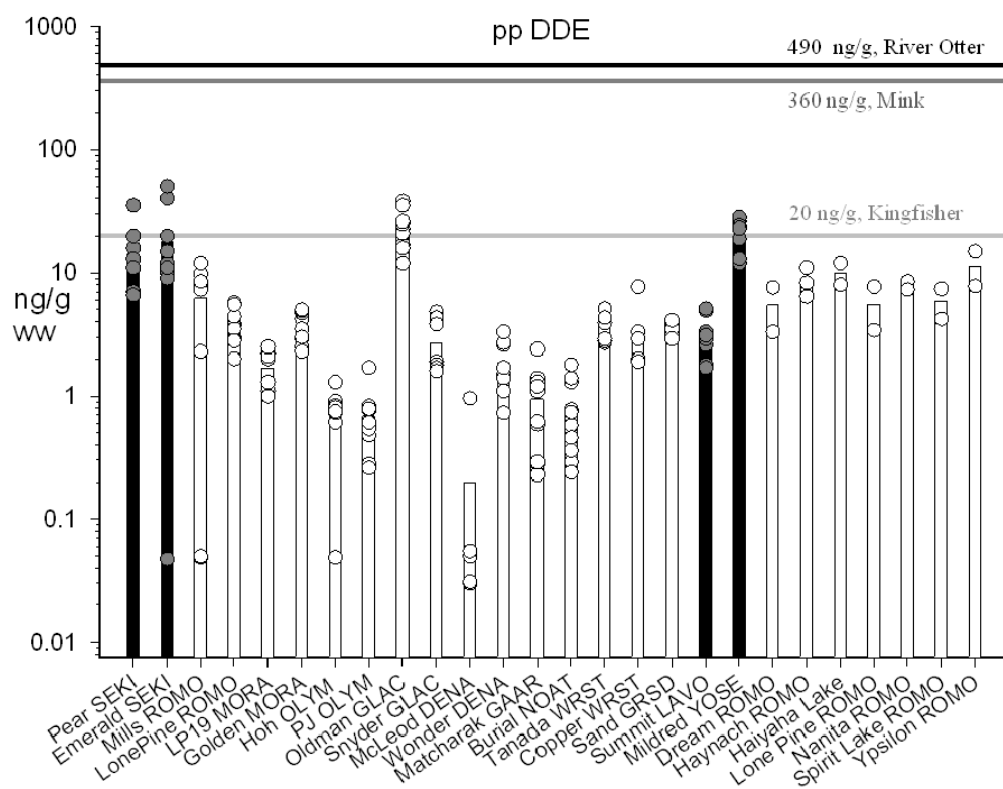
SEKI, LAVO, and YOSE bars are solid for purposes of Simonich and Nanus 2012.

(b) Dieldrin (historic-use pesticide)



SEKI, LAVO, and YOSE bars are solid for purposes of Simonich and Nanus 2012.

(c) p,p'-DDE (historic-use pesticide)



SEKI, LAVO, and YOSE bars are solid for purposes of Simonich and Nanus 2012.

Tables

Table 1: Fish samples analyzed for SOC.

Sample Name	Year Collected	Park	Waterbody	Species	Length (mm)	Intersex?	Gender
GRSA-SAND-12	2009	Great Sand Dunes	Sand Creek	Pikes Peak Cutthroat Hybrid	223		female
GRSA-SAND-31	2009	Great Sand Dunes	Sand Creek	Pikes Peak Cutthroat Hybrid	225		female
GRSA-SAND-04	2009	Great Sand Dunes	Sand Creek	Pikes Peak Cutthroat Hybrid	241		female
GRSA-SAND-27	2009	Great Sand Dunes	Sand Creek	Pikes Peak Cutthroat Hybrid	276		female
GRSA-SAND-01	2009	Great Sand Dunes	Sand Creek	Pikes Peak Cutthroat Hybrid	268		female
GRSA-SAND-25	2009	Great Sand Dunes	Sand Creek	Pikes Peak Cutthroat Hybrid	207		female
GRSA-SAND-22	2009	Great Sand Dunes	Sand Creek	Pikes Peak Cutthroat Hybrid	255		female
GRSA-SAND-19	2009	Great Sand Dunes	Sand Creek	Pikes Peak Cutthroat Hybrid	205		female
LAVO-SL-11	2009	Lassen Volcanic	Summit Lake	Brook Trout	420		female
LAVO-SL-12	2009	Lassen Volcanic	Summit Lake	Brook Trout	242		female
LAVO-SL-14	2009	Lassen Volcanic	Summit Lake	Brook Trout	292		female
LAVO-SL-36	2009	Lassen Volcanic	Summit Lake	Brook Trout	316		female
LAVO-SL-04	2009	Lassen Volcanic	Summit Lake	Brook Trout	398		male
LAVO-SL-23	2009	Lassen Volcanic	Summit Lake	Brook Trout	219		male
LAVO-SL-32	2009	Lassen Volcanic	Summit Lake	Brook Trout	272		male
LAVO-SL-37	2009	Lassen Volcanic	Summit Lake	Brook Trout	213		male
ROMO-DR-04	2006	Rocky Mountain	Dream Lake	Greenback Cutthroat	284	Intersex	male
ROMO-DR-01	2006	Rocky Mountain	Dream Lake	Greenback Cutthroat	280		male
ROMO-HA-13	2006	Rocky Mountain	Haynach Lake	Yellowstone River Cutthroat	232		female
ROMO-HA-03	2005	Rocky Mountain	Haynach Lake	Yellowstone River Cutthroat	350	Intersex	male
ROMO-HA-04	2006	Rocky Mountain	Haynach Lake	Yellowstone River Cutthroat	319		male
ROMO-HY-03	2005	Rocky Mountain	Lake Haiyaha	Cutthroat Trout	280	Intersex	male
ROMO-HY-10	2005	Rocky Mountain	Lake Haiyaha	Cutthroat Trout	281		male
ROMO-LP-50	2006	Rocky Mountain	Lone Pine Lake	Brook Trout	277	Intersex	male
ROMO-LP-49	2006	Rocky Mountain	Lone Pine Lake	Brook Trout	246		male
ROMO-Nan-03	2008	Rocky Mountain	Nanita Lake	Cutthroat Trout	228	Intersex	male
ROMO-Nan-04	2008	Rocky Mountain	Nanita Lake	Cutthroat Trout	232		male
ROMO-ST-07	2006	Rocky Mountain	Spirit Lake	Brook Trout	325	Intersex	male

Sample Name	Year Collected	Park	Waterbody	Species	Length (mm)	Intersex?	Gender
ROMO-ST-12	2006	Rocky Mountain	Spirit Lake	Brook Trout	195	Intersex	male
ROMO-YSP-17	2009	Rocky Mountain	Ypsilon Lake	Colorado River Cutthroat	237		male
ROMO-YSP-27	2009	Rocky Mountain	Ypsilon Lake	Colorado River Cutthroat	238		male
WRST-COP-14	2008	Wrangell-St. Elias	Copper Lake	Lake Trout	460		female
WRST-COP-29	2008	Wrangell-St. Elias	Copper Lake	Lake Trout	490		female
WRST-COP-02	2008	Wrangell-St. Elias	Copper Lake	Lake Trout	620		female
WRST-COP-03	2008	Wrangell-St. Elias	Copper Lake	Lake Trout	590		female
WRST-COP-22	2008	Wrangell-St. Elias	Copper Lake	Lake Trout	510		female
WRSTCOP-04	2008	Wrangell-St. Elias	Copper Lake	Lake Trout	475		female
WRST-TAN-17	2009	Wrangell-St. Elias	Tanada Lake	Lake Trout	499		female
WRST-TAN-02	2009	Wrangell-St. Elias	Tanada Lake	Lake Trout	570		female
WRST-TAN-12	2009	Wrangell-St. Elias	Tanada Lake	Lake Trout	500		female
WRST-TAN-07	2009	Wrangell-St. Elias	Tanada Lake	Lake Trout	504		female
WRST-TAN-13	2009	Wrangell-St. Elias	Tanada Lake	Lake Trout	519		female
WRST-TAN-16	2009	Wrangell-St. Elias	Tanada Lake	Lake Trout	526		female
YOS-ML-26	2009	Yosemite	Mildred Lake	Brook Trout	305	Intersex	female
YOS-ML-10	2009	Yosemite	Mildred Lake	Brook Trout	280		female
YOS-ML-24	2009	Yosemite	Mildred Lake	Brook Trout	269		female
YOS-ML-33	2009	Yosemite	Mildred Lake	Brook Trout	173		female
YOS-ML-05	2009	Yosemite	Mildred Lake	Brook Trout	265		male
YOS-ML12	2009	Yosemite	Mildred Lake	Brook Trout	300		male
YOS-ML-15	2009	Yosemite	Mildred Lake	Brook Trout	265		male
YOS-ML-27	2009	Yosemite	Mildred Lake	Brook Trout	270		male
YOS-ML-37	2009	Yosemite	Mildred Lake	Brook Trout	169		male
YOS-ML-38	2009	Yosemite	Mildred Lake	Brook Trout	187		male

Fish from GRSD, LAVO, WRST, YOSE, and ROMO -Nanita and -Ypsilon were collected by park resource managers and technicians in 2008–2009. Many of these fish samples were collected from these parks for other purposes such as non-native eradication efforts. ROMO -Dream, -Haynach, -Haiyaha, -Lone Pine, and -Spirit were collected by WACAP scientists in 2005–2006 as an add-on to that project. These fish samples were previously analyzed for intersex, but, at that time, were not analyzed for contaminant concentrations.

Table 2. SOC's measured in fish by Simonich Lab for purposes of this study.

Electron Impact Ionization	Negative Chemical Ionization
PAHs: Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Retene, Benz[a]anthracene, Chrysene, Triphenylene, Benzo[b]fluoranthene, Benzo[k]fluoranthene, Benzo[e]pyrene, Benzo[a]pyrene, Indeno[1,2,3-cd]pyrene, Dibenz[a,h]anthracene, Benzo[ghi]perylene Pesticides and degradation products: o,p'-DDT*, p,p'-DDT, o,p'-DDD*, p,p'-DDD, o,p'-DDE, p,p'-DDE, Diazinon, Demeton S, Ethion, Etriazole, Malathion*, Parathion and Methyl - Parathion, Phorate, Metolachlor*, Methoxychlor, Acetochlor*, Alachlor, Prometon, Pebulate, EPTC, Carbofuran, Carbaryl, Propachlor, Atrazine and degradation products, Simazine, Cyanazine Surrogates: d_{10}-Fluorene, d_{10}-Phenanthrene, d_{10}-Pyrene, d_{12}-Triphenylene, d_{12}-Benzo[a]pyrene, d_{12}-Benzo[ghi]perylene, d_{14}-EPTC, d_{10}-Phorate, d_5-Atrazine, d_{10}-Diazinon, d_7-Malathion, d_{10}-Parathion, d_8-p,p'-DDE, d_8-p,p'-DDT, d_6-Methyl Parathion, d_{13}-Alachlor, d_{11}-Acetochlor Internal Standards: d_{10}-Acenaphthene, d_{10}-Fluoranthene, d_{12}-Benzo[k]fluoranthene	PCBs: PCB 52 (2,2',5,5'-Tetrachlorobiphenyl), PCB 74 (2,4,4',5-Tetrachlorobiphenyl), PCB 101 (2,2',4,5,5'-Pentachlorobiphenyl), PCB 118 (2,3',4,4',5-Pentachlorobiphenyl), PCB 138 (2,2',3,4,4',5'-Hexachlorobiphenyl), PCB 153 (2,2',4,4',5,5'-Hexachlorobiphenyl), PCB 183* (2,2',3,4,4',5',6-Heptachlorobiphenyl), and PCB 187 (2,2',3,4',5,5',6-Heptachlorobiphenyl) Pesticides and degradation products: Hexachlorocyclohexanes (HCH) - α^*, β, γ-$\square$ (lindane), and δ, $\square$ Chlordanes – cis*, trans*, oxy*, Nonachlor – cis, trans, Heptachlor*, Heptachlor Epoxide*, Endosulfans - I, II, and sulfate, Dieldrin, Aldrin, Endrin, Endrin Aldehyde, Hexachlorobenzene, Dacthal, Chlorothalonil, Chlorpyrifos and oxon, Trifluralin, Metribuzin, Triallate, Mirex Surrogates: $^{13}\text{C}_{12}$ PCB 101 (2,2',4,5,5'-Pentachlorobiphenyl), $^{13}\text{C}_{12}$ PCB 180 (2,2', 3,4,4',5,5'-Heptachlorobiphenyl), d_{10}- Chlorpyrifos, $^{13}\text{C}_6$-HCB, d_6-γ-HCH, d_4-Endosulfan I, d_4-Endosulfan II Internal Standards: d_{14}-Trifluralin

Table 3: Number of fish exceeding recreational fishing consumption limits. Numerator indicates number of fish exceeding consumption limit and denominator indicates number of fish analyzed.

	GRSD	LAVO	ROMO							WRST		YOSE
	Sand Creek	Summit Lake	Dream Lake	Haynach Lake	Lake Hiayaha	Lone Pine Lake	Nanita Lake	Spirit Lake	Ypsilon Lake	Copper Lake	Tanada Lake	Mildred Lake
HCB	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
a-HCH	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
g-HCH	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Dacthal	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Chlorpyrifos	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Heptachlor epoxide	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Chlordanes	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Dieldrin	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Endosulfans	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Mirex	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
pp-DDE	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Methoxychor	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10

Table 4: Number of fish exceeding subsistence fishing consumption limits. Numerator indicates number of fish exceeding consumption limit and denominator indicates number of fish analyzed.

	GRSD	LAVO	ROMO							WRST		YOSE
	Sand Creek	Summit Lake	Dream Lake	Haynach Lake	Lake Hiayaha	Lone Pine Lake	Nanita Lake	Spirit Lake	Ypsilon Lake	Copper Lake	Tanada Lake	Mildred Lake
HCB	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
a-HCH	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
g-HCH	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Dacthal	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Chlorpyrifos	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Heptachlor epoxide	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Chlordanes	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Dieldrin	3 / 8	1 / 8	0 / 2	3 / 3	2 / 2	0 / 2	2 / 2	2 / 2	0 / 2	6 / 6	6 / 6	3 / 10
Endosulfans	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Mirex	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
pp-DDE	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	1 / 2	0 / 6	0 / 6	5 / 10
Methoxychor	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10

Table 5: Number of fish exceeding wildlife health thresholds. Numerator indicates number of fish exceeding consumption limit and denominator indicates number of fish analyzed.

	GRSD	LAVO	ROMO							WRST		YOSE
	Sand Creek	Summit Lake	Dream Lake	Haynach Lake	Lake Hiayaha	Lone Pine Lake	Nanita Lake	Spirit Lake	Ypsilon Lake	Copper Lake	Tanada Lake	Mildred Lake
Chlordanes	0 / 8	0 / 8	0 / 2	1 / 3	0 / 2	0 / 2	1 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
Dieldrin	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	0 / 10
pp-DDE	0 / 8	0 / 8	0 / 2	0 / 3	0 / 2	0 / 2	0 / 2	0 / 2	0 / 2	0 / 6	0 / 6	4 / 10

Discussion

Findings from this research emphasize the concern regarding concentrations of airborne contaminants in fish from national parks in high-elevation and high-latitude areas of the western U.S. and Alaska. DDE, HCB, chlorpyrifos, and mirex concentrations in fish were particularly high in Yosemite, Wrangell-St. Elias, Rocky Mountain, and Lassen Volcanic national parks. Dieldrin concentrations in fish from all parks exceeded the guideline for subsistence fish consumption. DDE concentrations in fish from Yosemite and Rocky Mountain national parks also exceeded the guideline for subsistence fish consumption. In addition, wildlife health thresholds established for the kingfisher were exceeded at Yosemite and Rocky Mountain national parks.

The relative concentrations of pesticides in fish from national parks appear to be highest in parks located in close proximity to agricultural areas, a probable source of both current-use and historic-use contaminants and consistent with Hageman *et al.* 2010. Elevated concentrations of DDE, methoxychlor, and γ -HCH in fish at Wrangell-St. Elias, the park most removed from agricultural areas, are likely a result of global transport or historically-contaminated sites located within the region.

Similar to Schwindt *et al.* 2009, the small sample size does not allow for the relationship between fish reproductive effects and contaminant concentrations to be established. Analyses indicate that fish SOC concentrations are not significantly different between intersex and non-intersex fish.

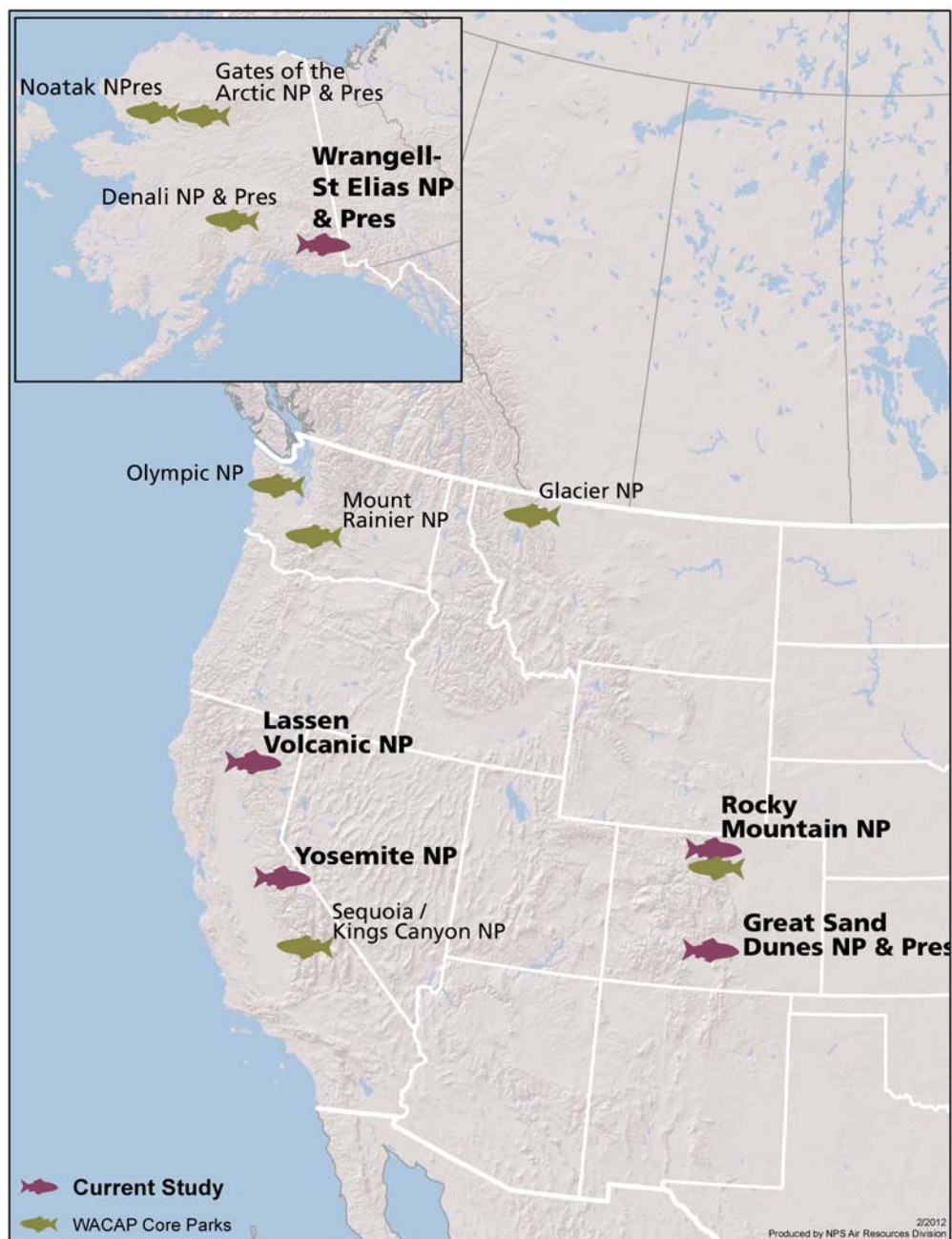
Fifty-three fish from 12 waterbodies throughout 5 national parks were analyzed for chemistry as a part of this study. The subsample of fish was selected from approximately 235 fish sampled in those same 12 waterbodies, and therefore the prevalence of intersex in fish will not be discussed here but in a subsequent report.

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Appendix

Appendix A. Fish from national parks analyzed for SOC concentrations by the Simonich Lab: WACAP and current study. WACAP fish samples were collected in 2003–2006. Fish samples analyzed in the current study were collected in 2005–2006 and 2008–2009.



Appendix B. List of Park Abbreviations, Defined.

DENA	<i>Denali National Park & Preserve</i>
GAAR	<i>Gates of the Arctic National Preserve</i>
GLAC	<i>Glacier National Park</i>
GRSD ¹	<i>Great Sand Dunes National Park & Preserve</i>
LAVO	<i>Lassen Volcanic National Park</i>
MORA	<i>Mount Rainier National Park</i>
NOAT	<i>Noatak National Preserve</i>
OLYM	<i>Olympic National Park</i>
ROMO	<i>Rocky Mountain National Park</i>
SEKI	<i>Sequoia & Kings Canyon National Parks</i>
WRST	<i>Wrangell-St. Elias National Park & Preserve</i>
YOSE	<i>Yosemite National Park</i>

¹ GRSA – not GRSD – is the correct park abbreviation for Great Sand Dunes National Park & Preserve; however GRSD is used throughout this report.

Appendix C. SOC concentrations in fish. Concentrations below the detection limit are represented by negative estimated detection limits. Blank cells represent SOC concentrations in laboratory blanks that were at least 30% the concentration in the sample.

Sample Name	Trifluralin ng/g ww	Trifluralin ng/g lipid	HCb ng/g ww	HCb ng/g lipid	a-HCH ng/g ww	a-HCH ng/g lipid	g-HCH ng/g ww	g-HCH ng/g lipid	Dacthal ng/g ww	Dacthal ng/g lipid	Chlorpyrifos ng/g ww	Chlorpyrifos ng/g lipid	HCLRE ng/g ww	HCLRE ng/g lipid	o-CLDN ng/g ww	o-CLDN ng/g lipid
GRSA-SAND-12	0.01	0.12	0.32	3.7	-0.0028	-0.031	-0.0039	-0.044	0.24	2.7	0.019	0.21	-0.01	-0.12	0.068	0.78
GRSA-SAND-31	0.0079	0.11	0.22	3	-0.0029	-0.04	-0.0041	-0.056	0.24	3.3	0.016	0.22	-0.011	-0.15	-0.0081	-0.11
GRSA-SAND-04	0.0066	0.12	0.35	6.5	-0.0027	-0.05	-0.0038	-0.07	0.25	4.7	0.007	0.13	-0.01	-0.19	0.1	1.9
GRSA-SAND-27	0.0088	0.073	0.24	2	-0.0023	-0.019	-0.0032	-0.027	0.22	1.8	0.0065	0.054	-0.0088	-0.072	-0.0064	-0.053
GRSA-SAND-01	0.0076	0.064	0.22	1.8	-0.0024	-0.02	-0.0033	-0.028	0.22	1.9	0.012	0.098	-0.0089	-0.076	0.089	0.75
GRSA-SAND-25	0.0069	0.072	0.29	3	-0.0025	-0.026	-0.0035	-0.037	0.23	2.4	0.01	0.11	-0.0095	-0.099	0.084	0.88
GRSA-SAND-22	0.0047	0.055	0.27	3.2	-0.0025	-0.029	-0.0035	-0.041	0.23	2.7	0.01	0.12	-0.0094	-0.11	0.077	0.9
GRSA-SAND-19	0.004	0.061	0.25	3.8	-0.0025	-0.039	-0.0036	-0.055	0.2	3	0.008	0.12	-0.0096	-0.15	-0.007	-0.11
LAVO-SL-11	-0.00020	-0.0043	0.28	6	0.042	0.91	-0.0031	-0.067	0.14	2.9	0.016	0.33	-0.0085	-0.18	0.15	3.1
LAVO-SL-04	-0.00021	-0.0061	0.23	6.9	0.040	1.2	-0.0033	-0.096	0.17	4.9	0.019	0.54	-0.0088	-0.26	0.11	3.3
LAVO-SL-12	-0.00022	-0.0043	0.24	4.7	0.044	0.87	-0.0034	-0.067	0.19	3.6	0.020	0.39	-0.0092	-0.18	0.068	1.3
LAVO-SL-14	-0.00022	-0.0055	0.20	5.1	0.032	0.8	-0.0034	-0.086	0.19	4.7	0.024	0.61	-0.0092	-0.23	0.054	1.4
LAVO-SL-23	-0.00022	-0.0039	0.28	5	0.042	0.74	-0.0034	-0.061	0.21	3.8	0.027	0.49	-0.0092	-0.16	0.13	2.2
LAVO-SL-32	-0.00021	-0.0037	0.25	4.4	0.057	1	-0.0033	-0.058	0.18	3.2	0.023	0.4	-0.0089	-0.16	0.10	1.8
LAVO-SL-36	-0.00022	-0.0041	0.25	4.7	0.051	0.95	-0.0034	-0.064	0.16	2.9	0.018	0.33	-0.0092	-0.17	0.072	1.3
LAVO-SL-37	-0.00021	-0.0046	0.18	3.9	0.056	1.2	-0.0033	-0.073	0.15	3.3	0.025	0.54	-0.0090	-0.20	0.035	0.77
DR04			0.22	24	0.029	3.2	-0.0036	-0.4	0.1	11	0.009	0.99	-0.0098	-1.1	-0.0072	-0.79
DR01			0.12	1.4	-0.0025	-0.027	-0.0034	-0.038	0.043	0.48	0.0045	0.05	-0.0093	-0.1	0.045	0.5
HA-13	0.0053	0.12	0.24	5.60	0.00	-0.09	-0.01	-0.12	0.42	9.8	0.015	0.34	-0.014	-0.33	0.1	2.4
HA03	0.0085	0.34			-0.0025	-0.1	-0.0035	-0.14	0.22	8.8	-0.0018	-0.072	-0.0094	-0.38	0.068	2.7
HA04			0.84	15	0.11	2	-0.0035	-0.063	0.66	12	-0.0018	-0.033	-0.0095	-0.17	0.16	2.9
HY03					0.024	0.32	-0.0036	-0.048	0.29	3.9			-0.0096	-0.13	0.15	2
HY10			0.46	8.4	0.028	0.51	-0.0034	-0.063	0.26	4.7	0.0088	0.16	-0.0093	-0.17	0.1	1.8
LP50			0.21	6.6	-0.0025	-0.08	-0.0035	-0.11	0.098	3.1	-0.0018	-0.058	-0.0095	-0.3	-0.007	-0.22
LP49					0.022	0.53	-0.0035	-0.085	0.15	3.5			-0.0096	-0.23	0.084	2
Nan03			0.35	15	-0.0025	-0.11	-0.0035	-0.15	0.32	14	-0.0018	-0.08	-0.0094	-0.42	0.1	4.4
Nan04			0.37	12	-0.0025	-0.078	-0.0035	-0.11	0.29	9.1	-0.0018	-0.056	-0.0094	-0.29	0.098	3

Sample Name	Trifluralin ng/g ww	Trifluralin ng/g lipid	HCb ng/g ww	HCb ng/g lipid	a-HCH ng/g ww	a-HCH ng/g lipid	g-HCH ng/g ww	g-HCH ng/g lipid	Dacthal ng/g ww	Dacthal ng/g lipid	Chlorpyrifos ng/g ww	Chlorpyrifos ng/g lipid	HCLRE ng/g ww	HCLRE ng/g lipid	o-CLDN ng/g ww	o-CLDN ng/g lipid
ST07			0.34	8.1	0.038	0.89	-0.0034	-0.081	0.19	4.5	-0.0018	-0.042	-0.0092	-0.22	0.22	5.2
ST12			0.31	7.6	0.048	1.2	0.025	0.63	0.22	5.5	0.0092	0.23	-0.0094	-0.23	0.1	2.5
ROMO-YSP-17	-0.00022	-0.0048	1.4	31	-0.0024	-0.054	-0.0034	-0.076	0.30	6.7	0.11	2.5	-0.0092	-0.20	0.33	7.3
ROMO-YSP-27	-0.00022	-0.019	0.17	15	-0.0024	-0.21	-0.0034	-0.30	0.057	5.0			-0.0092	-0.81	0.037	3.3
WRST-COP-14	0.011	0.18	1.9	30	0.31	5	-0.0033	-0.053	0.033	0.54	0.022	0.36	-0.0088	-0.14	0.31	5
WRST-COP-29	0.0064	0.075	1.2	14	0.24	2.8	-0.0037	-0.044	0.02	0.24	0.01	0.12	-0.01	-0.12	0.24	2.8
WRST-COP-02	0.0051	0.12	1.1	27	0.26	6.3	-0.0033	-0.079	0.016	0.38	0.0074	0.18	-0.0088	-0.21	0.25	6
WRST-COP-03	0.0067	0.082	1.3	16	0.33	3.9	0.053	0.64	0.017	0.21	0.014	0.17	0.12	1.5	0.35	4.3
WRST-COP-22	0.0047	0.097	1.1	24	0.21	4.3	0.035	0.72	0.016	0.33	0.0097	0.2	0.13	2.6	0.22	4.6
WRST-COP-04	0.0047	0.099	1.1	22	0.18	3.8	-0.0034	-0.073	0.015	0.33	0.012	0.26	-0.0092	-0.2	0.16	3.5
WRST-TAN-17	0.0073	0.11	2.5	38	0.18	2.8	-0.0033	-0.05	0.014	0.21	0.015	0.23	-0.0089	-0.14	0.38	5.8
WRST-TAN-02	0.0089	0.059	2.8	18	0.25	1.7	-0.0034	-0.022	0.02	0.13	0.014	0.091	-0.0091	-0.06	0.38	2.5
WRST-TAN-12	0.0096	0.098	2.4	24	0.17	1.7	-0.0034	-0.034	0.02	0.21	0.014	0.14	0.12	1.2	0.2	2.1
WRST-TAN-07	0.0061	0.031	2.7	14	0.3	1.5	-0.0034	-0.017	0.02	0.1	0.016	0.083	-0.009	-0.046	0.27	1.4
WRST-TAN-13	0.02	0.18	1.6	14	0.23	2	-0.0035	-0.031	0.055	0.5	0.045	0.41	-0.0093	-0.084	0.17	1.6
WRST-TAN-16	0.0088	0.22	1.4	35	0.16	4	-0.0033	-0.083	0.019	0.47	0.02	0.51	-0.0088	-0.22	0.19	4.8
YOS-ML-05	-0.00022	-0.019	0.19	17	0.025	2.2	-0.0034	-0.30	0.27	24	0.024	2.2	-0.0091	-0.81	0.17	15
YOS-ML-26	-0.00022	-0.019	0.14	13	0.016	1.5	-0.0034	-0.30	0.18	16	0.018	1.6	-0.0091	-0.81	0.11	9.8
YOS-ML-10	-0.00018	-0.013			-0.002	-0.15	-0.0028	-0.21	0.11	7.9	0.025	1.8	-0.0076	-0.56	0.069	5.1
YOS-ML12	-0.00022	-0.012	0.26	14	0.033	1.8	-0.0034	-0.19	0.30	17	0.034	1.9	-0.0092	-0.51	0.18	9.9
YOS-ML-15	-0.00022	-0.0087	0.18	7.4	0.027	1.1	-0.0034	-0.14	0.18	7.3	0.023	0.91	-0.0092	-0.37	0.20	8.1
YOS-ML-24	-0.00021	-0.0075	0.21	7.4	0.026	0.9	-0.0033	-0.12	0.26	9.1	0.032	1.1	-0.0089	-0.31	0.24	8.5
YOS-ML-27	-0.00022	-0.0088	0.24	9.5	0.022	0.89	-0.0034	-0.14	0.29	12	0.06	2.4	-0.0092	-0.37	0.18	7.3
YOS-ML-33	-0.00023	-0.0049	0.32	6.7	0.046	0.98	-0.0036	-0.077	0.44	9.3	0.027	0.56	-0.0098	-0.21	0.15	3.2
YOS-ML-37	-0.00022	-0.0048	0.27	6	0.040	0.89	-0.0034	-0.076	0.39	8.7			-0.0092	-0.2	0.16	3.5
YOS-ML-38	-0.00022	-0.0077	0.33	12	0.047	1.7	-0.0034	-0.12	0.48	17	0.038	1.3	-0.0091	-0.33	0.18	6.5

Sample Name	t-CLDN ng/g ww	t-CLDN ng/g lipid	ENDO I ng/g ww	ENDO I ng/g lipid	c-CLDN ng/g ww	c-CLDN ng/g lipid	t-NCLR ng/g ww	t-NCLR ng/g lipid	Dieldrin ng/g ww	Dieldrin ng/g lipid	PCB 74 ng/g ww	PCB 74 ng/g lipid	PCB 101 ng/g ww	PCB 101 ng/g lipid	PCB 118 ng/g ww	PCB 118 ng/g lipid
GRSA-SAND-12	0.059	0.68	0.15	1.8	0.12	1.3	0.24	2.7	0.49	5.6	-0.094	-1.1	-0.038	-0.43	0.031	0.36
GRSA-SAND-31	0.033	0.45	0.13	1.7	0.083	1.1	0.18	2.4	0.29	4	-0.099	-1.4	-0.04	-0.55	0.036	0.49
GRSA-SAND-04	0.056	1	0.17	3.2	0.13	2.5	0.27	5.1	0.36	6.6	-0.092	-1.7	-0.037	-0.68	0.038	0.71
GRSA-SAND-27	0.051	0.42	0.13	1.1	0.1	0.83	0.25	2.1	0.2	1.6	-0.079	-0.65	-0.032	-0.26	0.038	0.31
GRSA-SAND-01	0.053	0.45	0.12	1	0.11	0.93	0.26	2.2	0.2	1.7	-0.08	-0.68	-0.032	-0.27	0.033	0.28
GRSA-SAND-25	0.071	0.74	0.13	1.3	0.12	1.2	0.25	2.6	0.32	3.4	-0.086	-0.9	-0.034	-0.36	0.035	0.37
GRSA-SAND-22	0.067	0.78	0.13	1.5	0.1	1.2	0.24	2.8	0.25	2.9	-0.085	-0.99	-0.034	-0.4	0.036	0.42
GRSA-SAND-19	0.054	0.84	0.14	2.1	0.099	1.5	0.23	3.5	0.24	3.6	-0.087	-1.3	-0.035	-0.54	0.051	0.79
LAVO-SL-11	0.11	2.4	0.021	0.44	-0.015	-0.31	0.53	11	-0.017	-0.36	-0.076	-1.6	0.18	3.8	0.62	13
LAVO-SL-04	0.073	2.2	0.014	0.41	-0.015	-0.45	0.31	9.2	-0.017	-0.51	-0.079	-2.3	0.15	4.5	0.44	13
LAVO-SL-12	0.044	0.87	0.020	0.39	-0.016	-0.31	0.16	3.1	-0.018	-0.36	-0.083	-1.6	0.15	2.9	0.27	5.4
LAVO-SL-14	0.051	1.3	0.018	0.46	-0.016	-0.4	0.19	4.9	0.35	8.7	-0.083	-2.1	0.14	3.5	0.30	7.6
LAVO-SL-23	0.038	0.67	0.018	0.32	-0.016	-0.28	0.15	2.7	-0.018	-0.32	-0.083	-1.5	0.43	7.7	0.59	10
LAVO-SL-32	0.073	1.3	0.029	0.51	-0.015	-0.3	0.22	3.9	-0.018	-0.31	-0.080	-1.4	0.20	3.6	0.43	7.6
LAVO-SL-36	0.064	1.2	0.020	0.37	-0.016	-0.3	0.17	3.3	-0.018	-0.34	-0.083	-1.5	0.072	1.4	0.25	4.6
LAVO-SL-37	0.041	0.89	0.031	0.68	-0.016	-0.34	0.12	2.6	-0.018	-0.39	-0.081	-1.8	0.35	7.5	0.37	8.1
DR04	0.036	4	0.099	11	0.065	7.1	0.14	16	0.18	20	-0.089	-9.7	0.13	14	0.2	21
DR01	0.039	0.43	0.02	0.22	0.078	0.86	0.24	2.6	0.18	2	-0.084	-0.92	0.31	3.5	0.48	5.3
HA-13	0.1	2.4	0.25	5.9	0.18	4.1	0.39	9.1	0.66	15	-0.13	-3	-0.051	-1.2	0.12	2.9
HA03	0.14	5.4	0.18	7.1	0.25	9.9	0.42	17	0.4	16	-0.085	-3.4	0.23	9.3	0.15	6
HA04	0.2	3.6	0.7	13	0.32	5.7	0.64	11	1	19	-0.086	-1.5	-0.034	-0.61	0.19	3.4
HY03			0.3	4.1	0.12	1.6	0.44	6	0.52	7	-0.087	-1.2	0.33	4.4	0.26	3.6
HY10	0.049	0.89	0.35	6.4	0.082	1.5	0.3	5.6	0.33	6	-0.084	-1.5	0.25	4.6	0.26	4.7
LP50	0.038	1.2	0.027	0.84	0.058	1.8	0.45	14	0.24	7.6	-0.086	-2.7	-0.034	-1.1	0.13	4.2
LP49			0.032	0.77	0.042	1	0.27	6.4	0.29	6.9	-0.086	-2.1	0.073	1.7	0.083	2
Nan03	0.16	6.9	0.091	4	0.19	8.5	0.37	16	0.5	22	-0.085	-3.8	0.13	5.8	0.13	5.7
Nan04	0.2	6.2	0.087	2.7	0.28	8.7	0.44	14	0.34	11	-0.085	-2.6	0.15	4.8	0.13	4.1

Sample Name	ENDO II ng/g ww	ENDO II ng/g lipid	c-NCLR ng/g ww	c-NCLR ng/g lipid	ENDO S ng/g ww	ENDO S ng/g lipid	PCB 153 ng/g ww	PCB 153 ng/g lipid	PCB 138 ng/g ww	PCB 138 ng/g lipid	PCB 187 ng/g ww	PCB 187 ng/g lipid	PCB 183 ng/g ww	PCB 183 ng/g lipid	Mirex ng/g ww	Mirex ng/g lipid
ST07	0.013	0.31	0.33	7.9	0.79	19	0.57	14	0.58	14	0.32	7.5	0.079	1.9	0.047	1.1
ST12	0.01	0.26	0.16	3.9	0.72	18	0.34	8.5	0.3	7.5	0.13	3.2	0.04	1	0.026	0.64
ROMO-YSP-17	0.17	3.7	0.75	17	0.85	19	0.47	10	0.38	8.4	0.23	5.1	0.072	1.6	-0.0024	-0.053
ROMO-YSP-27	0.032	2.8	0.2	17	0.19	17	0.69	61	0.53	46	0.31	27	0.12	11	-0.0024	-0.21
WRST-COP-14	-0.0022	-0.036	0.56	9.2	0.21	3.4	0.63	10	0.51	8.3	0.19	3.1	0.065	1.1	0.055	0.9
WRST-COP-29	-0.0025	-0.03	0.27	3.2	0.13	1.5	0.71	8.3	0.56	6.5	0.13	1.6	0.065	0.75	0.055	0.64
WRST-COP-02	-0.0022	-0.054	0.49	12	0.11	2.7	0.94	23	0.77	19	0.3	7.4	0.085	2.1	0.04	0.97
WRST-COP-03	-0.0024	-0.029	0.96	12	0.11	1.3	2.6	32	2.1	25	0.66	8	0.24	2.9	0.21	2.5
WRST-COP-22	-0.0022	-0.046	0.41	8.4	0.085	1.7	1.6	33	1.3	27	0.45	9.2	0.14	3	0.081	1.7
WRSTCOP-04	-0.0023	-0.049	0.35	7.4	0.089	1.9	0.96	20	0.76	16	0.3	6.4	0.085	1.8	0.043	0.91
WRST-TAN-17	-0.0023	-0.034	0.71	11	0.11	1.7	1.4	21	1	16	0.41	6.3	0.12	1.9	0.11	1.6
WRST-TAN-02	-0.0023	-0.015	0.56	3.7	0.11	0.7	1.1	7.5	0.85	5.7	0.35	2.3	0.1	0.69	0.096	0.63
WRST-TAN-12	-0.0023	-0.023	0.32	3.2	0.084	0.85	0.89	9	0.63	6.4	0.24	2.4	0.07	0.71	0.067	0.68
WRST-TAN-07	-0.0023	-0.012	0.35	1.8	0.16	0.79	0.7	3.6	0.55	2.8	0.2	1	0.065	0.33	0.046	0.23
WRST-TAN-13	0.028	0.25	0.32	2.9	0.15	1.4	1.3	12	1.1	9.6	0.21	1.9	0.096	0.87	0.096	0.86
WRST-TAN-16	-0.0022	-0.057	0.24	6.1	0.09	2.3	1.3	32	0.97	25	0.39	9.9	0.1	2.6	0.035	0.89
YOS-ML-05	0.016	1.4	0.82	73	0.34	30	0.69	61	0.58	51	0.38	33	0.13	11	-0.0024	-0.21
YOS-ML-26	0.0056	0.50	0.58	52	0.36	32	0.41	37	0.36	32	0.27	24	0.095	8.4	-0.0024	-0.21
YOS-ML-10	0.010	0.77	0.37	28	0.17	13	0.37	28	0.30	22	0.22	16	0.075	5.6	-0.0020	-0.15
YOS-ML12	0.020	1.1	0.87	48	0.60	33	0.47	26	0.38	21	0.28	16	0.11	5.8	-0.0024	-0.13
YOS-ML-15	0.021	0.86	1.2	46	0.61	24	0.51	20	0.44	18	0.30	12	0.11	4.3	-0.0024	-0.095
YOS-ML-24	0.014	0.49	1.2	42	0.47	17	0.58	20	0.49	17	0.33	12	0.12	4.2	-0.0023	-0.081
YOS-ML-27	0.034	1.4	1.2	50	0.57	23	0.56	23	0.43	17	0.32	13	0.11	4.3	-0.0024	-0.096
YOS-ML-33	0.025	0.52	0.57	12	0.93	20	0.56	12	0.50	11	0.29	6.1	0.098	2.1	-0.0025	-0.054
YOS-ML-37	0.034	0.76	0.570	13	0.92	20	0.26	5.7	0.23	5.1	0.14	3.1	0.047	1.0	-0.0024	-0.053
YOS-ML-38	0.026	0.92	0.64	23	0.75	27	0.29	10	0.24	8.6	0.15	5.2	0.045	1.6	-0.0024	-0.084

Sample Name	ENDO II ng/g ww	ENDO II ng/g lipid	c-NCLR ng/g ww	c-NCLR ng/g lipid	ENDO S ng/g ww	ENDO S ng/g lipid	PCB 153 ng/g ww	PCB 153 ng/g lipid	PCB 138 ng/g ww	PCB 138 ng/g lipid	PCB 187 ng/g ww	PCB 187 ng/g lipid	PCB 183 ng/g ww	PCB 183 ng/g lipid	Mirex ng/g ww	Mirex ng/g lipid
GRSA-SAND-12	0.093	1.1	0.12	1.4	0.32	3.7	0.063	0.72	0.055	0.63	0.025	0.29	0.0085	0.097	0.017	0.19
GRSA-SAND-31	0.068	0.93	0.11	1.5	0.29	4	0.085	1.2	0.072	0.98	0.055	0.75	0.012	0.17	0.059	0.8
GRSA-SAND-04	0.1	1.9	0.15	2.9	0.36	6.6	0.082	1.5	0.063	1.2	0.042	0.78	0.01	0.19	0.023	0.42
GRSA-SAND-27	0.059	0.49	0.11	0.93	0.2	1.6	0.082	0.68	0.056	0.46	0.066	0.54	0.011	0.089	0.068	0.56
GRSA-SAND-01	0.053	0.45	0.11	0.93	0.16	1.3	0.083	0.7	0.069	0.59	0.057	0.48	0.011	0.096	0.015	0.13
GRSA-SAND-25	0.077	0.8	0.14	1.4	0.37	3.8	0.071	0.74	0.059	0.62	0.035	0.36	0.0096	0.1	0.018	0.19
GRSA-SAND-22	0.076	0.88	0.11	1.3	0.23	2.7	0.081	0.94	0.067	0.78	0.05	0.58	0.011	0.12	0.017	0.2
GRSA-SAND-19	0.056	0.87	0.1	1.6	0.21	3.3	0.11	1.8	0.097	1.5	0.067	1	0.017	0.27	-0.0025	-0.038
LAVO-SL-11	-0.0021	-0.046	0.19	4	0.18	3.9	0.99	21	0.64	14	0.64	14	0.15	3.2	0.28	5.9
LAVO-SL-04	-0.0022	-0.065	0.12	3.4	0.16	4.7	0.78	23	0.47	14	0.45	13	0.11	3.4	0.19	5.4
LAVO-SL-12	-0.0023	-0.046	0.094	1.8	0.16	3.2	0.43	8.5	0.31	6	0.23	4.4	0.053	1.0	0.17	3.3
LAVO-SL-14	0.013	0.34	0.089	2.2	0.016	0.4	0.58	15	0.41	10	0.34	8.5	0.088	2.2	0.23	5.9
LAVO-SL-23	-0.0023	-0.041	0.081	1.5	0.21	3.7	0.77	14	0.63	11	0.38	6.9	0.13	2.3	0.42	7.4
LAVO-SL-32	-0.0022	-0.04	0.089	1.6	0.21	3.8	0.60	11	0.41	7.3	0.36	6.3	0.088	1.6	0.20	3.5
LAVO-SL-36	-0.0023	-0.043	0.065	1.2	0.17	3.3	0.51	9.5	0.25	4.7	0.30	5.5	0.063	1.2	0.11	2.0
LAVO-SL-37	-0.0023	-0.049	0.048	1	0.21	4.7	0.64	14	0.55	12	0.32	7.0	0.11	2.4	0.14	3.1
DR04	0.09	9.8	0.63	69	2	220	0.43	47	0.46	51	0.16	18	0.055	6	0.05	5.5
DR01	0.02	0.22	0.18	2	0.21	2.3	1.2	14	1.2	13	0.41	4.5	0.15	1.7	0.12	1.4
HA-13	0.08	1.9	0.22	5.1	0.4	9.4	0.32	7.4	0.29	6.7	0.11	2.6	0.043	1	-0.0037	-0.085
HA03	0.064	2.5	0.36	15	0.15	6.2	0.41	16	0.44	18	0.19	7.7	0.064	2.6	0.055	2.2
HA04	0.38	6.8	3.5	62	5.6	99	0.45	8	0.37	6.6	0.17	3	0.059	1.1	0.044	0.78
HY03	0.11	1.5	0.28	3.8			0.8	11	0.82	11	0.38	5.1	0.13	1.7	0.053	0.71
HY10	0.11	2	0.18	3.3	0.29	5.3	0.61	11	0.63	11	0.27	4.9	0.089	1.6	0.049	0.89
LP50	-0.0024	-0.076	0.16	5	0.36	11	0.35	11	0.27	8.6	0.14	4.5	0.041	1.3	0.031	0.99
LP49	0.013	0.32	0.12	2.9			0.21	5.1	0.18	4.2	0.093	2.2	0.028	0.68	0.034	0.81
Nan03	0.035	1.6	0.3	13	0.19	8.3	0.33	15	0.33	15	0.14	6.3	0.05	2.2	0.029	1.3
Nan04	0.13	4.2	6.6	200	2	62	0.34	11	0.32	10	0.13	4	0.046	1.4	0.023	0.72

Sample Name	ENDO II ng/g ww	ENDO II ng/g lipid	c-NCLR ng/g ww	c-NCLR ng/g lipid	ENDO S ng/g ww	ENDO S ng/g lipid	PCB 153 ng/g ww	PCB 153 ng/g lipid	PCB 138 ng/g ww	PCB 138 ng/g lipid	PCB 187 ng/g ww	PCB 187 ng/g lipid	PCB 183 ng/g ww	PCB 183 ng/g lipid	Mirex ng/g ww	Mirex ng/g lipid
ST07	0.013	0.31	0.33	7.9	0.79	19	0.57	14	0.58	14	0.32	7.5	0.079	1.9	0.047	1.1
ST12	0.01	0.26	0.16	3.9	0.72	18	0.34	8.5	0.3	7.5	0.13	3.2	0.04	1	0.026	0.64
ROMO-YSP-17	0.17	3.7	0.75	17	0.85	19	0.47	10	0.38	8.4	0.23	5.1	0.072	1.6	-0.0024	-0.053
ROMO-YSP-27	0.032	2.8	0.2	17	0.19	17	0.69	61	0.53	46	0.31	27	0.12	11	-0.0024	-0.21
WRST-COP-14	-0.0022	-0.036	0.56	9.2	0.21	3.4	0.63	10	0.51	8.3	0.19	3.1	0.065	1.1	0.055	0.9
WRST-COP-29	-0.0025	-0.03	0.27	3.2	0.13	1.5	0.71	8.3	0.56	6.5	0.13	1.6	0.065	0.75	0.055	0.64
WRST-COP-02	-0.0022	-0.054	0.49	12	0.11	2.7	0.94	23	0.77	19	0.3	7.4	0.085	2.1	0.04	0.97
WRST-COP-03	-0.0024	-0.029	0.96	12	0.11	1.3	2.6	32	2.1	25	0.66	8	0.24	2.9	0.21	2.5
WRST-COP-22	-0.0022	-0.046	0.41	8.4	0.085	1.7	1.6	33	1.3	27	0.45	9.2	0.14	3	0.081	1.7
WRSTCOP-04	-0.0023	-0.049	0.35	7.4	0.089	1.9	0.96	20	0.76	16	0.3	6.4	0.085	1.8	0.043	0.91
WRST-TAN-17	-0.0023	-0.034	0.71	11	0.11	1.7	1.4	21	1	16	0.41	6.3	0.12	1.9	0.11	1.6
WRST-TAN-02	-0.0023	-0.015	0.56	3.7	0.11	0.7	1.1	7.5	0.85	5.7	0.35	2.3	0.1	0.69	0.096	0.63
WRST-TAN-12	-0.0023	-0.023	0.32	3.2	0.084	0.85	0.89	9	0.63	6.4	0.24	2.4	0.07	0.71	0.067	0.68
WRST-TAN-07	-0.0023	-0.012	0.35	1.8	0.16	0.79	0.7	3.6	0.55	2.8	0.2	1	0.065	0.33	0.046	0.23
WRST-TAN-13	0.028	0.25	0.32	2.9	0.15	1.4	1.3	12	1.1	9.6	0.21	1.9	0.096	0.87	0.096	0.86
WRST-TAN-16	-0.0022	-0.057	0.24	6.1	0.09	2.3	1.3	32	0.97	25	0.39	9.9	0.1	2.6	0.035	0.89
YOS-ML-05	0.016	1.4	0.82	73	0.34	30	0.69	61	0.58	51	0.38	33	0.13	11	-0.0024	-0.21
YOS-ML-26	0.0056	0.50	0.58	52	0.36	32	0.41	37	0.36	32	0.27	24	0.095	8.4	-0.0024	-0.21
YOS-ML-10	0.010	0.77	0.37	28	0.17	13	0.37	28	0.30	22	0.22	16	0.075	5.6	-0.0020	-0.15
YOS-ML12	0.020	1.1	0.87	48	0.60	33	0.47	26	0.38	21	0.28	16	0.11	5.8	-0.0024	-0.13
YOS-ML-15	0.021	0.86	1.2	46	0.61	24	0.51	20	0.44	18	0.30	12	0.11	4.3	-0.0024	-0.095
YOS-ML-24	0.014	0.49	1.2	42	0.47	17	0.58	20	0.49	17	0.33	12	0.12	4.2	-0.0023	-0.081
YOS-ML-27	0.034	1.4	1.2	50	0.57	23	0.56	23	0.43	17	0.32	13	0.11	4.3	-0.0024	-0.096
YOS-ML-33	0.025	0.52	0.57	12	0.93	20	0.56	12	0.50	11	0.29	6.1	0.098	2.1	-0.0025	-0.054
YOS-ML-37	0.034	0.76	0.570	13	0.92	20	0.26	5.7	0.23	5.1	0.14	3.1	0.047	1.0	-0.0024	-0.053
YOS-ML-38	0.026	0.92	0.64	23	0.75	27	0.29	10	0.24	8.6	0.15	5.2	0.045	1.6	-0.0024	-0.084

Sample Name	FLO ng/g ww	FLO ng/g lipid	PHE ng/g ww	PHE ng/g lipid	ANT ng/g ww	FLA ng/g ww	FLA ng/g lipid	PYR ng/g ww	PYR ng/g lipid	Retene ng/g ww	Retene ng/g lipid	op-DDE ng/g ww	op-DDE ng/g lipid	pp-DDE ng/g ww	pp-DDE ng/g lipid
GRSA-SAND-12	-0.013	-0.15			-0.049	0.16	1.8	0.14	1.6	-0.037	-0.42	-0.048	-0.55	4.1	46
GRSA-SAND-31	0.2	2.7			-0.052	0.13	1.8	0.1	1.4	-0.039	-0.53	-0.051	-0.7	3.1	43
GRSA-SAND-04	-0.013	-0.24			-0.048	-0.0061	-0.11	-0.0054	-0.1	-0.036	-0.66	-0.047	-0.87	3.8	70
GRSA-SAND-27	0.27	2.2			-0.041	0.14	1.2	0.15	1.2	-0.031	-0.25	-0.04	-0.33	3.2	26
GRSA-SAND-01	0.24	2			-0.042	-0.0054	-0.045	-0.0048	-0.04	-0.031	-0.27	-0.041	-0.35	3.6	30
GRSA-SAND-25	0.11	1.2			-0.045	-0.0057	-0.06	0.049	0.51	0.11	1.1	-0.044	-0.46	3.5	36
GRSA-SAND-22	0.1	1.2			-0.044	-0.0056	-0.066	-0.005	-0.058	-0.033	-0.38	-0.043	-0.51	4.1	48
GRSA-SAND-19	0.2	3.1			-0.045	-0.0058	-0.089	0.064	1	-0.034	-0.52	-0.044	-0.68	2.9	45
LAVO-SL-11	0.34	7.3			0.11	0.5100	11	0.15	3.3	1.3	28	-0.039	-0.84	4.9	110
LAVO-SL-04	0.36	11			0.13	0.63	18			2	58	-0.041	-1.2	3.3	98
LAVO-SL-12	0.27	5.3			-0.043					0.38	7.5	-0.042	-0.83	1.8	34
LAVO-SL-14	0.25	6.2			-0.043					0.49	12	-0.043	-1.1	2.6	65
LAVO-SL-23					-0.043					1.4	26	-0.042	-0.76	5.1	91
LAVO-SL-32	0.44	7.7	2.9	51	-0.042	0.16	2.8	0.077	1.4	0.17	3.1	-0.041	-0.72	2.9	51
LAVO-SL-36	0.31	5.8			-0.043					0.25	4.6	-0.042	-0.79	1.7	32
LAVO-SL-37	0.45	9.9			-0.042					0.67	15	-0.041	-0.9	3.1	68
DR04					-0.046							-0.045	-5	3.3	360
DR01					-0.044					2.3	25	-0.043	-0.47	7.6	83
HA-13	-0.018	-0.42	2.8	66	-0.066	-0.0085	-0.2	-0.0075	-0.17	-0.05	-1.2	-0.065	-1.5	6.4	150
HA03					-0.045							-0.044	-1.7	8.3	330
HA04	0.87	16			-0.045	0.56	10	0.49	8.7			-0.044	-0.78	11	200
HY03					-0.045							-0.044	-0.6	12	160
HY10					-0.044							-0.043	-0.78	8	150
LP50					-0.045							-0.044	-1.4	3.4	110
LP49					-0.045							-0.044	-1.1	7.7	180
Nan03					-0.044							-0.044	-1.9	8.5	380
Nan04					-0.044							-0.043	-1.4	7.3	230

Sample Name	FLO ng/g ww	FLO ng/g lipid	PHE ng/g ww	PHE ng/g lipid	ANT ng/g ww	FLA ng/g ww	FLA ng/g lipid	PYR ng/g ww	PYR ng/g lipid	Retene ng/g ww	Retene ng/g lipid	op-DDE ng/g ww	op-DDE ng/g lipid	pp-DDE ng/g ww	pp-DDE ng/g lipid
ST07					-0.043							-0.043	-1	7.4	180
ST12	1.1	29			-0.044	0.45	11			1.9	48	-0.043	-1.1	4.2	100
ROMO-YSP-17					-0.043	0.11	2.3	0.085	1.9	0.3	6.7	-0.042	-0.94	15	340
ROMO-YSP-27					-0.043					0.24	21	-0.042	-3.7	7.8	680
WRST-COP-14	0.22	3.5			0.11	0.18	2.9	0.13	2.1	0.3	4.9	-0.041	-0.66	3.3	53
WRST-COP-29	0.37	4.4			-0.047	0.25	2.9	0.19	2.3	0.41	4.8	-0.047	-0.54	2	23
WRST-COP-02	0.34	8.3	2.5	60	0.14	-0.0053	-0.13	0.47	11	1.1	27	-0.041	-0.98	1.9	46
WRST-COP-03	-0.012	-0.14			0.23	0.18	2.2	0.1	1.2	0.15	1.8	-0.043	-0.52	7.7	93
WRST-COP-22	0.29	6	1.6	32	0.15	-0.0053	-0.11	0.34	7.1	0.89	18	-0.041	-0.84	2.9	59
WRSTCOP-04	0.32	6.7	1.6	35	-0.043					0.3	6.3	-0.043	-0.9	1.9	40
WRST-TAN-17	0.33	5			-0.042	0.23	3.4	0.19	2.9	0.42	6.3	-0.041	-0.62	5.1	77
WRST-TAN-02	-0.011	-0.076			-0.043	0.26	1.7	0.23	1.5	-0.032	-0.21	-0.042	-0.28	4.3	29
WRST-TAN-12	0.27	2.7			-0.043	0.16	1.6	0.13	1.4	-0.032	-0.33	-0.042	-0.43	2.8	28
WRST-TAN-07	-0.011	-0.058			-0.042	-0.0054	-0.028	-0.0048	-0.025	-0.032	-0.16	-0.042	-0.21	2.7	14
WRST-TAN-13	-0.012	-0.11			-0.044	0.17	1.6	0.17	1.5	-0.033	-0.3	-0.043	-0.39	3.9	35
WRST-TAN-16	0.59	15	2.4	61	-0.041	-0.0053	-0.13	0.073	1.9	-0.031	-0.79	-0.041	-1	2.9	73
YOS-ML-05					-0.043	0.13	12	0.092	8.2	0.2	18	0.052	4.6	26	2310
YOS-ML-26					-0.043	0.12	11	0.086	7.6	0.086	7.6	-0.042	-3.7	12	1030
YOS-ML-10					-0.036					0.13	9.5	-0.035	-2.6	13	980
YOS-ML12	0.21	11			-0.043	0.22	12	0.18	9.7	0.45	25	-0.042	-2.3	28	1540
YOS-ML-15	0.32	13			-0.043					0.71	28	-0.042	-1.7	19	770
YOS-ML-24					-0.042	0.15	5.4			0.39	14	0.056	2	24	860
YOS-ML-27					-0.043	0.20	18	0.13	11	0.38	33	-0.042	-3.7	23	2030
YOS-ML-33	0.46	9.6	3.7	78	-0.046	0.17	3.6	0.092	1.9	0.71	15	0.081	1.7	12	250
YOS-ML-37					-0.043	0.48	11	0.32	7.1	1.1	24	0.089	2	12	260
YOS-ML-38					-0.043							0.078	2.8	13	460

Sample Name	op-DDD ng/g ww	op-DDD ng/g lipid	pp-DDD ng/g ww	pp-DDD ng/g lipid	op-DDT ng/g ww	op-DDT ng/g lipid	pp-DDT ng/g ww	pp-DDT ng/g lipid	MXCLR ng/g ww	MXCLR ng/g lipid	B[a]A ng/g ww	B[a]A ng/g lipid	CHR/TRI ng/g ww	CHR/TRI ng/g lipid
GRSA-SAND-12	-0.056	-0.64	-0.13	-1.5	-0.1	-1.2	-0.1	-1.2			0.095	1.1	-0.016	-0.18
GRSA-SAND-31	-0.06	-0.82	-0.14	-1.9	-0.11	-1.5	-0.11	-1.5			-0.023	-0.32	-0.017	-0.23
GRSA-SAND-04	-0.055	-1	-0.12	-2.3	-0.1	-1.9	-0.1	-1.9			-0.021	-0.39	-0.016	-0.29
GRSA-SAND-27	-0.047	-0.39	-0.11	-0.89	-0.088	-0.73	-0.086	-0.71	6.8	56	-0.018	-0.15	-0.014	-0.11
GRSA-SAND-01	-0.048	-0.41	-0.11	-0.93	-0.09	-0.76	-0.088	-0.74	1.5	13	-0.019	-0.16	-0.014	-0.12
GRSA-SAND-25	-0.052	-0.54	-0.12	-1.2	-0.096	-1	-0.094	-0.98			-0.02	-0.21	-0.015	-0.15
GRSA-SAND-22	-0.051	-0.59	-0.12	-1.3	-0.095	-1.1	-0.093	-1.1			-0.02	-0.23	-0.015	-0.17
GRSA-SAND-19	-0.052	-0.8	-0.12	-1.8	-0.097	-1.5	-0.095	-1.5			-0.02	-0.31	-0.015	-0.23
LAVO-SL-11	0.087	1.9	0.71	15	-0.085	-1.8	0.13	2.8	0.13	2.8	0.19	4	0.12	2.6
LAVO-SL-04	0.086	2.5	0.54	16	-0.089	-2.6	0.12	3.6			0.24	7.2	0.14	4.3
LAVO-SL-12	0.085	1.7	0.42	8.2	-0.093	-1.8	0.14	2.7						
LAVO-SL-14	0.059	1.5	0.32	8.0	-0.093	-2.3	0.22	5.4	0.57	14	0.048	1.2	0.046	1.2
LAVO-SL-23	0.14	2.5	0.9	16	-0.093	-1.7	0.26	4.7						
LAVO-SL-32	0.11	1.9	0.61	11	-0.09	-1.6	0.13	2.3						
LAVO-SL-36	0.061	1.1	0.37	6.9	-0.093	-1.7	-0.091	-1.7			0.029	0.54	0.028	0.52
LAVO-SL-37	0.088	1.9	0.40	8.60	-0.091	-2.0	0.12	2.6					0.048	1.1
DR04	-0.053	-5.8	-0.12	-13	-0.099	-11	-0.097	-11	-0.12	-13	-0.021	-2.2	-0.015	-1.7
DR01	-0.05	-0.55	0.31	3.4	-0.094	-1	-0.091	-1	-0.11	-1.2	-0.019	-0.21	-0.014	-0.16
HA-13	-0.077	-1.8	-0.17	-4	-0.14	-3.3	-0.14	-3.2			0.26	6	-0.022	-0.51
HA03	-0.052	-2	1.1	41	-0.096	-3.8	-0.094	-3.7	-0.11	-4.5	-0.02	-0.79	-0.015	-0.58
HA04	-0.052	-0.92	1.2	21	-0.096	-1.7	-0.094	-1.7	-0.11	-2	-0.02	-0.36	-0.015	-0.26
HY03	-0.052	-0.7	0.87	12	-0.097	-1.3	-0.095	-1.3	0.45	6	-0.02	-0.27	-0.015	-0.2
HY10	-0.05	-0.92	-0.11	-2.1	-0.094	-1.7	-0.091	-1.7	-0.11	-2	-0.019	-0.35	-0.014	-0.26
LP50	-0.052	-1.6	0.22	7	-0.096	-3	-0.094	-3	-0.11	-3.6	-0.02	-0.63	-0.015	-0.47
LP49	-0.052	-1.2	1.7	40	-0.097	-2.3	-0.094	-2.2	-0.11	-2.7	-0.02	-0.48	-0.015	-0.35
Nan03	-0.051	-2.3	1.5	65	-0.095	-4.2	-0.093	-4.1	-0.11	-5	-0.02	-0.87	-0.015	-0.65
Nan04	-0.051	-1.6	0.84	26	-0.095	-3	-0.093	-2.9	-0.11	-3.5	-0.02	-0.61	-0.015	-0.46

Sample Name	op-DDD ng/g ww	op-DDD ng/g lipid	pp-DDD ng/g ww	pp-DDD ng/g lipid	op-DDT ng/g ww	op-DDT ng/g lipid	pp-DDT ng/g ww	pp-DDT ng/g lipid	MXCLR ng/g ww	MXCLR ng/g lipid	B[a]A ng/g ww	B[a]A ng/g lipid	CHR/TRI ng/g ww	CHR/TRI ng/g lipid
ST07	-0.05	-1.2	1.6	38	-0.093	-2.2	-0.091	-2.1	-0.11	-2.6	-0.019	-0.46	-0.014	-0.34
ST12	-0.051	-1.3	1.1	26	-0.095	-2.4	-0.092	-2.3	-0.11	-2.8	-0.02	-0.49	-0.015	-0.36
ROMO-YSP-17	-0.05	-1.1	2.2	49	-0.093	-2.1	-0.091	-2			0.026	0.59	0.026	0.57
ROMO-YSP-27	-0.05	-4.4	0.22	20	-0.093	-8.2	0.12	10.0			0.021	1.8	0.022	2
WRST-COP-14	-0.048	-0.77	-0.11	-1.8	-0.089	-1.4	-0.087	-1.4	15	250	-0.018	-0.3	-0.014	-0.22
WRST-COP-29	-0.055	-0.64	-0.12	-1.4	-0.1	-1.2	-0.099	-1.2			-0.021	-0.25	-0.016	-0.18
WRST-COP-02	-0.048	-1.2	-0.11	-2.6	-0.089	-2.1	-0.087	-2.1	3.5	84	0.29	7.1	0.11	2.7
WRST-COP-03	-0.051	-0.62	-0.12	-1.4	-0.095	-1.1	0.54	6.6	1.2	14	-0.02	-0.24	-0.015	-0.18
WRST-COP-22	-0.048	-0.99	-0.11	-2.2	-0.089	-1.8	-0.087	-1.8	2.9	60	0.23	4.8	0.087	1.8
WRSTCOP-04	-0.05	-1.1	-0.11	-2.4	-0.093	-2	-0.091	-1.9	2.5	52	-0.019	-0.41	-0.014	-0.3
WRST-TAN-17	-0.048	-0.73	-0.11	-1.7	-0.09	-1.4	-0.088	-1.3	3.6	55	-0.019	-0.28	-0.014	-0.21
WRST-TAN-02	-0.049	-0.33	-0.11	-0.74	-0.091	-0.61	-0.089	-0.59			-0.019	-0.13	-0.014	-0.093
WRST-TAN-12	-0.05	-0.5	-0.11	-1.1	-0.092	-0.94	-0.09	-0.92	0.92	9.4	-0.019	-0.19	-0.014	-0.14
WRST-TAN-07	-0.049	-0.25	-0.11	-0.57	-0.091	-0.47	-0.089	-0.46			-0.019	-0.097	-0.014	-0.072
WRST-TAN-13	-0.05	-0.46	-0.11	-1	-0.094	-0.85	-0.092	-0.83			-0.019	-0.18	-0.014	-0.13
WRST-TAN-16	-0.048	-1.2	-0.11	-2.8	-0.089	-2.3	-0.087	-2.2	3.3	84	-0.018	-0.47	-0.014	-0.35
YOS-ML-05	0.16	14	1.7	150	-0.092	-8.2	0.36	32			-0.019	-1.7	0.02	1.7
YOS-ML-26	0.10	9.0	1.2	100	-0.092	-8.2	0.12	11.0			0.02	1.8	0.027	2.4
YOS-ML-10	0.055	4.0	0.92	68	-0.076	-5.7	0.14	10			0.018	1.4		
YOS-ML12	0.17	9.5	2.0	110	-0.093	-5.1	0.29	16.0	0.43	24	0.066	3.6	0.052	2.9
YOS-ML-15	0.18	7.1	1.5	59	-0.09	-3.7	0.19	7.7			-0.019	-0.76	0.0	0.96
YOS-ML-24	0.19	6.8	2.1	74	-0.09	-3.2	0.38	13			0.027	0.94		
YOS-ML-27	0.17	15	2.0	180	-0.092	-8.2	0.32	28			0.05	4.4	0.037	3.3
YOS-ML-33	0.21	4.4	1.5	31	-0.099	-2.1	0.3	6.3						
YOS-ML-37	0.22	4.8	1.4	32	-0.093	-2.1	0.33	7.3	0.96	21	0.16	3.5	0.1	2.3
YOS-ML-38	0.26	9.4	1.6	59	-0.092	-3.3	0.35	13						

Sample Name	B[b]F ng/g ww	B[b]F ng/g lipid	B[k]F ng/g ww	B[k]F ng/g lipid	B[e]P ng/g ww	B[e]P ng/g lipid	B[a]P ng/g ww	B[a]P ng/g lipid	I[1,2,3-cd]p ng/g ww	I[1,2,3-cd]p ng/g lipid	D[ah]A ng/g ww	D[ah]A ng/g lipid	B[ghi]P ng/g ww	B[ghi]P ng/g lipid
GRSA-SAND-12	-0.017	-0.19	-0.019	-0.22	-0.088	-1	-0.014	-0.16	-0.015	-0.17	-0.016	-0.18	0.064	0.73
GRSA-SAND-31	-0.018	-0.24	-0.02	-0.28	-0.094	-1.3	-0.015	-0.2	-0.016	-0.22	-0.017	-0.23	-0.0055	-0.075
GRSA-SAND-04	-0.016	-0.31	-0.019	-0.35	-0.086	-1.6	-0.013	-0.25	-0.015	-0.27	-0.015	-0.28	-0.0051	-0.094
GRSA-SAND-27	-0.014	-0.12	-0.016	-0.13	-0.074	-0.61	-0.012	-0.096	-0.013	-0.1	-0.013	-0.11	-0.0044	-0.036
GRSA-SAND-01	-0.014	-0.12	-0.017	-0.14	-0.076	-0.64	-0.012	-0.1	-0.013	-0.11	-0.013	-0.11	-0.0044	-0.038
GRSA-SAND-25	-0.015	-0.16	-0.018	-0.18	-0.081	-0.85	-0.013	-0.13	-0.014	-0.14	-0.014	-0.15	-0.0047	-0.049
GRSA-SAND-22	-0.015	-0.18	-0.017	-0.2	-0.08	-0.93	-0.012	-0.15	-0.013	-0.16	-0.014	-0.16	-0.0047	-0.054
GRSA-SAND-19	-0.016	-0.24	-0.018	-0.28	-0.082	-1.3	-0.013	-0.2	-0.014	-0.21	-0.014	-0.22	-0.0048	-0.074
LAVO-SL-11	0.26	5.6	0.079	1.7	0.17	3.6	0.17	3.7	0.1	2.2	0.34	7.2	0.13	2.8
LAVO-SL-04	0.35	10	0.11	3.1	0.21	6.2	0.24	7.0	0.14	4.2	0.041	1.2	0.17	5.1
LAVO-SL-12											-0.014	-0.27		
LAVO-SL-14	0.098	2.5			-0.078	-2	0.13	3.2	0.075	1.9	0.021	0.52	0.051	1.3
LAVO-SL-23											-0.014	-0.25		
LAVO-SL-32							-0.012	-0.21	0.013	0.24	0.043	0.77		
LAVO-SL-36	0.051	0.96					0.03	0.55	0.024	0.45	-0.014	-0.26		
LAVO-SL-37	0.03	0.66									-0.014	-0.29		
DR04	-0.016	-1.7	-0.018	-2	-0.084	-9.1	-0.013	-1.4	-0.014	-1.5	-0.015	-1.6	-0.0049	-0.54
DR01	-0.015	-0.17	-0.017	-0.19	-0.079	-0.87	-0.012	-0.14	-0.013	-0.15	-0.014	-0.15	-0.0046	-0.051
HA-13	-0.023	-0.53	-0.026	-0.61	-0.12	-2.8	-0.019	-0.44	-0.02	-0.47	-0.021	-0.49	-0.007	-0.16
HA03	-0.015	-0.61	-0.018	-0.7	-0.081	-3.2	-0.013	-0.5	-0.014	-0.54	-0.014	-0.57	-0.0047	-0.19
HA04	-0.015	-0.28	-0.018	-0.31	-0.081	-1.4	-0.013	-0.23	-0.014	-0.24	-0.014	-0.26	-0.0047	-0.085
HY03	-0.016	-0.21	-0.018	-0.24	-0.082	-1.1	-0.013	-0.17	-0.014	-0.19	-0.014	-0.2	-0.0048	-0.065
HY10	-0.015	-0.27	-0.017	-0.31	-0.079	-1.4	-0.012	-0.22	-0.013	-0.24	-0.014	-0.25	-0.0046	-0.084
LP50	-0.015	-0.49	-0.018	-0.56	-0.081	-2.6	-0.013	-0.4	-0.014	-0.43	-0.014	-0.45	-0.0047	-0.15
LP49	-0.016	-0.37	-0.018	-0.42	-0.081	-1.9	-0.013	-0.3	-0.014	-0.33	-0.014	-0.34	-0.0048	-0.11
Nan03	-0.015	-0.68	-0.017	-0.77	-0.08	-3.5	-0.013	-0.55	-0.013	-0.6	-0.014	-0.63	-0.0047	-0.21
Nan04	-0.015	-0.48	-0.017	-0.54	-0.08	-2.5	-0.012	-0.39	-0.013	-0.42	-0.014	-0.44	-0.0047	-0.15

Sample Name	B[b]F ng/g ww	B[b]F ng/g lipid	B[k]F ng/g ww	B[k]F ng/g lipid	B[e]P ng/g ww	B[e]P ng/g lipid	B[a]P ng/g ww	B[a]P ng/g lipid	I[1,2,3-cd]p ng/g ww	I[1,2,3-cd]p ng/g lipid	D[ah]A ng/g ww	D[ah]A ng/g lipid	B[ghi]P ng/g ww	B[ghi]P ng/g lipid
ST07	-0.015	-0.35	-0.017	-0.4	-0.078	-1.8	-0.012	-0.29	-0.013	-0.31	-0.014	-0.33	-0.0046	-0.11
ST12	-0.015	-0.38	-0.017	-0.43	-0.08	-2	-0.012	-0.31	-0.013	-0.33	-0.014	-0.35	-0.0047	-0.12
ROMO-YSP-17	0.094	2.1	0.56	13	-0.078	-1.7	0.036	0.81	0.044	0.98	-0.014	-0.31	0.054	1.2
ROMO-YSP-27	0.044	3.9	0.49	43	-0.078	-6.9	0.018	1.6	-0.013	-1.2	-0.014	-1.2	0.022	2
WRST-COP-14	-0.014	-0.23	-0.016	-0.26	-0.075	-1.2	-0.012	-0.19	-0.013	-0.2	-0.013	-0.21	-0.0044	-0.071
WRST-COP-29	-0.016	-0.19	-0.019	-0.22	-0.086	-1	-0.013	-0.16	-0.014	-0.17	-0.015	-0.18	-0.005	-0.059
WRST-COP-02	0.31	7.5	0.11	2.6	0.19	4.7	0.23	5.6	0.19	4.6	-0.013	-0.32	0.16	3.8
WRST-COP-03	-0.015	-0.18	-0.017	-0.21	-0.08	-0.97	-0.012	-0.15	-0.013	-0.16	-0.014	-0.17	-0.0047	-0.057
WRST-COP-22	0.23	4.6	-0.016	-0.34	0.16	3.3	-0.012	-0.24	0.16	3.3	-0.013	-0.27	0.17	3.4
WRSTCOP-04	-0.015	-0.32	-0.017	-0.36	-0.079	-1.7	-0.012	-0.26	-0.013	-0.28	-0.014	-0.29	-0.0046	-0.097
WRST-TAN-17	-0.014	-0.22	-0.017	-0.25	-0.076	-1.2	-0.012	-0.18	-0.013	-0.19	-0.013	-0.2	-0.0044	-0.067
WRST-TAN-02	-0.015	-0.097	-0.017	-0.11	-0.077	-0.51	-0.012	-0.08	-0.013	-0.086	-0.014	-0.09	-0.0045	-0.03
WRST-TAN-12	-0.015	-0.15	-0.017	-0.17	-0.078	-0.79	-0.012	-0.12	-0.013	-0.13	-0.014	-0.14	-0.0046	-0.046
WRST-TAN-07	-0.015	-0.075	-0.017	-0.086	-0.077	-0.39	-0.012	-0.061	-0.013	-0.066	-0.014	-0.069	-0.0045	-0.023
WRST-TAN-13	-0.015	-0.14	-0.017	-0.16	-0.079	-0.71	-0.012	-0.11	-0.013	-0.12	-0.014	-0.13	-0.0046	-0.042
WRST-TAN-16	-0.014	-0.36	-0.016	-0.42	-0.075	-1.9	-0.012	-0.3	-0.013	-0.32	-0.013	-0.34	-0.0044	-0.11
YOS-ML-05	0.037	3.3	0.039	3.5	-0.078	-6.9			-0.013	-1.2	-0.014	-1.2	0.02	1.8
YOS-ML-26	0.1	9	0.034	3	-0.077	-6.9	0.033	2.9	0.06	5.3	-0.014	-1.20	0.073	6.5
YOS-ML-10											-0.011	-0.84		
YOS-ML12	0.095	5.3	0.031	1.7	-0.078	-4.3	0.051	2.8	0.056	3.1	0.041	2.3	0.054	3
YOS-ML-15	0.051	2.1					-0.012	-0.49			-0.014	-0.55		
YOS-ML-24											-0.013	-0.47		
YOS-ML-27	0.072	6.3	0.058	5.1	-0.078	-6.9	0.030	2.7	-0.013	-1.2	-0.014	-1.2	0.039	3.4
YOS-ML-33							-0.013	-0.27	-0.014	-0.3	0.032	0.68		
YOS-ML-37	0.27	5.9	0.32	7	0.16	3.6	0.16	3.5	0.14	3.1	0.039	0.88	0.140	3.2
YOS-ML-38											-0.014	-0.49		