Ecological Assessment of Husky Lakes and Sitidgi Lake, Northwest Territories, 2000-2004

M.-J. Roux, P. Sparling, J. Felix, and L.A. Harwood

Central and Arctic Region
Fisheries and Oceans Canada
501 University Crescent
Winnipeg, MB R3T 2N6

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Central and Arctic Region

Fisheries and Oceans Canada

501 University Crescent

Winnipeg, MB R3T 2N6

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The Husky Lakes (formerly known as Eskimo Lakes) form an estuarine system consisting of five interconnected basins linked by narrow channels that drain into Liverpool Bay in the Beaufort Sea, Northwest Territories (NT), Canada. Sitidgi Lake is a large freshwater lake that drains into the inland-most basin of Husky Lakes. The Husky Lakes have been designated as an ecologically and biologically significant area, within the Beaufort Sea Large Ocean Management Area (LOMA). Both ecosystems are culturally and economically important to Inuvialuit, particularly residents of Tuktoyaktuk and Inuvik, NT. An annual survey of fishery resources and their habitats was conducted during the open-water season from 2001 to 2004 in Husky Lakes, and in 2002 and 2003 in Sitidgi Lake. Data collection involved water depth, water properties and composition, surface sediments and lower trophic levels, and sampling of the near-shore fish community using small-mesh experimental gillnets. Also conducted was a five-year (2000-2004) harvest-based monitoring survey of the subsistence Lake Trout (*Salvelinus namaycush*) fishery that occurs in the inner three basins of Husky Lakes, and in Sitidgi Lake, each spring. Here we present results from all study components, including physico-chemical ecosystem description; analyses of fish species abundance and distribution; biological characteristics of Lake Trout harvests; and selected contaminant levels in water, sediments and fish. The results reveal how complex bathymetric and shoreline characteristics of Husky Lakes ensure connectivity to the marine environment, shape mixing conditions and water properties, and determine structuring of the fish community. The available data indicate that salinity was determinant of fish distribution and suggest the biological structure of Husky Lakes may be vulnerable to changes in the freshwater budget. The Husky Lakes are oligotrophic and exhibit a strong dependence upon external subsidies. Fish production was closely associated with benthic and marine energy pathways at the time of sampling. The ecological assessment of Husky Lakes and Sitidgi Lake provides baseline biological and environmental information for use in future assessments and monitoring of the impacts of ongoing climate change and anthropogenic development in the area.

Key words: Arctic estuary; water properties; bathymetry; fish abundance; coregonids; Pacific Herring; subsistence fishery; Lake Trout; monitoring; sediments; contaminants.

RÉSUMÉ

Roux, M.-J., Sparling, P., Felix, J., and Harwood, L.A. 2014. Ecological assessment of Husky Lakes and Sitidgi Lake, Northwest Territories, 2000-2004. Can. Tech. Rep. Fish. Aquat. Sci. 3071: ix + 123 p.

Les lacs Husky (autrefois connus sous le nom des lacs Eskimo), forment un écosystème estuarien constitué de cinq bassins interconnectés et reliés entre eux par d’étroits canaux, se déversant dans la baie de Liverpool dans la mer de Beaufort, au Territoires du Nord-Ouest (TNO), Canada. Le lac Sitidgi est un grand lac d’eau douce se déversant dans le bassin de tête des lacs Husky par l’entremise d’un tributaire. Les lacs Husky ont été désignés zone d’importance écologique et biologique (ZIEB) au sein des zones étendues de gestion des océans (ZEGO) dans la mer de Beaufort. Ces écosystèmes ont une grande importance culturelle et économique pour les Inuvialuit, en particulier les résidents de Tuktoyaktuk et Inuvik aux TNO. Un échantillonnage annuel des ressources halieutiques et des habitats aquatiques a été réalisé pendant la saison d’eaux libres de 2001 à 2004 au sein des lacs Husky, ainsi qu’en 2002 et 2003 dans le lac Sitidgi. Les données récoltées incluent profondeur, composition et propriétés de l’eau; sédiments superficiels et niveaux trophiques inférieurs; ainsi qu’un échantillonnage de la communauté de poissons du littoral au moyen de filets maillants expérimentaux équipés de petites mailles. Un suivi des prises dans la pêche de subsistance au touladi (*Salvelinus namaycush*), ayant lieu chaque printemps dans le lac Sitidgi ainsi que dans les trois bassins de tête des lacs Husky, a également été réalisé au cours de cinq années consécutives (2000-2004) dans le contexte de cette étude. Nous présentons ici les résultats relatifs aux différentes composantes de l’étude, incluant la description physico-chimique de l’écosystème; les analyses d’abondance et de distribution des espèces de poissons; les caractéristiques biologiques des prises de touladi; ainsi que les niveaux de certains contaminants sélectionnés dans l’eau, les sédiments et les poissons. Les résultats révèlent comment la complexité du littoral et de la bathymétrie des lacs Husky assurent leur connectivité à l’environnement marin, façonnent les conditions de mélanges et de propriétés des eaux, et déterminent la structure de la communauté de poissons. Les données disponibles indiquent que la salinité détermine la distribution des poissons et suggèrent que la structure biologique des lacs Husky pourrait être vulnérable aux changements dans les budgets d’eaux douces. Les lacs Husky sont oligotrophes et démontrent une forte dépendance envers les apports externes. La production halieutique était étroitement associée aux sources d’énergies benthiques et marines au moment de l’échantillonnage. L’évaluation écologique des lacs Husky et du lac Sitidgi fournie des informations biologiques et environnementales de base pouvant servir aux fins de futurs évaluations et suivis des impacts causés par les changements climatiques et les aménagements d’ordre anthropique dans la région.

Mots-clés: estuaire Arctique; propriétés de l’eau; bathymétrie; abondance de poissons; corégonides; hareng du Pacifique; pêche de subsistance; touladi; surveillance; sédiments; contaminants.

INTRODUCTION

The Husky Lakes estuary consists of interconnected basins linked by narrow channels that drain into Liverpool Bay in the Beaufort Sea, Northwest Territories (NT), Canada (Fig. 1). Sitidgi Lake is a large freshwater lake that drains into the inland-most basin of Husky Lakes (Fig. 1). Both systems are located above the Arctic Circle between 68-69 degrees North latitude.

The Husky Lakes and Sitidgi Lake hold historical and present-day economic and cultural importance for the Inuvialuit of Canada's Western Arctic, particularly residents of Tuktoyaktuk and Inuvik, NT. For many centuries, the Husky Lakes have been used for subsistence fishing, hunting, trapping and travelling by residents from these communities. Fish species like Lake Trout (*Salvelinus namaycush*) and several coregonids such as whitefishes, ciscoes and Inconnu (*Stenodus leucichthys*) are a key source of traditional food in the Inuvialuit diet, and are harvested from Husky Lakes and Sitidgi Lake in the spring. Although technically an estuary, the Husky Lakes system is viewed and known locally as Husky Lakes, and we refer to it as such here to be consistent.

During July, researchers and harvesters have observed beluga whales (*Delphinapterus leucus*) at the mouth of, and within, Liverpool Bay, including whales diving in the presence of seabirds and darting, behaviours associated with feeding (Norton and Harwood 1985). It is presumed that beluga enter Husky Lakes to follow schools of fish, and are enticed to remain in the area by the abundant food resources. Beluga entering, and in some cases becoming trapped in the lakes when ice forms in the fall, provided an important source of winter food for Inuvialuit long ago. In the present day, hundreds or even thousands of belugas are often sighted in the outer three basins of Husky Lakes during July and August, and have on occasion been observed as far inland as Sitidgi Lake (authors' unpublished data). Sometimes a small proportion does not leave soon enough and become trapped by newly forming ice. Records show that Beluga entrapments have occurred at least six times since the 1960s: winter 1966-67 (n=50), 1969-70 (n=9), 1989-90 (n=125), 1996-97 (n=21), 2006-07 (n=37) and 2007-2008 (n=10) (DFO authors' unpublished data; Hill 1967). In 1989, 1996 and 2006, trapped whales were removed by Inuvialuit hunters and some were sampled. There were instances of large male belugas ($\geq$425 cm) having large (e.g., 1.1 m) Lake Trout in their stomachs (J. Orr, DFO, Winnipeg, unpublished data, 2006; authors' unpublished data). Seals are also sighted regularly in Husky Lakes, including where Pacific Herring (*Clupea pallasii*) spawn in spring in the outer fingers (authors unpublished data).

The Husky Lakes system was established as a protected area in the Northwest Territories (GNWT 2010). Its unique character and continuing importance to Inuvialuit was underscored during recent workshops for the identification of ecologically and biologically significant areas (EBSAs) within the Beaufort Sea Large Ocean Management Area (LOMA) (Cobb et al. 2008; Paulic et al. 2009). Both the Husky Lakes and Liverpool Bay were identified as EBSAs, a status implying an enhanced level of protection in the form of greater-than-average risk avoidance under Canada's Oceans Act (DFO 2004; Paulic et al. 2009). More recently, the Inuvialuit Land Administration (ILA) developed the Husky Lakes Special Cultural Area Criteria (ILA 2011) which sets management goals and environmental standards for protecting the system.

Management initiatives are emerging, as the area holds increasing opportunities for future anthropogenic development. While there is a ban on hydrocarbon development within 1 km of the shores of Husky Lakes (ILA 2011), natural gas exploration sites and a proposed production area (Parsons Lake Natural Gas Field) are located near, or within, the Husky Lakes drainage. In 2013, the construction and operation of an all-weather road between Inuvik and Tuktoyaktuk was approved by the Inuvialuit Environmental Impact Review Board (IRC 2013). Preliminary work on the road was initiated in February 2013, with the regulatory phase likely to begin in fall 2013, and construction expected to take place over three winter seasons, starting in 2013/2014. The highway alignment is located adjacent to the Husky Lakes for more than 50 km and potential borrow sources for road building are located mainly within the Husky Lakes drainage (Kiggiak-EBA Consulting 2010). This development, and others that are possible/pending, are occurring concurrently with climate change in the region (AANDC 2013). Climate changes that affect permafrost and erosion (Whalen 2013), freshwater, and ice and snow accumulation could have profound consequences on Arctic aquatic ecosystems such as Husky Lakes, in which physical, chemical and biological patterns and processes are highly influenced by annual freshwater budgets (Prowse et al. 2006).

This project was done to document baseline biological, environmental and contaminant information on the Husky Lakes area to ensure its protection in the future. Baseline information on Husky Lakes has been collected since the 1960s, and is sparsely available in the grey literature. This includes marine mammal observations (Hill 1967), zoobenthos and sediment composition data (Wacasey 1974), physical, nutrients and primary production data (Grainger et al. 1977), sea ice microalgae data (Hsiao 1979), freshwater budget information (Gushue et al. 1996) and adjacent fisheries investigations (i.e., Liverpool Bay) (Bray 1975; Hunter 1975; Gillman and Kristofferson 1984; Shields 1985; Bond and Erickson 1993; Bond et al. 1997). Peer-reviewed scientific information is available concerning the primary productivity of Husky Lakes (Grainger and Evans 1982), its zooplankton community (Evans and Grainger 1980), and more recently, on the oceanographic characteristics of the system (Macdonald et al. 1999, Carmack and Macdonald 2008).

Recognizing the importance of fishery resources from Husky Lakes and Sitidgi Lake to Inuvialuit communities, and considering the lack of information on fish species abundance and distribution in these systems, the Department of Fisheries and Oceans (DFO), together with the communities of Tuktoyaktuk and Inuvik, conducted a survey of fishery resources and habitat information in Husky Lakes and Sitidgi Lake from 2001 to 2004. This included a summary evaluation of contaminant concentrations in fish and in surface sediments in collaboration with Environment Canada. Also conducted was a five-year harvest-based monitoring survey of the Lake Trout subsistence fishery from 2000 to 2004. This report presents the major findings of these study components, including characterization of the physical environment; water properties and composition; fish species composition, relative abundance and distribution during the open water season; and characteristics of the spring subsistence fishery for Lake Trout. Biological and environmental information synthesized in this report details and reaffirms the unique character of the Husky Lakes ecosystem, and will serve as a baseline against which future activities can be monitored and evaluated.

MATERIALS AND METHODS

STUDY AREA

Geographic location, landscape, and climate

The Husky Lakes are located between 68°40' and 69°70' N Latitude, and 133°30' and 130°55' W longitude (Fig. 1). The lakes are separated from Liverpool Bay by a shallow sill near Kugaluk Channel and Thumb Island, roughly 4 m deep (Carmack and Macdonald 2008) (Fig. 1). From Thumb Island, the Husky Lakes system extends approximately 130 km inland, and is bounded by the Tuktoyaktuk Peninsula to the north. Sitidgi Lake is located south of Husky Lakes at 68°32' N and 132°42' W (centre point).

Two communities are located near the study area: Tuktoyaktuk (69°26'N, 133°01'W) and Inuvik (68°18'N, 133°29'W). Tuktoyaktuk (population 929 in 2009, NWT Bureau of Statistics 2010) is situated approximately 25 km north of Husky Lakes. Inuvik (population 3586 in 2009, NWT Bureau of Statistics 2010) is situated approximately 35 km from the southern edge of Sitidgi Lake and approximately 46 km southwest of the inland-most basin of Husky Lakes (Fig. 1). Three major river systems enter Liverpool Bay: the Miner River and Kugaluk River at Kugaluk Channel, and the Anderson River near the mouth in the Beaufort Sea (Fig. 1).

The Husky Lakes and Sitidgi Lake are located in the southern Arctic ecozone and Tuktoyaktuk coastal plain/Arctic coastal tundra ecoregion. The region is characterized by low, wet and gradually rising plains with poor drainage and many thaw lakes that can cover up to 50 percent of the land surface (Gallant et al. 1995; Ricketts et al. 1999; NRC 2007). Permafrost is deep and continuous, with elevated ice content (Ricketts et al. 1999). Pingos (conical hills with massive ice cores) are found in clusters on all sides of Husky Lakes (Cobb et al. 2008). Low arctic climate conditions characterize the region with mean annual temperatures ranging from -8.8°C to -10.6°C (calculated means for Inuvik and Tuktoyaktuk airports, respectively (Environment Canada 2010)). Annual precipitation is low (<250 mm), and occurs mostly as snow. Summers are short with monthly means >0°C occurring from June to September only. Daily average temperatures for July are equivalent to 11°C and 14.2°C in Tuktoyaktuk and Inuvik, respectively (Environment Canada 2010).

Shrubby tundra vegetation consisting of dwarf birch, willow, northern Labrador Tea, *Dryas* spp. and sedge tussocks and sphagnum moss (in damper sites) covers most of the area. Stunted white spruce, black spruce and some larch are also common around Sitidgi Lake and on the southern shore of the inland-most basins of Husky Lakes located near the tree line.

Basin identifiers

The Husky Lakes consist of a series of five interconnected, unnamed basins, linked by two sets of narrow channels or "fingers". For the purpose of this study, we have named, and hereafter refer to, the five basins as B1 through B5, the two finger areas as inner fingers (IF) and outer fingers (OF), and Kugaluk Channel (KG) (Fig. 2). B1 is the inland-most basin, while B5 is located closest to the mouth, and separated from Liverpool Bay by the OF. KG is the narrow inlet located at the southwest end of Liverpool Bay comprising the mouths of Miner and Kugaluk Rivers. The Beaufort Sea is seaward of

Liverpool Bay, Sitidgi Lake is inland of, and connected to, Husky Lakes by a narrow, shallow, 6 km long channel called Sitidgi Creek.

Water dynamics

The Husky Lakes are ice-covered, on average, eight months a year from mid-October to mid-June. Ice thickness can reach up to 2 m depending on location. Land fast ice covers most of the system with the exception of finger areas and headlands, where currents and inflows usually maintain regions of thin ice or open water throughout the winter (Macdonald et al. 1999). Freshet usually begins in mid- to late-May however, breakup times are highly variable between basins and years (Grainger and Evans 1982; Macdonald et al. 1999).

An annual freshwater discharge of 1 $km^3 \cdot yr^{-1}$ to Husky Lakes was estimated by Gushue et al. (1996). Macdonald et al. (1999) estimated that freshwater inputs to the system originate mainly from ice melt, with melting ice contributing four times the amount of freshwater compared to surface runoff and precipitation combined. The estuary is characterized by semidiurnal (12.4 hr period) tides of small amplitude (typically less than 0.5 m (Grainger and Evans 1982; Carmack and Macdonald 2008). Details on tidal flows into Husky Lakes are provided by Carmack and Macdonald (2008). The small channels between B2 and B3 and the IF (IF) between B3 and B4 have been shown to limit water mixing to some degree (Evans and Grainger 1980). Alternatively, the OF area has been suggested to enhance water mixing and saltwater dispersion into the estuary (Carmack and Macdonald 2008).

FIELD SAMPLING

Sampling effort

<u>Husky Lakes</u>

The Husky Lakes were sampled for fish, water properties and water depth during July 2001, 2002, 2003, and 2004. Each year, sampling was conducted by one DFO contract biologist working with five community co-researchers. In all years, sampling was conducted shortly after ice breakup between late-June and mid- to late-July, depending on year and location. B1 and B2 were sampled in 2001 (June 26-July 7); B3, B4 and IF in 2002 (July 5-16); B5, OF and KG in 2003 (June 30-July 11). Parts of B4, B5 and OF were re-sampled in 2004 (July 16-24). Sediment and zooplankton collections were conducted in a separate study by Environment Canada in August 2002 and 2004, respectively (Evans 2003; Evans 2004).

<u>Sitidgi Lake</u>

Sitidgi Lake was sampled for fish, water quality, and water depth in July 2002 (26-31) and 2003 (5-14), by a team consisting of one DFO biologist, a student, and two community co-researchers.

Bathymetry

The bathymetric survey of Husky Lakes consisted of 17 016 depth soundings collected using a Garmin GPSMAP 168 Sounder mounted in an 18’ Lund with 60 hp outboard.

Spatial coverage was equivalent to 9 depth measurements per km^2 throughout the system, but varied among basins, from 2 soundings per km^2 in B3 to 20 soundings per km^2 in B5 (Table 1). In KG, 474 depth measurements (4 per km^2) were taken. The bathymetric survey of Sitidgi Lake consisted of 6 539 depth soundings (22 per km^2) (Table 1).

Water properties and composition

Surface water temperature, pH, and salinity measurements were taken at 196 locations in Husky Lakes using a Horiba U-10 water quality profiler (Fig. 3a). The same profiler was used to conduct salinity and temperature profiles with depth at 20 stations in Husky Lakes and 3 stations in Sitidgi Lake (Fig. 3b). Water temperature and pH measurements were taken at 36 locations in Sitidgi Lake (Fig. 3a).

Water samples were collected from 10 stations in Husky Lakes for determination of nutrients, organic carbon (dissolved and particulate) and other trace element (i.e., trace nutrient and trace metals) and organic contaminants (i.e., PAHs) concentrations (Fig. 3b). At each station, water samples were collected using a Kemmerer bottle suspended at three or four different depths: 1-2 m below the surface, 1-2 m above the bottom, and approximately mid-depth(s).

Zooplankton

Zooplankton was sampled from 11 locations in the inner-most basins of Husky Lakes (B1, B2, B3 and IF) in August 2004 (Fig. 4). Sampling was conducted from the floats (pontoons) of a Cessna 206 floatplane. Zooplankton was collected using a 50 cm, 73-76 μm-mesh plankton net equipped with a calibrated flow-meter. Sampling involved two vertical tows throughout the entire water column at each sampling site. Maximum depth, Secchi depth and selected water properties (temperature, conductivity, dissolved oxygen, turbidity and pH) were recorded at each site (Evans 2004).

Sediments

Sediments were collected from 8 sites in Husky Lakes and one site in Liverpool Bay in August 2002 (Fig. 5). Sampling was conducted from a Cessna 206 floatplane. Surface sediments (i.e., upper few centimetres) were collected using an Ekman dredge for determination of inorganic and organic carbon and nutrient content, as well as alkanes and polycyclic aromatic hydrocarbons (PAHs) concentrations. Water temperature and conductivity were measured at all sites (Evans 2003).

Fish

Sampling of the fish community involved an extensive test netting survey using experimental nets that were 54.9 m in length, and either 1.8 m or 3.7 m in height. Each net consisted of three 18.3 m panels of 76 mm (3"), 38 mm (1.5") and 64 mm (2.5") monofilament, stretched-mesh. Nets were anchored close to shore in ≤0.5 m of water, and set perpendicular to the shore, along the perimeter of all basins and the fingers, at intervals of approximately 1 km. The end panels of 76 mm or 64 mm were set at the shore end in alternate sets. Nets were set in water that was 0.5-27 m deep, depending on site. A total of 585 nets were set in Husky Lakes, 21 of these in KG) (Fig. 6). A total of 55 nets were set in Sitidgi Lake (Fig. 7). The spatial coordinates for all netting sites are provided in Appendix 1. All nets were left fishing for approximately 50 minutes prior to being checked and moved.

Catch and effort information was recorded for all net sets. Fish were identified to species or genus (i.e., *Gadus* spp.) and counted prior to being released. Each year a random sample of fish from various species was live-sampled for fork length (Husky Lakes: n=372 (2001); n=320 (2002); n=437 (2003); n=207 (2004); Sitidgi Lake: n=44 (2002); n=45 (2003) and in some cases weight (Husky Lakes: n=123 (2001); n=242 (2002); Sitidgi Lake: n=45 (2003). In 2002, a random sample of fish from various species was dead-sampled in Husky Lakes (n=74). Length, weight, sex and maturity were determined on all dead-samples, and otoliths were collected for age determination. The stomach contents of 55 specimens were examined in the field. White (skeletal) muscle tissue samples were collected from 29 fish for contaminant (mercury and PAHs) analyses. A random sample of 17 fish of various species was dead-sampled from Sitidgi Lake for fork length, weight, sex, maturity and stomach contents, in 2003.

Subsistence Fishery

The subsistence spring fishery that occurs annually in parts of Husky Lakes and Sitidgi Lake was sampled by community monitors from Tuktoyaktuk and Inuvik during five consecutive years from 2000 to 2004. Early summer (June-July) monitoring was conducted in some years. Fishery monitors were responsible for recording fishing locations, catch and effort information, and for sampling/measuring Lake Trout taken in their own, and nearest neighbour’s, annual harvest.

In each of 2000-2004, at least three fishery monitors recorded fork length, weight, sex and maturity for a random sample of approximately 80 Lake Trout caught in their respective fishing areas in B1, B2, B3 and Sitidgi Lake. Monitors sampled their own, and near-neighbours catch. Sagittal otoliths were collected for age determination. Maturity was assessed using a four-tier maturity scale, to distinguish between maturing and resting adults (Appendix 2). Stomach contents were examined in the field in 2001-2003. Contents were classified as fish remains, invertebrates, or unidentifiable material, the former identified to species when possible. In 2004, the stomachs of 24 Lake Trout were collected for more detailed laboratory analyses, and shipped frozen to the DFO laboratory at the Freshwater Institute in Winnipeg, MB.

Catch and effort data was collected during earlier years of the monitoring program (2000-2002). In 2002, white (skeletal) muscle was taken from a random sample of 10 Lake Trout caught by subsistence fishers for contaminants (Hg and PAHs) determination.

LABORATORY ANALYSES

Physical ecosystem characteristics

Surface area, perimeter and drainage area were determined using ArcGIS (ESRI 2005). A drainage area boundary for Husky Lakes (not including KG) was defined based on examination of available 1:50 000 and 1:250 000 scale topographic maps and satellite imagery.

Surface salinity and temperature data were interpolated to the entire Husky Lakes surface using inverse distance weighted (IDW) technique in ArcGIS. Interpolation was done using a 100 m cell size, a distance exponent (power) of 2, and a variable search radius with 5 points. A barrier polyline features file was used to delimit shoreline and inter-basin influences.

Depth soundings were used to produce a bathymetric map of Husky Lakes and Sitidgi Lake in ArcGIS 9.1 (ESRI 2005). Interpolation was done using the Kriging method with 100 m cell resolution and a 1000 m filter. A variable search radius was used, ranging between 10-50 m depending on the distribution of the data points. A shoreline barrier file was created from 1:250 000 topographic maps, and used to define the land-water interface by setting the shoreline to 0 m depth. No corrections were made for tides.

Water composition

Water samples were analyzed for nutrient and organic carbon concentrations, water color, conductivity, pH, turbidity, and dissolved and suspended solids at Taiga Environmental Laboratory (Yellowknife, NT). Silicates, particulate organic carbon and nitrogen, major ions and 34 trace elements concentrations were determined at Environment Canada's National Laboratory for Environmental Testing (NLET) (Burlington, ON). Trace elements were determined using ultra-trace inductively coupled plasma sector-field mass spectrometry ICP-SFMS (NLET 2004-2005). Concentrations of 47 organic contaminants (including organochlorine pesticides and polynuclear aromatic hydrocarbons (PAHs) in water samples were determined using gas liquid chromatography following extraction/clean-up with dichloromethane (NLET 2004-2005). The concentration of organics was determined only in surface water samples from B3, IF and B4.

Zooplankton

Zooplankton samples were examined at the Environment Canada laboratory in Saskatoon, SK. Zooplankton specimens were sorted into four broad categories and counted: rotifera (phylum); copepods (subclass); copepod nauplii; and cladocerans (order). Adult copepods and cladocerans were further identified to order, family or species, and counted, whenever possible. Emphasis was placed on distinguishing dominant freshwater taxa from dominant marine or brackish water taxa. Relative abundance was estimated and reported as number of specimens per m^3.

Sediments

Surface sediment samples were also examined at Environment Canada laboratories in Saskatoon, SK. Sediment composition was assessed as grain size distribution. Sediment concentrations of organic/inorganic carbon, phosphorous and nitrogen, alkanes and polycyclic aromatic hydrocarbons (PAHs) were determined at Environment Canada's National Laboratory for Environmental Testing (NLET) (Burlington, ON). Methods are described in NLET (2004-2005).

Contaminants in fish

Fish dead sampled during the summer test fisheries and spring subsistence fisheries were analysed for mercury and PAHs concentrations at Freshwater Institute (Winnipeg, MB). Total mercury (Hg) concentrations in fish tissue were determined by Cold Vapour Atomic Absorption spectroscopy (CVAAS) (Armstrong and Uthe 1971). Analytical details (i.e., samples digestion process and reference materials used) are available in Loseto et al. (2008). Fish PAH concentrations were determined using high-resolution gas chromatography (GC) and mass selective detection in the single ion monitoring mode (SIM), following a modified version of EPA method 8270 (EPA 1999).

Fish age

Fish ages were determined by an independent contractor. Fish caught during experimental surveys in Husky Lakes were aged using the whole otolith method, described in Nordeng (1961). Lake trout samples from the harvest monitoring program were aged using the 'break and burn' otolith method (Christensen 1964).

Fish stomach contents

Stomach contents were analyzed at DFO's Freshwater Institute (Winnipeg, MB). Stomachs were cut open and rinsed over a 500 micron sieve. Total weight of all contents (g) was determined prior to sorting. Contents were sorted into five groups: invertebrates (identifiable invertebrates), fish (identifiable fish), fish remains (otoliths, scales, eggs, bones, tissue attached to bones), unidentifiable material and other (rocks, feathers, vegetation, twigs, etc.). Specimens classified as invertebrates and fish were identified to species, or the lowest possible taxonomic level. Wet weight (g) was measured for each of the five groups.

DATA ANALYSES

Catch composition, richness, and diversity

Catch proportion, frequency of occurrence and index of relative importance (IRI) were estimated for each fish species caught, separately for Husky Lakes and Sitidgi Lake, and also for ecosystem subunits (Husky Lakes basins). Catch proportion is the ratio of species i catch over total catch:

$$\%Catch_T^i = Catch_i / Catch_T \times 100 \qquad \text{(eq. 2.4.2 -1)}$$

Frequency of occurrence is the number of sampling units (test net sets) in which species i was caught, expressed as a percentage relative to the total number of test nets with catch greater than zero (T>0).

$$\%Freq_i = \frac{Freq_i}{Freq_{(T>0)}} \times 100 \qquad \text{(eq. 2.4.2 -2)}$$

IRI is the product of catch proportion and proportional frequency occurrence, expressed as a percentage:

$$\%IRI_i = \frac{\%Catch_T^i \times \%Freq_i}{\sum \%Catch_T^i \times \%Freq_i} \times 100 \qquad \text{(eq. 2.4.2 -3)}$$

%IRI was used to rank species incidence based on the following thresholds:

%IRI	*incidence*
≥ 20	*dominant species*
5-19	*common species*
0.30-4.99	*occasional species*
≤ 0.29	*rare species*

Diversity was assessed and compared as species richness (*S*) (count of species) and using Simpsons (D) and Shannon–Weaver (H') indices:

$$D = 1 - \sum p_i^2 \qquad \text{(eq. 2.4.2 -4)}$$

$$H' = -\sum p_i \ln p_i \qquad \text{(eq. 2.4.2 -5)}$$

Where p_i is the proportion of *S* made up of the *i*th species (ratio of species *i* catch over total catch in test nets with catch > 0).

Diversity indices were averaged and compared at both ecosystem and ecosystem subunits (basins) scales. Within Husky Lakes, we distinguished between gamma (γ) diversity (observed species richness in the entire ecosystem), alpha (α) diversity (mean species richness and diversity within basins) and beta (β) diversity (degree of differentiation in species richness among basins). β-diversity was quantified as a multiple of basin-specific species richness (Whittaker 1972; Tuomisto 2010):

$$\beta = (\gamma / \alpha) - 1 \qquad \text{(eq. 2.4.2 -6)}$$

Relative abundance and distribution

Catch per unit effort (CPUE) was used as an index of fish relative abundance. CPUE were estimated as counts of fish per 100 m^2 experimental net per hour. Total and species-specific CPUE were estimated and compared among systems/basins. For each species, spatial distribution, and relative abundance were examined by mapping experimental netting locations with positive catches distinguished using a five-tiers CPUE classification (<1.00, 1.00-4.99, 5.00-14.99, 15.00-24.99, and >25.00 fish per net hour). Spatial differences in relative abundance were statistically assessed for species having dominant, common and occasional incidence (as based on %IRI (previous section)).

CPUE data for Lake Trout in the subsistence fishery was collected by fishery monitors in 2000-2002. These data were standardized as counts of Lake Trout per angling hour.

Biological characteristics

Fish length, weight, age and maturity information collected during experimental surveys and subsistence fishery monitoring were compared among years and/or locations using frequency distributions and mean, mode and min/max values. Length structure was assessed only for species with sample sizes ≥90 specimens. Length-weight relationships were calculated whenever sample size permitted, and used as an index of body condition. Lake Trout length-weight relationships were compared basins, for Husky Lakes. Length-at-age data for Lake Trout sampled during the spring subsistence fishery were compared between sexes and among fishing locations.

Stomach contents

Frequency of occurrence was estimated in percentage (%O) for all prey items found in stomachs. Numerical abundance (percent number %N) of different prey items was estimated whenever possible. Percent composition by weight (%W) was assessed only in stomachs analyzed in more detail at the laboratory.

STATISTICAL ANALYSES

Differences in water properties data and in fish length, weight and age data among basins were assessed using t-tests (n=2) or one-way analysis of variance (ANOVA) (n>2) for normally distributed data, and using the two-sample Wilcoxon (or 'Mann-Whitney') Test (n=2) or Kruskall-Wallis Rank Sum Test (n>2) for non-normal data. Pairwise comparisons were performed using pairwise t-tests (normal data) or pairwise Wilcoxon Rank Sum tests (non-normal data), in both cases using Bonferroni correction. Normality was assessed using the Shapiro-Wilk Normality Test.

Differences in fish CPUE among basins were assessed using generalized linear models (GLM) and zero-inflation mixtures models (ZIM). 'Basin' was used as a factorial, explanatory variable with levels equivalent to the number of ecosystem subunits in which a species was caught. Sampling year was included as covariate. The response variable (CPUE - counts of fish per net hour) was rounded to the next integer and assumed to have a Poisson distribution. The Poisson distribution is typically used for count data and has two main advantages; a probability of '0' for negative values and a mean-variance relationship that allows for heterogeneity (Zuur et al. 2009). In cases where the variance was larger than the mean (overdispersion), CPUE data were assumed to follow the negative binomial distribution. Overdispersion was assessed using the ratio of squared Pearson residuals, to residual degrees of freedom (or sample size minus the number of parameters in the model). A ratio close to 1 indicated little or no dispersion. ZIM combine a Poisson or negative binomial (log-link) GLM for count data, and a binomial (logit-link) GLM assessing the probability of measuring 'false zeros' (i.e., zeros resulting from experimental design and/or observational errors) (Zuur et al. 2009). ZIM can handle overdispersion in positive counts (non-zero) data, as well as overdispersion caused by too many zeros (zero inflation). The likelihood ratio test was used to compare nested models and assess the significance of year effects. P-values were generated assuming that deviance (twice the negative log of the likelihood ratio) had a chi-square (X^2) distribution (Bolker 2008). Model selection was done by minimizing the Akaike (AIC) selection criterion.

Fish length-weight relationships were characterized using the power function:

$$W = aL^{b} \qquad \text{(eq. 2.4.3 -1)}$$

Where W is weight (g), L is length (cm) and *a* and *b* are parameters to be estimated. The power function was fitted to length-weight data using general purpose Nelder-Mead optimization. Fitting was done by minimizing the residual sums of squares.

Size and age differences for Lake Trout among fishing locations in the subsistence fishery were assessed using generalized linear models with ‘sample year’ as covariate. Size and age data were assumed to be Gamma-distributed. Lake Trout length-at-age was compared between sexes and among Husky Lakes basins, using linear models.

All statistical analyses were done using ‘R’ software (R Core Development Team 2013). The critical alpha (α) level of statistical significance throughout was 0.05. Specific packages used included ‘vegan’ (diversity indices), ‘lmtest’ (likelihood ratio tests), ‘pscl’ (ZIM) and ‘MASS’ (negative binomial GLM).

RESULTS

PHYSICAL ECOSYSTEM STRUCTURE

Husky Lakes

The Husky Lakes cover an area of 1933 km^2 (Table 2). Mean depth was 13 m throughout, but varied greatly among basins, from 6 m in B3 and B4, to 23 m in B1 (Table 1, Fig. 8a). Maximum depth peaked at 98-100 m in B1, B2, and B5, and exceeded 70 m in all basins but B4 and IF (40 m and 36 m, respectively) (Table 1, Fig. 8a). KG is comparatively shallow with mean and maximum water depths of 6 m and 24 m..Interpolated depths on the bathymetric map (Fig. 8a) should be interpreted with caution, owing to differences in the spatial coverage of sampling between basins and tidal uncertainties. Spatial coverage was limited (<5 depth measurements per km^2) in B2, B3, B4, and KG, and comparatively higher in B1, B5, and OF (≥10 depth measurements per km^2) (Table 1). The results indicate that the middle section of the Husky Lakes system (B3, B4 and IF) is generally shallower, compared to the inland-most basins (B1 and B2), and to sections located near the mouth (B5 and OF).

The Husky Lakes system has an extensive and complex shoreline including several regions of narrow peninsulas. Perimeter, and perimeter-to-area ratios, for all Husky Lakes basins combined are 2265 km and 1.2, respectively (Table 2). Among basins, a larger perimeter to area ratio (≥1.9) was characteristic of finger areas (IF and OF), and B1. KG also had a high perimeter-to-area ratio (3.3).

Catchment area calculated for Husky Lakes (e.g., not including KG and associated freshwater inputs from the Miner and Kugaluk rivers) was 9543 km^2 (Fig. 2, Table 2). This is equivalent to 9.7% the total catchment area of Liverpool Bay and Husky Lakes combined (98 000 km^2), as estimated by Gushue et al. (1996).

Sitidgi Lake

Sitidgi Lake covers an area of 291 km^2 and has a 111 km-long shoreline corresponding to a small perimeter-to-area ratio (0.38) (Table 2). The lake is relatively shallow with mean and maximum depths of 7 m and 37 m, respectively (Table 1). Deeper areas (>20 m) are mainly located in the eastern arm (Fig. 8b).

WATER COMPOSITION (HUSKY LAKES)

Physico-chemical water properties and essential nutrient and organic carbon concentrations are summarized by basin, station and water strata in Table 3. Silica and other trace nutrient concentrations are summarized in Table 4. The concentrations of 34 trace elements in water samples are summarized in Appendix 3.

Vertical gradients in water composition (i.e., changing concentrations with increasing depth) were generally small, indicating that within the depth range considered (1-25 m), the water column was relatively well-mixed. Horizontal (spatial) gradients among basins were more important.

Organic carbon (OC) concentrations at the surface ranged between 1.7-6.9 mg•L^{-1} (dissolved (DOC)) and 0.12-0.68 mg•L^{-1} (particulate (POC)) among stations (Table 3). Higher OC concentrations were found at all depths in KG. High DOC values (≥5.0 mg•L^{-1}) were also measured in B1 and B2. Lower DOC concentrations (≤2.0 mg•L^{-1}) occurred at all depths in B4, and at the surface in B3 and IF.

Particulate organic nitrogen (PON) concentrations ranged 0.01-0.10 mg•L^{-1} in the Estuary and were highest (>0.08 mg•L^{-1}) at all depths in KG and lower (<0.02 mg•L^{-1}) in B4, IF (surface) and B5 (surface and bottom layers). Total phosphorous (P_t) ranged from half detection limit (0.002 mg•L^{-1}) in the bottom layer of B1, to a peak concentration of 2.78 mg•L^{-1} at intermediate depths (5-10 m) in the OF (OF). P_t concentrations were higher (≥2.5 mg•L^{-1}) in KG and near the mouth of the system (station I in OF), relative to other parts of Husky Lakes. In comparison, the surface layer in OF was depleted (P_t = 0.02 mg•L^{-1}). Lower P_t concentrations (0.01 mg•L^{-1}) were found throughout the water column in B4 and B2, and at the surface in IF. Dissolved phosphorous (P_{diss}) was at half detection limit in bottom waters of B1, B2 (station D), B4 and KG. Higher P_{diss} concentrations (≥0.06 mg•L^{-1}) were found at all depths in B5, and at intermediate depth (10 m) in KG (Table 3). In contrast, dissolved nitrogen concentrations were lower (<0.14 mg•L^{-1}) near the mouth, in KG, B5 and OF (not including surface), and higher (≥0.2 mg•L^{-1}) in B2. The ratio of dissolved nitrogen to phosphorous (N/P) was higher in the inland-most basins, and lower near the mouth of the Estuary. The N/P ratio in surface waters ranged 2-35 with min/max in B5/B2. In bottom waters, N/P ratio ranged from a low of 3 (in B5) to >100 (in B1 and B2). N/P ratios ≤6 near the mouth of the Estuary (i.e., at all depths in B5 and between 5-18 m in OF and 0-10 m in KG) are indicative of nitrogen limitation. Similar to N/P ratios, horizontal gradients in nitrite/nitrate concentrations peaked near the bottom in B1 and B2 (at 0.047-0.07 mg•L^{-1}), and were below detection limit at all depths in KG, near the surface (0-10 m) in OF, and at stations F and G in B4 and IF, respectively. Ammonia was generally scarce in the system with peak concentrations (0.022-0.035 mg•L^{-1}) measured in B1 and B2.

Silica in surface water was most abundant (≥0.50 mg•L^{-1}) in B1, B2 and KG, and least abundant (<0.20) in IF and B3 (Table 4). Bottom layer silica concentrations were also highest in B1 and B2. The concentrations of other trace nutrient (Ca, Mg, Na, K, Cl and sulphate) were lowest in B1 and B2, and highest at all depths in B5 and in the bottom layer in OF (Table 4).

Water color, turbidity, and total suspended solids (TSS) were highest in KG (Table 3). Within Husky Lakes basins, color was higher (10 TCU) at all depths in OF, and at the surface in B4. In other parts of the system, water color was at or below the detection limit (except for surface waters in B1). Turbidity was higher (≥5.0 NTU) near the surface in B3 and near the bottom in B2 (station D). The concentration of total suspended solids (TSS) was higher (≥50 mg•L^{-1}) in IF, and between 8-17 m in B4. Higher and lower conductivity, and alkalinity, were measured in B5 and in B1 and B2 stations, respectively (Table 3). The concentration of total dissolved solids (TDS) peaked near the surface in B4, were higher (≥14 700 mg•L^{-1}) at all depths in IF, B4, B5, and OF, and lowest in B1 and B2. Horizontal gradients in TDS and conductivity/alkalinity reflect salinity gradients throughout the estuary.

WATER PROPERTIES

Water properties measured in different years in different parts of Husky Lakes and Sitidgi Lake were assumed to reflect conditions during the open-water season, shortly following ice break-up.

Husky Lakes

Surface water properties

Surface water temperature, salinity and pH information for Husky Lakes are summarized, by basin, in Table 5. Marked horizontal gradients in surface water properties characterized the Husky Lakes. Salinity was the most contrasting property, ranging from 0.4 to 17.4 parts per thousand (ppt) over the system. Average salinity differed among basins (Kruskall-Wallis Rank Sum Test, H= 158.91, df=7, p<0.001, with Wilcoxon Rank Sum pairwise comparisons). Salinity increased from B1 (1.3 ppt) to OF (12.9 ppt) (Table 5, Fig. 9a). Finger areas had higher mean salinity values (≥10 ppt) than the basins. Highly variable salinity measurements characterized KG (range 2.2-10.8 ppt) and the OF (range 1.8-17.4 ppt) (Fig. 9a). Surface water salinity in KG was significantly higher than B1. Statistically similar salinity values were observed between B4 and IF, and near the mouth between B5 and OF. Interpolated surface water salinity illustrates the brackish character of the system shortly after ice breakup (Fig. 10). B1 and B2 are characterized by oligohaline water (<5.0 ppt salinities), while the remainder of the Husky Lakes system was in the mesohaline range (salinities between 5-17.4 ppt).

Surface water pH averaged 7.7, and ranged from 6.5-9.0 throughout the system (Table 5). Average pH differed among basins (Kruskall-Wallis Rank Sum Test, H= 90.84, df=7, p<0.001, with Wilcoxon Rank Sum pairwise comparisons). pH decreased from B1, to OF and KG – with the exception of higher pH values in B5 (Fig. 9b). Average pH in B5 was higher compared to all basins, except KG. KG had a lower mean pH (7.0) relative to B1, B2 and B4 (7.8-7.9), but did not differ from B3, B5 and both finger areas (IF and OF). The OF had a lower mean pH (7.1) relative to all inland basins (≥7.5) (Fig. 9b).

Average surface water temperature ranged from 7.5^{o}C in B3 to 13.3^{o}C in B1, corresponding to a significant difference among basins (ANOVA, $F_{7,193}$=12.45, p<0.001 with pairwise t-tests) (Table 5). Variability was most important in OF with measured temperatures ranging 1.9-18.3^{o}C in this part the system (Table 5, Fig. 9c). Surface waters were significantly warmer in B1 than in the rest of the system, but similar to KG (Fig. 11). Finger areas (IF and OF), and B3, had the coolest surface waters relative to all other areas in the system (Fig. 9c).

Water column profiles

Temperature and salinity profiles with depth are presented, by basin (Fig. 12). Temperature stratification of the water column was evident in the inland-most basins (B1 and B2), and corresponded to a mixed layer 3-6 m deep with temperatures ranging from 7-11^{o}C (depending on station) and a bottom layer ≤2^{o}C (Fig. 12a-b). At station 11 in B4, a deeper (10 m) mixed layer ≥8^{o}C laid above colder waters (2^{o}C) near the bottom (Fig. 12c). A cold (≤2^{o}C) bottom layer was also visible at stations 13 and 14 in B5 and stations 18 and 19 in OF (Fig. 12d and f). This cold layer was underneath a thermocline extending from the surface (absence of mixed layer) (Fig. 12d and f). In other parts of the system, temperature either gradually decreased with depth, or the water column was thoroughly mixed, as indicated by constant temperature with increasing depth in IF (station 7), B4 (stations 9 and 10) and OF (station 17).

Salinity generally increased with water depth, although differences in salinity among stations were greater than water column gradients within stations (Fig. 12). A halocline was evident between 5-8 m depth at station 6 in B2, between 5-20 m in IF and between 2-15 m in OF (stations 18 and 19). Lower salinities were observed near the bottom in B1, B2 (station 6) and B4 (station 9). A similar pattern at station 10 (B4) station 13 (B5), station 18 (OF) and station 20 (KG) was in all cases driven by a single data point and should therefore be interpreted with caution. Bottom layer (≥20 m depth) salinity ranged 10-20 ppt in OF, 10-15 ppt in B5, 11 ppt in B4, 15 ppt in IF and 3-4 ppt in B1 and B2 (Fig. 12). These results suggest limited salt water intrusion beyond IF and important freshening (salt water dilution) in B3.

Mixing conditions characterized KG, with water temperatures ranging 8.1-6.7^{o}C (from surface to bottom), and salinities ranging 10.8-11.5 ppt (surface to 18 m) (Fig. 12g).

Sitidgi Lake

<u>Surface water properties</u>

Surface water temperature in Sitidgi Lake averaged 14^{o}C (range: 8-16°C) (Table 5). Surface water pH ranged from slightly acidic (5.4) to neutral (7.3), and averaged 6.7 throughout the lake (Table 5). Average water temperature in Sitidgi Lake was similar to B1 in Husky Lakes (Mann-Whitney Test, $W = 218.5$, $p>0.05$), reflecting the connectivity between the two systems. Warmer waters characterized Sitidgi Lake and B1 relative to B2 (Kruskall-Wallis Rank Sum Test, $H= 48.49$, $df=2$, $p<0.001$, with Wilcoxon Rank Sum pairwise comparisons) (Fig. 13a). Average pH however, was significantly lower in Sitidgi Lake compared to B1 and B2 in Husky Lakes (Kruskall-Wallis Rank Sum Test, $H= 72.73$, $df=2$, $p<0.001$, with Wilcoxon Rank Sum pairwise comparisons) (Fig. 13b).

<u>Water column profiles</u>

Vertical water temperature profiles for Sitidgi Lake are shown in Figure 14. A mixed layer was visible at all stations up to approximately 10 m depth, with temperatures ranging 12-13^{o}C depending on site. Stratification was visible at the deeper site (station 22), where a colder (7^{o}C) layer extended from 21 m down to the bottom (30 m). Thermocline depth ranged 11-20 m (Fig. 14).

ZOOPLANKTON

Results of the Husky Lakes zooplankton survey in August 2004 are presented separately in Evans (2004). The survey revealed greater zooplankton abundance (copepods and cladocerans combined) at intermediate salinities (8-10 ppt) in B3 and IF, relative to stations located in B1 and B2 (Fig. 15). Estuarine (brackish water) taxa dominated over freshwater forms in these basins.

Copepods were dominant in B3 and IF. One estuarian species was identified (*Acartia clausii*), compared to three dominant freshwater species (the cyclopoids *Acanthacyclops vernalis*, *Limnocalanus macrurus*, and *Eurytemora arctica*). The relative abundance of freshwater copepods ranged from 1,200-1,600 individuals per m^3 in B1 and B2, and >3000 individuals per m^3 in B3 and parts of IF. The abundance of *Acartia clausii* in B3 and IF ranged from 5000-14 000 individuals per m^3.

The abundance of cladocerans peaked in areas with lower salinities (B1 and B2). Estuarine species from the family Polyphemidae were dominant, and included *Evadne nordmanii* (1500 per m^3) and *Podon leuckarti* (2100 per m^3). Freshwater cladocerans were rare. Only the small-bodied *Bosmina longirostris* and *Eubosmina coregoni* were observed, and in very low numbers (<50 individuals per m^3).

Rotifers were numerous and their abundance was probably underestimated due to the large mesh size (73-76 µm) used for sampling (Evans 2004). Approximate rotifers abundance peaked in B2 stations with 38 000 individuals per m^3. Copepod nauplii were also found in larger numbers (up to 9000 individuals per m^3) in B1 and B2.

SEDIMENT COMPOSITION

Results from sediment sampling sites (Fig. 5) are summarized in Evans (2003). Sediment samples were dominated by silts and clays, at all sites except in IF where sandy sediments predominated. Sandy sediments also accounted for a larger fraction of sediment samples collected from OF and Liverpool Bay (Fig. 16a). Carbon content ranged from 0.7-4.5% among sites. Carbon concentrations were highest and lowest in sediment samples taken from OF and IF, respectively. Most carbon was in the organic form, except in the sample from IF in which the carbonate fraction was more prevalent (Fig. 16b). Nutrient abundance was generally low. Phosphorous concentrations ranged from 0.2-1.6 $mg \bullet g^{-1}$, and nitrogen concentrations ranged from 0.4-3.5 $mg \bullet g^{-1}$ in the estuary.

FISH

Arctic Cod (*Boreogadus saida*), Saffron Cod (*Eleginus gracilis*), and Greenland Cod (*Gadus ogac*) were encountered during the experimental surveys in Husky Lakes. Because of uncertainties in species identification, all cod (*Gadidae*) specimens were pooled into a single ‘cod spp.’ group (n=103) for analyses.

Catch composition, richness, and diversity

<u>Husky Lakes</u>

A total of 6108 fish from eight families and more than 17 species were caught in 541 experimental sets during summer test netting surveys in the Husky Lakes basins and KG (Table 6). The Salmonidae were the most diverse and abundant family, with eight species accounting for 58% of total catch – the majority of which (54%) were coregonids: Lake Whitefish (*Coregonus clupeaformis*), Least Cisco (*C. sardinella*), Arctic Cisco (*C. autumnalis*), and Broad Whitefish (*C. nasus*). Next in importance were Pacific Herring and two Pleuronectidae species: Starry Flounder (*Platichthys stellatus*) and Arctic Flounder (*Liopsetta glacialis*).

Lake Whitefish, Least Cisco and Pacific Herring were the dominant species in the Husky Lakes system. Pacific Herring and Lake Whitefish each accounted for about one fourth (25%) of total fish catches in the system, compared to 18% for Least Cisco (Table 6). Common species included Arctic Cisco and Starry Flounder. Occasional species were Lake Trout, Broad Whitefish, Arctic Flounder, cod spp., Fourhorn Sculpin (*Myoxocephalus quadricornis*) and Northern Pike (*Esox lucius*). Other species had only rare occurrences in the system and included Inconnu, Arctic Grayling (*Thymallus arcticus*), Round Whitefish (*Prosopium cylindraceum*), Burbot (*Lota lota*), Rainbow Smelt (*Osmerus mordax*) and Longnose Sucker (*Catostomus catostomus*) (Table 6).

Species composition and incidence varied noticeably among basins. Lake Whitefish was highly dominant in the inland-most basins B1, B2, B3 and the IF (IF) area (Table 7, Fig. 17). Arctic Cisco was dominant in B4 and B5, while Least Cisco was dominant in the OF (OF) (Fig. 17). Pacific Herring was dominant in KG and ranked second in importance in all parts of Husky Lakes system between (and including) IF and OF (Table 7, Fig. 17).

Common species also differed between the inland-most and outer-most basins. Lake Trout were common in B1, B2 and B3. Starry Flounder was a common species in B3, IF, B4 and KG. Arctic Grayling and Northern Pike were third in importance in B1 and B2, respectively. Cod spp. was common only in B5, and Arctic Flounder only in KG. When not dominant, Lake Whitefish generally ranked as a common species, except in B5 (Table 7).

Species richness ranged from 1-8 among test net sets, and 10-13 among basins. Average Simpson's diversity (D) for the Husky Lakes system was 0.35 (range 0-0.82 among test nets) and Shannon's (H') was 0.59 (range 0-1.83) (Table 8). Among basins (α) diversity was highest in KG, with 13 species encountered (mean of 5 different species per test net) and average diversity indices of 0.49 (D) and 0.95 (H') (Table 8). Differentiation (β) diversity was lowest in KG (β=1.63), indicating that most species found in the Husky Lakes system occurred there. Second most diverse was B4, with average diversity indices of 0.41 (D) and 0.70 (H') and a differentiation diversity (β) of 3.17 (Table 8). The OF ranked third, with mean diversity indices of 0.36 (D) and 0.60 (H'), and a differentiation value (β) of 3.22. Fish diversity was lowest in B3, with an average of two different species per net set, lower mean diversity indices of 0.26 (D) and 0.43 (H'), and a higher degree of differentiation relative to the entire system (β=4.11). B5 ranked second lowest.

Sitidgi Lake

A total of 115 fish from three families and eight species were caught in 35 sets of the experimental nets in Sitidgi Lake (Table 9). Similar to Husky Lakes, the Salmonidae were the most diverse and abundant family, with six species accounting for the, majority (82%) of the catch. Lake Trout and Lake Whitefish were the dominant species, comprising 32% and 36% of the catch, respectively. Lake Trout occurred more frequently in test nets (71%) compared to Lake Whitefish (40%), and thus had comparatively greater incidence as %IRI (Table 9). Northern Pike was a common species in the lake, occurring in 31% of the test net sets, and explaining 17% of total catch. Round Whitefish, Broad Whitefish, and Least Cisco were caught occasionally and Arctic Cisco, Burbot, and Arctic Cisco were rarely caught (Table 9).

Species richness ranged from 1-4 among test net sets, and average fish diversity was equivalent to 0.25 (D) (range 0-0.72 among test nets) and 0.40 (H') (range 0-1.33) in Sitidgi Lake (Table 8). This is lower compared to the entire Husky Lakes system, but similar to diversity indices measured for B3 (Table 8).

Relative abundance

Summary of GLM and ZIM procedures used to assess differences in fish CPUE are summarized in Appendix 4. Coefficient values are presented for the selected models.

Husky Lakes

Survey intensity throughout the estuary was equivalent to 0.28 net per km^2 (Table 10). Finger areas had comparatively higher coverage with 0.81 (IF) and 0.68 (OF) net per km^2, respectively (Table 10).

Total CPUE in the Husky Lakes averaged nine fish per net hour (Table 10). Variability was high, with CPUE ranging 0-253 fish per net hour. Among-basins, differences in CPUE were obvious. KG had a higher CPUE compared to other parts of the system (Table 10, Fig. 18). B2 and OF also had a higher mean CPUE (>8 fish per net hour) compared to other basins, however this difference was only marginally significant in B2 (Appendix 4-A).

Sitidgi Lake

Survey intensity in Sitidgi Lake was equivalent to 0.19 net per km^2. CPUE averaged 2 fish per net hour (range 0-20 among test nets) (Table 10). The relative abundance of fish in Sitidgi Lake was significantly lower compared to Husky Lakes basins (Appendix 4-A).

Lake Whitefish

Lake Whitefish was encountered throughout the Husky Lakes and Sitidgi Lake (Fig. 19a). Lake Whitefish CPUE averaged 2 specimens per net hour (range 0-46 among nets) in Husky Lakes, and 0.8 fish per net hour (range 0-13) in Sitidgi Lake (Table 11A). Within Husky Lakes, finger areas had significantly lower Lake Whitefish CPUE (Table 11A, Appendix 4-B). Zero inflation was significant in B5, and to a lesser extent in OF and Sitidgi Lake (Appendix 4-B). Experimental design error, including a significant year effect, might explain the occurrence of 'false positive' and/or 'false zero' catches of Lake Whitefish in those areas.

Least Cisco

Least Cisco were caught mainly in OF, but occurred in all Husky Lakes basins and in Sitidgi Lake (Fig. 19b). Least Cisco CPUE in Husky Lakes averaged 1.7 fish per net hour, and ranged from a mean of 0.04 in B1 to a mean of 4.15 in OF (Table 11A). In Sitidgi Lake, Least Cisco CPUE averaged 0.10 fish per net hour (range 0-5 among nets) (Table 11A). Sampling year had a significant effect on CPUE. The relative abundance of Least Cisco was significantly lower in B1, B3, and Sitidgi Lake (Appendix 4-C).

Arctic Cisco

Arctic Cisco was mainly caught between the IF and OF areas of Husky Lakes (Fig. 19c). The species was caught only in a few sets in KG, B3, B2, B1 and Sitidgi Lake (Fig. 19c). Mean CPUE in Husky Lakes was about one cisco per net hour (range 0-27 among nets). Arctic Cisco CPUE increased from B1 (0.05 fish per net hour) to B5 (2.35 fish per net hour), declining again in OF (0.93) and KG (0.21) (Table 11A). In Sitidgi Lake, Arctic Cisco CPUE averaged 0.02 fish per net hour (Table 11A). B1, B2, KG and Sitidgi Lake had significantly lower Arctic Cisco CPUE (Appendix 4-D).

Pacific Herring

Pacific Herring were absent from Sitidgi Lake and found mainly seaward of B3 in Husky Lakes (Fig. 19d). Herring CPUE averaged 2 fish per net hour, and was highly variable (range 0-145 per net hour). Highest catches (>30 fish per net hour) occurred in KG. Herring CPUE were significantly lower in the inland basins (B1 and B3, <0.03 fish per net hour) (Appendix 4-E).

Starry Flounder

Starry Flounder was absent from Sitidgi Lake and B1, and generally common seaward of B2 (Fig. 19e). The upstream limit of their distribution was near the boundary between B3 and B2 (Fig. 19e). Starry Flounder CPUE averaged 0.73 specimens per net hour (range 0-153 among nets). Larger catches (>20 Starry Flounder per net hour) occurred only in KG (Table 11A). Starry Flounder CPUE was significantly lower in B2 (Appendix 4-F).

Lake Trout

Lake Trout were common in the inland-most basins (B1, B2, and B3) and did not occur seaward of IF (Fig. 19f). This species dominated the catch in Sitidgi Lake, with an average CPUE of 0.65 trout per net hour (Table 11A). Lake Trout CPUE ranged 0.48-0.59 per net hour in B1, B2, and B3 (Table 11A). CPUE were statistically similar among these basins, however zero-inflation was significant at the seaward limit of the species distribution in IF (Appendix 3-G). This indicates a significant probability that ‘false positive’ (or ‘false zero’) catches of Lake Trout were recorded in this part of the system.

Northern Pike

Northern Pike were common in Sitidgi Lake and were caught mainly in the inland-most basins B1 and B2 in Husky Lakes (Fig. 19g). CPUE in Sitidgi Lake averaged 0.33 fish per net hour (range 0-5 among test nets) (Table 11B). The effect of sampling year on CPUE was significant; however, year was strongly correlated to fishing location (Appendix 4). A higher mean CPUE (0.73 Northern Pike per net hour) was observed in B2 in Husky Lakes (Appendix 4-H).

Broad Whitefish

Broad Whitefish were encountered in small numbers in Sitdigi Lake and in all parts of Husky Lakes (Fig. 19h). The species had a higher incidence in nets located near or within the OF (Fig. 19h). Broad Whitefish CPUE averaged 0.19 fish per net hour in Husky Lakes and ranged from 0.02 in IF to just over one fish per net hour in KG (Table

11B). Sampling year had a significant effect on CPUE. Low catches per net hour in B1 were rounded to zero, and had to be removed from GLM/ZIM procedures. Broad whitefish CPUE were significantly higher in KG (Appendix 4-I).

Arctic Flounder

Arctic flounder was caught only in B4, B5, OF and KG in Husky Lakes (Fig. 19i). CPUE values were low (0.05-0.06 fish per net hour) in B4 and B5, increased to 0.19 in the OF, and were significantly higher (>5 Arctic Flounder per net hour) in KG (Appendix 4-J).

Cod spp.

Cods were caught in KG and further upstream in Husky Lakes as far as IF (Fig. 19j). Cod CPUE averaged 0.14 specimens per net hour (range 0-12 among nets), and varied with sampling year (Table 11B, Appendix 4). The relative abundance of cods was significantly higher in KG (mean 0.85 per net hour), and generally lower at the upstream limit of its distribution (mean 0.03 per net hour in IF) (Appendix 4-K).

Fourhorn Sculpin

Fourhorn Sculpin occurred in low numbers throughout Husky Lakes, and was not caught in Sitidgi Lake (Fig. 19k). Mean CPUE was 0.12 sculpins per net hour, and ranged from a low of 0.02 (in B2) to a high of 0.36 (in KG) (Table 11B). Fourhorn Sculpin CPUEs were statistically similar among Husky Lakes basins (Appendix 4-L).

Rare species

Among the rare species, Inconnu had the most widespread distribution. Inconnu occurred in low numbers in most basins of Husky Lakes, except B1 and IF (Fig. 20c). Inconnu CPUE were higher in KG (mean 1.11 per net hour) (Table 11C). Rainbow Smelt and Longnose Sucker were found only in KG (Fig. 20d and e). Rainbow Smelt CPUE averaged 1.5 fish per net hour (range 0-20 among test nets). Longnose Sucker CPUE did not exceed one fish per net hour (mean 0.1) (Table 11C).

Round Whitefish and Arctic Grayling occurred only in the inner two basins of Husky Lakes (B1 and B2), with higher CPUE in B1 (Table 11C) (Fig. 20a and f). Arctic Grayling CPUE averaged 0.58 fish per net hour in B1 (range 0-7 among test nets). CPUE for Round Whitefish averaged 0.21 (ranged 0-4 among test nets). Round Whitefish were also caught in Sitidgi Lake, where they ranked as an occasional species with mean CPUE 0.13 (range 0-3) (Table 11C). Finally, two specimens of Burbot (freshwater cod) occurred in the catch: one in Sitidgi Lake and one in KG (Table 11C) (Fig. 20b).

Size and age composition of the test net catches

Length, weight, and age information collected during experimental test net surveys in Husky Lakes and Sitidgi Lake were compiled by species (Tables 12 and 13). Sample sizes for age estimation for most species were generally small, and therefore not for valid for statistical comparisons. Size composition was assessed in more detail in cases with sample sizes >90 specimens.

Arctic Cisco

Arctic Cisco length averaged 35 cm (FL) and ranged 16-46 cm in Husky Lakes (Table 12). A single specimen (32 cm) was measured in Sitidgi Lake (Table 13). Modal length in Husky Lakes was 36 cm (Fig. 21a). All fish >30 cm were caught in B4, B5, and both finger areas. Only smaller ciscoes (16-30 cm) were caught in the inland-most basins, B1 and B2 (Fig. 21a). Among basins, differences in mean length were significant and corresponded to smaller Arctic Cisco in B2 relative to B5 and OF (Kruskal-Wallis chi-squared=37.162, df = 6, p<0.001).

The average weight of Arctic Cisco was 543 g (range 300-1000 g) (Table 12). Only 58 specimens were sampled for both fork length and round weight. A length-weight function for this sample is shown in Figure 22a. The mean age of Arctic Cisco sampled was 5 years (range 3-7 yr) (Table 12).

Least Cisco

The mean fork length for Least Cisco in Husky Lakes was 34 cm (range 17-68 cm) (Table 12). Four were caught in Sitidgi Lake, and had a mean length of 20 cm (Table 13). Least Cisco length ranged 17-45 cm in Husky Lakes (Fig. 21b). Modal length was 36 cm. Least Cisco from all sizes were caught in the OF area. KG had higher frequencies of smaller-size ciscoes (Fig. 21b). Among basins, differences in mean length were significant and corresponded to smaller Least Cisco in KG relative to B4, B5 and both finger areas, and smaller cisco in B2 compared to B5 and IF (Kruskal-Wallis chi-squared=46.6862, df=7, p<0.001).

Average weight for Least Cisco was 507 g (range 55-1500 g) in Husky Lakes and 66 g (range 55-70 g) in Sitidgi Lake. A length-weight relationship for 51 Least Cisco caught in Husky Lakes basins B1, B2, B3, B4 and IF is shown in Figure 22b. The mean age of Least Cisco in Husky Lakes was 5 years (range 3-9 yr) (Table 12).

Pacific Herring

The mean length of Pacific Herring in Husky Lakes was 25 cm (range 18-42 cm). Pacific Herring larger than 30 cm were only caught in IF, OF and KG (Fig. 21c). Among basins, differences in mean length were significant with smaller Pacific Herring in B5 relative to finger areas (IF and OF) (Kruskal-Wallis chi-squared=23.5204, df=6, p=0.001). Mean weight was 281 g (range 80-700 g). Too few were weighed to derive a length-weight relationship.

The mean age of Pacific Herring sampled was 6 years (range 5-7 yr) (Table 12).

Lake Trout

Lake Trout length averaged 67 cm (range 38-120 cm) in Husky Lakes and 60 cm (range 48-92 cm) in Sitidgi Lake. Lake Trout caught in Sitidgi Lake were significantly smaller than Lake Trout from Husky Lakes (Two-sample Wilcoxon Test, W=2931, p=0.001).

Modal length in Husky Lakes peaked at 54 cm and 59 cm (Fig. 21d). Frequencies of larger Lake Trout (>60 cm) were higher in B3 and IF (Fig. 21d). Differences in mean length among basins were significant (Kruskall-Wallis Rank Sum Test, H=33.15, df=3, p<0.001), and corresponded to larger Lake Trout in B3 and IF relative to B2 (based on Wilcoxon Rank Sum pairwise comparisons). Lake Trout from B3 were also significantly larger than Lake Trout from B1. Lake Trout round weight averaged 4.4 kg (range 600-18 000 g) in Husky Lakes and 3.1 kg (range 1300-9500 g) in Sitidgi Lake. Length-weight relationships for Lake Trout from Husky Lakes were distinguishable between fish caught in B1 and B2, and fish caught in B3 and IF (Fig. 22c). Lake Trout between 60-80 cm were generally heavier in B3 and IF (Fig. 22c).

The mean age of Lake Trout caught in Husky Lakes during the experimental netting program was 14 years (range 11-20).

<u>Lake Whitefish</u>

Lake Whitefish fork lengths averaged 43 cm (range 16-58 cm) in Husky Lakes and 30 cm (range 15-52 cm) in Sitidgi Lake (Table 12 and 13). Lake whitefish caught in Sitidgi Lake were significantly smaller compared to those caught in Husky Lakes (two-sample Wilcoxon Test, W=12169, p<0.001).

Catch location was recorded for 380 specimens of Lake Whitefish from Husky Lakes. Inland-most basins B1, B2 and B3 had higher frequencies of intermediate size (40-50 cm) Lake Whitefish (Fig. 21e). Smaller fish (<40 cm) mainly occurred in OF and KG. Specimens larger than the modal length (46 cm) were mainly caught in IF (Fig. 21e). Among basins differences in mean length were significant and corresponded to smaller Lake Whitefish in OF and KG, and larger Lake Whitefish in IF (Kruskall-Wallis Rank Sum Test, H=161.80, df=7, p<0.001, with Wilcoxon Rank Sum pairwise comparisons).

The mean weight of Lake Whitefish from Husky Lakes was 1.4 kg (range 40-3500 g) (Table 12). Lake Whitefish from Sitidgi Lake had a lower mean weight (461 g, range 35-1500 g) (Table 13). A length-weight relationship for 183 specimens of Lake Whitefish caught in B1, B2, B3 and IF in Husky Lakes is shown in Figure 22d. The mean age of Lake Whitefish from Husky Lakes was 9 years (range 5-13) (Table 12).

Stomach contents

The stomachs of seven species of fish caught in Husky Lakes basins B3 and B4 in 2002 were examined (Table 14). Invertebrates were the dominant prey type in stomachs of Arctic Cisco, Least Cisco, Arctic Flounder, Broad Whitefish and Lake Whitefish. Bivalves were a preferred invertebrate prey in Arctic Flounder, Broad Whitefish and Lake Whitefish, occurring in ≥50% of stomachs and accounting for 48%-91% of prey items by numbers (Table 14). Arctic Cisco and Least Cisco had a more diverse invertebrate diet, including varying proportions (9-39%) of bivalves, gastropods, amphipods, terrestrial insects and insect larvae and unidentified invertebrates. Fish was the only prey item identified in the stomachs of 11 Lake Trout and one Northern Pike that were dead sampled during the test netting. All fish prey consisted of Pacific Herring. Percentage occurrence and numerical abundance of Pacific Herring in the stomachs of the Lake Trout from B3 were equivalent to 100% (Table 14).

SUBSISTENCE FISHERY

A total of 921 Lake Trout caught during the spring subsistence fisheries in Husky Lakes and Sitidgi Lake were sampled by community fishery monitors in each of 2000-2004.

Fork length and weight were recorded on 918 specimens. Age determination was possible for 675 Lake Trout using the break and burn method.

Catch per unit effort

CPUE data (counts of Lake Trout per angling hour) were collected by fishery monitors in Husky Lakes basins B1, B2 and B3 in 2000-2002 (Table 15). Catch rates averaged 0.15 Lake Trout per hour (range 0.05-0.21 among years).

Biological characteristics of harvested Lake Trout

The mean length of harvested Lake Trout varied 65-68 cm among the five years of the monitoring program. Modal length was 66-67 cm in 2000-2001; 62 cm in 2002; 64 cm in 2003; and 57 cm in 2004 (Fig. 23). Minimum and maximum lengths were 22 cm and 102 cm, respectively. Large specimens (>90 cm) occurred in the catch in all years. Smaller Lake Trout (<50 cm) were absent from 2002 and 2004 samples (Fig. 23).

The mean weight of harvested Lake Trout was 3.7 kg and ranged 3.2-4.8 kg among years (Table 16).

Mean age was 21 years and varied 20-22 years among years (Table 16). The minimum age of Lake Trout in harvest samples was 8 years. Maximum age was 55 years (Table 16). Older Lake Trout (≥50 y) occurred in the catch only in 2002 and 2004. Younger specimens (<10 y) were encountered in 2001 and 2002 (Fig. 24). Modal age was variable among years (Fig. 24).

Males and females were generally harvested in similar proportions, although numbers of females were slightly higher than males in 2003 and slightly lower in 2004 (Table 16). In both sexes, Lake Trout in resting condition were dominant over maturing fish (Fig. 25). Sixty-two percent of females were resting, compared to 86% for males. These results are expected for an autumn spawning species.

Sampling effort was highest in May of all years. April sampling took place in 2001-2003 and June and/or July sampling took place in 2001 and 2002. To avoid potential bias resulting from sampling at different times of the year, only samples collected during the month of May were considered to assess spatial differences in the biological characteristics of Lake Trout.

The mean fork length, weight and age of Lake Trout harvested during May of each year differed among fishing locations (basins) (Kruskall-Wallis Rank Sum Tests with Wilcoxon Rank Sum pairwise comparisons; fork length: $H=66.78$, $df=3$, $p<0.001$; weight: $H=50.73$, $df=3$, $p<0.001$; age: $H=28.48$, $df=3$, $p<0.001$). Larger Lake Trout were harvested from B3 (mean length 71 cm) relative to Lake Trout harvested in B1 and B2 (mean lengths of 66 cm and 65 cm, respectively) (Fig. 26a). Lake Trout caught in B2 and B3 were also heavier (mean weights of 3.8 kg and 4.2 kg, respectively) than those caught in B1 (3.2 kg) (Fig. 26b). Lake Trout from B1 were older (mean age 23 yr) than Lake Trout harvested in B2 (21 yr) and B3 (18 yr) (Fig. 26c). A small sample size (n=6) precluded meaningful comparisons of Lake Trout harvested from Sitidgi Lake.

Lake Trout lengths-at-age in Husky Lakes are compiled by basin in Table 17. Differences in length-at-age among basins are shown in Figure 27 for the age range encountered at all fishing locations (11-27 yr). Lake Trout from B3 had larger lengths-at-age compared with Lake Trout harvested in B1 and B2, indicating faster growth in B3. The 'basin' effect was significant and variations in lengths-at-age were independent from gender effects (GLM model: Log(Fork Length) ~ Log(Age) + Basin + Sex; for Basin: $F=66.54$, $df=2$, $p<0.001$); for Sex: $F=1.62$, $df=1$, $p>0.05$ (See Appendix 5 for model coefficients)). The absence of fish younger than 8 y in the sample did not permit the fitting of basin-specific von Bertalanffy growth models.

Lake Trout length-weight relationships were fitted by basin (Fig. 28). Similar length-weight functions were observed in B1 and B3, although fitted weights for Lake Trout from B3 were slightly higher than Lake Trout from B1 (Fig. 29). Two different patterns were observed in B2 (Fig. 28b). This corresponded to a year effect, with heavier Lake Trout caught in 2002 (Fig. 30).

Lake Trout stomach contents

The stomachs of 25 Lake Trout examined by fishery monitors in 2001-2003 contained mainly fish (Table 18). The occurrence of Pacific Herring was high (69%-83%) in 2002 and 2003. In 2002, Ninespine Stickleback (*Pungitius pungitius*) and Fourhorn Sculpin also occurred in 19% and 13% of Lake Trout stomachs, respectively. Ciscoes were the only prey item identified in the stomachs of three Lake Trout in 2001.

Detailed analyses of 24 Lake Trout stomachs from 2004 confirmed the predominance of fish prey by weight (average of 64% for identifiable fish and 17% for fish remains). Pacific Herring was again the dominant fish prey both in terms of numerical abundance (9%) and frequency occurrence (42%). The incidence of cannibalism was relatively high, with Lake Trout prey occurring in 13% of Lake Trout stomachs. Fourhorn Sculpin occurred in 8% of Lake Trout stomachs. Invertebrate prey were diverse and accounted for 0.4-15% of identified prey items, depending on species/genera. The occurrence of parasites was high by numbers (>50% for nematodes, 25% for trematodes and 21% for cestodes), but low by weight (average of 1.1%).

CONTAMINANTS

Fish mercury levels

Mercury (Hg) and selenium (Se) concentrations were determined for 39 fish specimens from 8 species (Table 19). Average Hg concentrations were lowest (<0.030 ppm) in Arctic Cisco and Pacific Herring. Lake Trout had a higher mean Hg concentration of 0.18 ppm. Intermediate Hg levels (0.030-0.040 ppm) were measured in Lake Whitefish, Least Cisco, and Broad Whitefish. One specimen of Inconnu had 0.09 ppm of Hg in its tissue. A large Northern Pike (79 cm FL) had the highest Hg concentration in the sample (0.24 ppm). In all species, Hg concentrations were below the advisory limit of 0.5 ppm for safe human consumption (Kamman et al. 2005). Mean selenium concentrations varied from a low of 0.55 ppm in Pacific Herring to a high of 1.44 ppm in Arctic Cisco. Sample sizes were too small to explore Hg-Se or Hg-length and Hg-age relationships.

Organics in water samples

Organic contaminants concentrations in water samples were generally at or below detection limits (Appendix 6). Exceptions to this were gamma and alpha-1,2,3,4,5,6-

Hexachlorocyclohexane (lindane and lindane by-product – an organochlorine insecticide) with concentrations ranging (0.21-0.62 ng•L^{-1}) (gamma) and 0.46-0.56 ng•L^{-1} (alpha) among stations.

PAHs in sediment samples

Results of sediment alkanes and PAHs concentrations were synthesized in a preliminary report by Evans (2003). Alkane concentrations were moderately high and positively correlated to percent contributions of silts and clays in the sediment. Total alkane concentrations ranged 1600-7700 ng•g^{-1} and were lowest in a sediment sample from the IF (Fig. 16c). Alkane composition was dominated by similar contributions of algal and terrestrial materials. Pristane and phytane (which dominate in partially weathered petroleum products) accounted for only a small fraction of total alkanes.

Sediment PAHs were abundant with concentrations ranging 1200-5000 ng•g^{-1} in Husky Lakes. Like alkanes, PAHs concentrations were positively correlated to the abundance of silts and clays in the sediment. PAHs were dominated by lighter molecular-weight alkylated forms of petrogenic origin, including naphthalene, phenanthrene and anthracene (Fig. 16d). Concentrations of naphthalene, 2-methylnaphthalene, fluorene and phenanthrene exceeded Interim Sediment Quality Guidelines (ISQG) at a number of sites (Macdonald et al. 1999).

PAHs in fish

Organic contaminant concentrations in fish tissue are shown in Table 20. Total PAH levels were relatively low, with highest concentrations measured in Lake Trout and one Northern Pike specimen. Lowest concentrations were found in the two cisco species. Concentrations of known or probable carcinogenic compounds (benzo[*a*]pyrene, benzo[*b*]fluoranthene, benzo[*k*]fluoranthene and indeno[*1,2,3-cd*]-pyrene) were mostly below detection limits.

DISCUSSION

ECOSYSTEM STRUCTURE AND PRODUCTIVITY

The physical features of Husky Lakes determine its connectivity to the ocean, shape mixing conditions, and water properties, and have both direct and indirect effects on the structure of biological communities in the different basins.

The ratio of drainage area to surface area for Husky Lakes (excluding KG) was about 5, suggesting limited surface water runoff outside of Liverpool Bay and KG. Total annual freshwater discharge estimated in the 1990s, from a water gauging station and precipitation records, was 0.71 km^3•yr^{-1} for Husky Lakes and 6.72 km^3•yr^{-1} for Liverpool Bay (Gushue et al. 1996). These numbers indicated that only 10% of the annual freshwater runoff to the system occurred in areas located upstream from KG. Sitidgi Lake is the largest freshwater body in the Husky Lakes drainage, and its outlet in B1 likely contributes a large fraction of annual freshwater inputs to the inland-most basins (Grainger and Evans 1982). Connectivity between Sitidgi Lake and B1 was here supported by similar surface water temperatures.

During winter months, the Husky Lakes drainage is entirely frozen (Macdonald et al 1999). The lakes themselves are ice-covered for about 7-8 months a year (Grainger and Evans 1982; Macdonald et al. 1999). Thus, freshwater inputs to the system, through discharge and precipitation, are highly seasonal and essentially limited to the May - September period. Most notably, there is a single large pulse of freshwater inflow during break-up in June or July (Gushue et al. 1996). The amount of freshwater supplied to the system via ice melt may be about 4 times greater than that supplied by runoff and precipitation (Macdonald et al. 1999; Carmack and Macdonald 2008). A small drainage area and a cold arctic climate minimize freshwater inputs to Husky Lakes, and underscore the importance of stream and river tributaries in determining the overall freshwater budget of the system. The highly seasonal character of freshwater discharge moreover suggests that freshwater budget would be highly sensitive to local climatic variation and perturbation.

Bathymetric information on Husky Lakes collected in this study differs in some ways from earlier descriptions of inland-most basins, since B1, B2 and B3 have previously been characterized as being flat-bottomed with maximum depths of 7-8 m (Mackay 1963; Grainger and Evans 1982; Macdonald et al. 1999). The present survey revealed the highly complex bottom topography of the system, characterized by alternating shallows and deeper pools/channels over the length of Husky Lakes. Deep pools and channels were found near the mouth (in B5 and OF), and within the two inner basins (B1 and B2). Intermediate (middle) sections (B3, B4 and IF) and KG were shallower than previously documented – although one deeper hole was present in B3. Liverpool Bay has been described as having a generally uniform, shallow bathymetry (Carmack and Macdonald 2008). Transitions between shallow and deeper areas, and alternating between narrow channels and wider basins (shoreline complexity), together ensure water mixing throughout the Husky Lakes.

Strong mixing conditions and the occurrence of horizontal gradients in water properties during the summer months were originally described by Grainger and Evans (1982). Our study reaffirmed similar conditions prevailed, shortly after ice break-up. A horizontal salinity gradient was evident with oligohaline waters in the inner basins (B1 and B2), and progressively increasing mesohaline salinities from B3 through OF. Grainger and Evans (1982) argued that the IF area acted as a barrier to water mixing in Husky Lakes. Our study demonstrated a stronger salinity gradient between B3 and B2, similar to Macdonald et al. (1999).

The presence of lower surface water temperatures in B3 – like those encountered in OF and parts of B5 - may indicate the resurgence of colder, more saline marine waters. Comparable surface water temperatures and higher (marine-like) pH values suggest that similar phenomena probably occur in B5. Both horizontal circulation and vertical mixing may explain saltwater diffusion near the surface in B3. Carmack and Macdonald (2008) determined that mixing processes and horizontal exchanges in Husky Lakes were the result of its unique shoreline, bathymetry and tidally-induced shear dispersion. Together, semi-diurnal tidal forcing (of generally small amplitude) and flow acceleration (constrained and accelerated flow) in the finger areas, could explain the extent of saltwater dispersion throughout the length of the Husky Lakes system (Carmack and Macdonald 2008).

Our data suggest that strong mixing in finger areas may cause the upwelling of colder marine waters to occur within, and upstream of the finger areas, whilst enhancing surface water transport in the downstream direction. Strong mixing conditions in the finger areas was apparent from observations of higher salinities and lower temperatures near the surface, highly variable surface water temperature and salinity values (in OF), consistent water temperatures and salinity with increasing depth (at certain stations), high or higher TDS/TSS concentrations, and predominance (IF) or higher proportions (OF) of finer, sandy substrate sediments (and comparatively less silts and clays). Some of these features were also observed in KG.

On the other hand, the presence of thermoclines and weak haloclines (>3 ppt increase in salinity with depth) at some stations indicated that the finger areas also channeled horizontal circulation of intermediate and/or deeper layers. A decrease in bottom water salinities by about 10 ppt between IF and B1/B2 indicated that freshening of the deeper layers occurred in the upstream direction somewhere between B3 and B2. Salinity values measured near the surface in B3 were last encountered at depths of 7-13 m in the narrow channel linking B3 and B2. Lower salinities were found at all stations located upstream of the division between B3 and B2. Similarly, water properties and nutrient concentrations measured in intermediate and deeper layers which remained constant or progressively decreased from KG to the B3/B2 division, changed drastically in B2 and B1. These data indicate that the narrow channels linking B3 and B2 restrict horizontal circulation below the surface, and in the upstream direction. Our observation of temperature stratification in B1 and B2, even shortly after ice break-up, supports the hypothesis of their conservative nature and longer residence times, as suggested by Macdonald et al. (1999). The same may be true for Sitidgi Lake.

Extrapolating salinities from ice cores, Macdonald et al. (1999) showed that horizontal salinity gradients were maintained throughout the winter along the axis of Husky Lakes, suggesting the system retain its horizontal structure year-round. In summary, our data generally support earlier physical-chemical descriptions of the Husky Lakes, however, adding that horizontal circulation of deeper layers is most limited at the B2/B3 division, and that vertical mixing in or near the finger areas appears to contribute to the maintenance of horizontal gradients in water composition.

The oligotrophic character of Husky Lakes was previously documented by Grainger and Evans (1982). In this study, low nutrient concentrations were also encountered throughout the system. There was a horizontal gradient in the ratio of nitrogen-to-phosphorous. Total and dissolved phosphorous concentrations, although low, were distinctively higher in KG and OF. In contrast, dissolved nitrogen concentrations in the inner basins were generally two times higher than in the rest of the system. Phosphorous is usually the limiting nutrient for primary production in freshwater, while nitrogen tends to be limiting in saline waters (Doering et al. 1995). The spatial transition from phosphorous to nitrogen limitation, from the inner to the outer basins of Husky Lakes, is thus consistent with the horizontal salinity gradient that characterizes the system.

The input of nutrients from external sources can shape spatial patterns of phosphorous/nitrogen limitation in an estuary such as this (Doering et al. 1995). In Husky Lakes, surface runoff was shown to contribute only small amounts of nitrate and phosphate to the system, whereas deep Beaufort Sea water may be the main source of phosphate (Grainger and Evans 1982). Our data suggest that marine waters from the Beaufort Sea may also be the main supplier of trace nutrient and major ions, such as calcium, magnesium, potassium and sulfate – since these were found in higher concentrations near the outer basins. River inflows were rich in silica, and dissolved and particulate organic carbon, the latter occurring in largest concentration in KG. Rivers may also provide an intermittent supply of ammonia substrate and particulate organic nitrogen (PON), as indicated by ammonia concentrations that were above the detection limit in B1, B2 and KG, and higher PON concentrations near the head and mouth of Husky Lakes. Recent changes in climate (Carmack and Macdonald 2002; Carmack and Macdonald 2008; AANDC 2013; Whalen 2013), however, are expected to have had consequences to the composition of freshwater runoff into Husky Lakes, especially in areas of melting permafrost. For this reason, revisiting and monitoring of nutrient concentrations and physico-chemical water properties of the tributaries to Husky Lakes would be prudent.

Based on the data collected in this study, primary productivity in the water column, in both time and space, appears limited and highly dependent upon external nutrient supplies. Areas of pronounced water mixing are the most likely to be the most productive, with primary production possibly restricted by low light penetration in turbid waters (Grainger and Evans 1982). Contributions of ice algae to primary productivity in Husky Lakes may be important and warrants further investigation. Alternatively, benthic productivity may prevail in parts of the system, and sustain higher trophic levels such as fish, as is often the case in arctic lakes (Sierszen et al. 2003; Roux et al. 2011). The importance of benthic resources was supported by high incidence of benthic invertebrates in fish stomachs that we were able to sample. Past records of abundant polychaete and cirripede larvae in the herbivorous zooplankton community during summer (Evans and Grainger 1980) suggest that benthic production may predominate, at least on a seasonal basis. High abundance of rotifers in B1 and B2 (Evans and Grainger 1980; Evans 2004) may be a reflection of an important microbial food web in these inner basins. This is consistent with these basins being less mixed and having longer residence times than other parts of Husky Lakes.

The composition of the zooplankton community in Husky Lakes was previously described as being dictated by salinity and other water properties (Evans and Grainger 1980). A generally similar community composition was observed in this study, although copepods were more abundant in August 2004 than in August 1973 (Evans 2004). Higher copepod abundance may reflect warmer conditions in more recent years, causing more nauplii to mature into copepodites (Evans 2004). The prevalence of estuarine species (characterized by a broader range of salinity tolerance) and higher abundance of zooplankton in B3 suggest the marine inputs and extent of mixing enhance productivity in the water column.

FISH

The Husky Lakes fish community was diverse, considering its polar, inshore location. More than 17 fish species were caught (total 19, when distinguishing between cod species). Smaller-size fish such as Ninespine Stickleback were found in Lake Trout stomachs but were not vulnerable to, or captured in, the experimental nets. Species richness was similar to adjacent Liverpool Bay (Bond and Erickson 1993), and nearby Tuktoyaktuk Harbour (Harwood et al. 2008). The composition of fish communities, particularly Lake Trout, along the length of Husky Lakes is linked to the horizontal salinity gradient (Harwood and Sparling 2008; Roux et al. 2011) and is the subject of a separate paper (authors' unpublished data).

Relative to the Husky Lakes basins, KG was distinct given its higher fish diversity and relative abundance. KG serves as a junction between the marine environment of Liverpool Bay, the mouths of two river systems, and the five basins of Husky Lakes. Fish species composition in KG reflected both marine and freshwater influences – with marine predominance. Rainbow Smelt, an anadromous species that overwinters in the coastal Beaufort Sea and occurs in Liverpool Bay (Bond and Erickson 1993), was found only in KG. Similarly, freshwater species like Burbot and Longnose Sucker were caught only in KG, and in Sitidgi Lake. The catch in KG was dominated by Pacific Herring, a marine schooling fish that overwinters and spawns there and in the OF of Husky Lakes (Gillman and Kristofferson 1984; Bond and Erickson 1993). Common species included amphidromous Lake Whitefish and marine flounders. KG had higher relative abundances of cods, Arctic Flounder and Broad Whitefish, relative to Husky Lakes. With such combination of marine, anadromous, amphidromous and freshwater species, changes in freshwater inputs (including seasonal variation such as winter flow reductions) could influence fish species composition and abundance in KG.

Among Husky Lakes basins, high fish diversity in B4 was consistent with it being characterized by a wide range of salinities. Co-dominance of anadromous and marine schooling fish (Arctic Cisco and Pacific Herring) was observed in B4. Common species included Least Cisco, Lake Whitefish and Starry Flounder. Freshwater fish such as the Northern Pike also occurred in small numbers. The occurrence of vertical mixing in adjacent fingers, and the presence of islands and several small channels on the southern shore, appear to provide habitat for a wide range of fish species in B4.

B2 had a higher species richness and higher abundance of fish, compared to most basins except the OF. Fish abundance was comparable between B2 and OF, although species composition differed considerably. In OF, the catch was dominated by schooling fish. Together, Least Cisco, Pacific Herring and Arctic Cisco accounted for three quarters of the catch. All anadromous and marine species found in Husky Lakes were caught in OF. Diversity indices calculated for OF were thus slightly higher than B2. In contrast, the B2 fish community was dominated by Lake Whitefish and other freshwater or amphidromous species with limited salinity tolerance, such as Lake Trout and Northern Pike. Marine fish were generally absent from B2, while freshwater species such as Broad Whitefish and Arctic Grayling were common.

The small channels connecting B3 and B2 were an apparent division for fish distribution in Husky Lakes. The division between B2 and B3 was the upstream limit of Starry Flounder, and the downstream limit of Round Whitefish and Arctic Grayling. Northern Pike were found only in a few net sets downstream of B2. The IF were another division point of fish distribution, marking the upstream limit of Cods and Arctic Flounder, and the downstream limit of Lake Trout (Harwood and Sparling 2008; Roux et al. 2011). We note that Lake Trout occurred in the OF during 1980, presumably in a freshwater layer just below the ice surface and just prior to break up that year (authors' unpublished data). Some species including Least Cisco and Arctic Cisco, Pacific Herring and Starry Flounder, occurred further upstream from the IF but in significantly lower abundance.

As expected for Arctic aquatic ecosystems, the order Salmoniformes dominated the catch and had greatest species richness indices in both Husky Lakes and Sitidgi Lake. Coregonids from three genera (*Prosopium*, *Stenodus,* and *Coregonus*) were caught in Husky Lakes, and only Inconnu was absent from Sitidgi Lake. Coregonids are ‘true arctic species’, in that they live and spawn (i.e., complete most of their life cycle) in arctic waters (Reshetnikov 2004). Most have migratory, anadromous life histories that ensure access to enhanced resources and habitats, in comparison with riverine or lacustrine forms (Tallman et al. 2002). Lake Whitefish, Arctic Cisco, and Least Cisco dominated the catch from B1 through B5, and Lake Whitefish was the second most dominant species in Sitidgi Lake, after Lake Trout.

Coregonids play a major role as energy conveyors in arctic aquatic food webs (Reshetnikov 2004). Their abundance in Husky Lakes, and reliance on benthic prey (e.g., bivalves, gastropods, and insect larvae) in early summer, suggest that coregonids likely play a key ecological role in mobilizing and transferring benthic production in the Husky Lakes food-web. The same may be true in Sitidgi Lake.

Lake Whitefish were dominant in the inland basins, from B1 to IF. Over the length of the Husky Lakes, their relative abundance was lower in both IF and OF, suggesting a preference for pelagic habitats and/or avoidance of higher salinity, turbulent and faster flowing waters encountered in the finger areas. The occurrence of Lake Whitefish in all parts of Husky Lakes indicates the species can tolerate a wide range of salinity conditions. Since the species is not known to undertake coastal migrations (Reist and Bond 1988; Bond and Erickson 1993), Lake Whitefish from Husky Lakes and Sitidgi Lake may constitute one (or more) local population(s).

Least and Arctic Ciscoes migrate extensively along the Beaufort Sea coast during summer and autumn (Reist and Bond 1988; Bond and Erickson 1993). Least Cisco tend to be the less migratory of the two species, and their distribution in coastal habitats is more closely associated with the plume of their natal river (Reist and Bond 1988; Bond and Erickson 1993). The high abundance of Least Cisco from all sizes in the OF, and occurrence of smaller specimens (17-23 cm) in KG, suggest that these fish could belong to a local population which spawns in the Kugaluk River and/or Miner River or in the Anderson River in Liverpool Bay.

Arctic Cisco abundance was lowest in areas with the greatest inputs of freshwater, namely B1, B2 and KG. They did however dominate the catch between IF and OF, and in B4 and B5. The species spawns in major tributaries of the Mackenzie River in the fall and undertakes extensive migrations along the Beaufort Sea coast during summer (Bond and Erickson 1997; Harwood et al. 2008). Arctic Cisco caught in Liverpool Bay during the summer months originate from the Mackenzie River stocks (Bond and Erickson 1993), and are generally assumed to overwinter there. Most Arctic Cisco caught in B4 and B5 were larger than the potential spawning size of 33 cm identified by Bond and Erickson (1993) for Liverpool Bay. If the Husky Lakes system indeed maintains a horizontal salinity gradient throughout the winter (Macdonald et al. 1999), over-wintering of Arctic Cisco in Husky Lakes cannot be discounted. Over-wintering has been shown to occur outside the Mackenzie River basin in other similar locations, such as Tuktoyaktuk Harbour (Bond 1982; Harwood et al. 2008).

Pacific Herring is distributed along the west coast of North America from California to the Beaufort Sea (Hart 1973), and was the only dominant marine species in Husky Lakes. However, due to our test netting efforts being only in nearshore waters, the abundance of demersal species such as Arctic Flounder, Starry Founder and cods, was probably underestimated. Some of these species may occur in large numbers in deeper areas of Husky Lakes.

The OF of Husky Lakes are a known major spawning and overwintering site for Pacific Herring (Gillman and Kristofferson 1984; Bond and Erickson 1993). Spawning takes place immediately prior to ice breakup in June (Shields 1985), and this is followed by a seasonal dispersal throughout the southern Beaufort Sea and Husky Lakes (Bond and Erickson 1993). Herring abundance may thus be higher than estimated in this study, as some fish would have already left the lakes to forage in the ocean at the time of our sampling. Pacific Herring were nonetheless encountered throughout the system, and their high incidence in Lake Trout stomachs indicated they provide an important prey item for Lake Trout, and are an important marine subsidy to the inland-most basins. Decreased herring abundance upstream from the IF may reflect lower salinities but also an increase in predation intensity.

Lake Trout is an important species owing to its high cultural and nutritional value for local residents. The monitoring of the spring subsistence fishery produced an extensive database and time series about the timing, location and composition of Lake Trout harvested from Husky Lakes. Subsistence harvest-based monitoring offers several advantages including opportunities for local harvesters to participate in the delivery of biological studies and foster the development of sampling and data collection skills. Together, indigenous and scientific knowledge can greatly enhance the understanding of ecological relationships between a resource and its habitat(s) (Bell and Harwood 2012).

Boulva and Simard (1968) set the upper limit of Lake Trout salinity tolerance at about 11-13 ppt. Our data suggested a lower salinity tolerance for Lake Trout in the Husky Lakes system at this time of year. Lake Trout were common only in the inner basins of Husky Lakes and in Sitidgi Lake, rarely seaward of IF. Locations where Lake Trout were caught did not exceed salinities of 4.4 ppt (in B1 and B2), or only occasional incidence of salinities ranging 2.7-9.3 ppt (in B3). Lake Trout were rare (in IF) or absent in areas where surface water salinity consistently exceeded 7 ppt. The extent of Lake Trout distribution in Husky Lakes therefore, was linked to the availability of oligohaline (≤5 ppt salinity) waters at this time of year. We note that Lake Trout have been caught in the past in OF during Pacific Herring spawning season in June, in this case probably within a freshwater layer under the ice surface (P. Sparling, personal observation, 1980).

There was a marked transition from smaller and older Lake Trout at low salinities in B1, to larger, heavier and younger Lake Trout at intermediate salinities in B3. Faster growth rates and higher body condition indices of anadromous versus resident Lake Trout were demonstrated in lacustrine populations from western Nunavut (Swanson et al. 2010). In Husky Lakes, the difference in size of Lake Trout between basins appears to be related to diet. In this case, the differences among basins may be related to the availability of marine prey such as Pacific Herring, and the prevalence of anadromous schooling fish such as Arctic Cisco and Least Cisco in B3. Local harvesters describe the larger Lake Trout caught in B3 as being ‘different’ and ‘fattier’, interpreted to be a discrete stock from Lake Trout caught in B1, B2 and Sitidgi Lake (authors' unpublished data, Carmack and Macdonald 2008). Lake Trout caught in B3 may be a different morphotype than those caught in B1 and B2. Differentiation between Lake Trout morphotypes in Husky Lakes might be related to an ontogenetic shift in diet and/or habitat use, similar to Lake Trout from Great Slave Lake (Zimmerman et al. 2009) and Lake Superior (Moore and Bronte 2001). In this case however, the transition might be from predominantly-freshwater to predominantly-brackish water prey and habitat. The assessment of ontogenetic variations in diet and habitat use and evaluation of differences in growth rates and condition of Lake Trout from Husky Lakes is an important area for future study (Kissinger et al. 2013). Another line of evidence which may reveal the nature and extent of dietary/habitat shifts may be parasite communities in Lake Trout in the different basins, but this has not been examined.

CONTAMINANTS

Mercury and PAH concentrations in fish were below values reported in the literature to be of concern for human consumption. Mercury concentrations in Lake Trout were lower than reported for most lakes of the neighbouring Mackenzie River basin (Evans et al. 2005). Detailed studies of mercury concentrations in fishes in the Husky Lakes are ongoing and include investigations of relationships with length, age, and diet, as well as potential sources to the Husky Lakes (Gantner and Gareis 2012; Gantner and Gareis 2013). Low levels of PAHs were expected, considering that fish rapidly metabolize PAHs to more water-soluble compounds which are excreted through bile (Tuvikene 1995; Brian Billeck, DFO, Winnipeg, pers. comm. 2003). Levels of total PAHs in fish from Husky Lakes were similar to those found in other lakes and rivers in the Northwest Territories (Brian Billeck, pers. comm. 2003).

PAH concentrations in sediment were typical of those observed in the Mackenzie River delta and further downstream at Lake Athabasca and its delta (Yunker and Macdonald 1995; Evans et al. 2002; Evans 2003). PAHs were abundant and dominated by low molecular weight compounds of petrogenic origin, with a number of compounds exceeding ISQG at some sites. Sediment alkane concentrations were approximately 50% lower than in the Mackenzie river delta, had lower contributions of terrestrial matter, and were comparatively less degraded (Yunker et al. 2002; Evans 2003).

CONCLUSION AND RECOMMENDATIONS

The ecological assessment of Husky Lakes and Sitidgi Lake underscored the vulnerable character of this unique system. The Husky Lakes are home to a diverse and abundant fish community, promoted by the mixing of different water types and characterized by salinity and temperature gradients throughout the system. Fish utilize Husky Lakes for spawning, overwintering and/or foraging. As the lakes are highly oligrotrophic, fish productivity appears to be closely associated with the benthic and marine energy pathways. Tidal forcing and the physical features of Husky Lakes (complex shoreline and bathymetry) ensure marine inputs to the system (in the form of nutrients and prey), via horizontal circulation and vertical mixing. In contrast, freshwater supplies tend to be limited, especially in the inland-most basins. The tributaries to Husky Lakes are an essential source of freshwater and nutrients to the system, and likely also provide spawning habitat for some species of fish. Natural phenomena and/or human activities that either affect or interfere with the freshwater influx throughout this system would have consequences on biological productivity and the structure of fish communities. These may include the effects of climate change on precipitation, runoff composition, erosion and ice thickness, as well as direct human activity such as diversion of tributaries and water withdrawals. Finally, freshening of the Arctic Ocean through global warming may ultimately affect the composition and abundance of the marine subsidies to Husky Lakes (McPhee et al. 2012).

The inner and seaward parts of the Husky Lakes system KG/OF and inland-most basins B1/B2) are especially vulnerable to changes in marine and freshwater budgets. Both of these areas had higher fish abundance, and, the inner basins had comparatively limited exchanges with the marine environment and more conservative water properties, compared with the outer basins. Changes in water quality of tributaries to B1, B2 and Sitidgi Lake could thus have a long-term influence on fish communities and abundance. Similarly, changes in water temperature and salinity in the outer basins may affect successful spawning and egg development in Pacific Herring, and alter overwintering/foraging habitat quality for other species.

This study enhanced the understanding of the Husky Lakes ecosystem and provided a snapshot of near-shore fish species composition and relative abundance during the open water season, shortly after ice break-up. The data will serve as a baseline to study temporal and spatial variation in marine and freshwater inputs to the system, as well as to spatial or temporal shifts in fish species composition, abundance and distribution in relation to environmental change.

Possible future studies:

- Monitoring of major freshwater tributaries to Husky Lakes, including water quality, composition and flow velocity.
- Monitoring of climate-induced changes in precipitation, ice thickness, salinity and erosion (bank slumping, compare with air photos).
- Seasonal evaluation of the relative abundance of fish, to distinguish local (spawning) from overwintering and transient (foraging) populations in Husky Lakes.
- Survey and identification of potential spawning areas for local fish populations (including scientific and traditional knowledge components).
- Deep-water fish survey and estimation of the abundance of demersal marine fish such as cod and flounders in Husky Lakes.
- Food web studies to evaluate the strength and seasonality of benthic energy pathways (in Husky Lakes and Sitidgi Lake), and marine energy pathways (Husky Lakes).

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Table 1. Summary of depth information for Husky Lakes and Sitidgi Lake.

Location		n_s	n_s/km^2	Depth (m)		
				mean ± sd	max	range
Husky Lakes						
	B1	1082	10	22.7 ± 20.6	97.6	0.5-97.6
	B2	1609	3	12.2 ± 10.3	98.1	0.6-98.1
	B3	423	2	6.3 ± 4.5	73.0	0.6-73.0
	B4	1036	3	5.7 ± 4.8	39.9	0.6-39.9
	B5	8229	20	11.8 ± 13.9	99.7	0.3-99.7
	IF	597	7	10.5 ± 7.1	35.7	0.5-35.7
	OF	4040	15	17.7 ± 13.0	72.8	0.5-72.8
Husky Lakes Total		17016	9	13.4 ± 13.8	99.7	99.7
Kugaluk Channel (KG)		474	4	5.9 ± 4.1	24.4	0.6-24.4
Sitidgi Lake		6539	22	6.7 ± 7.0	37.4	0.4-37.4

$n_{s\,=}$ number of depth soundings recorded.

Table 2. Physical characteristics of Husky Lakes and Sitidgi Lake.

Location	Area (A) (km^2)	Perimeter (P) (km)	P:A ratio	Catchment A* (km^2)
Husky Lakes				
B1	107	200	1.88	
B2	512	599	1.17	
B3	250	164	0.66	
B4	299	289	0.97	
B5	418	253	0.61	
IF	86	170	1.97	
OF	263	590	2.24	
Total	1933	2265	1.17	9543
Kugaluk Channel	128	421	3.30	
Sitidgi Lake	291	111	0.38	

* Catchment Area based on boundary visible in Figure 2.

Table 3. Physicochemical water properties and nutrient concentrations in Husky Lakes (values are in mg•L^{-1} unless specified otherwise).

Basin	Stn	Water strata	Depth (m)	Alk.	Colour (TCU)	Cond. ms•cm^{-1}	pH	TDS	TSS	Turb. (NTU)	DOC	POC	PON	P_T	$P_{(diss)}$	$N_{(diss)}$	$N/P_{(diss)}$	NO_2+NO_3	NH_3
B1	A	surf	2	45.2	5.0	4920	7.71	na	na	na	na	na	na	na	na	na	na	na	na
B1		inter	8	50.6	(2.5)	5740	7.65	3310	9	0.6	5.3	0.146	0.034	0.032	0.007	0.165	24	0.035	0.022
B1		bottom	20	54.8	(2.5)	6480	7.64	3870	15	0.6	5.0	0.140	0.022	(0.002)	(0.002)	0.220	110	0.047	0.008
B2	B	surf	2	52.6	(2.5)	6250	7.77	3330	15	0.7	5.3	0.117	0.026	0.007	0.006	0.208	35	0.016	0.022
B2		inter	10	57.9	(2.5)	7050	7.75	4130	4	1.0	5.2	0.206	0.036	0.011	0.012	0.139	12	0.022	0.017
B2		bottom	20	56.7	(2.5)	7070	7.74	5160	29	0.7	5.4	0.148	0.025	0.007	0.006	0.199	33	0.047	(0.0025)
B2	C	surf	2	60.3	5.0	7120	7.83	4190	14	1.0	5.9	0.159	0.033	0.018	0.012	0.189	16	0.017	0.024
B2		inter	10	60.7	(2.5)	7310	7.77	4160	12	0.9	5.6	0.136	0.028	0.01	0.007	0.248	35	0.016	0.017
B2		bottom	18	62.6	(2.5)	8170	7.67	na	na	na	na	na	na	na	na	na	na	na	na
B2	D	surf	2	51.3	(2.5)	8900	7.80	5500	33	na	na	0.339	0.051	na	na	na	na	na	na
B2		inter	7	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na	na
B2		bottom	13	79.1	(2.5)	14500	7.56	9310	43	5.2	16.2	0.393	0.065	0.006	(0.002)	0.374	187	0.07	0.035
B3	E	surf	2	81.1	(2.5)	19500	7.93	10400	48	5.0	2.2	0.375	0.041	0.022	0.025	0.167	7	(0.004)	(0.003)
IF	F	surf	1	83.9	(2.5)	21200	7.93	14700	50	1.6	1.9	0.145	0.013	0.007	0.007	0.145	21	(0.004)	(0.0025)
B4	G	surf	2	85.3	10.0	22200	7.91	24000	6	0.7	1.7	0.132	0.013	0.009	0.006	0.146	24	(0.004)	0.008
B4		inter	8	86.9	5.0	23000	7.91	16700	70	1.4	1.8	0.139	0.014	0.008	0.008	0.140	18	(0.004)	0.006
B4		bottom	17	87.9	(2.5)	23500	7.92	16500	56	2.0	1.8	0.178	0.019	0.010	(0.002)	0.150	75	(0.004)	(0.003)
B5	H	surf	2	89.0	(2.5)	24500	7.85	17800	8	1.3	4.0	0.171	0.015	0.067	0.06	0.135	2	0.013	(0.0025)
B5		inter_1	10	90.3	(2.5)	24800	7.84	17900	4	1.2	3.8	0.209	0.020	0.068	0.063	0.119	2	0.012	(0.0025)
B5		inter_2	15	92.3	(2.5)	25200	7.82	18200	46	1.7	4.2	0.236	0.022	0.074	0.064	0.106	2	0.016	(0.0025)
B5		bottom	25	95.9	(2.5)	26200	7.77	18900	8	1.1	4.0	0.178	0.015	0.082	0.058	0.147	3	0.030	(0.0025)
OF	I	surf	2	78.7	10.0	21500	7.93	14800	30	1.0	4.0	0.295	0.032	0.021	0.021	0.299	14	(0.004)	(0.0025)
OF		inter_1	5	79.0	10.0	21600	7.93	15100	48	1.1	3.9	0.251	0.036	2.780	0.03	0.147	5	(0.004)	0.02
OF		inter_2	10	79.5	10.0	21700	7.96	15700	2	1.1	3.8	0.394	0.032	2.780	0.022	0.099	5	(0.004)	(0.0025)
OF		bottom	18	87.0	10.0	23600	7.92	18500	14	1.5	4.2	0.228	0.021	2.450	0.022	0.124	6	0.016	(0.0025)
KG	J	surf	2	70.4	30.0	19100	7.88	13200	66	9.7	6.9	0.673	0.086	2.520	0.031	0.111	4	(0.004)	(0.0025)
KG		inter_1	5	70.7	20.0	19400	7.82	13100	66	10.4	6.7	0.699	0.101	2.620	0.021	0.130	6	(0.004)	0.006
KG		inter_2	10	70.8	20.0	19500	7.83	13300	48	9.7	6.7	0.681	0.075	2.460	0.096	0.131	1	(0.004)	0.009
KG		bottom	18.5	71.2	20.0	19700	7.83	13600	50	10.7	6.7	0.667	0.080	2.480	(0.002)	0.114	57	(0.004)	0.018

Table 4. Trace nutrient concentrations by water strata and basins in Husky Lakes (all values are in mg•L^{-1}).

Basin	Stn	Water strata	Depth (m)	SiO_2	Ca	Mg	Na	K	Cl	SO_4	F
B1	A	surf	2	0.55	69.7	158	1263	47.1	2270	386	0.21
		inter	8	0.63	82.6	193	1530	56.6	2750	469	0.24
		bottom	20	0.75	90.1	211	1697	62.4	3100	480	0.27
B2	B	surf	2	0.67	61.7	134	1040	39.0	1850	290	0.20
		inter	10	0.75	70.0	153	1210	44.5	2040	356	0.24
		bottom	20	0.69	67.4	148	1160	42.9	2090	316	0.23
B2	C	surf	2	0.71	69.7	148	1180	44.3	2150	405	0.19
		inter	10	0.73	70.7	158	1220	45.4	2250	380	0.20
		bottom	18	0.86	80.0	175	1420	52.1	2590	400	0.25
B2	D	surf	2	0.26	77.7	193	1570	58.0	2810	463	0.25
		inter	7	0.40	107.0	269	2160	80.0	3960	670	0.28
		bottom	13	0.70	123.0	311	2510	92.2	4620	724	0.33
B3	E	surf	2	0.19	160.0	456	3820	136.0	6670	944	(0.01)
IF	F	surf	1	0.17	169.0	495	4190	147.0	7060	995	(0.01)
B4	G	surf	2	0.22	178.0	525	4420	159.0	7780	1090	(0.01)
		inter	8	0.35	183.0	547	4620	163.0	7840	1210	(0.01)
		bottom	17	0.23	187.0	550	4600	165.0	8110	1060	(0.01)
B5	H	surf	2	0.21	207.0	617	5180	177.0	14300	1250	na
		inter_1	10	0.22	209.0	620	5240	180.0	14400	1250	na
		inter_2	15	0.24	209.0	623	5210	181.0	14600	1260	na
		bottom	25	0.31	214.0	644	5410	188.0	15400	1300	na
OF	I	surf	2	0.22	174.0	526	4420	150.0	8270	1090	na
		inter_1	5	0.23	179.0	533	4630	156.0	8280	1100	na
		inter_2	10	0.26	183.0	548	4730	160.0	8640	1120	na
		bottom	18	0.64	227.0	681	5710	201.0	10200	1490	na
KG	J	surf	2	0.50	152.0	456	3960	134.0	6870	946	na
		inter_1	5	0.48	152.0	457	3980	135.0	6890	952	na
		inter_2	10	0.49	155.0	462	4040	136.0	7030	963	na
		bottom	18.5	0.51	153.0	471	4070	137.0	7190	975	na

Table 5. Surface water properties measured in Husky Lakes and Sitidgi Lake (2001-2004).

Location	n	pH		Salinity (ppt)		Temperature (°C)	
		mean ± sd	range	mean ± sd	range	mean ± sd	range
Husky Lakes							
B1	14	7.9 ± 0.2	7.7-8.2	1.3 ± 0.4	0.8-2.3	13.3 ± 2.3	6.8-15.8
B2	54	7.8 ± 0.1	7.6-8.3	2.9 ± 0.7	0.4-4.4	10.7 ± 2.1	6.7-16.7
B3	23	7.7 ± 0.4	6.9-8.3	7.0 ± 1.6	2.7-9.3	7.5 ± 1.6	3.9-11.1
B4	34	7.8 ± 0.3	7.1-8.5	9.3 ± 1.3	6.7-13.0	10.3 ± 2.1	6.4-13.5
B5	10	8.5 ± 0.6	6.8-9.0	9.9 ± 1.5	8.4-13.8	9.4 ± 2.4	4.1-12.9
IF	28	7.5 ± 0.2	7.2-8.1	10.8 ± 1.6	7.2-13.0	8.2 ± 1.8	6.0-13.6
OF	33	7.1 ± 0.5	6.5-8.7	12.9 ± 3.6	1.8-17.4	8.2 ± 3.9	1.9-18.3
Husky Lakes Total	196	7.7 ± 0.5	6.5-9.0	7.5 ± 4.4	0.4-17.4	9.6 ± 2.9	1.9-18.3
Kugaluk Channel	5	7.0 ± 0.3	6.7-7.4	6.8 ± 3.8	2.2-10.8	12.7 ± 3.3	8.1-16.2
Sitidgi Lake	36	6.7 ± 0.4	5.4-7.3	0.0		14.0 ± 1.3	11.9-17.0

Table 6. Fish species catch composition in Husky Lakes.

Family	Scientific name	Common name	Acronym	Catch	%CatchT	Freq	%Freq	IRI	%IRI	Incidence
Salmonidae										
	Coregonus clupeaformis	Lake Whitefish	LWF	1476	24.2	259	47.9	1157.1	35.87	dominant
	Coregonus sardinella	Least Cisco	LC	1071	17.5	235	43.4	761.8	23.61	dominant
	Coregonus autumnalis	Arctic Cisco	AC	647	10.6	150	27.7	293.7	9.11	common
	Salvelinus namaycush	Lake Trout	LT	141	2.3	85	15.7	36.3	1.12	occasional
	Coregonus nasus	Broad Whitefish	BWF	109	1.8	54	10.0	17.8	0.55	occasional
	Stenodus leucichthys	Inconnu	INC	44	0.7	23	4.3	3.1	0.09	rare
	Thymallus arcticus	Arctic Grayling	AG	48	0.8	18	3.3	2.6	0.08	rare
	Prosopium cylindraceum	Round Whitefish	RWF	13	0.2	8	1.5	0.3	0.01	rare
Clupeidae										
	Clupea pallasii	Pacific Herring	PH	1510	24.7	145	26.8	662.7	20.54	dominant
Pleuronectidae										
	Platichthys stellatus	Starry Flounder	SF	536	8.8	139	25.7	225.5	6.99	common
	Pleuronectes glacialis	Arctic Flounder	AF	163	2.7	49	9.1	24.2	0.75	occasional
Gadidae										
	Cod spp.*	Cod spp.*	COD	103	1.7	58	10.7	18.1	0.56	occasional
	Lota lota	Burbot	BT	1	0.0	1	0.2	0.0	0.00	rare
Cottidae										
	Myoxocephalus quadricornis	Fourhorn Sculpin	FHS	87	1.4	47	8.7	12.4	0.38	occasional
Esocidae										
	Exos lucius	Northern Pike	NP	97	1.6	34	6.3	10.0	0.31	occasional
Osmeridae										
	Osmerus mordax	Rainbow Smelt	RBS	60	1.0	5	0.9	0.9	0.03	rare
Catostomidae										
	Catostomus catostomus	Longnose Sucker	LNS	2	0.0	2	0.4	0.0	0.00	rare

*Cod spp. includes Arctic Cod (*Arctogadus glacialis*), Saffron Cod (*Eleginus gracilis*), and Greenland Cod (*Gadus ogac*). Species were pooled for analyses owing to uncertainty in the identification of certain specimens.

Table 7. Catch composition by species (dominant vs. common species) among Husky Lakes basins.

Basin	Species	%Catch$_T$	%Freq	%IRI	Incidence
B1	LWF	61.0	68.0	78.87	dominant
	LT	10.8	52.0	10.64	common
	AG	12.3	28.0	6.55	common
B2	LWF	70.5	86.8	85.05	dominant
	LT	8.0	60.5	6.76	common
	NP	9.2	32.9	4.23	occasional
B3	LWF	65.0	75.6	81.61	dominant
	SF	13.7	40.0	9.12	common
	LT	10.1	40.0	6.73	common
B4	AC	27.8	56.3	36.76	dominant
	PH	25.1	38.8	22.90	dominant
	LC	14.1	43.8	14.55	common
	LWF	17.5	35.0	14.38	common
	SF	8.5	48.8	9.73	common
B5	AC	49.8	60.0	70.46	dominant
	PH	13.7	33.3	10.76	common
	LC	13.7	31.7	10.22	common
	COD	7.6	31.7	5.70	common
IF	LWF	36.4	73.0	61.57	dominant
	PH	21.5	36.5	18.18	common
	SF	12.9	33.3	9.96	common
	AC	11.2	17.5	4.52	occasional
OF	LC	48.4	74.9	74.31	dominant
	PH	14.2	27.5	7.99	common
	AC	12.0	25.7	6.33	common
	LWF	9.3	28.7	5.46	common
KG	PH	59.9	90.5	74.90	dominant
	SF	16.5	38.1	8.69	common
	LWF	5.9	71.4	5.79	common
	AF	6.9	52.4	5.00	common

Table 8. Fish species richness and diversity in Husky Lakes and Sitidgi Lake and distinction between gamma (ecosystem), alpha (basins), and beta (differentiation) diversity in the estuary.

Location		Richness		Simpson's D		Shannon-Weaver H'	
		S	range	mean	range	mean	range
Husky Lakes		17	1-8	0.35	0-0.82	0.59	0-1.83
Sitidgi Lake		8	1-4	0.25	0-0.72	0.40	0-1.33
Husky Lakes basins		S	S	S		D	H'
		(γ)	(α)	(β)		(α)	(α)
	B1	10	2.2	3.55		0.32	0.52
	B2	12	2.6	3.65		0.33	0.57
	B3	10	2.0	4.11		0.26	0.43
	IF	10	2.1	3.74		0.33	0.53
	B4	11	2.6	3.17		0.41	0.70
	B5	10	2.0	4.00		0.31	0.49
	OF	10	2.4	3.22		0.36	0.60
	KG	13	5.0	1.63		0.49	0.95

Table 9. Fish species catch composition in Sitidgi Lake.

Family	Scientific name	Common name	Acronym	Catch	%CatchT	Freq	%Freq	IRI	%IRI	Incidence
Salmonidae										
	Salvelinus namaycush	Lake Trout	LT	37	32.2	25	71.4	2298.1	52.05	dominant
	Coregonus clupeaformis	Lake Whitefish	LWF	41	35.7	14	40.0	1426.1	32.30	dominant
	Prosopium cylindraceum	Round Whitefish	RWF	6	5.2	5	14.3	74.5	1.69	occasional
	Coregonus nasus	Broad Whitefish	BWF	4	3.5	4	11.4	39.8	0.90	occasional
	Coregonus sardinella	Least Cisco	LC	5	4.3	2	5.7	24.8	0.56	occasional
	Coregonus autumnalis	Arctic Cisco	AC	1	0.9	1	2.9	2.5	0.06	rare
Gadidae										
	Lota lota	Burbot	BT	1	0.9	1	2.9	2.5	0.06	rare
Esocidae										
	Exos lucius	Northern Pike	NP	20	17.4	11	31.4	546.6	12.38	common

Table 10. Fish relative abundance as CPUE (counts of fish per experimental net per hour) in Husky Lakes basins and Sitidgi Lake, including total number of nets (n), total number of fish caught (catch) and survey intensity (number of nets per km2 of surface area). CPUE range were rounded to the nearest fish per net hour.

	n	Catch	$CPUE_T$		Survey I
	(nets)	(total)	(mean ± SD)	(range)	(nets/km^2)
Husky Lakes					
Estuary	585	6108	8.57 ± 17.09	0-253	0.28
B1	29	195	4.99 ± 5.02	0-17	0.27
B2	84	916	8.10 ± 8.66	0-47	0.16
B3	50	306	4.88 ± 4.99	0-21	0.20
IF	70	349	3.94 ± 3.15	0-16	0.81
B4	85	601	5.91 ± 6.28	0-35	0.28
B5	67	446	5.08 ± 5.46	0-27	0.16
OF	179	1658	8.53 ± 8.86	0-43	0.68
KG	21	1637	61.85 ± 62.82	2-253	0.16
Sitidgi Lake	55	115	2.06 ± 3.27	0-20	0.19

Catch = number of fish from all species.

Table 11. Relative abundance as CPUE (counts of fish per net hour) for fish species in Husky Lakes basins and Sitidgi Lake. CPUE range (min-max values) were rounded to the nearest fish per net hour.

A. Dominant and common species

Location		$CPUE_{AC}$		$CPUE_{LC}$		$CPUE_{LT}$		$CPUE_{LWF}$		$CPUE_{PH}$		$CPUE_{SF}$	
		(mean ± sd)	(range)	(mean ± sd)	(range)	(mean ± sd)	(range)	(mean ± sd)	(range)	(mean ± sd)	(range)	(mean ± sd)	(range)
Husky Lakes		0.89 ± 2.62	0-27	1.65 ± 3.80	0-34	0.17 ± 0.50	0-4	2.07 ± 4.16	0-46	2.04 ± 10.12	0-145	0.73 ± 6.67	0-153
	B1	0.05 ± 0.20	0-1	0.08 ± 0.25	0-1	0.49 ± 0.70	0-3	3.17 ± 4.46	0-17	0.02 ± 0.12	0-1	0	0
	B2	0.08 ± 0.30	0-2	0.43 ± 1.05	0-5	0.59 ± 0.70	0-3	5.74 ± 7.43	0-46	0.09 ± 0.59	0-5	0.01 ± 0.08	0-1
	B3	0.10 ± 0.52	0-3	0.04 ± 0.20	0-1	0.48 ± 0.84	0-3	3.24 ± 4.08	0-16	0.02 ± 0.14	0-1	0.64 ± 1.25	0-5
	IF	0.44 ± 1.28	0-8	0.30 ± 0.88	0-5	0.17 ± 0.60	0-4	1.46 ± 1.77	0-9	0.84 ± 1.83	0-11	0.47 ± 0.92	0-4
	B4	1.70 ± 2.71	0-14	0.85 ± 1.49	0-9	0	0	1.06 ± 2.47	0-14	1.42 ± 3.80	0-27	0.48 ± 0.64	0-3
	B5	2.35 ± 4.75	0-27	0.77 ± 1.71	0-10	0	0	0.40 ± 2.02	0-13	0.81 ± 1.68	0-7	0.16 ± 0.56	0-3
	OF	0.93 ± 2.84	0-22	4.15 ± 5.89	0-34	0	0	0.84 ± 2.24	0-16	1.26 ± 3.74	0-26	0.48 ± 1.42	0-16
	KG	0.21 ± 0.56	0-2	1.82 ± 1.83	0-6	0	0	4.71 ± 4.60	0-16	34.51 ± 40.36	0-145	10.61 ± 34.10	0-153
Sitidgi Lake		0.02 ± 0.13	0-1	0.10 ± 0.65	0-5	0.65 ± 0.85	0-3	0.75 ± 2.09	0-13	0		0	

B. Occasional species

Location		$CPUE_{AF}$		$CPUE_{BWF}$		$CPUE_{COD}$		$CPUE_{FHS}$		$CPUE_{NP}$	
		(mean ± sd)	(range)	(mean ± sd)	(range)	(mean ± sd)	(range)	(mean ± sd)	(range)	(mean ± sd)	(range)
Husky Lakes		0.26 ± 3.04	0-72	0.19 ± 0.85	0-13	0.14 ± 0.67	0-12	0.12 ± 0.54	0-6	0.12 ± 0.75	0-12
	B1	0	0	0.03 ± 0.12	0	0		0.11 ± 0.62	0-3	0.19 ± 0.51	0-2
	B2	0	0	0.13 ± 0.67	0-5	0		0.02 ± 0.15	0-1	0.73 ± 1.83	0-12
	B3	0	0	0.04 ± 0.18	0-1	0		0.31 ± 0.80	0-4	0.02 ± 0.12	0-1
	IF	0	0	0.02 ± 0.09	0-1	0.03 ± 0.17	0-1	0.17 ± 0.63	0-4	0.01 ± 0.12	0-1
	B4	0.06 ± 0.28	0-2	0.07 ± 0.30	0-2	0.15 ± 0.38	0-2	0.02 ± 0.10	0-1	0.02 ± 0.12	0-1
	B5	0.05 ± 0.24	0-2	0.13 ± 0.55	0-4	0.35 ± 0.70	0-3	0.05 ± 0.19	0-1	0	0
	OF	0.19 ± 0.51	0-4	0.32 ± 1.30	0-13	0.14 ± 0.54	0-4	0.15 ± 0.61	0-6	0	
	KG	5.09 ± 15.52	0-72	1.01 ± 1.35	0-4	0.85 ± 2.72	0-12	0.36 ± 1.05	0-5	0	
Sitidgi Lake		0		0.05 ± 0.19	0-1	0		0		0.33 ± 0.91	0-5

Table 11 (continued). Relative abundance as CPUE (counts of fish per net hour) for fish species in Husky Lakes basins and Sitidgi Lake. CPUE range (min-max values) were rounded to the nearest fish per net hour.

C. Rare species

Location		$CPUE_{AG}$		$CPUE_{BB}$		$CPUE_{INC}$		$CPUE_{LNS}$		$CPUE_{RS}$		$CPUE_{RWF}$	
		(mean ± sd)	(range)	(mean ± sd)	(range)	(mean ± sd)	(range)	(mean ± sd)	(range)	(mean ± sd)	(range)	(mean ± sd)	(range)
Husky Lakes		0.06 ± 0.47	0-7	0.002 ± 0.041	0-1	0.07 ± 0.56	0-11	0.003 ± 0.058	0-1	0.05 ± 0.90	0-20	0.02 ± 0.18	0-4
	B1	0.58 ± 1.55	0-7	0		0		0		0		0.21 ± 0.71	0-4
	B2	0.22 ± 0.79	0-6	0		0.01 ± 0.07	0	0		0		0.04 ± 0.18	0-1
	B3	0		0		0.01 ± 0.06	0	0		0		0	
	IF	0		0		0		0		0		0	
	B4	0		0		0.05 ± 0.24	0-2	0		0		0	
	B5	0		0		0.02 ± 0.12	0-1	0		0		0	
	OF	0		0		0.05 ± 0.27	0-2	0		0		0	
	KG	0		0.05 ± 0.22	0-1	1.11 ± 2.63	0-11	0.09 ± 0.30	0-1	1.47 ± 4.66	0-20	0	
Sitidgi Lake		0		0.01 ± 0.07	0	0				0		0.13 ± 0.47	0-3

Table 12. Biological information on fish species collected during experimental surveys in Husky Lakes.

Species	Length (cm)			Weight (g)			Age (yr)		
	n	Mean ± sd	range	n	mean ± sd	range	n	mean ± sd	range
Arctic Cisco	293	35 ± 5	16-46	73	543 ± 131	300-1000	10	5 ± 1	3-7
Arctic Flounder	9	29 ± 7	14-36	5	560 ± 96	400-650	0		
Arctic Grayling	16	37 ± 8	28-61	11	486 ± 142	300-700	0		
Broad Whitefish	32	50 ± 10	22-61	18	2478 ± 728	600-3600	7	7 ± 1	6-10
Cod spp.	48	35 ± 5	17-45	11	345 ± 93	200-500	0		
Fourhorn Sculpin	22	21 ± 4	11-28	3	150 ± 50	100-200	0		
Inconnu	16	79 ± 29	45-130	5	7500 ± 2318	5500-10000	1	13	
Least Cisco	281	34 ± 6	17-68	63	507 ± 248	55-1500	8	5 ± 2	3-9
Longnose Sucker	2	39 ± 15	28-49	0			0		
Lake Trout	143	67 ± 13	38-120	140	4447 ± 3287	600-18000	13	14 ± 3	11-20
Lake Whitefish	407	43 ± 7	16-58	209	1396 ± 515	40-3500	10	9 ± 3	5-13
Northern Pike	29	53 ± 9	32-79	1	2900		0		
Pacific Herring	91	25 ± 5	18-42	13	281 ± 225	80-700	10	6 ± 1	5-7
Round Whitefish	8	30 ± 7	22-42	4	389 ± 267	90-700	0		
Starry Flounder	38	34 ± 5	16-43	25	586 ± 160	350-1000	0		

Table 13. Biological information for fish species collected during experimental surveys in Sitidgi Lake.

Species	Fork length (cm)			Weight (g)		
	n	mean ± sd	range	n	mean ± sd	range
Arctic Cisco	1	32		1	340	
Burbot	1	36		0		
Broad Whitefish	4	52 ± 15	31-63	0		
Least Cisco	4	20 ± 5	19-21	4	66 ± 8	55-70
Lake Trout	34	60 ± 11	48-92	18	3111 ± 2374	1300-9500
Lake Whitefish	41	30 ± 12	15-52	33	461 ± 474	35-1500
Northern Pike	20	58 ± 6	43-73	1	400	
Round Whitefish	5	30 ± 5	22-35	5	256 ± 122	90-410

Table 14. Stomach contents for fish species collected during experimental surveys in Husky Lakes (%O = proportional occurrence of prey type in fish stomachs, %F = numerical abundance of prey type in fish stomachs).

Species	n	Group	Class/order/species	%O	%N	Location(s)
Arctic Cisco	7	Invertebrates	bivalves spp.	28.6	19.2	B4
			unidentified	28.6	38.5	
			gasteropoda spp.	14.3	9.6	
			insect larvae	14.3	28.8	
		Others	sediment	28.6	3.8	
Arctic Flounder	3	Invertebrates	bivalves spp.	100	77.4	B4
			polychaete spp.	33.3	12.9	
			gasteropoda spp.	33.3	9.7	
Broad Whitefish	4	Invertebrates	unidentified	75	26.1	B3,B4
			bivalves spp.	50	47.8	
			chironomids spp.	25	8.7	
			amphipods spp.	25	8.7	
			terrestrial insects spp.	25	8.7	
Least Cisco	8	Invertebrates	bivalves spp.	12.5	17.5	B4
			amphipods spp.	12.5	8.8	
			terrestrial insects spp.	50	38.6	
			unidentified	25	35.1	
Lake Trout	11	Fish	*Clupea pallasii*	100	100	B3
Lake Whitefish	14	Invertebrates	bivalves spp.	100	90.8	B3,B4
			copepods spp.	7.1	5.1	
			chironomid larvae	7.1	3.1	
			unidentified	7.1	1	
Northern Pike	1	Fish	*Clupea pallasii*	100	100	na

Table 15. CPUE data (counts of Lake Trout per jigging hour) collected by fishery monitors in Husky Lakes basins B1, B2, and B3 during spring subsistence fisheries in 2000-2002.

Year	Month(s)	CPUE		
		n	mean ± sd	min-max
2000	5	37	0.21 ± 0.38	0-1.83
2001	4,5	18	0.05 ± 0.09	0-0.25
2002	4,5	12	0.08 ± 0.15	0-0.50
all years		67	0.15 ± 0.30	

Table 16. Biological information for Lake Trout harvested during spring subsistence fisheries.

Year	Month(s)	Location(s)	Fork length (mm)			Weight (kg)			Age (yr)			Sex ratio
			n	mean ± sd	range	n	mean ± sd	range	n	mean ± sd	range	(F/M)
2000	5	B2,B3	158	668 ± 106	223-1016	157	3.6 ± 1.6	0.2-11.0	94	19.9 ± 6.0	11-40	1.06
2001	4,5,6,7	B1,B2,B3,SL	229	676 ± 86	503-999	229	3.6 ± 1.6	1.1-10.9	167	20.1 ± 7.3	8-48	0.98
2002	4,5,7	B1,B2,B3	153	653 ± 81	510-1000	153	4.8 ± 2.0	1.4-9.5	123	21.4 ± 8.4	9-55	0.96
2003	4,5	B1,B2,B3	217	662 ± 84	270-990	217	3.5 ± 1.5	1.5-11.5	173	20.3 ± 7.0	10-46	1.27
2004	5	B1,B2,B3,SL	164	658 ± 84	515-980	164	3.2 ± 1.4	1.6-11.0	118	22.4 ± 7.1	12-50	0.89
2000-2004			921	664 ± 88	223-1016	920	3.7 ± 1.7	0.2-11.5	675	20.8 ± 7.3	8-55	1.02

Table 17. Average length-at-age for harvest samples of Lake Trout among Husky Lakes basins.

Age (yr)	n	Fork length (cm)		
		B1	B2	B3
		mean ± sd	mean ± sd	mean ± sd
8	1	54		
9	1		62	
10	5		57 ± 1	69 ± 2
11	14	56 ± 2	60 ± 4	65 ± 4
12	31	57 ± 4	62 ± 5	67 ± 4
13	23	57 ± 3	61 ± 4	70 ± 6
14	18	56 ± 2	62 ± 7	69 ± 3
15	32	58 ± 4	61 ± 7	67 ± 7
16	32	61 ± 5	62 ± 5	69 ± 4
17	23	61 ± 6	63 ± 8	73 ± 7
18	22	61 ± 4	62 ± 6	76 ± 2
19	19	69 ± 1	65 ± 5	71 ± 3
20	28	65 ± 3	63 ± 5	74 ± 6
21	34	67 ± 10	64 ± 7	75 ± 8
22	37	66 ± 7	64 ± 7	75 ± 6
23	34	67 ± 7	62 ± 7	73 ± 12
24	29	64 ± 8	65 ± 8	78 ± 4
25	23	66 ± 6	71 ± 11	77 ± 8
26	18	67 ± 4	68 ± 10	81
27	25	68 ± 7	69 ± 7	76 ± 10
28	9	66 ± 7	73 ± 6	
29	8	78	69 ± 11	76 ± 4
30	6	72 ± 1	65 ± 1	
31	11	76 ± 12	65 ± 7	78
32	4	84 ± 23	69 ± 1	
33	6	72 ± 12	66 ± 10	
34	2		66 ± 11	
35	4	80	73 ± 13	
36	2	70 ± 9		
37	1	67		
38	2	91	66	
39	2	59	98	
40	40	66 ± 10	66 ± 4	
42	2		67 ± 3	
43	1	78		
44	1	69		
45	2	75 ± 5		
46	3		77 ± 6	66
48	1		77	
50	1	84		
55	1	84		

Table 18. Stomach contents of Lake Trout harvested in Husky Lakes basins during spring subsistence fisheries.

Year	n	Group	%W	Class/order/species	%O	%N	Location(s)
2001	3	fish		cisco spp.	100.0		B1
2002	16	fish		*Clupea pallasi*	68.8		B1,B2
				Pungitius pungitius	18.8		
				Myoxocephalus quadricornis	12.5		
				fish remains	6.3		
		invertebrates		amphipods spp.	18.8		
		others		sticks	6.3		
2003	6	fish		*Clupea pallasi*	83.3		B1
		others		rocks, unidentifiable materials	16.7		
2004	24	fish	63.9	*Clupea pallasi*	41.7	8.6	B1,B2,B3
				Salvelinus namaycush	12.5	3.0	
				Myoxocephalus quadricornis	8.3	1.1	
		fish remains	16.5	unidentifiable fish remains	8.3	0.7	
		invertebrates	1.1	Nematoda (unid)	54.2	14.6	
				Crepidostomum spp.	25.0	36.3	
				Cestoda spp	20.8	8.2	
				Onisimus nanseni	8.3	15.0	
				Gammarus lacustris	8.3	3.0	
				Mesidotea spp.	8.3	0.7	
				Mysis relicta	4.2	3.4	
				Pontoporeia affinis	4.2	3.0	
				Trematoda (unid.)	4.2	0.7	
				Echinorhynchus spp.	4.2	0.4	
				Cumacea spp.	4.2	0.4	
				Mysis littoralis	4.2	0.4	
				Pelycepoda (unid.)	4.2	0.4	
		others	21.7	rocks, twigs, vegetation	41.7		
		unidentifiable materials	46.3		91.7		

Table 19. Tissue mercury and selenium concentrations in fish samples from Husky Lakes (data collected in 2002) with corresponding biological characteristics.

Species	n	[Hg]	[Se]	Length (cm)		Age (yr)		Weight (g)
		µg/g wet weight	µg/g wet weight	mean ± sd	min-max	mean ± sd	min-max	mean ± sd
Arctic Cisco	5	0.024 ± 0.010	1.438 ± 0.231	36 ± 4	33-42	4.4 ± 1.5	3-7	500
Broad Whitefish	6	0.039 ± 0.024	0.678 ± 0.332	54 ± 3	49-58	7.3 ± 1.4	6-10	2450 ± 508
Inconnu	1	0.09	1.129	82		13		6500
Least Cisco	5	0.036 ± 0.026	0.826 ± 0.161	40 ± 16	32-68	5.2 ± 2.7	3-9	450 ± 94
Lake Trout	10	0.178 ± 0.036	0.974 ± 0.110	63 ± 4	55-68	19.0 ± 4.1	14-25	2702 ± 442
Lake Whitefish	5	0.031 ± 0.005	1.131 ± 0.167	46 ± 3	43-49	7.6 ± 2.2	5-11	1200 ± 154
Northern Pike	1	0.24	0.764	79		nd		2900
Pacific Herring	6	0.028 ± 0.007	0.554 ± 0.286	23 ± 3	20-27	5.3 ± 0.5	5-6	93 ± 18

Table 20. Organic contaminants concentrations in fish (all values in ng/g). Compounds marked with * are known or probable carcinogens (Health Canada 1996).

Compound	Code	LT (n=10)		LWF (n=5)		PH (n=5)		BWF (n=6)		AC (n=5)		LC (n=5)		NP (n=1)	INC (n=1)
		mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd		
Naphthalene	N	4.35	3.27	0.44	0.11	1.37	0.82	1.05	0.68	1.71	0.74	0.75	0.1	7.89	1.22
2-Methylnaphthalene		4.65	5.72	0.47	0.22	1.47	1.18	0.93	0.55	1.53	0.34	0.63	0.15	12.16	1.22
1-Methylnaphthalene		2.45	3.34	0.3	0.14	0.85	0.63	0.53	0.24	0.84	0.08	0.36	0.09	7.07	0.67
C1 Naphthalenes	N1	0	0	0	0	0	0	1.46	0.79	2.38	0.37	0.99	0.24	0	0
C2 Naphthalenes	N2	2.02	1.65	1.12	0.37	1.35	0.36	1.06	0.23	1.46	0.24	1.06	0.35	4.42	1.44
C3 Naphthalenes	N3	1.18	1.73	0.44	0.22	0.47	0.32	0.71	0.31	0.91	0.17	0.54	0.18	4.37	0.48
C4 Naphthelenes	N4	3.44	4.98	0.53	0.22	0.7	0.19	1.35	0.82	0.71	0.38	0.76	0.16	3.25	0.34
Biphenyl		0.36	0.25	0.17	0.07	0.23	0.07	0.17	0.05	0.23	0.02	0.13	0.02	0.59	0.22
Acenaphthylene	AC	0.08	0.06	0	0	0.05	0.01	0.07	0.14	0.03	0.01	0.02	0.01	0.09	0.02
Acenaphthene	AE	0.09	0.03	0.07	0.03	0.07	0.02	0.03	0.01	0.03	0.01	0.02	0.01	0.05	0.08
Fluorene	F	0.16	0.09	0.11	0.09	0.14	0.09	0.08	0.05	0.09	0.02	0.04	0.01	0.51	0.06
C1 Fluorenes	F1	3.06	1.49	2.91	0.48	3.09	0.51	4.77	3.08	1.71	0.95	1.9	0.78	5.32	2.42
C2 Fluorenes	F2	4.42	2.07	2.59	0.29	3.15	0.55	3.18	1.62	1.72	1.58	1.97	1.33	5.54	2.21
C3 Fluorenes	F3	8.24	2.58	5.51	0.11	6.7	0.62	0	0	0	0	0	0	5.66	5.68
Dibenzothiophene	D	0.05	0.08	0	0	0	0.01	0.02	0.02	0.03	0.01	0.03	0.01	0.26	0
C1 Dibenzothiophenes	D1	1.8	0.69	1.76	0.21	1.69	0.3	3.09	1.93	1.38	1.13	1.43	0.28	2.3	1.3
C2 Dibenzothiophenes	D2	2.55	2.85	1.45	0.33	1.49	0.36	2.4	1.6	0.95	0.85	0.97	0.28	1.78	1.2
C3 Dibenzothiophenes	D3	2.61	4.14	0.62	0.1	0.57	0.05	0.04	0.05	0.02	0.04	0.03	0.02	0.61	0.56
Phenanthrene	P	0.41	0.4	0.15	0.03	0.33	0.08	0.21	0.07	0.17	0.03	0.14	0.02	0.99	0.17
Anthracene		0.09	0.02	0.1	0.02	0.12	0.01	0.11	0.06	0.05	0.04	0.05	0.01	0.1	0.11
C1 Phen_Anthr	P1	0.8	0.73	0.27	0.05	0.36	0.11	1.13	0.56	0.35	0.15	0.39	0.12	1.73	0.22
C2 Phen_Anthr	P2	6.03	4.15	0.87	0.22	2.97	1.68	0.07	0.04	0.19	0.08	0.07	0.09	1.96	0.57
C3 Phen_Anthr	P3	0.68	0.99	0.02	0.04	0.02	0.05	0.06	0.05	0.01	0.02	0.02	0.04	0.09	0
C4 Phen_Anthr	P4	0.44	0.61	0.01	0.02	0.01	0.02	0	0	0	0	0	0.01	0	0
Fluoranthene	FL	0.06	0.03	0.03	0.02	0.05	0.04	0.05	0.02	0.05	0.02	0.03	0.01	0.09	0.04
Pyrene	PY	0.06	0.04	0.04	0.01	0.05	0.02	0.04	0.01	0.03	0.02	0.03	0.01	0.1	0.03
C1 Pyrene	PY1	0.2	0.25	0	0	0	0.01	0	0	0	0	0	0	0	0
C2 Pyrene	PY2	0.37	0.6	0.04	0.08	0.07	0.02	0	0	0	0	0	0	0	0
C3 Pyrene	PY3	0.41	1.03	0	0	0.01	0.02	0	0	0	0	0	0	0	0
Retene		0	0.01	0	0.01	0	0	0.01	0.01	0	0	0	0	0.02	0
Benzo(a)anthracene	BA	0.05	0.05	0.04	0.04	0.01	0.01	0.02	0.01	0.02	0.02	0.01	0.02	0.04	0.03
Chrysene (+ Triphenylene)	C	0.23	0.47	0.03	0.02	0.02	0.03	0.02	0.01	0.03	0.02	0.01	0.01	0.04	0.03
C1 Chrysene	C1	0.63	0.93	0	0	1.53	1.23	0	0	0	0	0	0	0	0
C2 Chrysene	C2	3.5	2.75	0.44	0.55	5.05	1.37	0	0	0	0	0	0	1.27	0.79
C3 Chrysene	C3	0.68	0.57	0.08	0.09	0.91	0.27	0	0	0	0	0	0	0.28	0.17
Benzo(b)fluoranthene*	BB	0.04	0.08	0	0	0	0	0	0.01	0.01	0.01	0	0	0	0
Benzo(k)fluoranthene*	BK	0	0	0	0	0	0	0	0	0.01	0.02	0	0	0	0
Benzo(e)Pyrene	BEP	0.08	0.16	0	0	0.01	0.01	0	0	0.01	0.02	0	0.01	0	0
Benzo(a)pyrene*	BAP	0.06	0.17	0	0	0	0	0	0	0.01	0.02	0	0	0	0
Perylene	PERY	0	0	0	0	0	0	0	0	0	0.01	0	0	0	0
Indeno(1,2,3-c,d)pyrene*	IDP	0	0	0	0	0	0	0	0	0.02	0.03	0	0	0	0
Dibenzo(a,h)anthracene	DBA	0	0	0	0	0	0	0	0	0.01	0.02	0	0	0	0
Benzo(g,h,i)perylene	BPE	0	0	0	0	0	0	0.01	0.02	0.02	0.02	0	0	0	0
Total PAH (nap to bpe)		5.74	3.9	1.01	0.21	2.22	0.93	1.69	0.8	2.29	0.9	1.1	0.13	9.91	1.78
Total PAH (phn to bpe)		1.07	0.99	0.39	0.09	0.59	0.15	0.45	0.16	0.43	0.24	0.27	0.03	1.37	0.41
Total Alkylated PAH		36.09	19.31	14.82	1.89	26.4	3.78	13.78	5.39	9.43	3.4	7.7	2.76	33.88	14.32

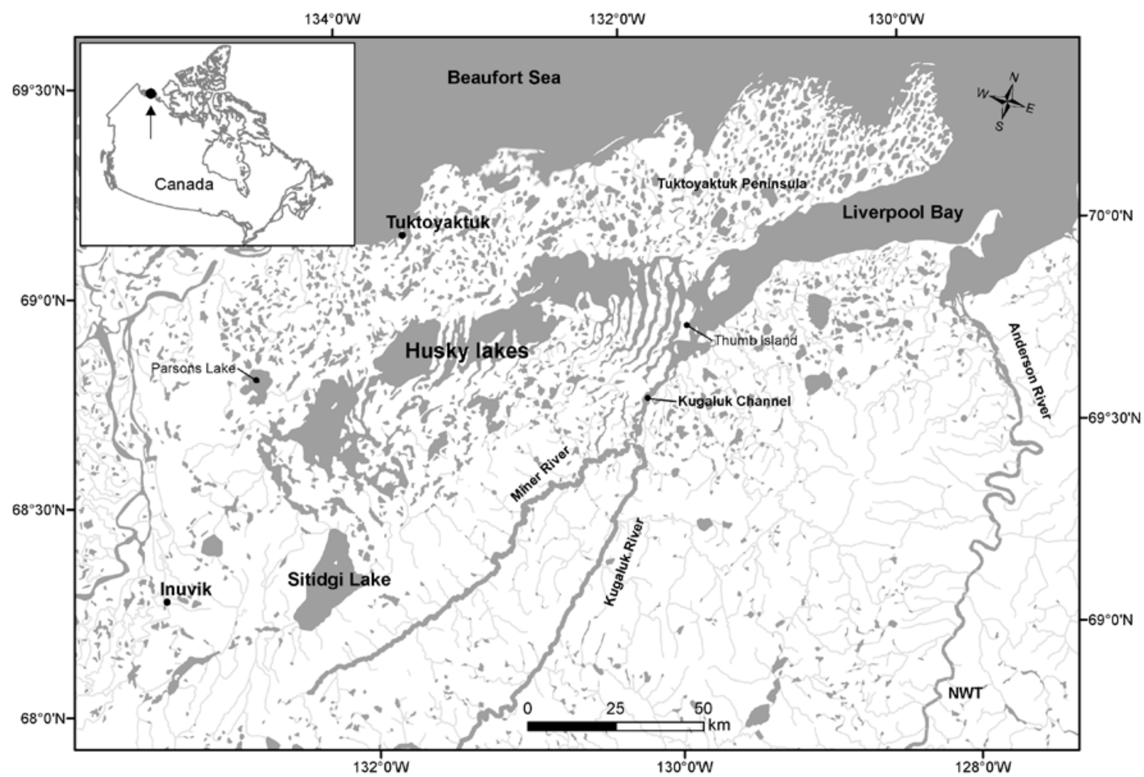


Figure 1. Geographic location and features of the Husky Lakes and Sitidgi Lake area.

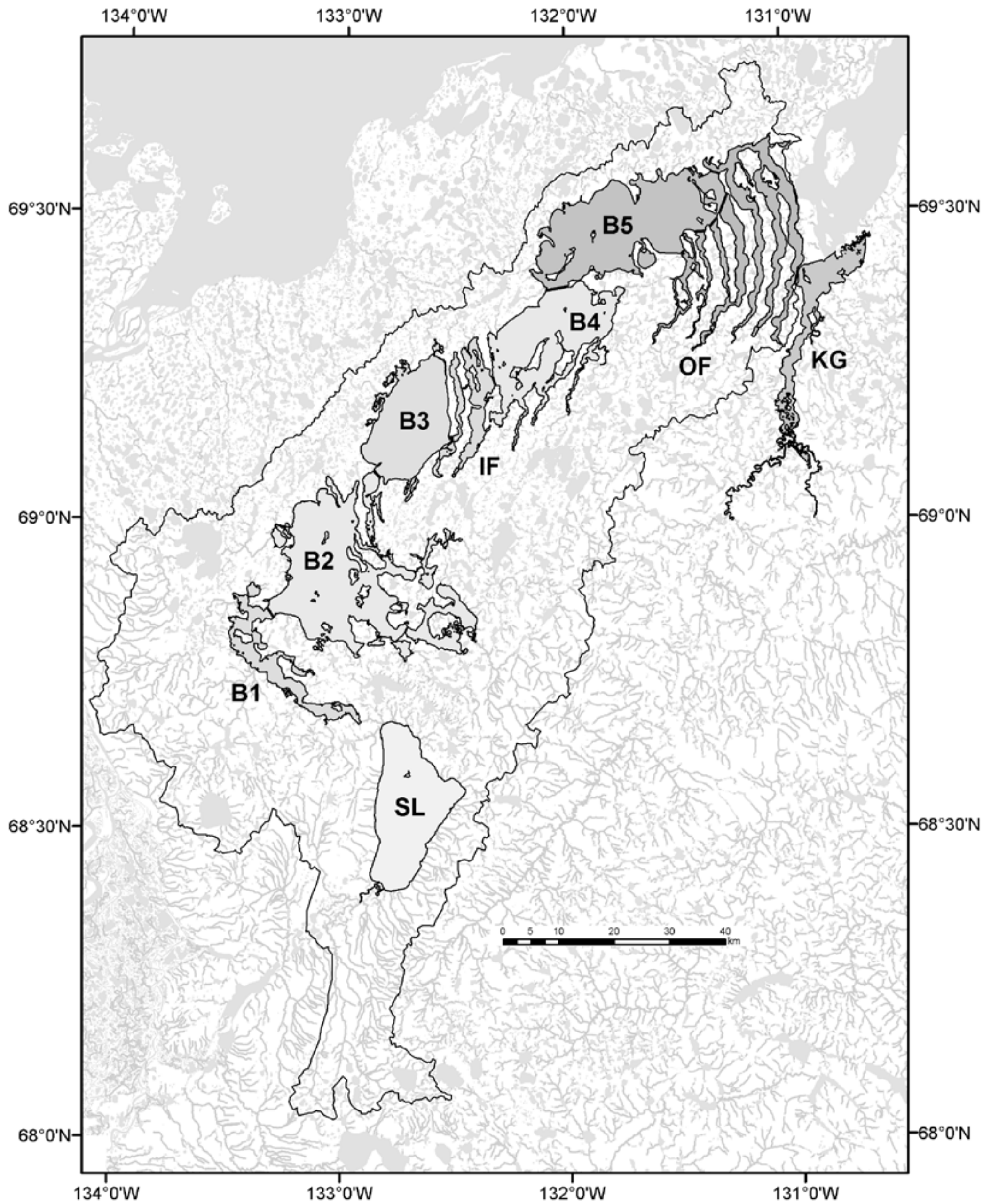
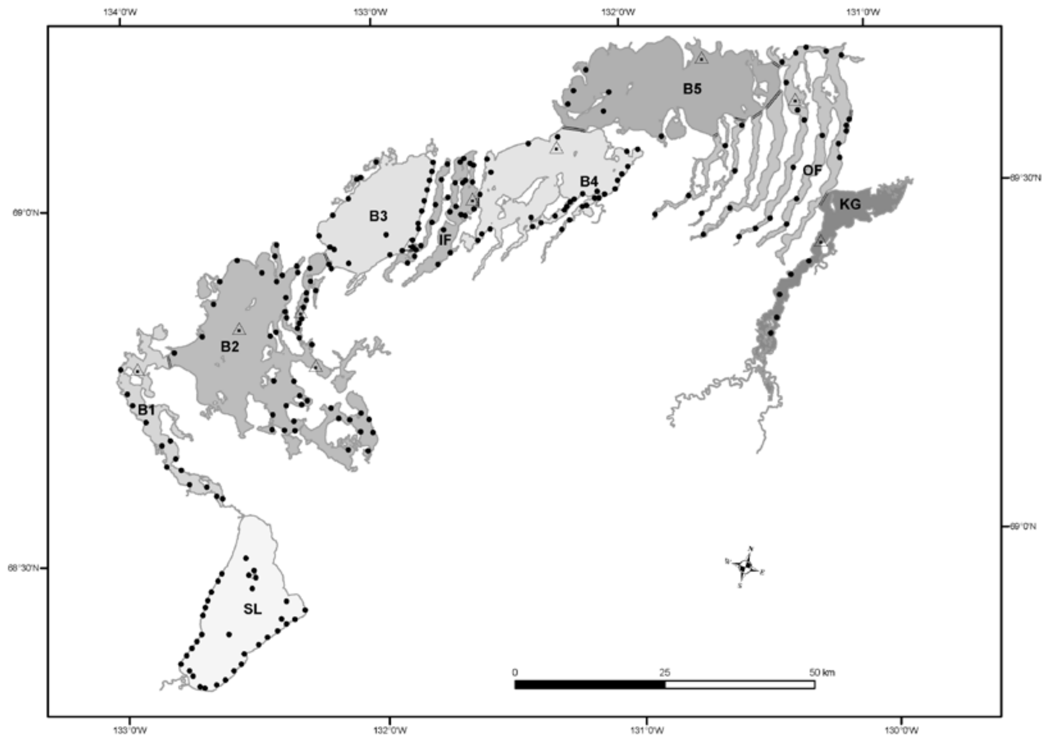


Figure 2. Husky Lakes basins delimitation used in this study, including Sitidgi Lake (SL), Kugaluk Channel (KG) and the inner fingers (IF) and outer fingers (OF) areas. The contour line corresponds to the drainage area boundary for Husky Lakes (not including Kugaluk Channel).

(a)



(b)

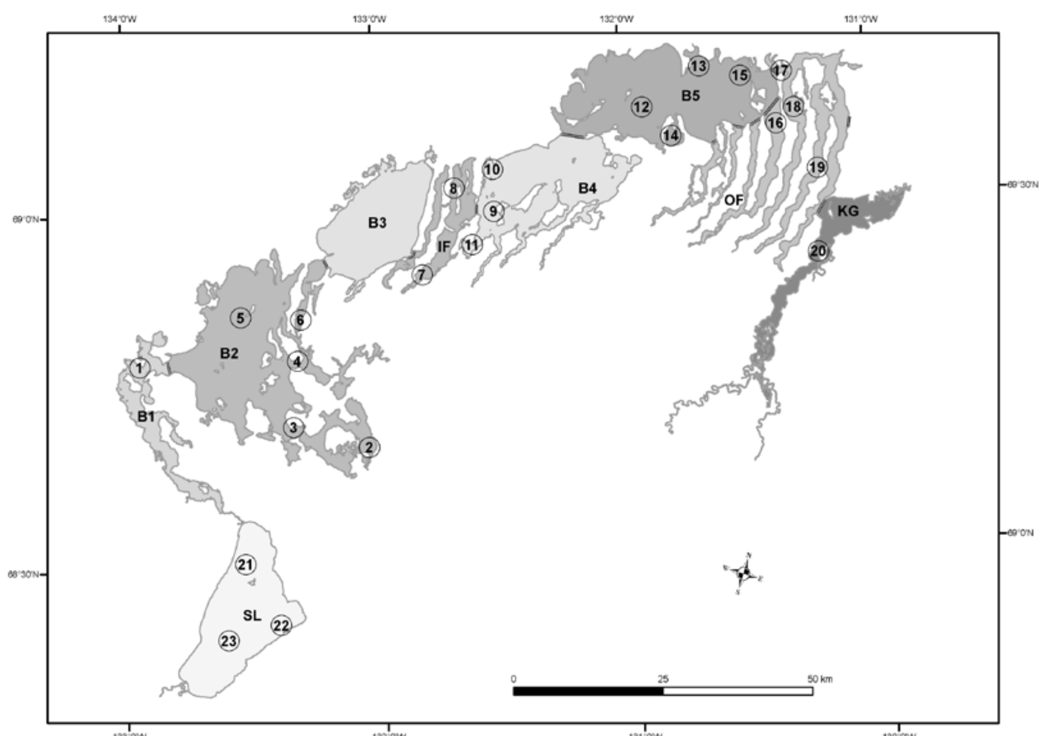


Figure 3. Sampling locations for (a) surface water properties measurements (black dots) and water samples (triangles) and (b) vertical water column profiling.

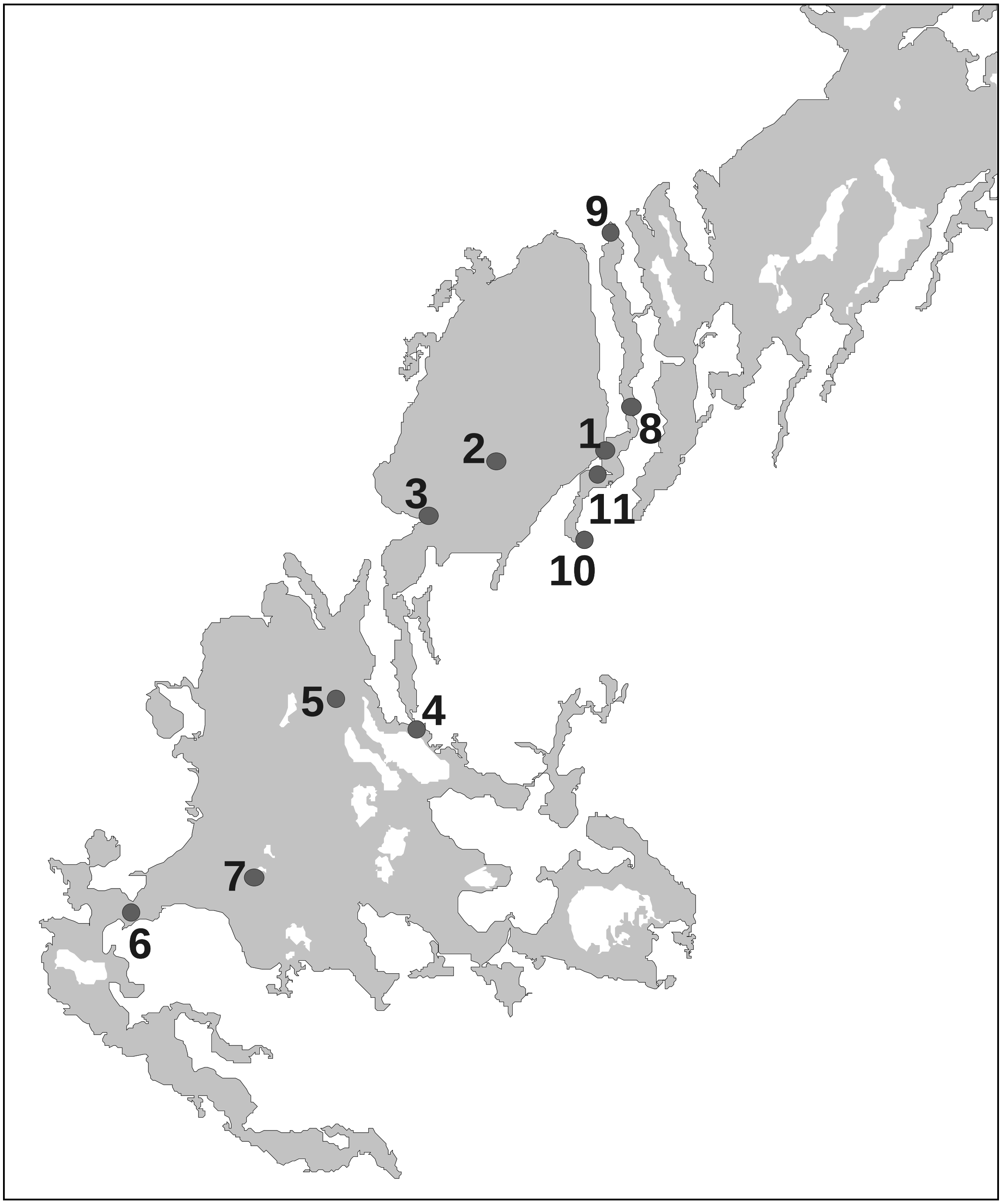


Figure 4. Zooplankton sampling locations in basins B1, B2, B3, and IF of Husky Lakes (modified from Evans, 2004 (unpublished data)).

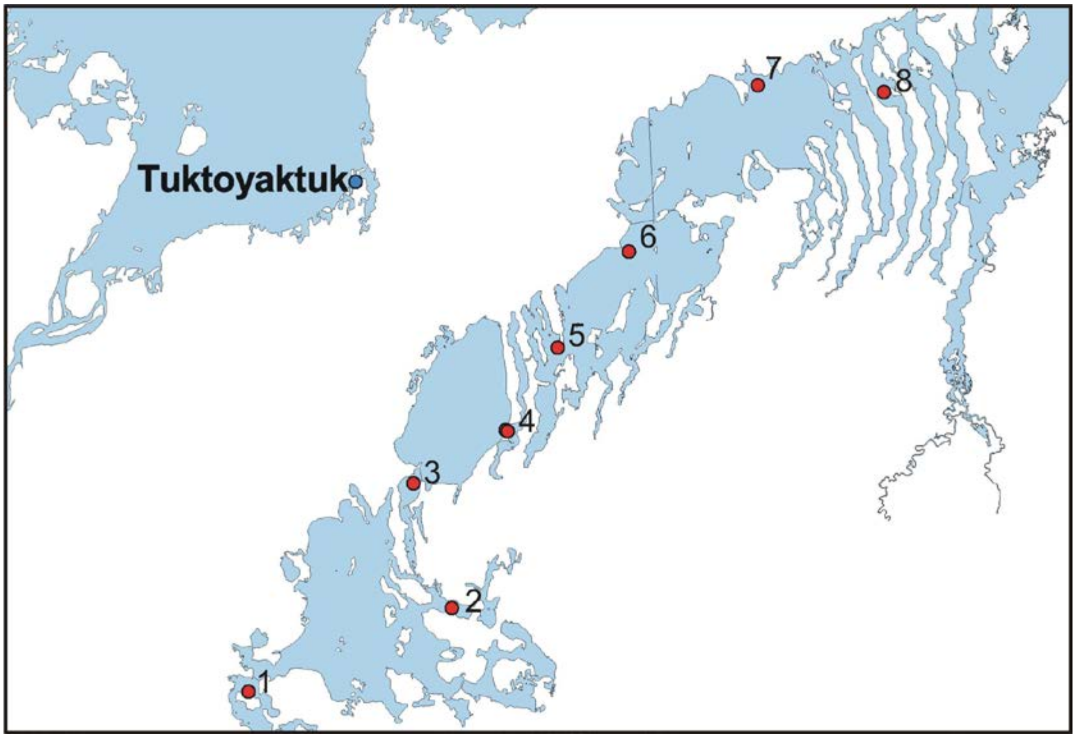


Figure 5. Sediment sampling sites in Husky Lakes (2002). Sites were numbered from 1 to 8 starting at the head of the estuary in B1 (site #1) up to the outer fingers (site #8). An additional site (site #9) not shown in this figure was located in Liverpool Bay (modified from Evans, 2003 (unpublished data)).

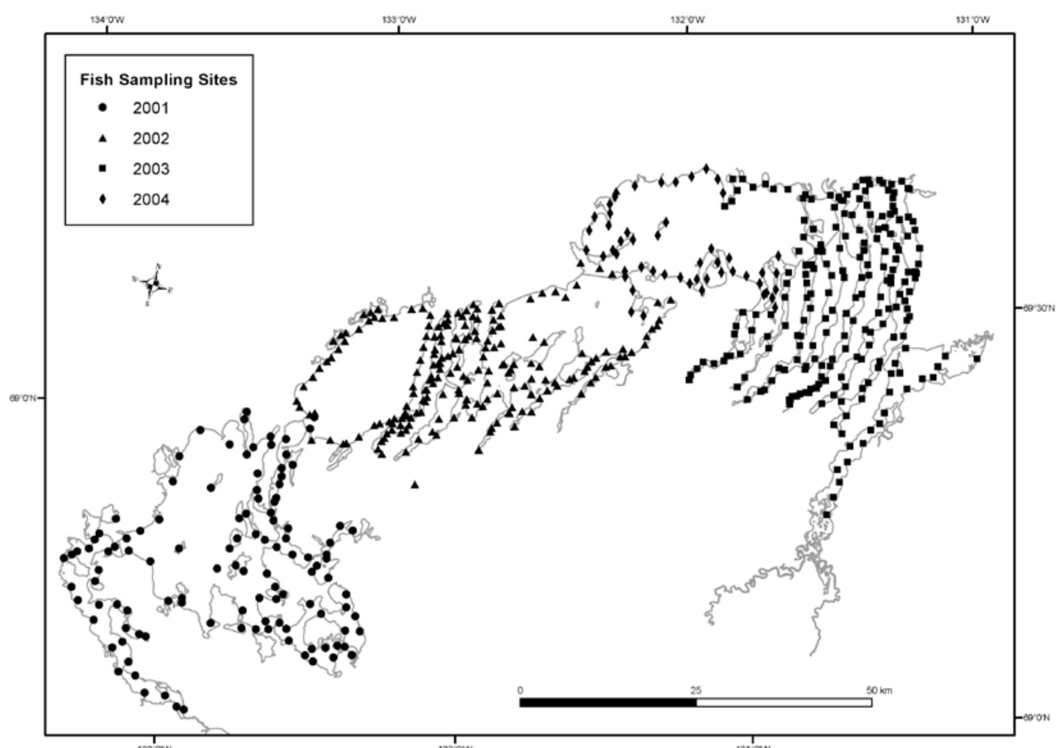


Figure 6. Experimental nets locations by year in Husky Lakes (n=585) (See Appendix 1 for the spatial coordinates of all netting sites).

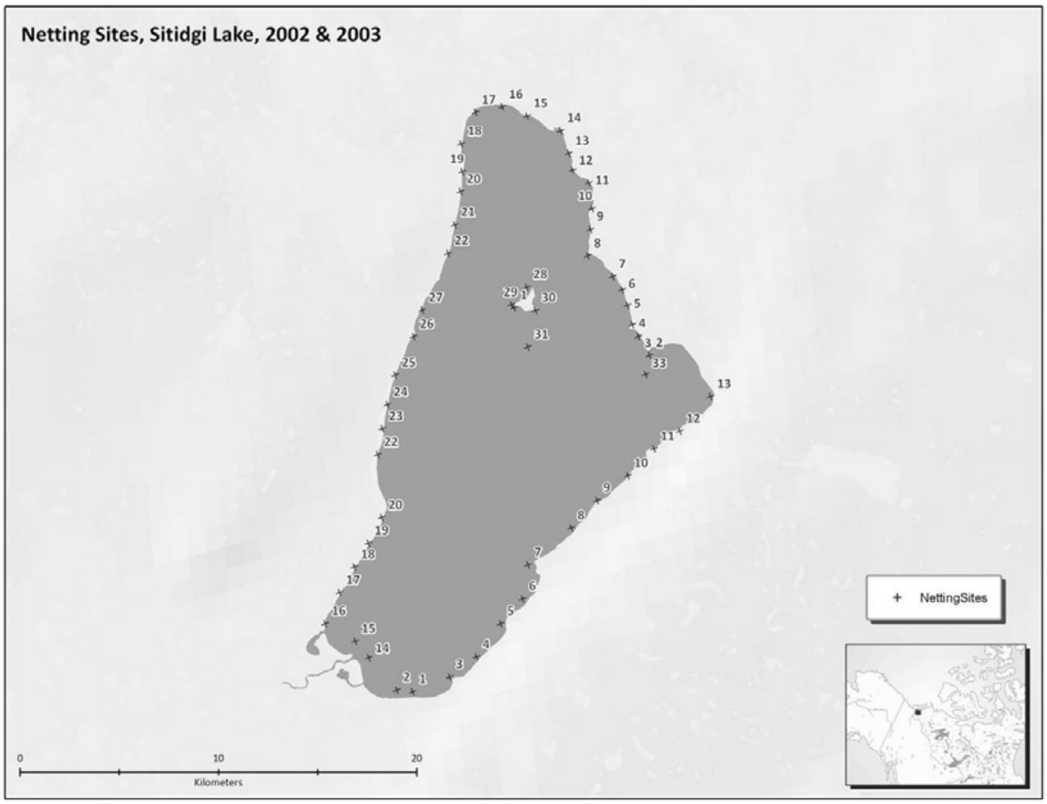
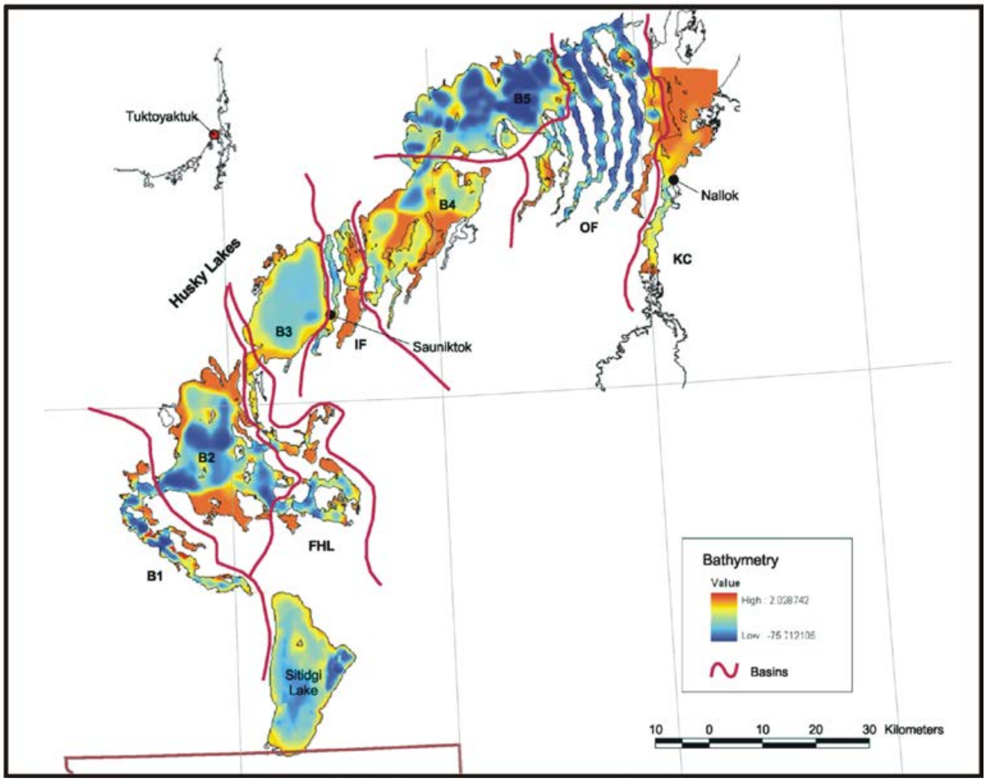


Figure 7. Experimental nets locations in Sitidgi Lake in 2002-2003 (n=55). (See Appendix 1 for the spatial coordinates of all netting sites).

(a)



(b)

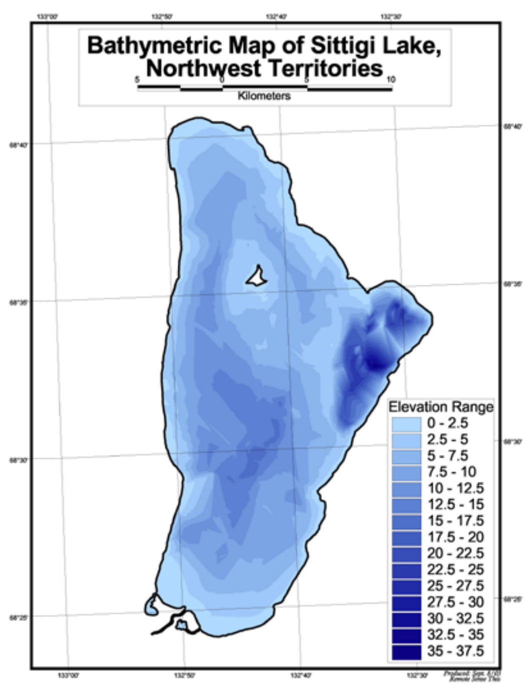
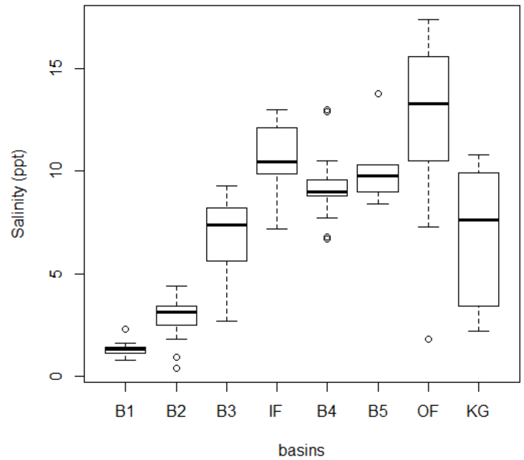
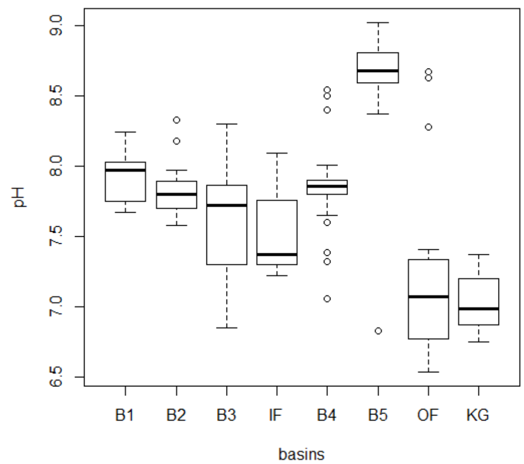


Figure 8. Bathymetric map of Husky Lakes (a) and Sitidgi Lake (b). ‘FHL’ in Husky Lakes is a sub-area of B2 not distinguished in this study.

(a)



(b)



(c)

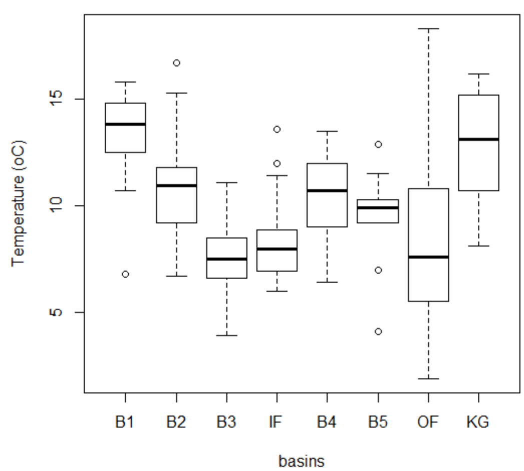


Figure 9. Variation in surface water properties among Husky Lakes basins (a) salinity, (b) pH, and (c) temperature.

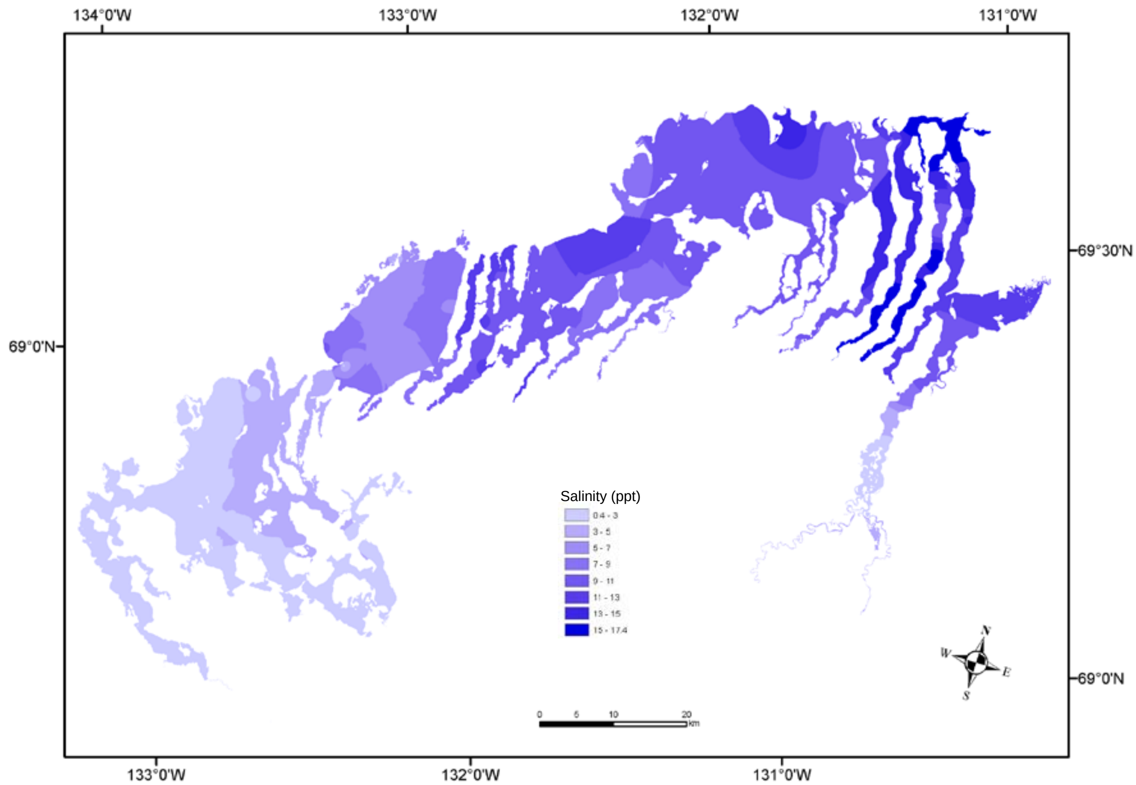


Figure 10. Interpolated surface water salinity map for Husky Lakes.

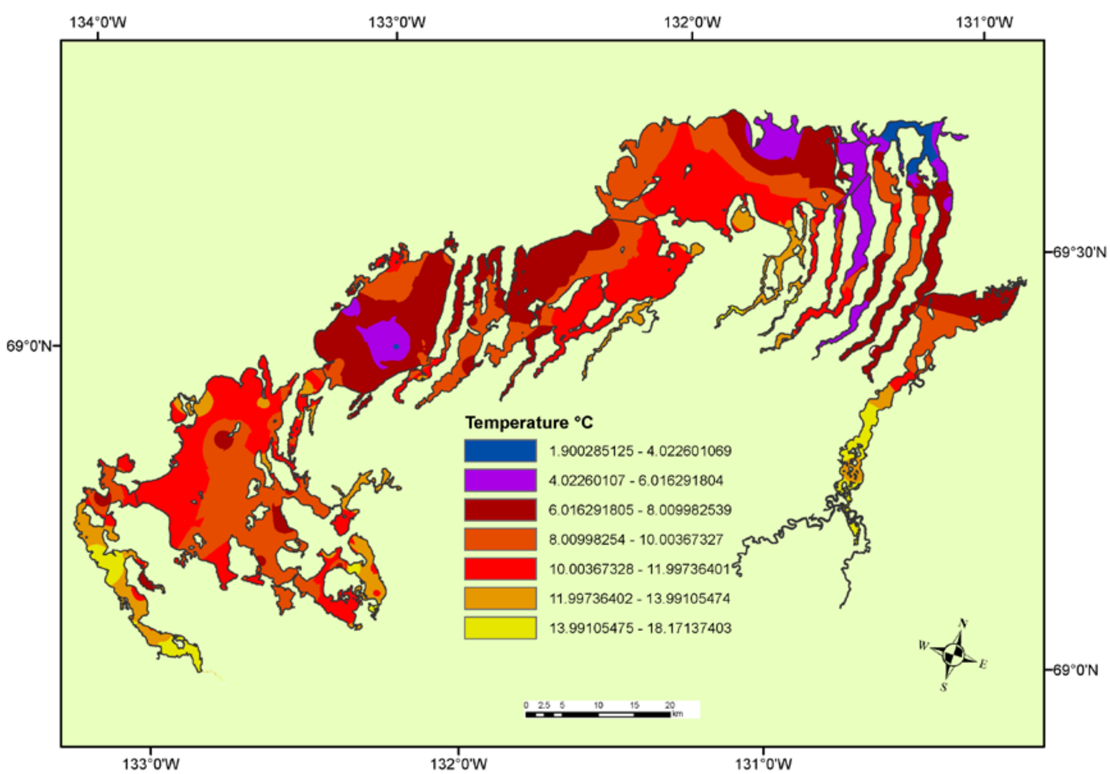
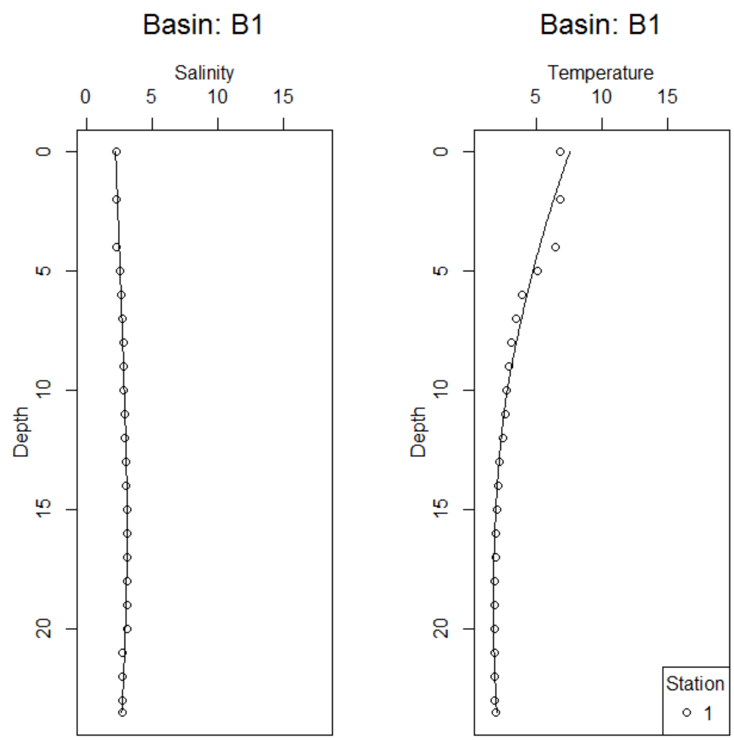


Figure 11. Interpolated surface water temperatures in Husky Lakes.

(a)



(b)

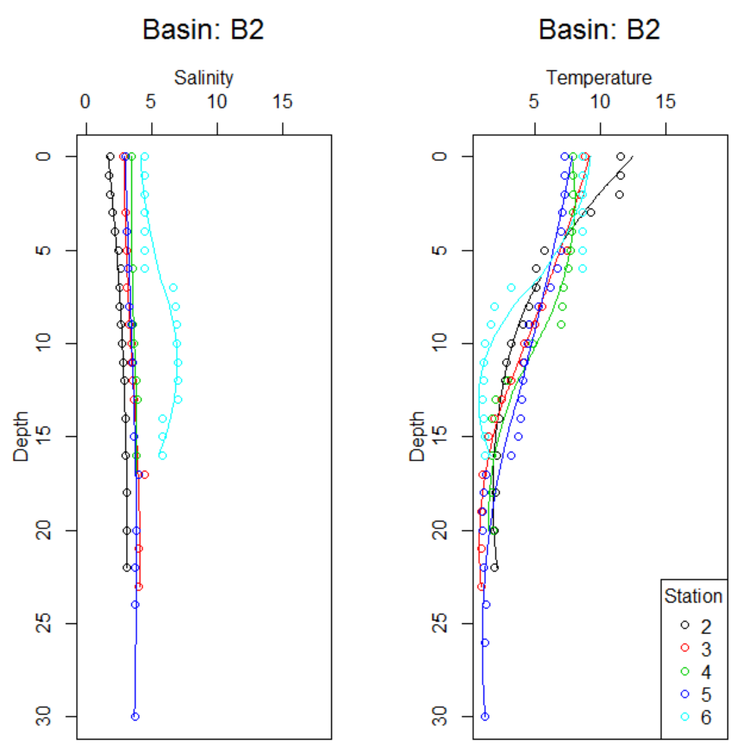
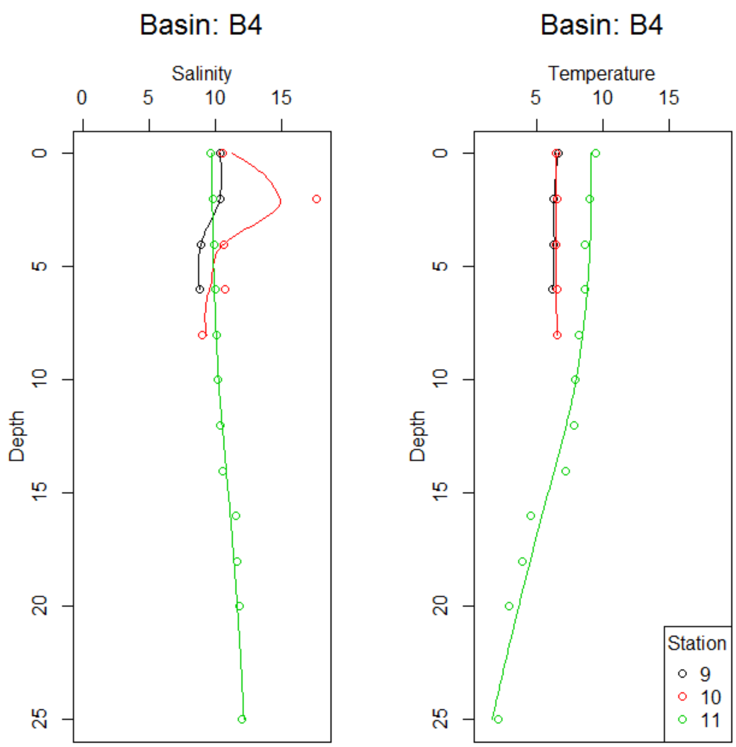


Figure 12. Salinity and temperature profiles with depth among stations in Husky Lakes basins: (a) B1 and (b) B2.

(c)



(d)

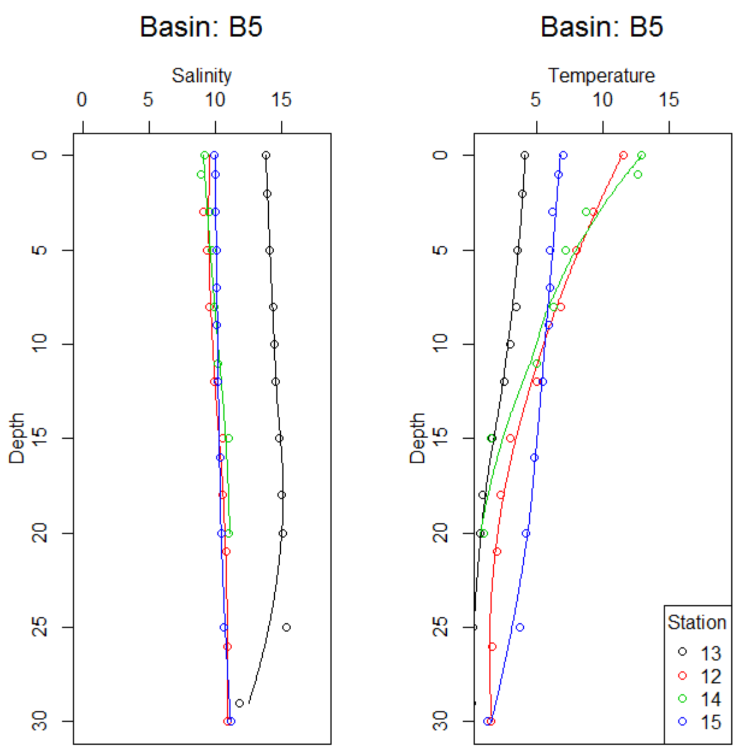
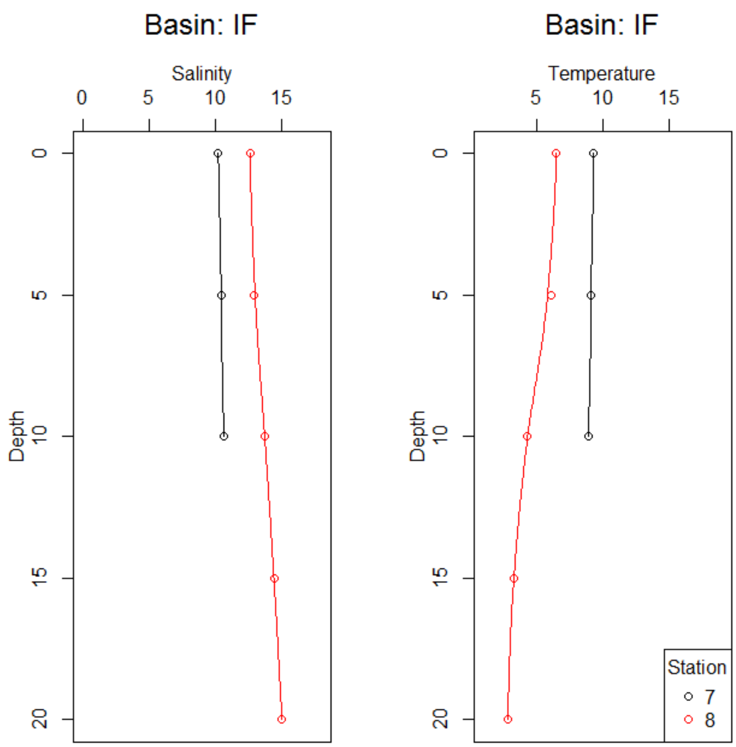


Figure 12 (continued). Salinity and temperature profiles with depth among stations in Husky Lakes basins: (c) B4 and (d) B5.

(e)



(f)

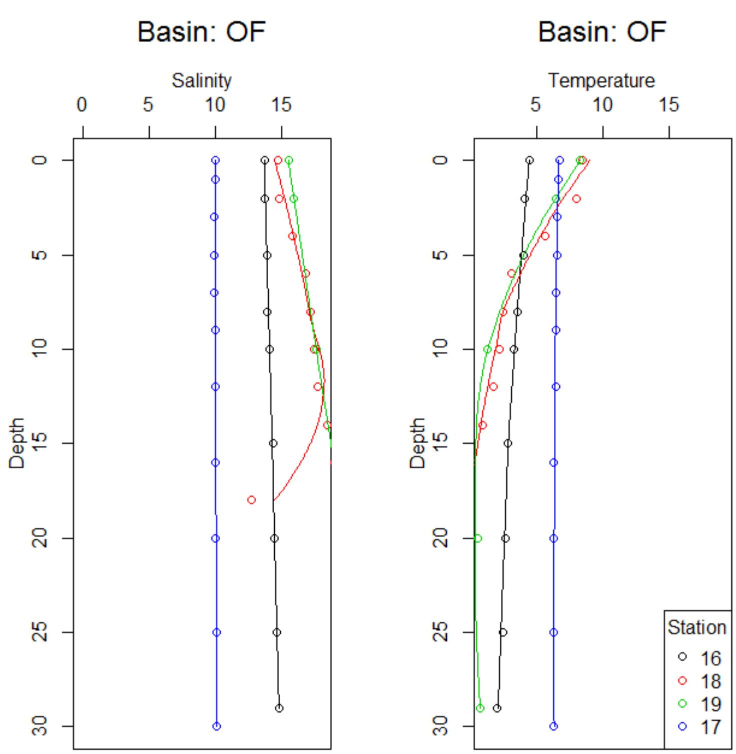


Figure 12 (continued). Salinity and temperature profiles with depth among stations in Husky Lakes basins: (e) inner fingers and (f) outer fingers.

(g)

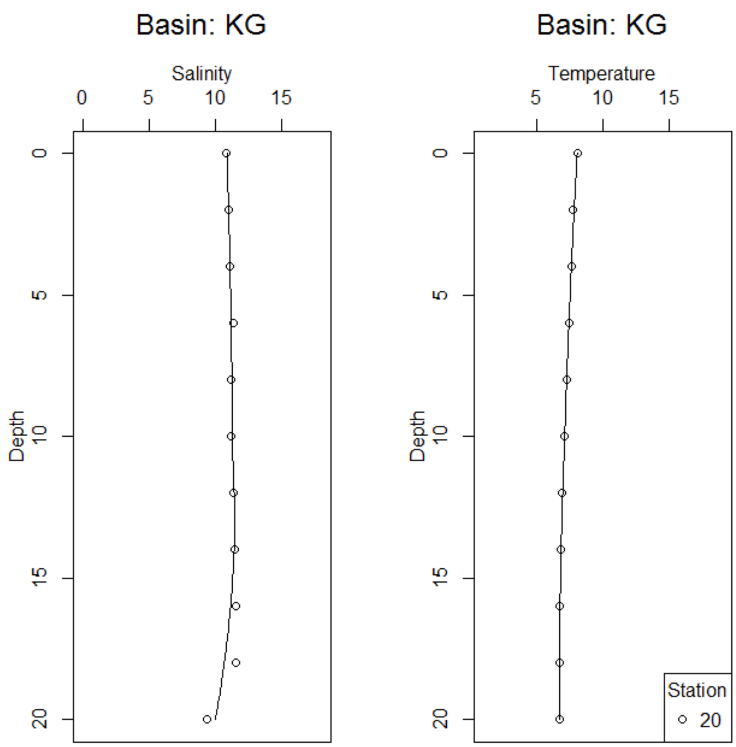
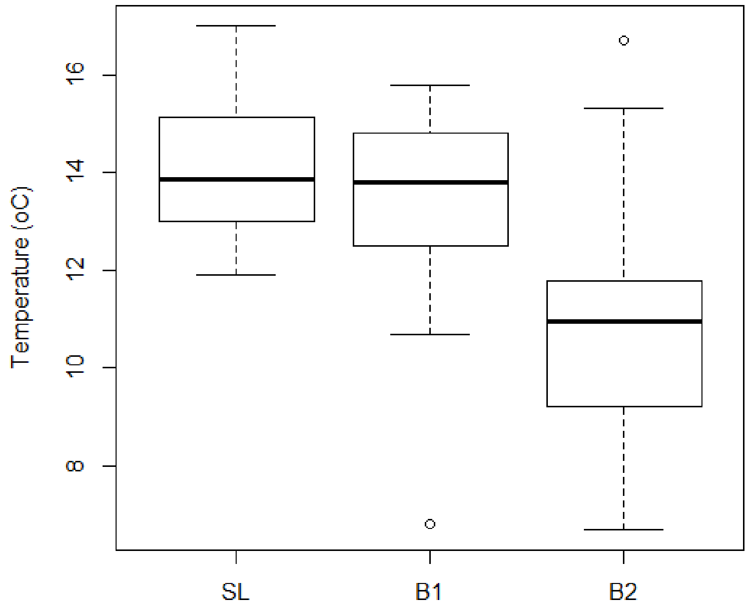


Figure 12 (continued). Salinity and temperature profiles with depth in Husky Lakes basins: (g) Kugaluk Channel.

(a)



(b)

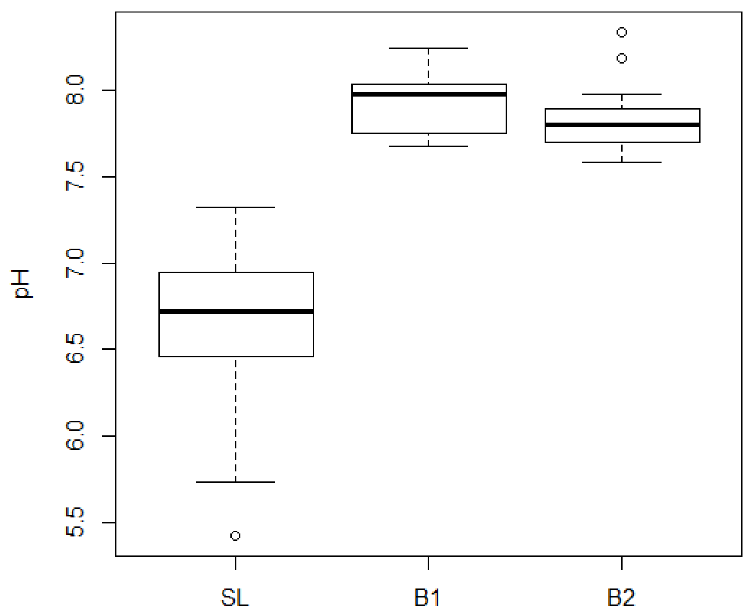


Figure 13. Variation in surface water temperature and pH in Sitidgi Lake (SL) and inland-most basins B1 and B2 of Husky Lakes.

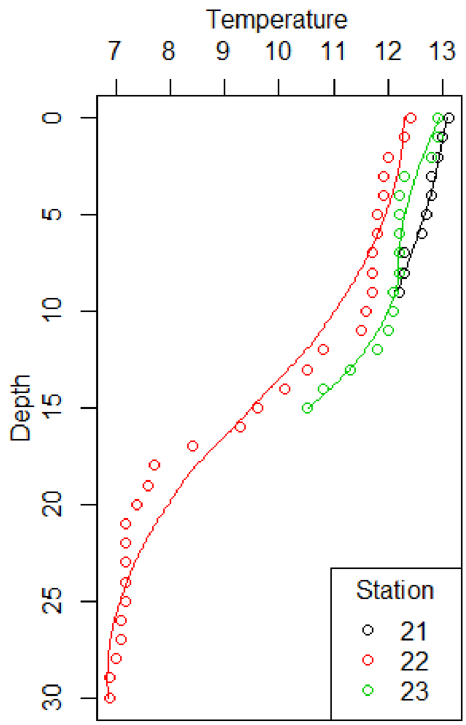


Figure 14. Temperature profiles with depth at three stations in Sitidgi Lake in June 2003.

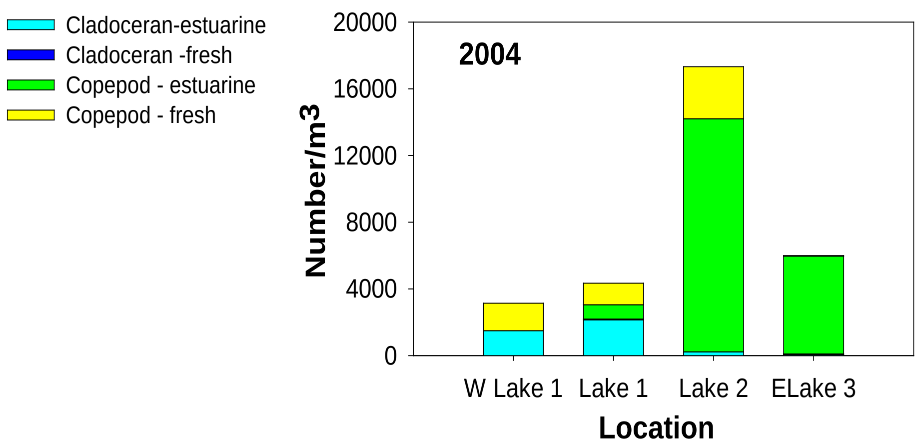


Figure 15. Total zooplankton abundances (exclusive of rotifers and nauplii) in the lower Husky Lakes in August 2004. W Lake = B1, Lake 1 = B2, Lake 2 = B3, and ELake 4 = IF (modified from Evans 2004).

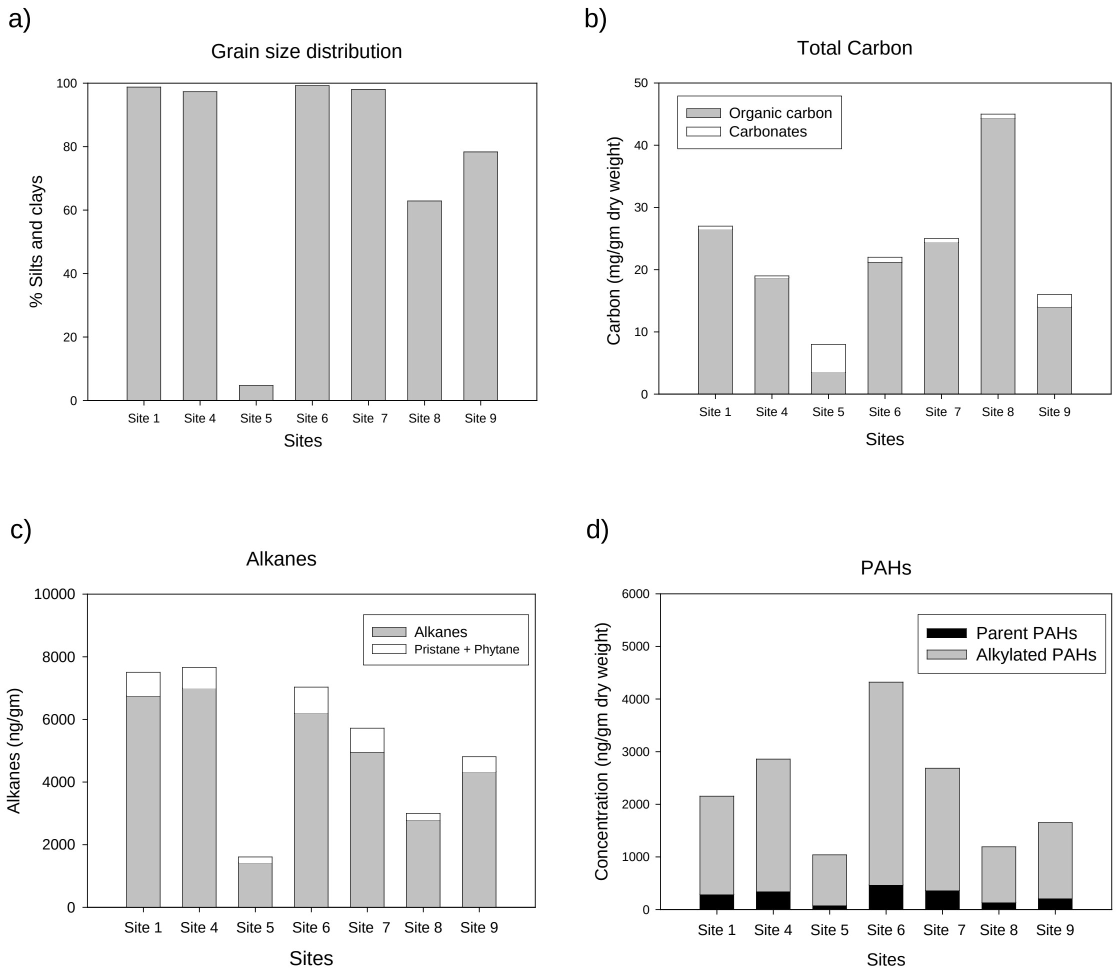


Figure 16. Results from sediment studies in Husky Lakes in August 2002 (modified from Evans 2003): a) percent composition of silts and clays in sediments, b) inorganic and organic carbon concentrations in sediments, c) alkane and pristane+phytane concentrations in sediments, and d) PAH (parent and alkylated) concentrations in sediments. (Site 1 = B1, Site 4 = B3, Site 5 = IF, Site 6 = B4, Site 7 = B5, Site 8 = OF, and Site 9 = Liverpool Bay).

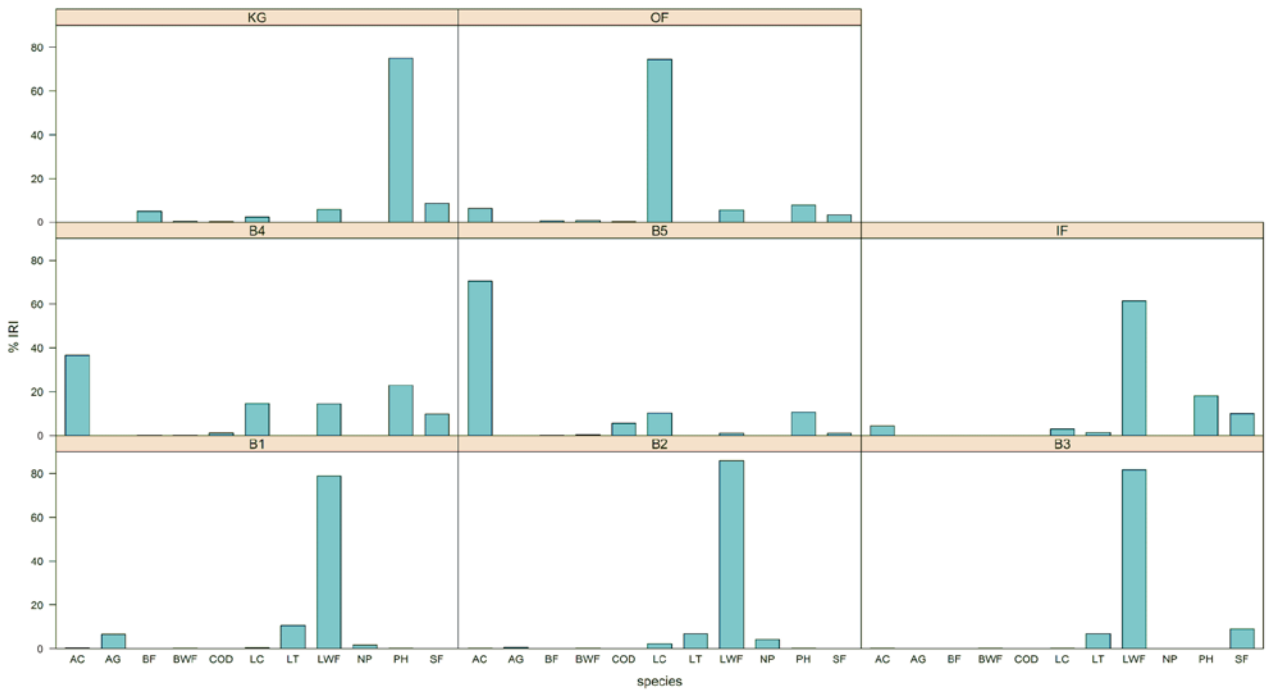
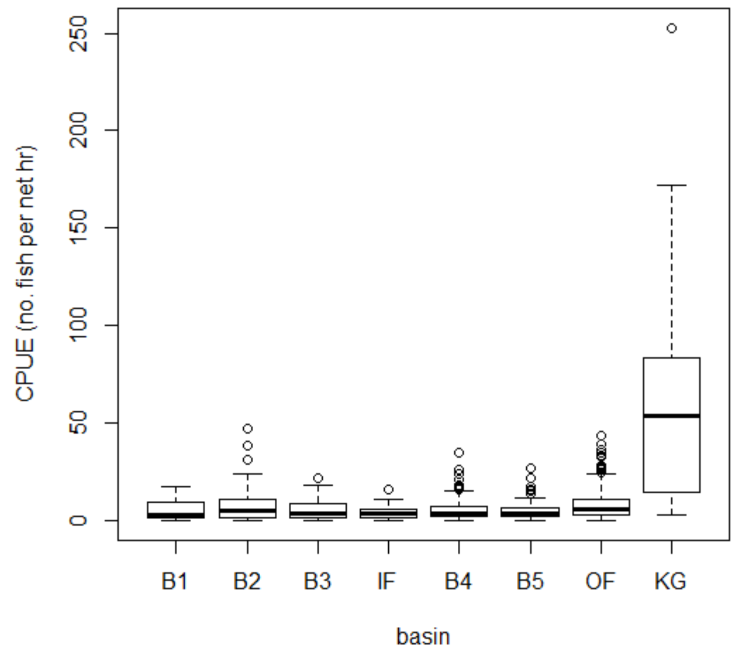


Figure 17. Composition plot of %IRI (Index of Relative Importance) for dominant, common, and occasional fish species among Husky Lakes basins.

(a)



(b)

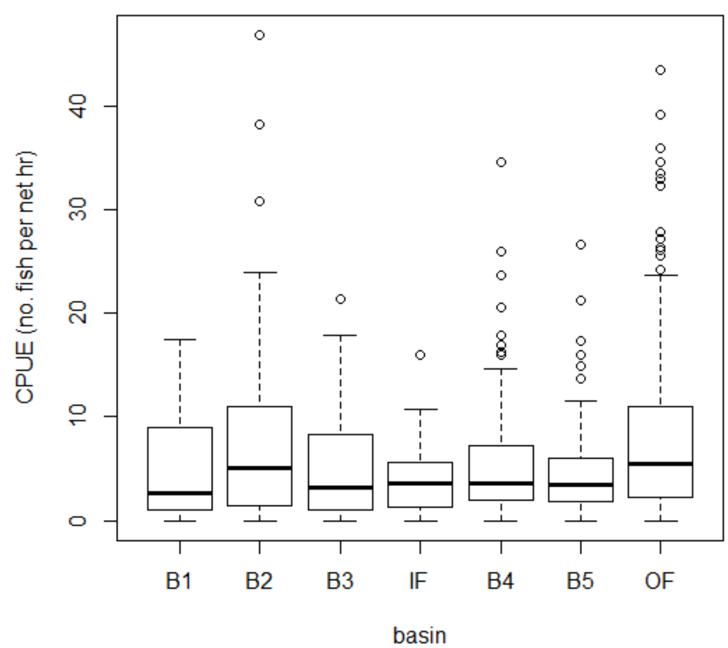
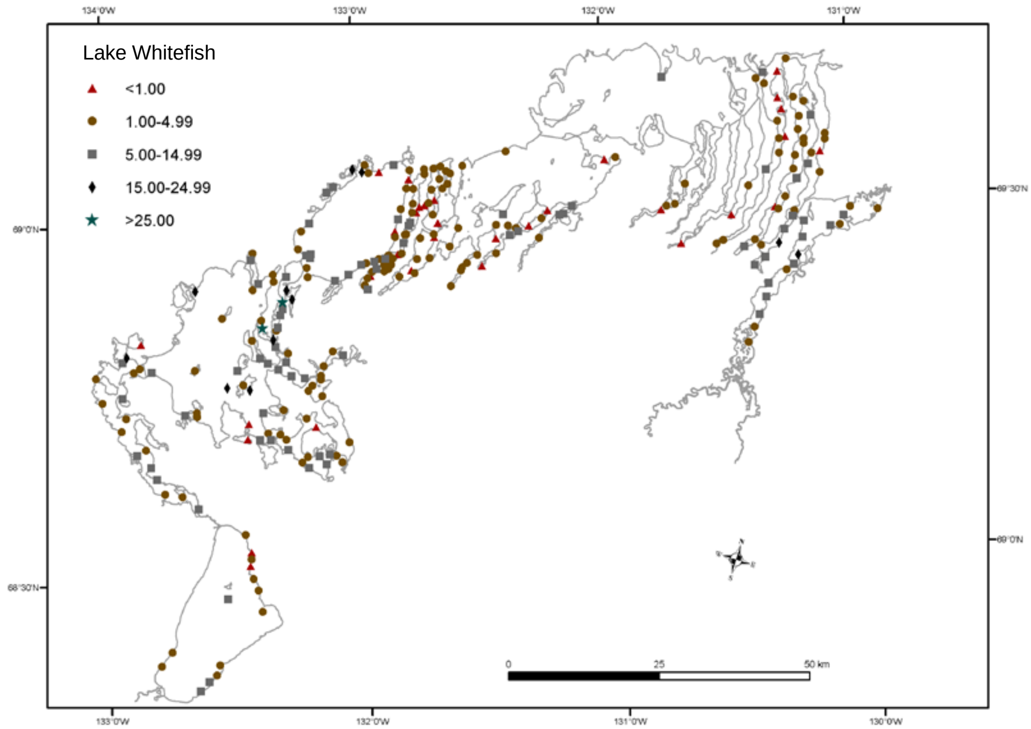


Figure 18. Variability in catch rates of fish from all species among Husky Lakes basins, including Kugaluk Channel (a) and not including KG (b).

(a) Lake Whitefish



(b) Least Cisco

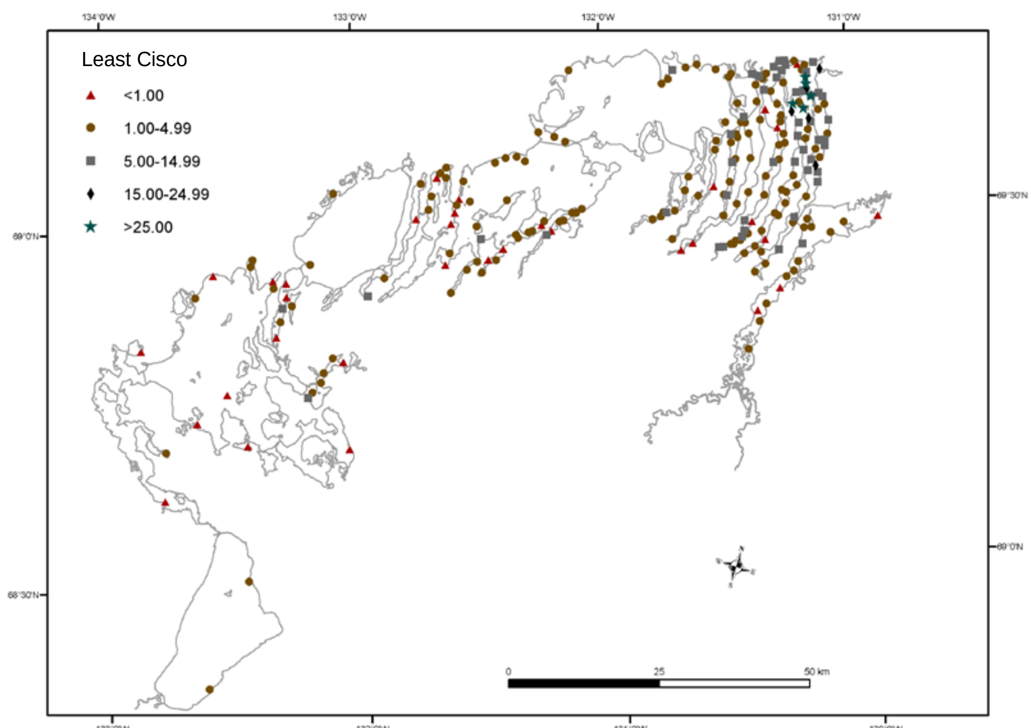
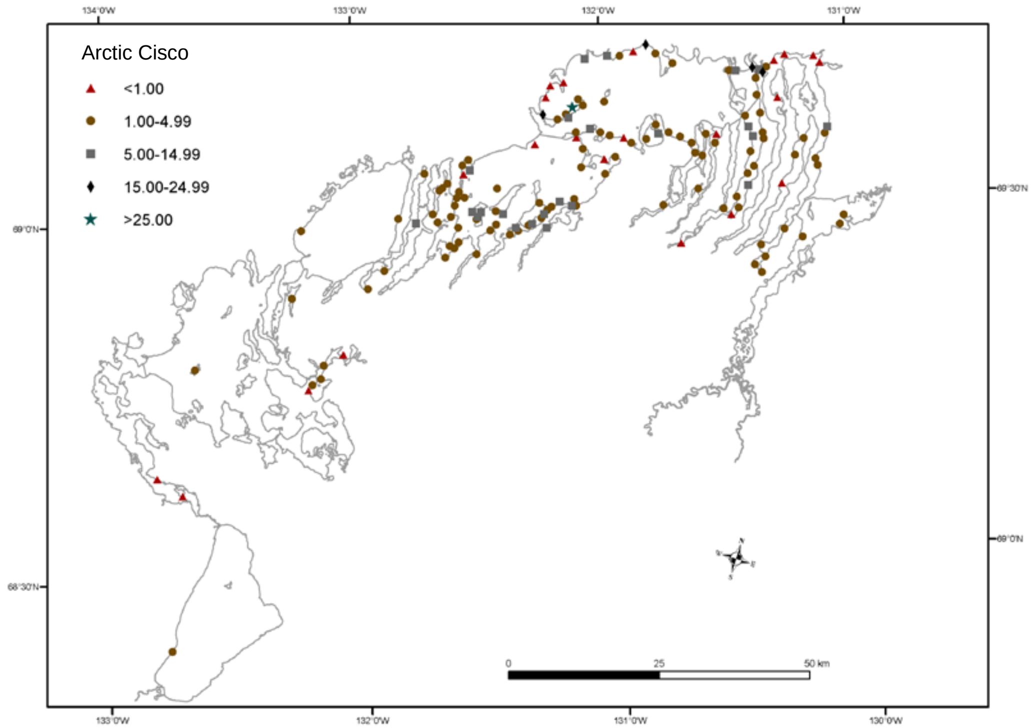


Figure 19. Spatial distribution and relative abundance (CPUE) of fish species in Husky Lakes and Sitidgi Lake: (a) Lake Whitefish and (b) Least Cisco.

(c) Arctic Cisco



(d) Pacific Herring

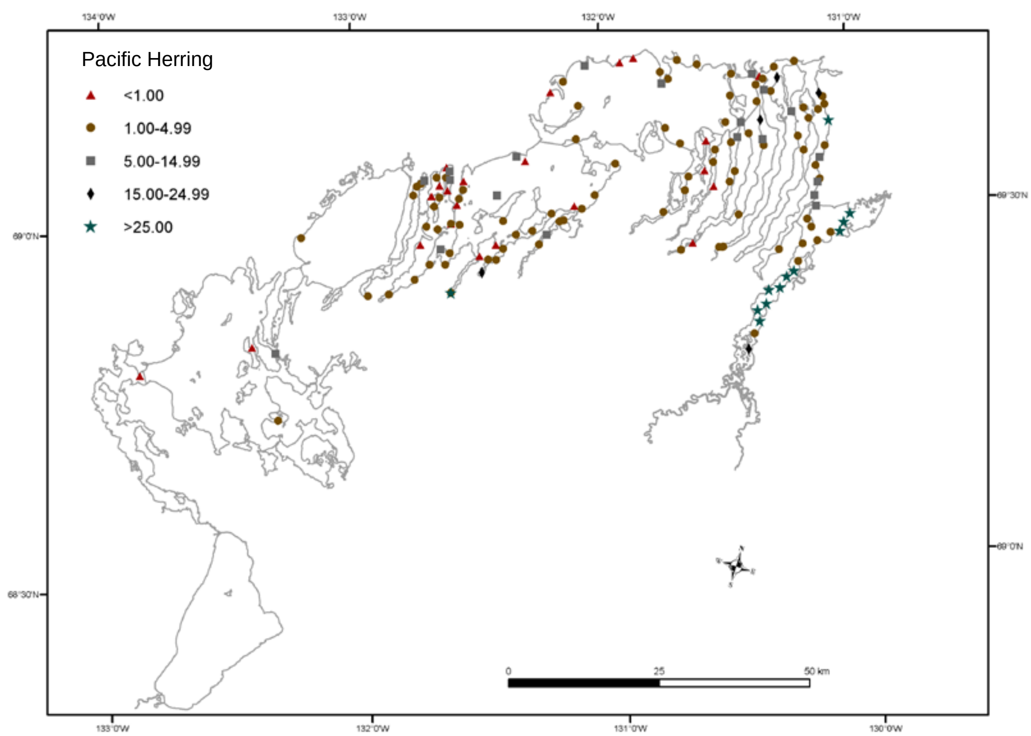
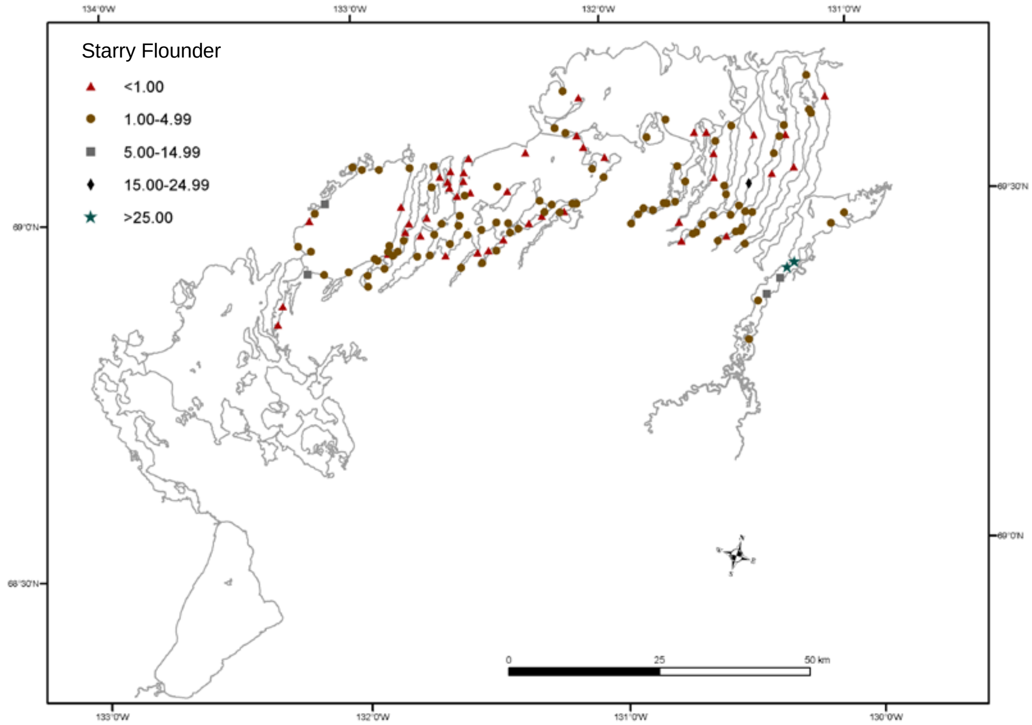


Figure 19 (continued). Spatial distribution and relative abundance (CPUE) of fish species in Husky Lakes and Sitidgi Lake: (c) Arctic Cisco and (d) Pacific Herring.

(e) Starry Flounder



(f) Lake Trout

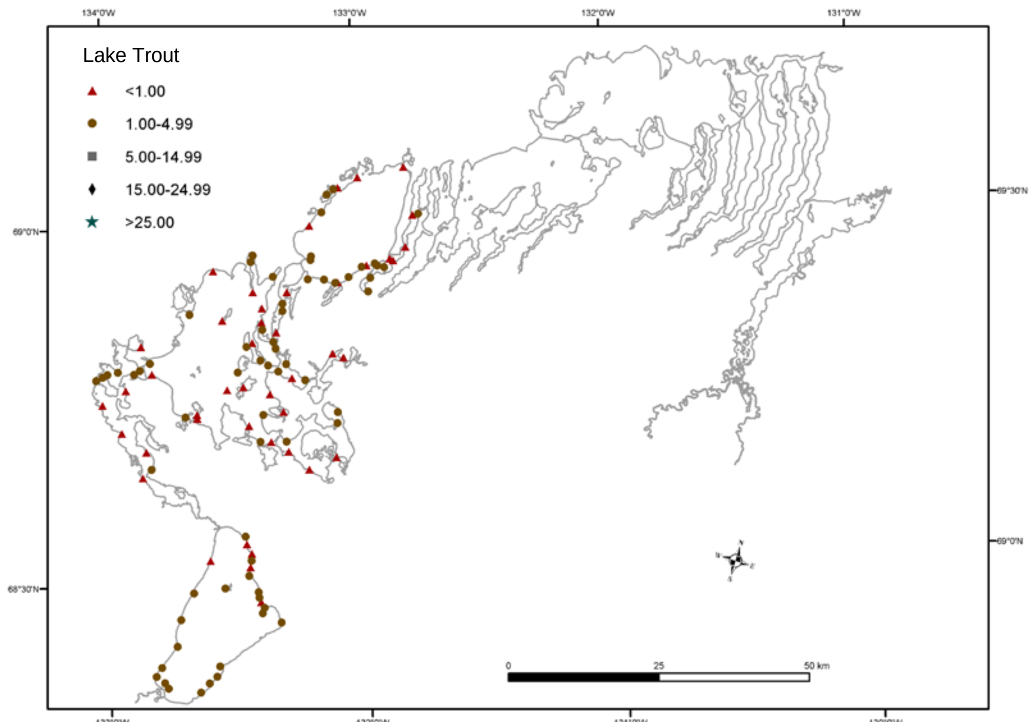
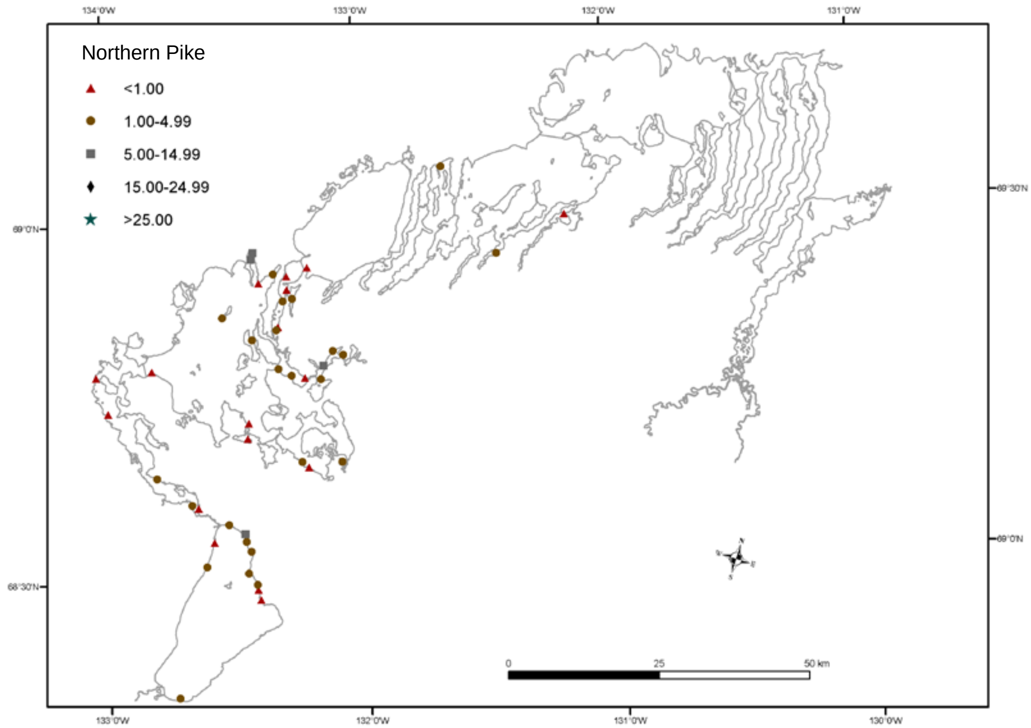


Figure 19 (continued). Spatial distribution and relative abundance (CPUE) of fish species in Husky Lakes and Sitidgi Lake: (e) Starry Flounder and (f) Lake Trout.

(g) Northern Pike



(h) Broad Whitefish

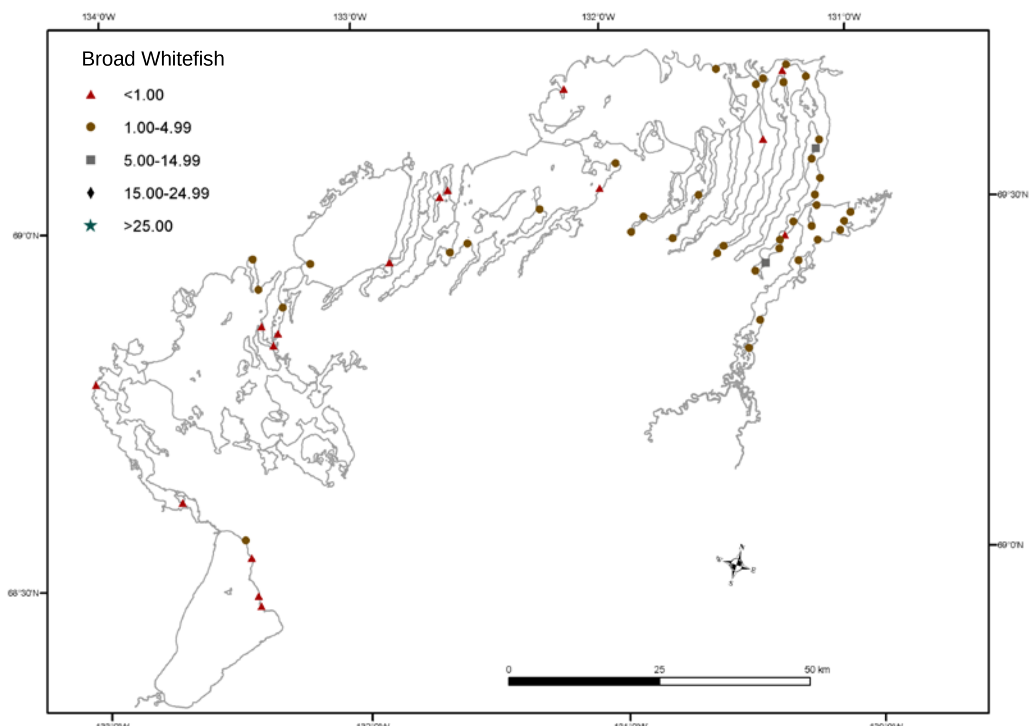
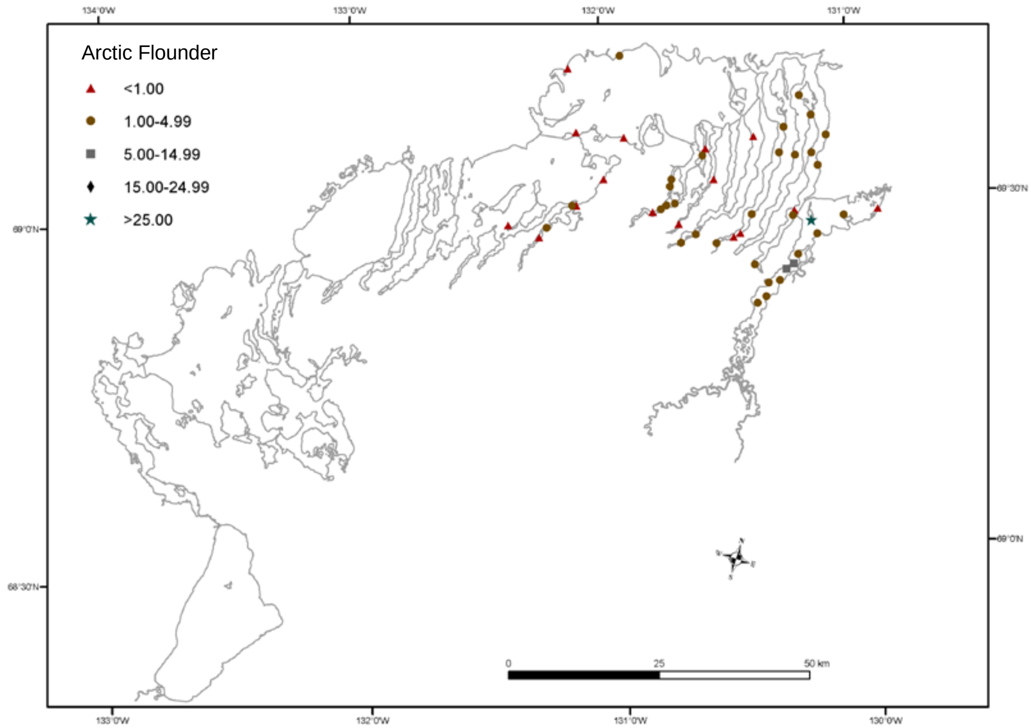


Figure 19 (continued). Spatial distribution and relative abundance (CPUE) of fish species in Husky Lakes and Sitidgi Lake: (g) Northern Pike and (h) Broad Whitefish.

(i) Arctic Flounder



(j) Cod spp.

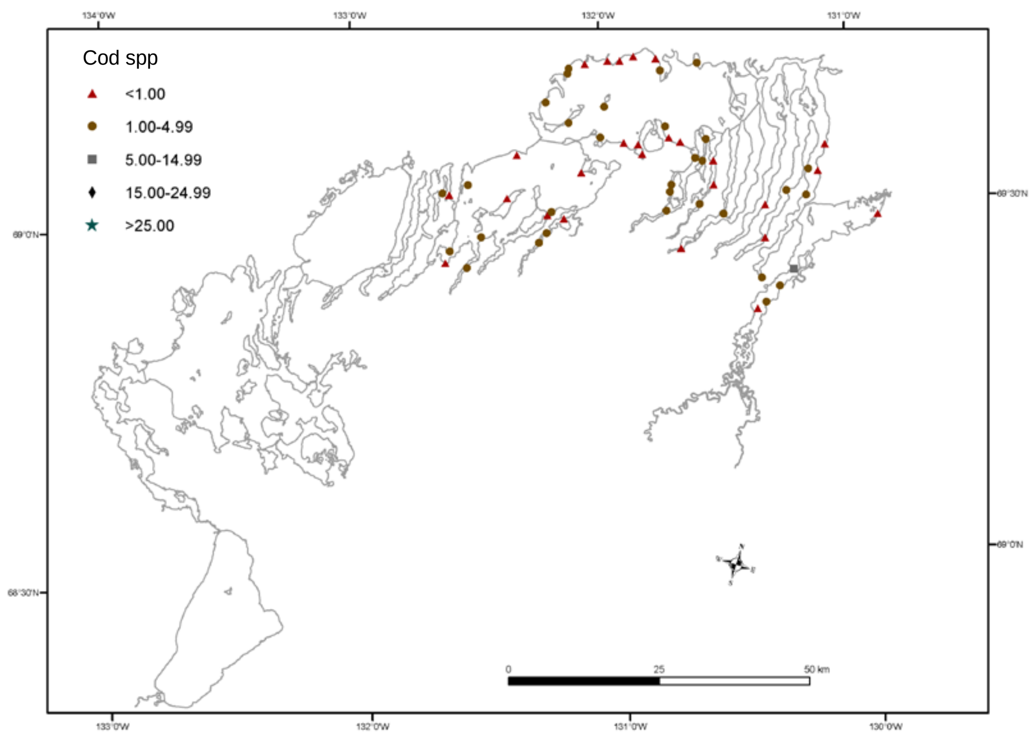


Figure 19 (continued). Spatial distribution and relative abundance (CPUE) of fish species in Husky Lakes and Sitidgi Lake: (i) Arctic Flounder and (j) Cod spp.

(k) Fourhorn Sculpin

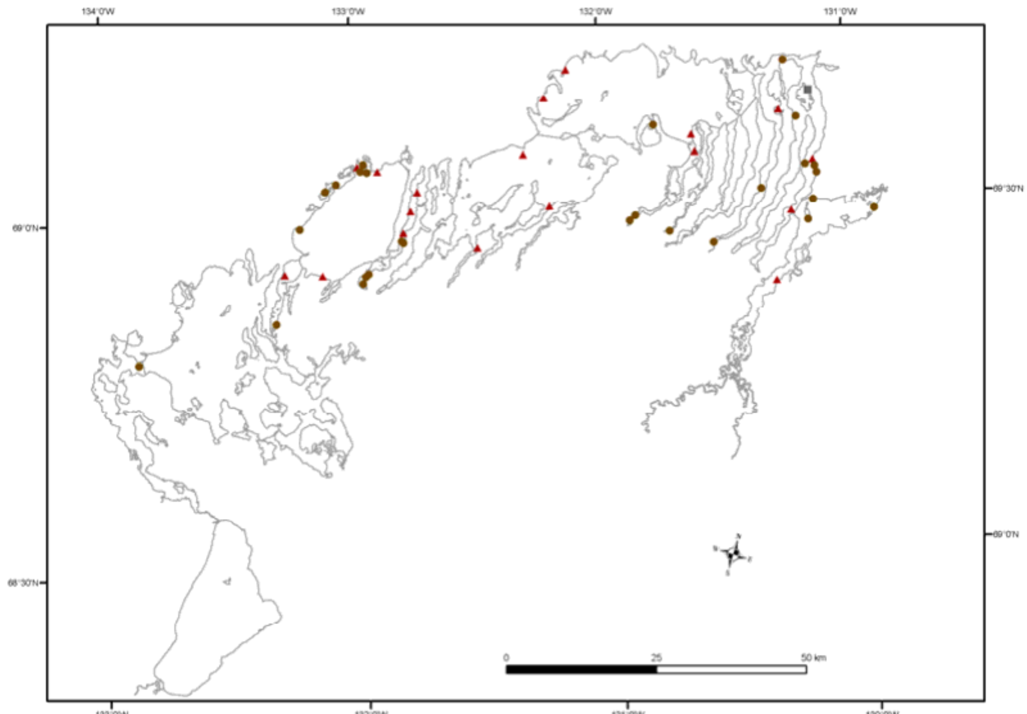
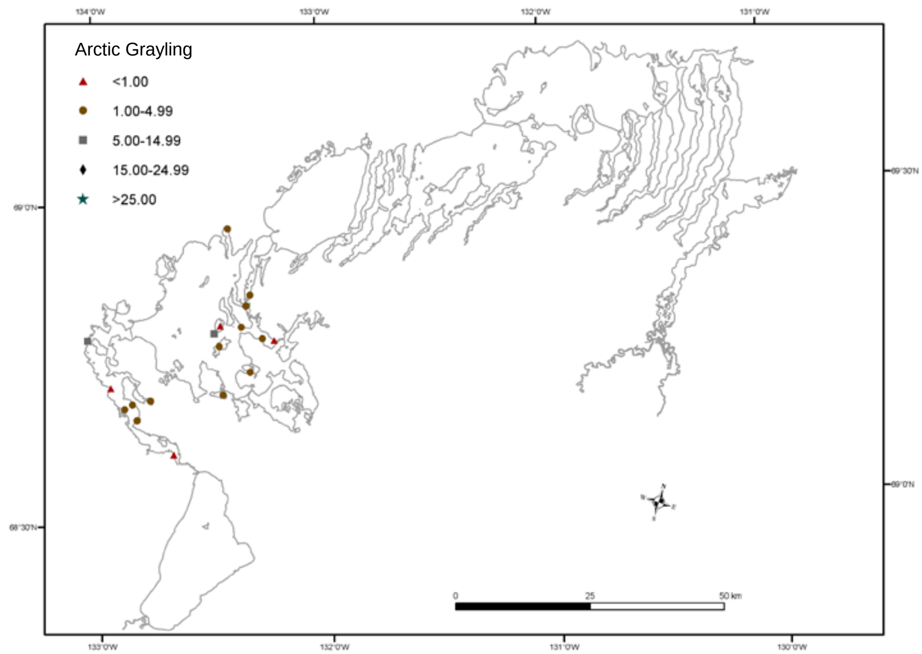


Figure 19 (continued). Spatial distribution and relative abundance (CPUE) of fish species in Husky Lakes and Sitidgi Lake: (k) Fourhorn Sculpin.

(a) Arctic Grayling



(b) Burbot

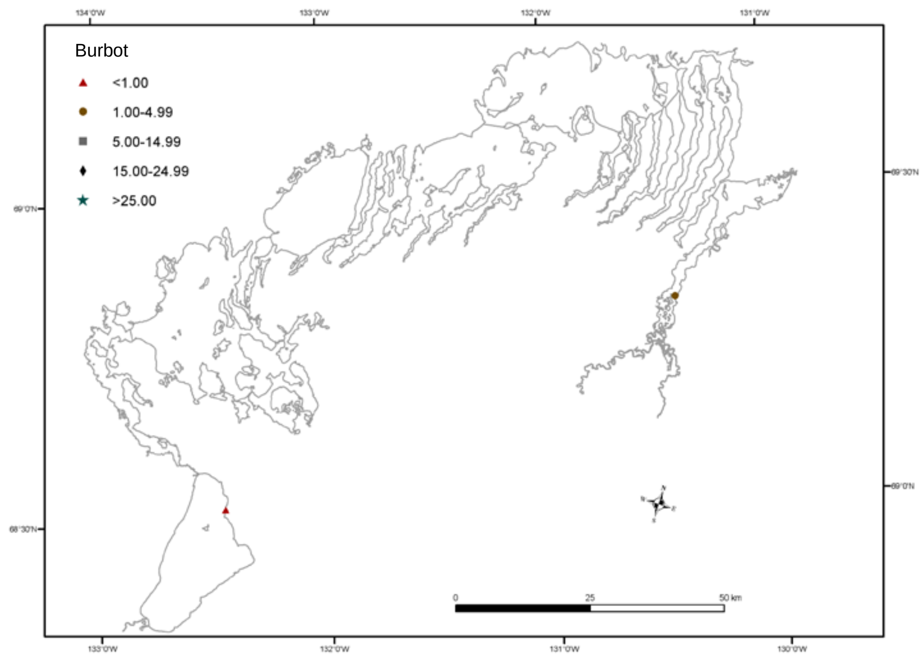
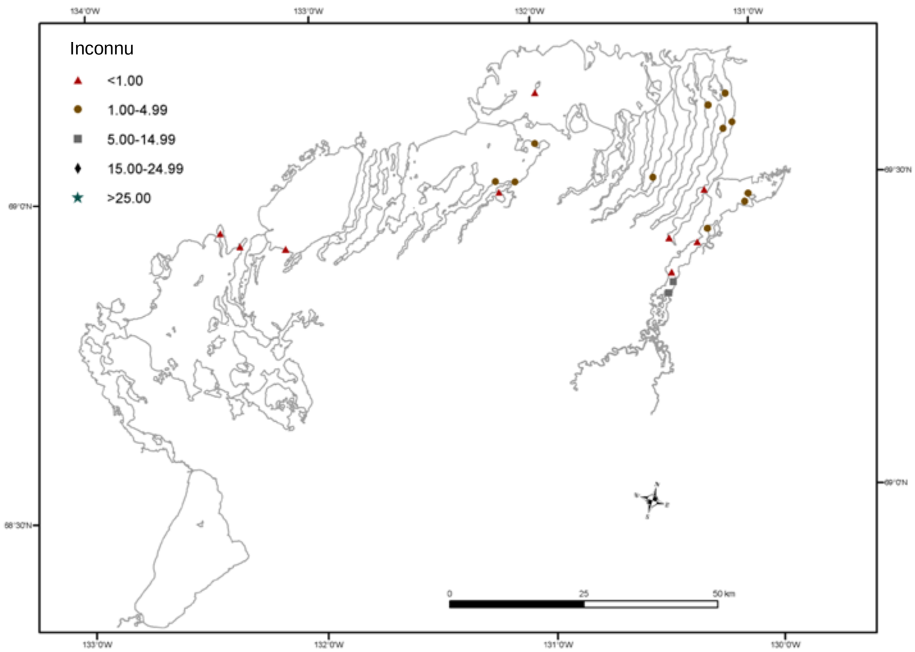


Figure 20. Spatial distribution and relative abundance (CPUE) of rare fish species in Husky Lakes and Sitidgi Lake: (a) Arctic Grayling and (b) Burbot.

(c) Inconnu



(d) Longnose Sucker

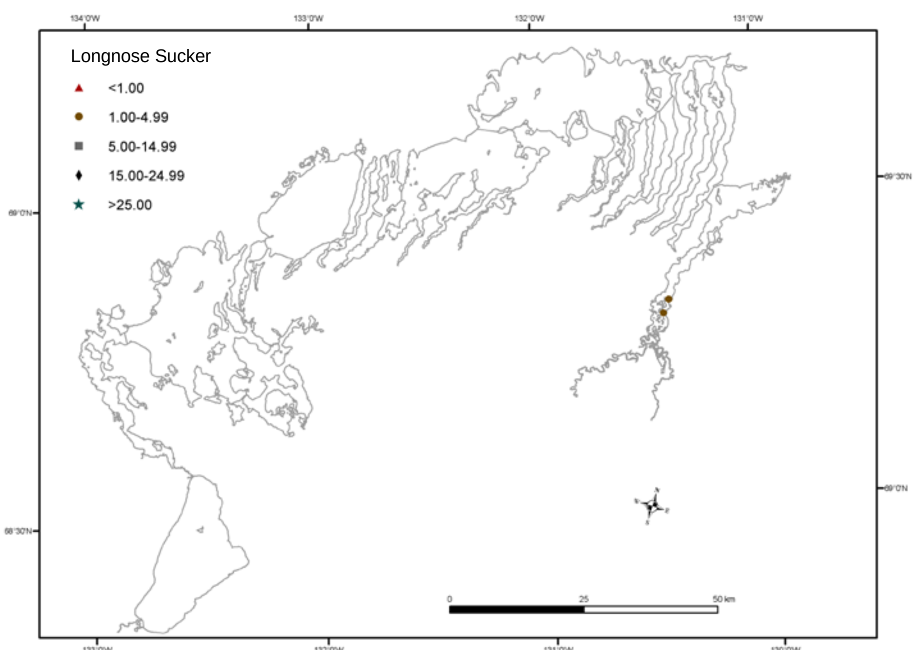
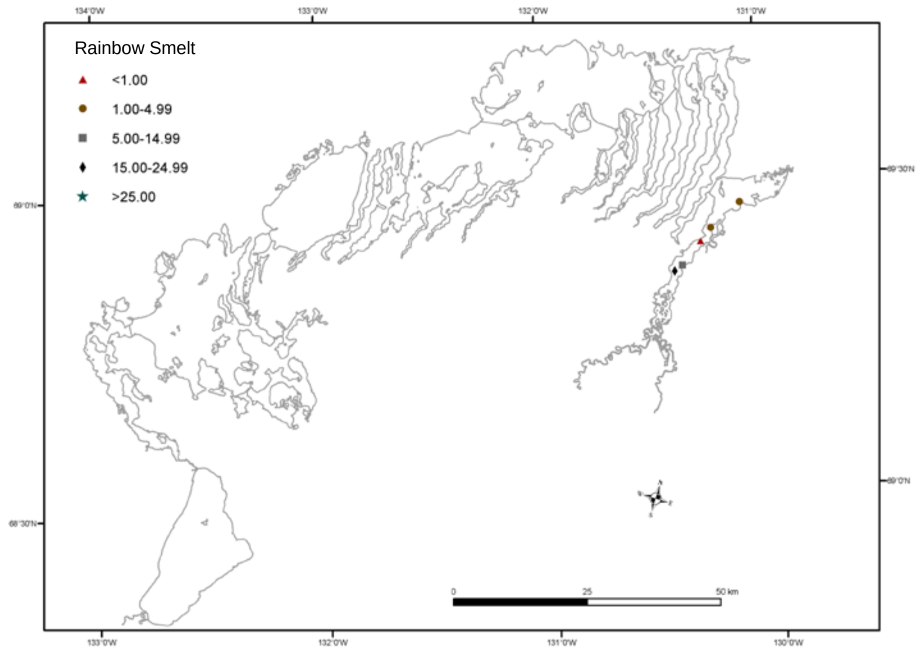


Figure 20 (continued). Spatial distribution and relative abundance (CPUE) of rare fish species in Husky Lakes and Sitidgi Lake: (c) Inconnu and (d) Longnose Sucker.

(e) Rainbow Smelt



(f) Round Whitefish

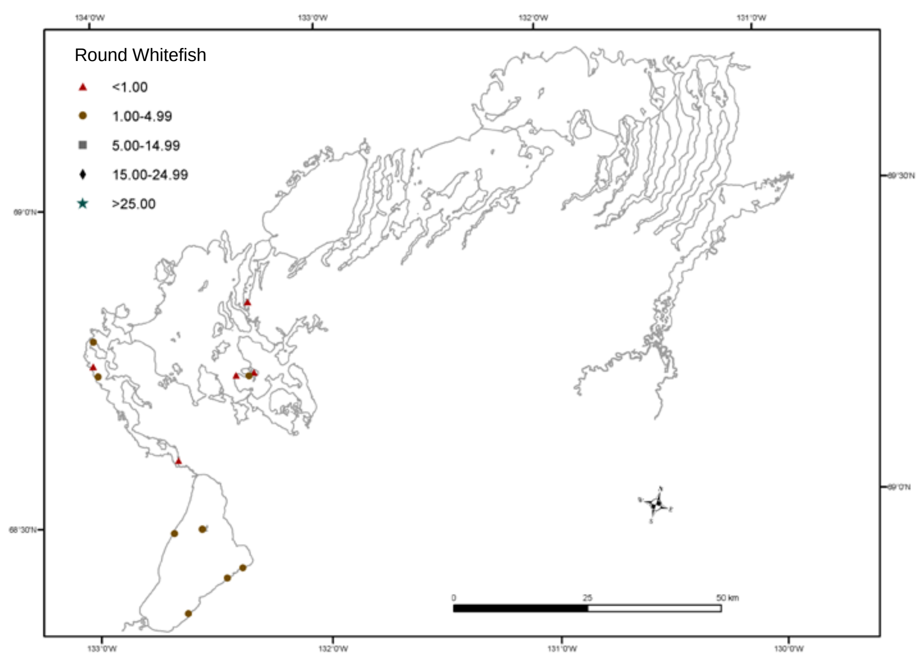
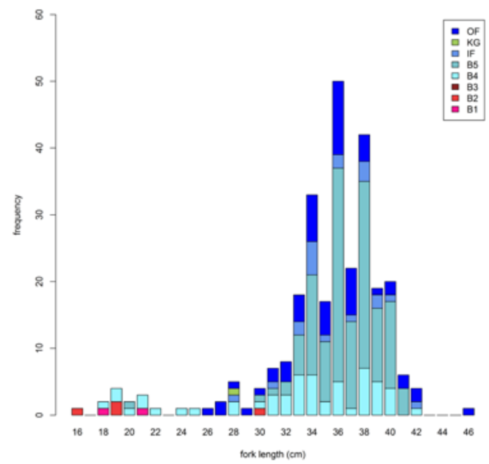
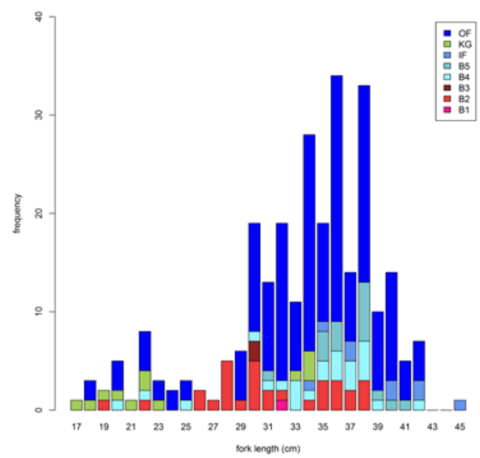


Figure 20 (continued). Spatial distribution and relative abundance (CPUE) of rare fish species in Husky Lakes and Sitidgi Lake: (e) Rainbow Smelt and (f) Round Whitefish.

a)



(b)



(c)

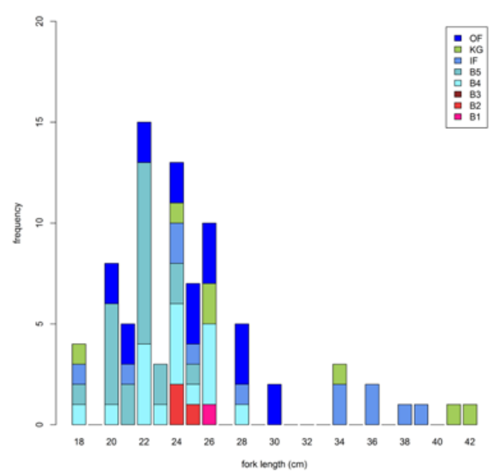
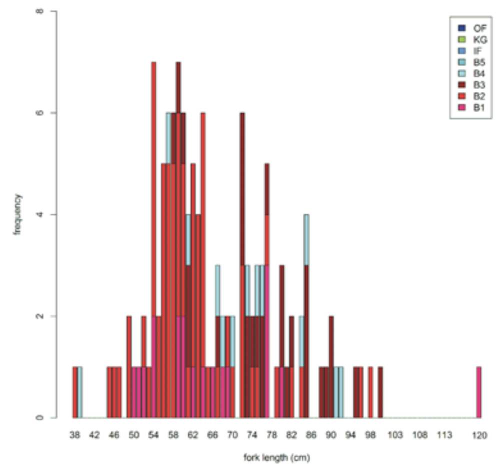


Figure 21. Length frequency distributions by basins for random samples of a) Arctic Cisco (n=275), (b) Least Cisco (n=269), and (c) Pacific Herring (n=81) in Husky Lakes.

(d)



(e)

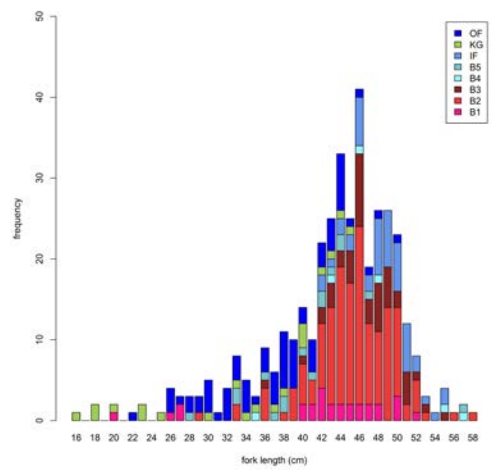


Figure 21 (continued). Length frequency distributions by basins for random samples of (d) Lake Trout (n=127) and (e) Lake Whitefish (n=381) in Husky Lakes.

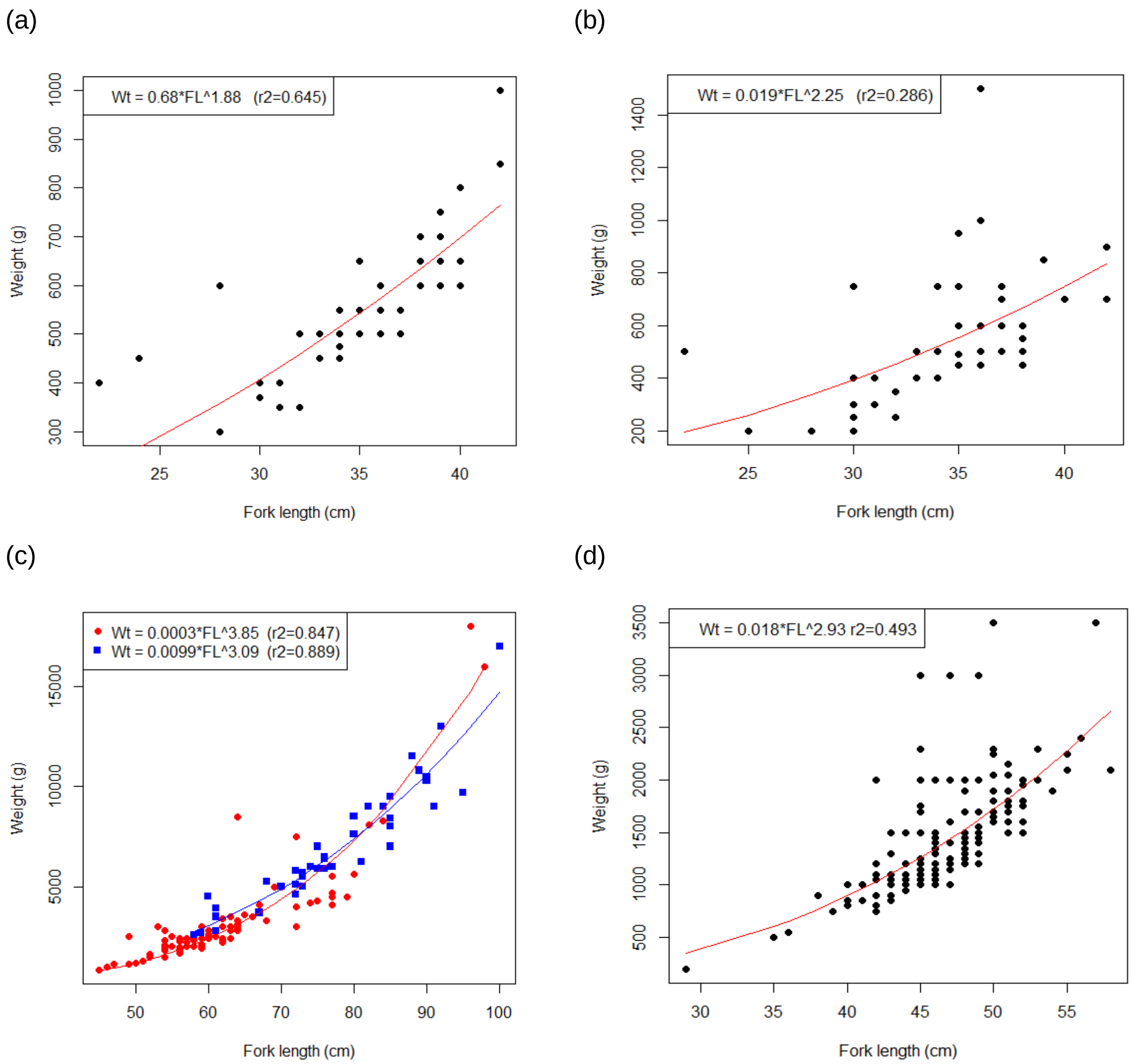


Figure 22. Length-weight functions for random samples of fish from Husky Lakes: (a) Arctic Cisco (n=58), (b) Least Cisco (n=51), and (c) Lake Trout (n=124) distinguishing between fish caught in B1 and B2 (red) and fish caught in B3 and IF (blue), and (d) Lake Whitefish (n=183).

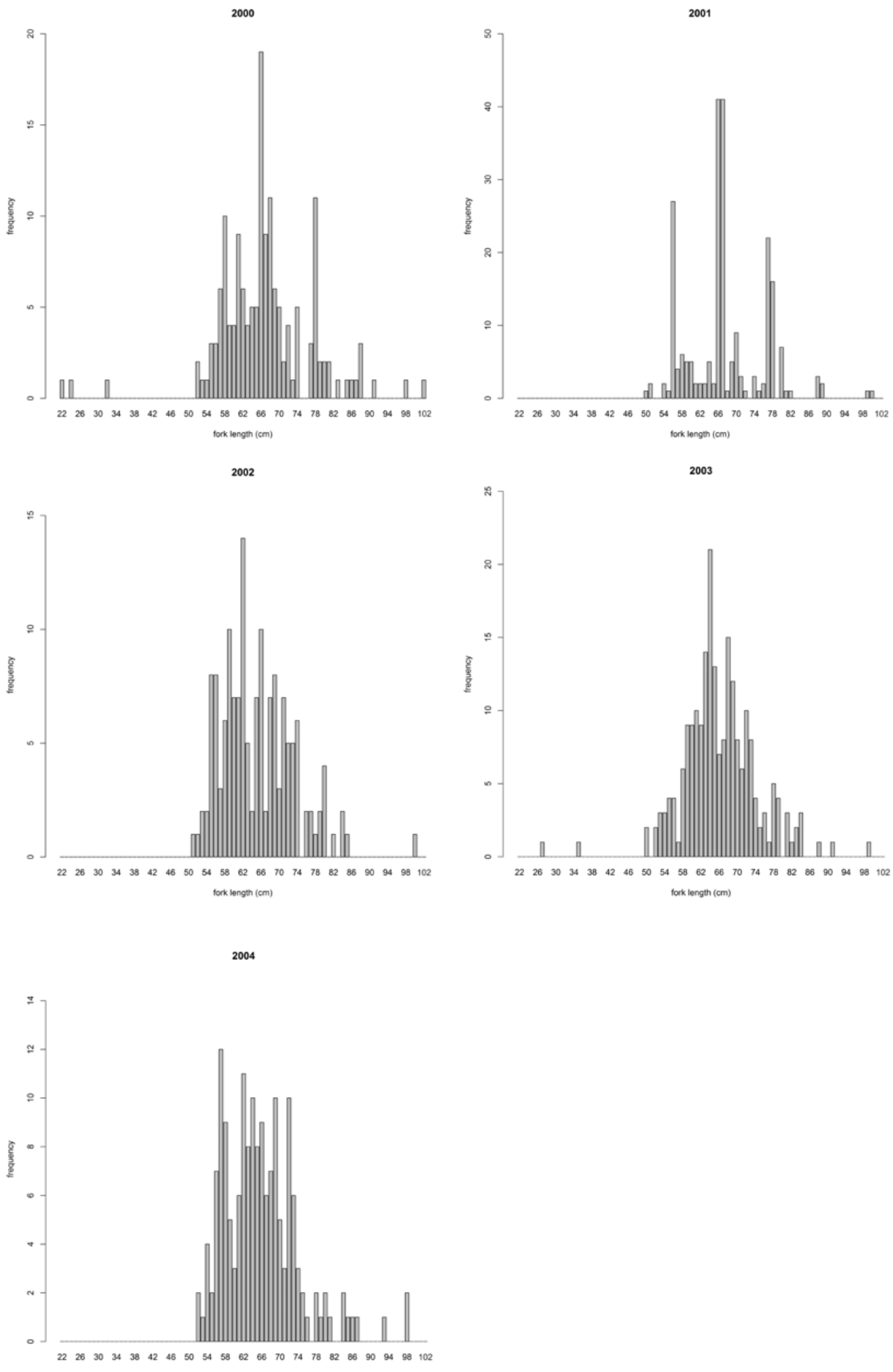


Figure 23. Annual length frequency distributions for Lake Trout harvested during spring subsistence fisheries in Husky Lakes and Sitidgi Lake.

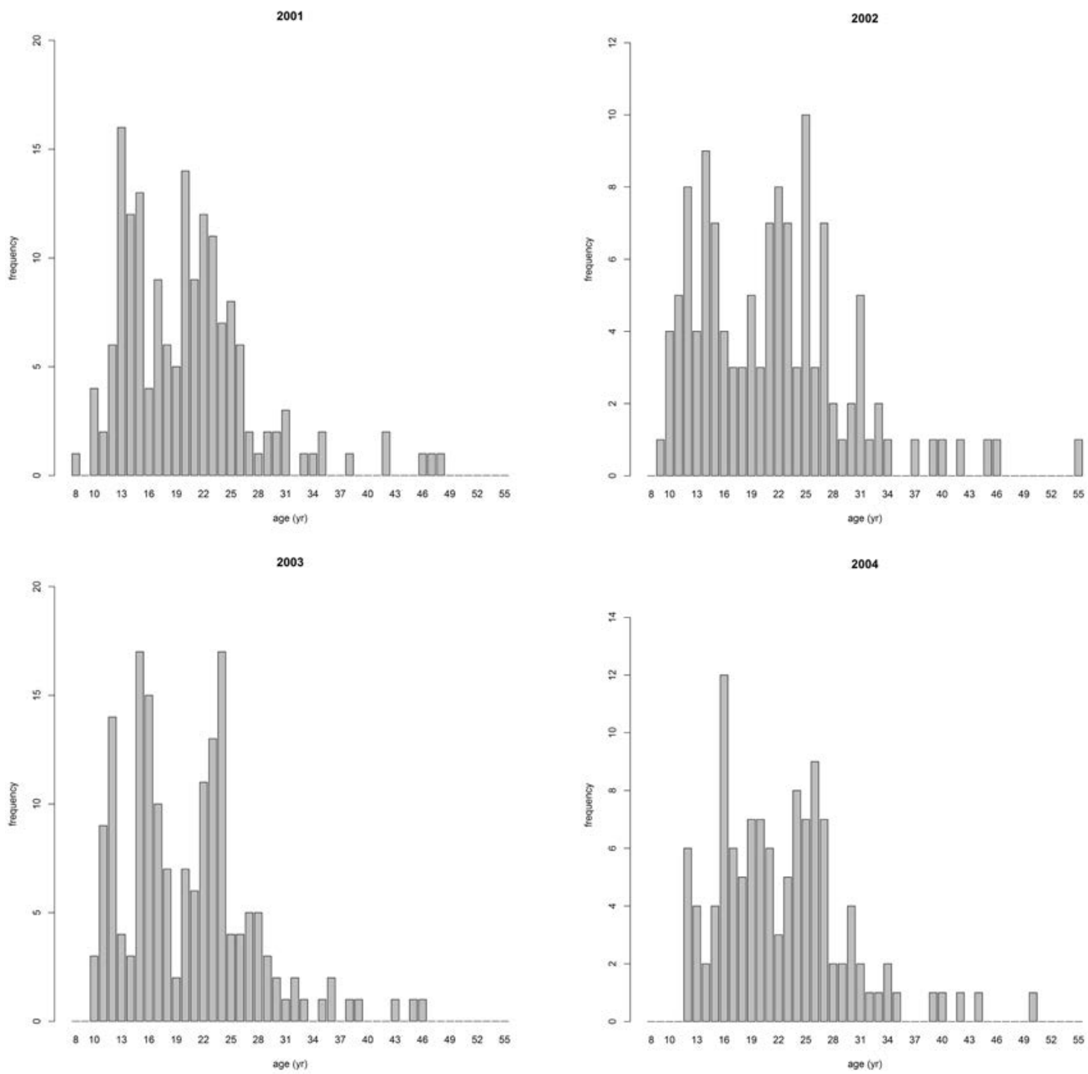


Figure 24. Annual age frequency distributions for Lake Trout harvested during spring subsistence fisheries in Husky Lakes and Sitidgi Lake.

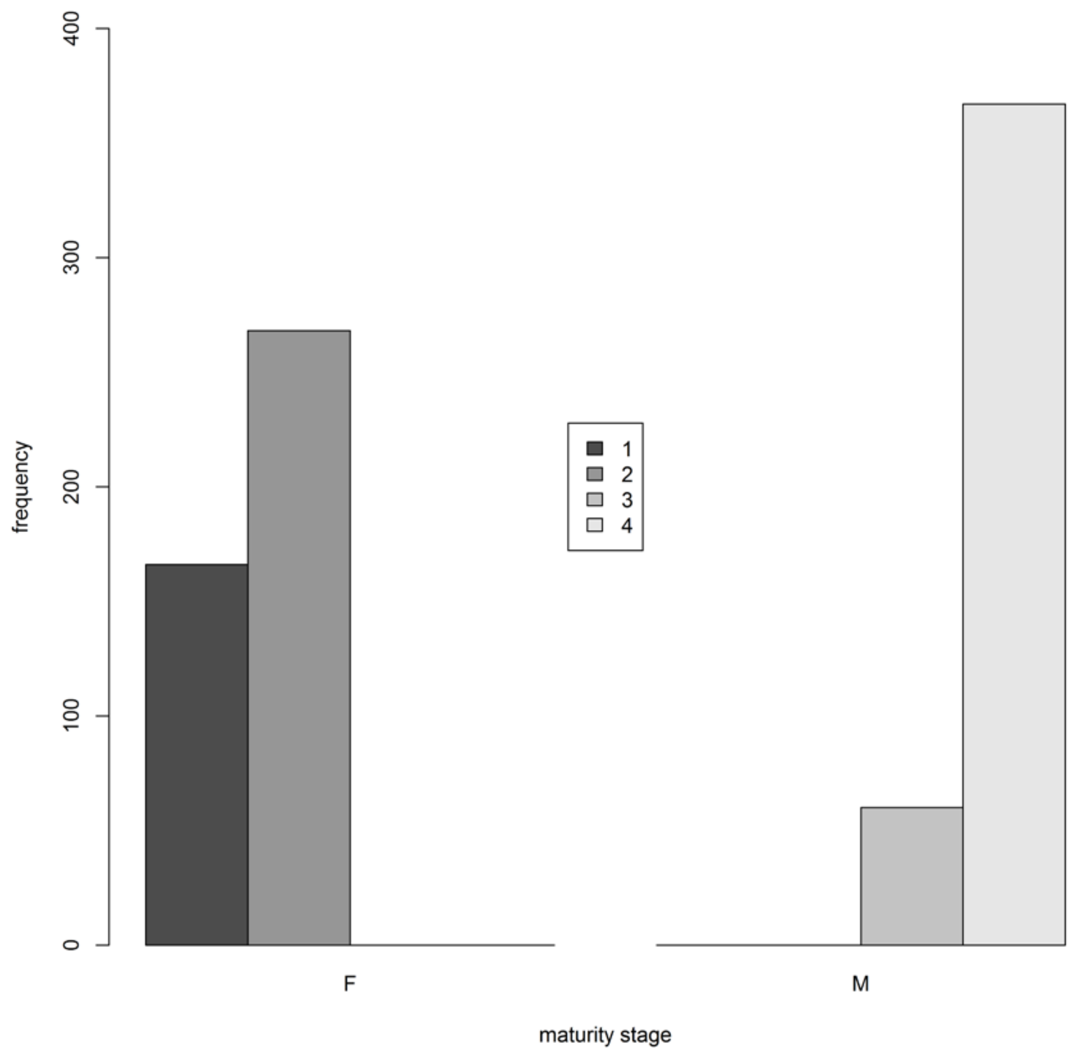


Figure 25. Maturity stage distribution for female (F) and male (M) Lake Trout harvested in spring subsistence fisheries, 2000-2004. Maturity stages 1 and 2 correspond to developing and resting females, respectively. Maturity stages 3 and 4 correspond to developing and resting males.

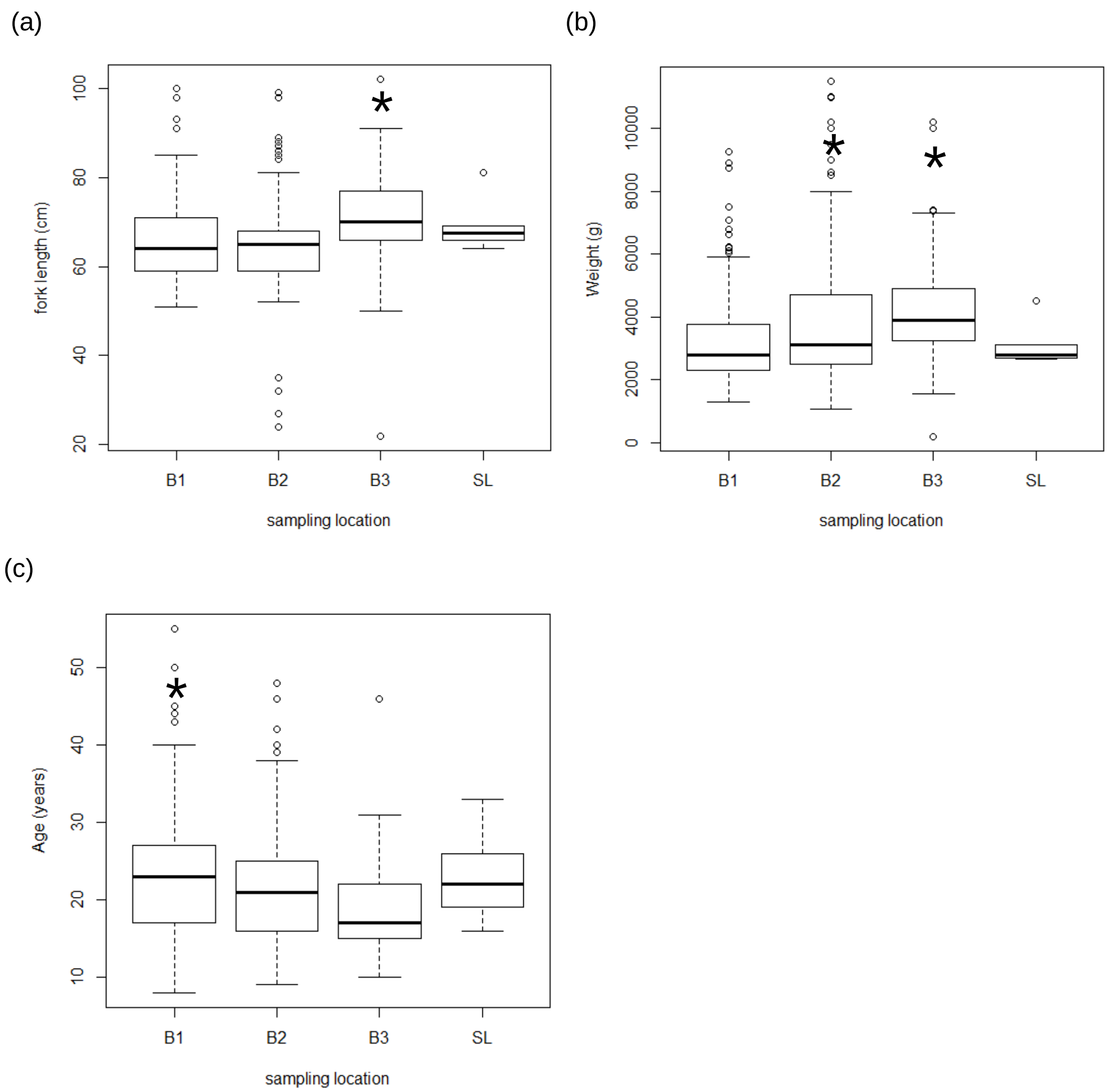


Figure 26. Variation in (a) length, (b) weight, and (c) age for Lake Trout harvested in basins B1, B2, and B3 and Sitidgi Lake during spring subsistence fisheries. * = significant difference in mean.

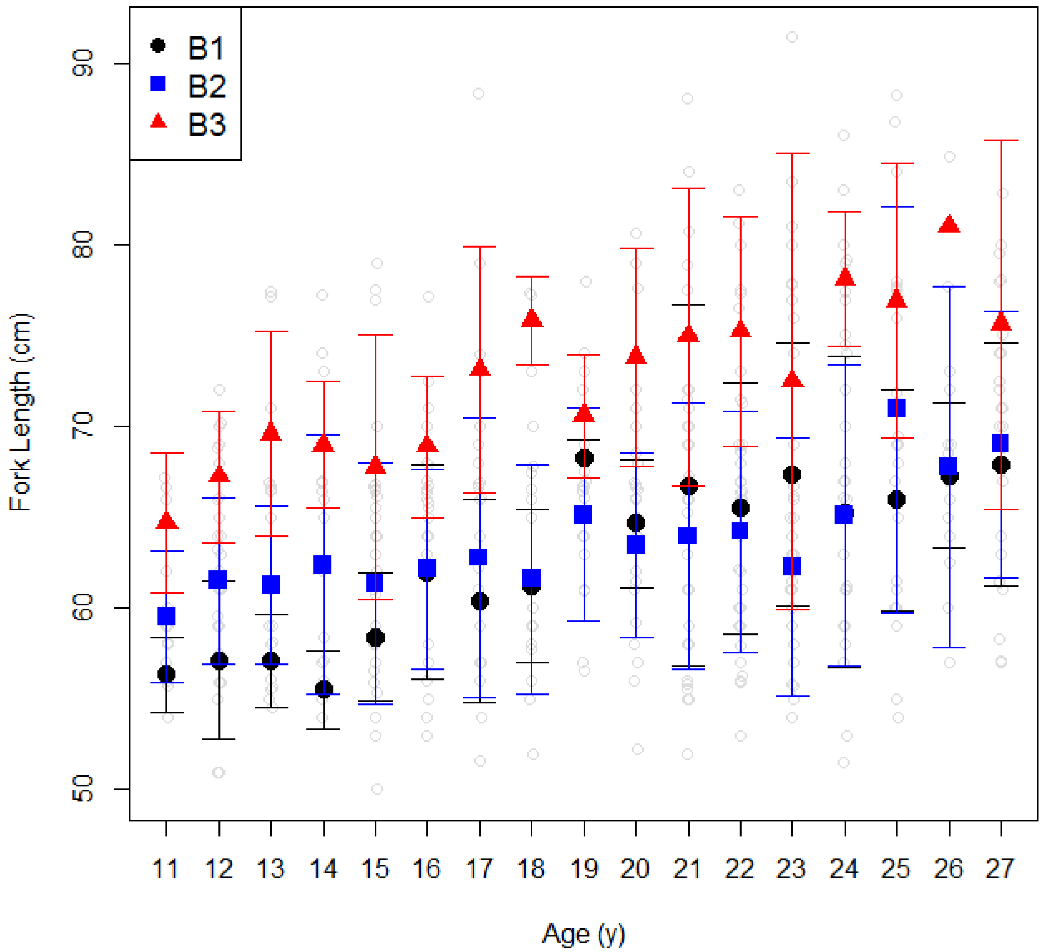


Figure 27. Average (± 1sd) lengths-at-age for Lake Trout harvested from basins B1, B2, and B3 of Husky Lakes during spring subsistence fisheries (May harvests only).

(a)

(b)

(c)

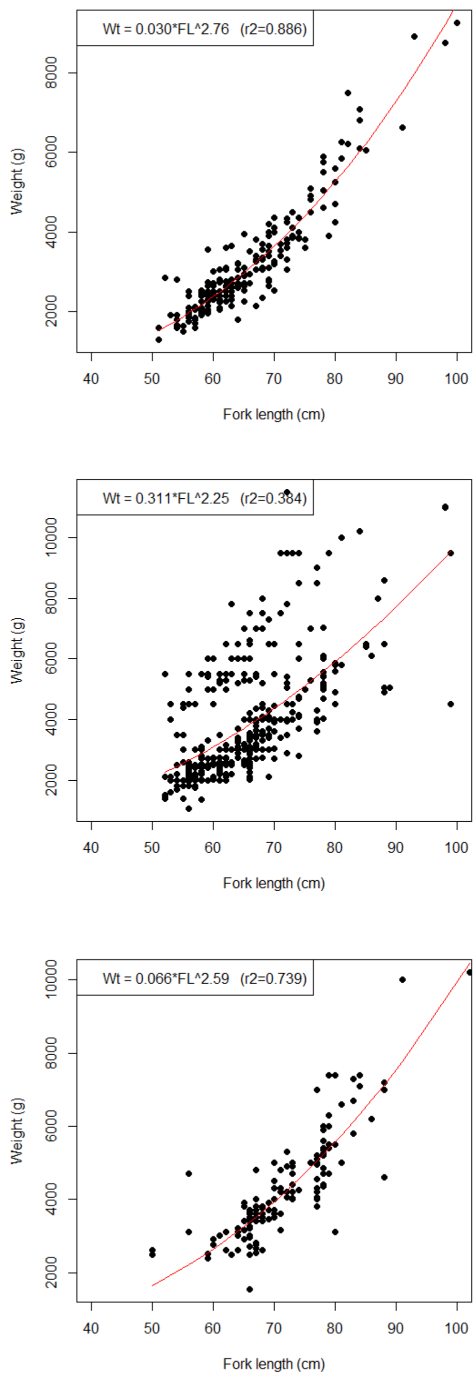


Figure 28. Length-weight relationships for Lake Trout harvested from basins B1 (a), B2 (b), and B3 (c) of Husky Lakes during spring subsistence fisheries.

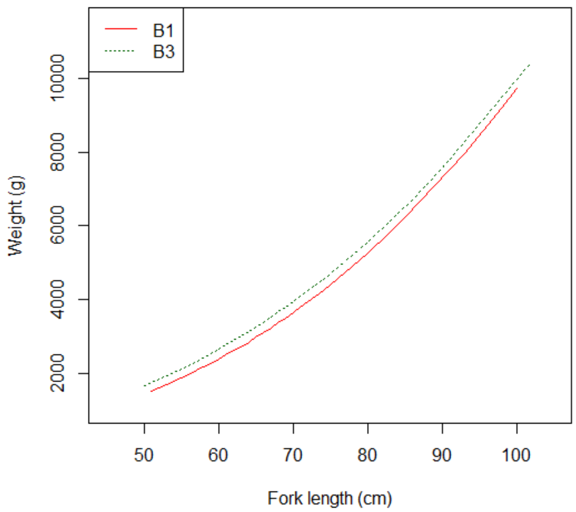


Figure 29. Comparison of fitted length-weight relationships for Lake Trout harvested in B1 and B3 during spring subsistence fisheries.

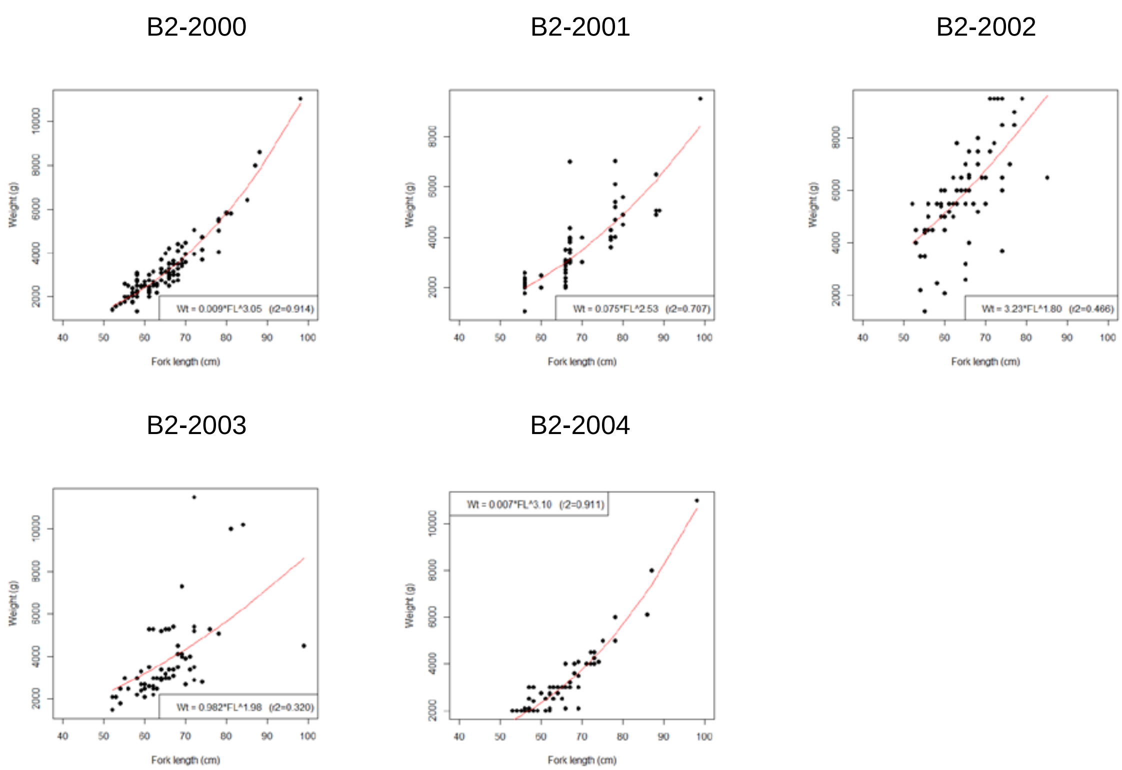


Figure 30. Annual length-weight functions for Lake Trout harvested from B2 of Husky Lakes during spring subsistence fisheries.

Appendix 1. Spatial coordinates of the netting sites in the experimental netting survey of Husky Lakes and Sitidgi Lake, including year, basins, and total catch (catch = number of fish caught in each net). HL = Husky Lakes, SL = Sitidgi Lake.

Year	Location	Net_key	Basin	Catch	Lat (^oN)	Lon (^oW)
2001	HL	2001001	B2	2	68.931	-132.633
2001	HL	2001002	B2	3	68.926	-132.628
2001	HL	2001003	B2	25	68.971	-132.572
2001	HL	2001004	B2	17	68.971	-132.620
2001	HL	2001005	B2	14	68.947	-132.635
2001	HL	2001006	B2	1	68.903	-132.601
2001	HL	2001007	B2	16	68.904	-132.662
2001	HL	2001008	B2	5	68.913	-132.652
2001	HL	2001009	B2	18	68.920	-132.692
2001	HL	2001010	B2	3	68.827	-132.466
2001	HL	2001011	B2	6	68.820	-132.434
2001	HL	2001012	B2	8	68.852	-132.433
2001	HL	2001013	B2	0	68.847	-132.483
2001	HL	2001014	B2	0	68.868	-132.467
2001	HL	2001015	B2	1	68.891	-132.521
2001	HL	2001016	B2	2	68.875	-132.507
2001	HL	2001018	B2	1	68.857	-132.583
2001	HL	2001019	B2	1	68.864	-132.632
2001	HL	2001020	B2	8	68.818	-132.531
2001	HL	2001021	B2	11	68.825	-132.493
2001	HL	2001022	B2	7	68.810	-132.493
2001	HL	2001023	B2	8	68.796	-132.556
2001	HL	2001024	B2	3	68.811	-132.575
2001	HL	2001025	B2	4	68.800	-132.589
2001	HL	2001026	B2	8	68.812	-132.661
2001	HL	2001027	B2	4	68.825	-132.682
2001	HL	2001028	B2	3	68.829	-132.712
2001	HL	2001029	B2	3	68.828	-132.850
2001	HL	2001030	B2	5	68.807	-132.833
2001	HL	2001031	B2	25	68.812	-132.783
2001	HL	2001032	B2	12	68.817	-132.742
2001	HL	2001033	B2	3	68.825	-132.761
2001	HL	2001034	B2	9	68.851	-132.808
2001	HL	2001035	B2	4	68.857	-132.750
2001	HL	2001036	B2	9	68.865	-132.733
2001	HL	2001037	B2	0	68.871	-132.768
2001	HL	2001038	B2	1	68.883	-132.810
2001	HL	2001039	B2	15	68.877	-132.892
2001	HL	2001040	B2	19	69.070	-133.067
2001	HL	2001041	B2	56	69.060	-133.066
2001	HL	2001042	B2	21	69.030	-133.003
2001	HL	2001043	B2	9	69.018	-133.017
2001	HL	2001044	B2	18	69.050	-132.958
2001	HL	2001045	B2	9	69.041	-132.946
2001	HL	2001046	B2	1	69.000	-132.958
2001	HL	2001047	B2	47	68.970	-132.927
2001	HL	2001048	B2	12	68.980	-132.942
2001	HL	2001049	B2	6	68.947	-132.950

Appendix 1. Continued.

Year	Location	Net_key	Basin	Catch	Lat (^oN)	Lon (^oW)
2001	HL	2001050	B2	3	68.938	-132.967
2001	HL	2001051	B3	13	69.092	-132.833
2001	HL	2001052	B3	6	69.076	-132.834
2001	HL	2001053	B2	18	69.053	-132.903
2001	HL	2001054	B2	38	69.035	-132.883
2001	HL	2001055	B2	32	69.025	-132.850
2001	HL	2001056	B2	30	69.017	-132.883
2001	HL	2001057	B2	19	69.006	-132.874
2001	HL	2001058	B2	6	68.996	-132.873
2001	HL	2001059	B2	35	68.978	-132.867
2001	HL	2001060	B2	12	68.973	-132.869
2001	HL	2001061	B2	42	68.959	-132.868
2001	HL	2001062	B2	15	68.950	-132.850
2001	HL	2001063	B2	10	68.963	-133.098
2001	HL	2001064	B2	18	68.898	-132.965
2001	HL	2001065	B2	5	68.880	-132.924
2001	HL	2001066	B2	22	68.926	-132.893
2001	HL	2001067	B2	8	68.923	-132.857
2001	HL	2001068	B2	9	68.919	-132.808
2001	HL	2001069	B2	25	68.933	-132.787
2001	HL	2001070	B2	18	68.917	-132.747
2001	HL	2001071	B2	3	68.947	-132.792
2001	HL	2001072	B2	1	68.913	-132.952
2001	HL	2001073	B2	0	69.023	-133.087
2001	HL	2001074	B2	2	69.028	-133.202
2001	HL	2001075	B2	21	68.988	-133.241
2001	HL	2001076	B2	1	68.955	-133.233
2001	HL	2001077	B2	0	68.903	-133.233
2001	HL	2001078	B2	0	68.882	-133.283
2001	HL	2001079	B2	1	68.867	-133.320
2001	HL	2001080	B2	3	68.877	-133.133
2001	HL	2001081	B1	1	68.830	-133.470
2001	HL	2001082	B1	5	68.824	-133.484
2001	HL	2001083	B1	2	68.757	-133.142
2001	HL	2001084	B1	0	68.757	-133.167
2001	HL	2001085	B1	0	68.758	-133.217
2001	HL	2001086	B1	0	68.780	-133.233
2001	HL	2001087	B1	0	68.783	-133.274
2001	HL	2001088	B1	2	68.775	-133.333
2001	HL	2001089	B1	7	68.802	-133.375
2001	HL	2001090	B1	1	68.817	-133.377
2001	HL	2001091	B1	5	68.843	-133.367
2001	HL	2001092	B1	16	68.852	-133.350
2001	HL	2001093	B1	19	68.861	-133.417
2001	HL	2001094	B1	3	68.886	-133.379
2001	HL	2001095	B1	5	68.852	-133.425
2001	HL	2001096	B1	2	68.838	-133.433
2001	HL	2001097	B1	22	68.684	-132.931
2001	HL	2001098	B1	3	68.685	-132.958
2001	HL	2001099	B1	8	68.693	-133.009

Appendix 1. Continued.

Year	Location	Net_key	Basin	Catch	Lat (^oN)	Lon (^oW)
2001	HL	2001100	B1	4	68.688	-133.080
2001	HL	2001101	B1	21	68.705	-133.131
2001	HL	2001102	B1	1	68.703	-133.191
2001	HL	2001103	B1	9	68.719	-133.169
2001	HL	2001104	B1	8	68.741	-133.213
2001	HL	2001105	B1	12	68.729	-133.240
2001	HL	2001106	B1	7	68.755	-133.334
2001	HL	2001107	B1	5	68.772	-133.409
2001	HL	2001108	B1	6	68.784	-133.447
2001	HL	2001109	B1	21	68.816	-133.506
2001	HL	2001110	B2	15	68.853	-133.298
2001	HL	2001111	B2	0	68.849	-133.215
2001	HL	2001112	B2	8	68.809	-133.108
2001	HL	2001113	B2	5	68.813	-133.061
2001	HL	2001114	B2	3	68.818	-133.067
2001	HL	2001115	B2	0	68.800	-132.942
2001	HL	2001116	B2	25	68.868	-132.983
2002	HL	2002001	B3	11	69.127	-132.536
2002	HL	2002002	B3	5	69.123	-132.561
2002	HL	2002003	B3	11	69.118	-132.575
2002	HL	2002004	B3	3	69.111	-132.605
2002	HL	2002005	IF	6	69.116	-132.561
2002	HL	2002006	IF	9	69.118	-132.532
2002	HL	2002007	B3	14	69.087	-132.660
2002	HL	2002008	B3	8	69.107	-132.622
2002	HL	2002009	B3	3	69.164	-132.855
2002	HL	2002010	B3	5	69.171	-132.846
2002	HL	2002011	B3	0	69.184	-132.831
2002	HL	2002012	B3	10	69.202	-132.839
2002	HL	2002013	B3	0	69.196	-132.819
2002	HL	2002014	B3	9	69.192	-132.858
2002	HL	2002015	B3	5	69.207	-132.826
2002	HL	2002016	B3	0	69.217	-132.786
2002	HL	2002017	B3	1	69.231	-132.761
2002	HL	2002018	B3	17	69.236	-132.787
2002	HL	2002019	B3	1	69.242	-132.765
2002	HL	2002020	B3	3	69.249	-132.745
2002	HL	2002021	B3	30	69.237	-132.746
2002	HL	2002022	B3	1	69.153	-132.873
2002	HL	2002023	B3	16	69.140	-132.885
2002	HL	2002024	B3	9	69.124	-132.905
2002	HL	2002025	B3	0	69.104	-132.912
2002	HL	2002026	B3	2	69.098	-132.894
2002	HL	2002027	B3	12	69.093	-132.852
2002	HL	2002028	B3	12	69.097	-132.837
2002	HL	2002029	B3	8	69.063	-132.817
2002	HL	2002030	B3	10	69.071	-132.753
2002	HL	2002031	B3	10	69.072	-132.705
2002	HL	2002032	B3	1	69.074	-132.696
2002	HL	2002033	B4	5	69.234	-132.330

Appendix 1. Continued.

Year	Location	Net_key	Basin	Catch	Lat (°N)	Lon (°W)
2002	HL	2002034	B4	7	69.246	-132.333
2002	HL	2002035	B4	5	69.256	-132.333
2002	HL	2002036	B4	3	69.270	-132.328
2002	HL	2002037	B4	5	69.283	-132.338
2002	HL	2002038	B4	5	69.295	-132.354
2002	HL	2002039	B4	3	69.305	-132.338
2002	HL	2002040	B4	6	69.292	-132.317
2002	HL	2002041	IF	14	69.278	-132.393
2002	HL	2002042	IF	11	69.290	-132.406
2002	HL	2002043	IF	4	69.294	-132.425
2002	HL	2002044	IF	5	69.283	-132.441
2002	HL	2002045	IF	4	69.265	-132.428
2002	HL	2002046	IF	6	69.279	-132.413
2002	HL	2002047	IF	6	69.275	-132.449
2002	HL	2002048	IF	5	69.277	-132.466
2002	HL	2002049	IF	13	69.246	-132.446
2002	HL	2002050	IF	5	69.226	-132.438
2002	HL	2002051	B4	0	69.278	-132.305
2002	HL	2002052	B4	3	69.277	-132.314
2002	HL	2002053	IF	2	69.088	-132.483
2002	HL	2002054	IF	3	69.109	-132.456
2002	HL	2002055	B4	2	69.052	-132.417
2002	HL	2002056	IF	1	69.123	-132.418
2002	HL	2002057	IF	4	69.121	-132.400
2002	HL	2002058	IF	5	69.141	-132.410
2002	HL	2002059	IF	7	69.149	-132.361
2002	HL	2002060	IF	8	69.180	-132.372
2002	HL	2002061	IF	5	69.173	-132.424
2002	HL	2002062	IF	2	69.200	-132.356
2002	HL	2002063	IF	1	69.185	-132.376
2002	HL	2002064	IF	6	69.201	-132.424
2002	HL	2002065	B3	9	69.239	-132.719
2002	HL	2002066	B3	4	69.246	-132.680
2002	HL	2002067	B3	7	69.263	-132.630
2002	HL	2002068	B3	1	69.268	-132.592
2002	HL	2002069	B4	0	69.233	-132.256
2002	HL	2002070	B4	3	69.225	-132.226
2002	HL	2002071	B4	10	69.175	-132.297
2002	HL	2002072	B4	14	69.176	-132.337
2002	HL	2002073	B4	0	69.169	-132.335
2002	HL	2002074	B4	12	69.157	-132.299
2002	HL	2002075	B4	1	69.174	-132.275
2002	HL	2002076	B4	4	69.185	-132.267
2002	HL	2002077	B4	2	69.196	-132.240
2002	HL	2002078	IF	2	69.217	-132.332
2002	HL	2002079	IF	13	69.203	-132.376
2002	HL	2002080	IF	0	69.258	-132.488
2002	HL	2002081	IF	9	69.265	-132.494
2002	HL	2002082	IF	3	69.272	-132.503
2002	HL	2002083	IF	4	69.258	-132.503

Appendix 1. Continued.

Year	Location	Net_key	Basin	Catch	Lat (^oN)	Lon (^oW)
2002	HL	2002084	IF	0	69.243	-132.500
2002	HL	2002085	IF	1	69.253	-132.517
2002	HL	2002086	IF	1	69.236	-132.491
2002	HL	2002087	IF	10	69.239	-132.520
2002	HL	2002088	IF	3	69.207	-132.476
2002	HL	2002089	IF	0	69.223	-132.503
2002	HL	2002090	IF	1	69.216	-132.471
2002	HL	2002091	IF	1	69.209	-132.469
2002	HL	2002092	IF	0	69.202	-132.464
2002	HL	2002093	IF	8	69.191	-132.461
2002	HL	2002094	IF	2	69.171	-132.485
2002	HL	2002095	IF	0	69.163	-132.475
2002	HL	2002096	IF	8	69.217	-132.332
2002	HL	2002097	IF	2	69.254	-132.374
2002	HL	2002098	IF	7	69.262	-132.389
2002	HL	2002099	IF	3	69.253	-132.404
2002	HL	2002100	IF	11	69.248	-132.412
2002	HL	2002101	IF	0	69.245	-132.442
2002	HL	2002102	IF	3	69.233	-132.421
2002	HL	2002103	IF	4	69.212	-132.407
2002	HL	2002104	IF	1	69.221	-132.452
2002	HL	2002105	IF	1	69.217	-132.500
2002	HL	2002106	IF	6	69.205	-132.491
2002	HL	2002107	IF	8	69.190	-132.484
2002	HL	2002108	IF	10	69.184	-132.486
2002	HL	2002109	IF	0	69.182	-132.470
2002	HL	2002110	IF	7	69.170	-132.491
2002	HL	2002111	IF	7	69.158	-132.485
2002	HL	2002112	IF	8	69.156	-132.476
2002	HL	2002113	IF	4	69.142	-132.479
2002	HL	2002114	IF	16	69.075	-132.563
2002	HL	2002115	IF	5	69.080	-132.582
2002	HL	2002116	IF	8	69.091	-132.579
2002	HL	2002117	IF	7	69.096	-132.572
2002	HL	2002118	IF	1	69.102	-132.570
2002	HL	2002119	IF	4	69.108	-132.557
2002	HL	2002120	B3	9	69.263	-132.559
2002	HL	2002121	B3	1	69.250	-132.551
2002	HL	2002122	B3	4	69.236	-132.547
2002	HL	2002123	B3	0	69.221	-132.545
2002	HL	2002124	B3	7	69.204	-132.541
2002	HL	2002125	B3	8	69.189	-132.538
2002	HL	2002126	B3	1	69.170	-132.534
2002	HL	2002127	B3	1	69.162	-132.526
2002	HL	2002128	B3	2	69.143	-132.535
2002	HL	2002129	B3	1	69.134	-132.532
2002	HL	2002130	B3	6	69.133	-132.526
2002	HL	2002131	B4	4	69.207	-132.091
2002	HL	2002132	B4	7	69.187	-132.104
2002	HL	2002133	B4	4	69.184	-132.136

Appendix 1. Continued.

Year	Location	Net_key	Basin	Catch	Lat (°N)	Lon (°W)
2002	HL	2002134	B4	6	69.277	-132.140
2002	HL	2002135	B4	33	69.163	-132.144
2002	HL	2002136	B4	0	69.208	-132.124
2002	HL	2002137	B4	2	69.208	-132.124
2002	HL	2002138	B4	6	69.210	-132.190
2002	HL	2002139	B4	2	69.185	-132.174
2002	HL	2002140	B4	7	69.176	-132.176
2002	HL	2002141	B4	6	69.160	-132.208
2002	HL	2002142	B4	5	69.151	-132.220
2002	HL	2002143	B4	33	69.120	-132.240
2002	HL	2002144	B4	3	69.258	-132.285
2002	HL	2002145	B4	2	69.250	-132.303
2002	HL	2002146	B4	7	69.234	-132.252
2002	HL	2002147	B4	7	69.230	-132.223
2002	HL	2002148	B4	1	69.176	-132.180
2002	HL	2002149	B4	3	69.147	-132.221
2002	HL	2002150	B4	3	69.300	-131.863
2002	HL	2002151	B4	20	69.290	-131.916
2002	HL	2002152	B4	20	69.278	-131.943
2002	HL	2002153	B4	5	69.278	-131.998
2002	HL	2002154	B4	4	69.272	-131.956
2002	HL	2002155	B4	7	69.264	-131.963
2002	HL	2002156	B4	6	69.258	-131.968
2002	HL	2002157	B4	8	69.245	-131.998
2002	HL	2002158	B4	10	69.242	-132.010
2002	HL	2002159	B4	15	69.229	-132.045
2002	HL	2002160	B4	27	69.232	-132.057
2002	HL	2002161	B4	8	69.220	-132.074
2002	HL	2002162	B4	6	69.232	-132.092
2002	HL	2002163	B4	6	69.120	-132.240
2002	HL	2002164	B4	1	69.359	-132.093
2002	HL	2002165	B4	12	69.340	-132.118
2002	HL	2002166	B4	15	69.342	-132.158
2002	HL	2002167	B4	4	69.335	-132.202
2002	HL	2002168	B4	2	69.324	-132.236
2002	HL	2002169	B5	5	69.387	-132.104
2002	HL	2002170	B5	2	69.489	-132.065
2002	HL	2002171	B5	2	69.389	-132.033
2002	HL	2002172	B5	10	69.386	-131.984
2002	HL	2002173	B4	6	69.278	-132.184
2002	HL	2002174	B4	1	69.246	-132.159
2002	HL	2002175	B4	17	69.245	-132.127
2002	HL	2002176	B4	7	69.238	-132.217
2002	HL	2002177	B4	3	69.227	-132.141
2002	HL	2002178	B4	2	69.216	-132.157
2002	HL	2002179	B4	5	69.205	-132.287
2002	HL	2002180	B4	3	69.220	-132.296
2002	HL	2002181	B4	5	69.371	-131.795
2002	HL	2002182	B4	6	69.379	-131.753
2002	HL	2002183	B4	3	69.342	-131.771

Appendix 1. Continued.

Year	Location	Net_key	Basin	Catch	Lat (^oN)	Lon (^oW)
2002	HL	2002184	B4	2	69.350	-131.771
2002	HL	2002185	B4	1	69.336	-131.785
2002	HL	2002186	B4	3	69.325	-131.794
2002	HL	2002187	B4	0	69.314	-131.792
2002	HL	2002188	B4	4	69.300	-131.829
2002	HL	2002189	B4	10	69.291	-131.846
2002	HL	2002190	B4	26	69.289	-131.863
2002	HL	2002191	B4	26	69.275	-131.885
2002	HL	2002192	B4	15	69.272	-131.901
2002	HL	2002193	B4	1	69.255	-131.923
2002	HL	2002194	B4	19	69.246	-131.935
2002	HL	2002195	B4	10	69.229	-131.954
2002	HL	2002196	IF	9	69.109	-132.523
2002	HL	2002197	IF	4	69.114	-132.509
2002	HL	2002198	IF	2	69.122	-132.504
2002	HL	2002199	IF	6	69.131	-132.507
2002	HL	2002200	B3	1	69.131	-132.524
2002	HL	2002201	B3	5	69.132	-132.523
2002	HL	2002202	B3	3	69.132	-132.529
2002	HL	2002203	IF	7	69.139	-132.493
2003	HL	2003001	OF	11	69.518	-130.935
2003	HL	2003002	OF	13	69.508	-130.939
2003	HL	2003003	OF	19	69.499	-130.931
2003	HL	2003004	OF	2	69.506	-130.931
2003	HL	2003005	OF	20	69.481	-130.936
2003	HL	2003006	OF	30	69.467	-130.943
2003	HL	2003007	OF	25	69.459	-130.926
2003	HL	2003008	OF	14	69.445	-130.914
2003	HL	2003009	OF	8	69.504	-130.962
2003	HL		B5	32	na	na
2003	HL	2003011	OF	18	69.491	-130.963
2003	HL	2003012	OF	12	69.474	-130.968
2003	HL	2003013	OF	23	69.457	-130.966
2003	HL	2003014	OF	14	69.457	-130.966
2003	HL	2003015	OF	2	69.419	-130.942
2003	HL	2003016	KG	12	69.424	-130.630
2003	HL	2003017	OF	14	69.384	-130.964
2003	HL	2003018	OF	3	69.575	-131.260
2003	HL	2003019	OF	18	69.588	-131.238
2003	HL	2003020	OF	11	69.599	-131.221
2003	HL	2003021	OF	33	69.601	-131.203
2003	HL	2003022	OF	9	69.605	-131.163
2003	HL	2003023	OF	4	69.605	-131.116
2003	HL	2003024	OF	19	69.612	-131.083
2003	HL	2003025	OF	20	69.606	-131.049
2003	HL	2003026	OF	0	69.606	-131.054
2003	HL	2003027	OF	0	69.560	-131.156
2003	HL	2003028	OF	2	69.570	-131.178
2003	HL	2003029	OF	10	69.586	-131.200
2003	HL	2003030	OF	10	69.596	-131.192

Appendix 1. Continued.

Year	Location	Net_key	Basin	Catch	Lat (°N)	Lon (°W)
2003	HL	2003031	OF	1	69.602	-131.147
2003	HL	2003032	OF	1	69.596	-131.121
2003	HL	2003033	OF	8	69.595	-131.099
2003	HL	2003034	OF	27	69.588	-131.096
2003	HL	2003035	OF	22	69.579	-131.087
2003	HL	2003036	OF	6	69.568	-131.086
2003	HL	2003037	OF	13	69.573	-131.076
2003	HL	2003038	OF	28	69.564	-131.050
2003	HL	2003039	OF	3	69.304	-131.231
2003	HL	2003040	OF	2	69.310	-131.215
2003	HL	2003041	OF	1	69.314	-131.204
2003	HL	2003042	OF	6	69.319	-131.174
2003	HL	2003043	OF	8	69.328	-131.153
2003	HL	2003044	OF	3	69.341	-131.130
2003	HL	2003045	OF	11	69.360	-131.129
2003	HL	2003046	OF	1	69.387	-131.096
2003	HL	2003047	OF	1	69.424	-131.100
2003	HL	2003048	OF	6	69.460	-131.099
2003	HL	2003049	OF	10	69.486	-131.095
2003	HL	2003050	OF	5	69.497	-131.112
2003	HL	2003051	OF	3	69.298	-131.228
2003	HL	2003052	OF	4	69.303	-131.234
2003	HL	2003053	OF	8	69.308	-131.228
2003	HL	2003054	OF	16	69.310	-131.213
2003	HL	2003055	OF	2	69.318	-131.186
2003	HL	2003056	OF	3	69.325	-131.171
2003	HL	2003057	OF	10	69.333	-131.150
2003	HL	2003058	OF	7	69.344	-131.149
2003	HL	2003059	OF	11	69.357	-131.159
2003	HL	2003060	OF	0	69.369	-131.130
2003	HL	2003061	OF	3	69.402	-131.113
2003	HL	2003062	OF	8	69.430	-131.132
2003	HL	2003063	OF	7	69.453	-131.117
2003	HL	2003064	OF	5	69.480	-131.117
2003	HL	2003065	OF	38	69.575	-131.212
2003	HL	2003066	OF	11	69.552	-131.220
2003	HL	2003067	OF	6	69.537	-131.176
2003	HL	2003068	OF	5	69.523	-131.146
2003	HL	2003069	OF	1	69.513	-131.140
2003	HL	2003070	OF	4	69.504	-131.146
2003	HL	2003071	OF	2	69.524	-131.219
2003	HL	2003072	OF	12	69.551	-131.247
2003	HL	2003073	OF	23	69.531	-131.030
2003	HL	2003074	OF	36	69.544	-131.065
2003	HL	2003075	OF	5	69.550	-131.091
2003	HL	2003076	OF	17	69.527	-131.018
2003	HL	2003077	OF	1	69.515	-131.019
2003	HL	2003078	OF	1	69.501	-131.018
2003	HL	2003079	OF	8	69.484	-131.010
2003	HL	2003080	OF	2	69.491	-131.016

Appendix 1. Continued.

Year	Location	Net_key	Basin	Catch	Lat (^{o}N)	Lon (^{o}W)
2003	HL	2003081	OF	0	69.452	-130.990
2003	HL	2003082	OF	10	69.432	-130.994
2003	HL	2003083	OF	3	69.417	-131.028
2003	HL	2003084	OF	5	69.400	-131.018
2003	HL	2003085	OF	6	69.380	-131.030
2003	HL	2003086	KG	224	69.309	-130.898
2003	HL	2003087	KG	249	69.297	-130.921
2003	HL	2003088	KG	101	69.278	-130.932
2003	HL	2003089	KG	109	69.270	-130.975
2003	HL	2003090	KG	84	69.250	-130.968
2003	HL	2003091	KG	415	69.237	-130.994
2003	HL	2003092	OF	6	69.282	-131.016
2003	HL	2003093	OF	18	69.290	-131.054
2003	HL	2003094	OF	25	69.306	-131.021
2003	HL	2003095	OF	3	69.321	-131.053
2003	HL	2003096	OF	26	69.332	-130.986
2003	HL	2003097	OF	2	69.345	-130.994
2003	HL	2003098	OF	17	69.354	-130.980
2003	HL		B5	16	na	na
2003	HL	2003100	OF	12	69.377	-130.962
2003	HL	2003101	KG	11	69.374	-130.911
2003	HL	2003102	KG	16	69.351	-130.897
2003	HL	2003103	KG	2	69.388	-130.909
2003	HL	2003104	KG	65	69.378	-130.882
2003	HL	2003105	OF	2	69.341	-131.054
2003	HL	2003106	OF	8	69.311	-131.118
2003	HL	2003107	OF	10	69.326	-131.086
2003	HL	2003108	OF	2	69.351	-131.079
2003	HL	2003109	OF	7	69.382	-131.047
2003	HL	2003110	OF	6	69.417	-131.048
2003	HL	2003111	OF	13	69.443	-131.020
2003	HL	2003112	OF	16	69.463	-131.030
2003	HL	2003113	KG	9	69.410	-130.889
2003	HL	2003114	OF	16	69.424	-130.909
2003	HL	2003115	OF	5	69.451	-130.910
2003	HL	2003116	OF	28	69.537	-130.948
2003	HL	2003117	OF	6	69.558	-130.984
2003	HL	2003118	OF	11	69.568	-131.001
2003	HL	2003119	OF	21	69.571	-131.022
2003	HL	2003120	OF	5	69.548	-131.004
2003	HL	2003121	OF	5	69.564	-131.049
2003	HL	2003122	OF	12	69.562	-131.113
2003	HL	2003123	OF	28	69.545	-131.113
2003	HL	2003124	OF	23	69.533	-131.108
2003	HL	2003125	OF	12	69.520	-131.065
2003	HL	2003126	OF	13	69.501	-131.053
2003	HL	2003127	OF	0	69.486	-131.025
2003	HL	2003128	OF	5	69.298	-131.426
2003	HL	2003129	OF	3	69.313	-131.412
2003	HL	2003130	OF	2	69.358	-131.360

Appendix 1. Continued.

Year	Location	Net_key	Basin	Catch	Lat (^oN)	Lon (^oW)
2003	HL	2003131	OF	3	69.372	-131.378
2003	HL	2003132	OF	0	69.400	-131.390
2003	HL	2003133	OF	6	69.392	-131.329
2003	HL	2003134	OF	9	69.426	-131.361
2003	HL	2003135	OF	0	69.452	-131.302
2003	HL	2003136	OF	8	69.444	-131.370
2003	HL	2003137	OF	3	69.457	-131.375
2003	HL	2003138	OF	1	69.373	-131.257
2003	HL	2003139	OF	5	69.385	-131.264
2003	HL	2003140	OF	3	69.405	-131.270
2003	HL	2003141	OF	1	69.423	-131.262
2003	HL	2003142	OF	8	69.434	-131.284
2003	HL	2003143	OF	1	69.440	-131.276
2003	HL	2003144	OF	7	69.462	-131.315
2003	HL	2003145	OF	9	69.472	-131.294
2003	HL	2003146	OF	11	69.473	-131.325
2003	HL	2003147	OF	3	69.476	-131.305
2003	HL	2003148	B5	10	69.495	-131.300
2003	HL	2003149	B5	6	69.504	-131.295
2003	HL	2003150	B5	3	69.488	-131.363
2003	HL	2003151	B5	3	69.520	-131.338
2003	HL	2003152	B5	0	69.506	-131.363
2003	HL	2003153	B5	4	69.527	-131.380
2003	HL	2003154	B5	2	69.553	-131.407
2003	HL	2003155	B5	4	69.559	-131.403
2003	HL	2003156	OF	10	69.288	-131.600
2003	HL	2003157	OF	1	69.295	-131.600
2003	HL	2003158	OF	4	69.305	-131.585
2003	HL	2003159	OF	4	69.316	-131.572
2003	HL	2003160	OF	9	69.318	-131.532
2003	HL	2003161	OF	9	69.333	-131.497
2003	HL	2003162	OF	2	69.385	-131.276
2003	HL	2003163	OF	2	69.394	-131.442
2003	HL	2003164	OF	5	69.373	-131.438
2003	HL	2003165	OF	6	69.340	-131.454
2003	HL	2003166	OF	11	69.334	-131.485
2003	HL	2003167	OF	5	69.325	-131.502
2003	HL	2003168	OF	2	69.362	-131.495
2003	HL	2003169	OF	3	69.372	-131.498
2003	HL	2003170	OF	1	69.391	-131.490
2003	HL	2003171	B5	16	69.513	-131.671
2003	HL	2003172	B5	4	69.522	-131.652
2003	HL	2003173	B5	10	69.537	-131.646
2003	HL	2003174	B5	0	69.550	-131.673
2003	HL	2003175	B5	2	69.553	-131.640
2003	HL	2003176	B5	1	69.547	-131.595
2003	HL	2003177	B5	4	69.556	-131.554
2003	HL	2003178	B5	0	69.553	-131.522
2003	HL	2003179	B5	5	69.558	-131.471
2003	HL	2003180	OF	11	69.287	-131.378

Appendix 1. Continued.

Year	Location	Net_key	Basin	Catch	Lat (^{o}N)	Lon (^{o}W)
2003	HL	2003181	OF	10	69.302	-131.340
2003	HL	2003182	OF	5	69.305	-131.330
2003	HL	2003183	OF	4	69.320	-131.315
2003	HL	2003184	OF	0	69.338	-131.305
2003	HL	2003185	OF	3	69.338	-131.283
2003	HL	2003186	OF	3	69.355	-131.251
2003	HL	2003187	OF	5	69.346	-131.212
2003	HL	2003188	OF	2	69.351	-131.213
2003	HL	2003189	OF	7	69.363	-131.191
2003	HL	2003190	OF	4	69.378	-131.212
2003	HL	2003191	OF	30	69.399	-131.180
2003	HL	2003192	OF	1	69.416	-131.198
2003	HL	2003193	OF	3	69.429	-131.183
2003	HL	2003194	OF	5	69.448	-131.215
2003	HL	2003195	OF	7	69.473	-131.178
2003	HL	2003196	OF	11	69.470	-131.223
2003	HL	2003197	OF	10	69.482	-131.254
2003	HL	2003198	OF	2	69.496	-131.283
2003	HL	2003199	OF	21	69.480	-131.190
2003	HL	2003200	OF	24	69.507	-131.225
2003	HL	2003201	B5	6	69.531	-131.262
2003	HL	2003202	B5	8	69.555	-131.289
2003	HL	2003203	B5	19	69.555	-131.380
2003	HL	2003204	OF	40	69.568	-131.316
2003	HL	2003205	OF	33	69.566	-131.267
2003	HL	2003206	OF	45	69.568	-131.285
2003	HL	2003207	KG	5	69.361	-130.841
2003	HL	2003208	KG	13	69.379	-130.798
2003	HL	2003209	KG	85	69.400	-130.758
2003	HL	2003210	KG	61	69.415	-130.743
2003	HL	2003211	KG	55	69.385	-130.763
2003	HL	2003212	KG	28	69.178	-130.982
2003	HL	2003213	KG	47	69.222	-130.973
2003	HL	2003214	KG	14	69.202	-130.978
2003	HL	2003215	KG	32	69.324	-130.893
2004	HL	2004001	OF	17	69.567	-131.285
2004	HL	2004002	B5	9	69.443	-131.978
2004	HL	2004003	B5	29	69.429	-131.991
2004	HL	2004004	B5	1	69.416	-132.008
2004	HL	2004005	B5	9	69.404	-132.035
2004	HL	2004006	B5	20	69.405	-132.100
2004	HL	2004007	B5	6	69.430	-132.112
2004	HL	2004008	B5	2	69.449	-132.109
2004	HL	2004009	B5	2	69.444	-132.051
2004	HL	2004010	B5	2	69.459	-132.060
2004	HL	2004011	B5	4	69.470	-132.071
2004	HL	2004012	B5	0	69.471	-131.857
2004	HL	2004013	B5	12	69.451	-131.870
2004	HL	2004014	B5	4	69.481	-132.062
2004	HL	2004015	B5	27	69.502	-132.006

Appendix 1. Continued.

Year	Location	Net_key	Basin	Catch	Lat (^oN)	Lon (^oW)
2004	HL	2004016	B5	14	69.517	-131.919
2004	HL	2004017	B5	6	69.523	-131.869
2004	HL	2004018	B5	4	69.536	-131.820
2004	HL	2004019	B5	14	69.552	-131.778
2004	HL	2004020	B5	5	69.543	-131.727
2004	HL	2004021	B5	4	69.528	-131.692
2004	HL	2004022	B5	12	69.412	-131.992
2004	HL	2004023	B5	15	69.395	-131.944
2004	HL	2004024	B5	7	69.407	-131.891
2004	HL	2004025	B5	4	69.436	-131.951
2004	HL	2004026	B5	4	69.406	-131.846
2004	HL	2004027	B5	7	69.406	-131.803
2004	HL	2004028	B5	3	69.410	-131.745
2004	HL	2004029	B5	1	69.406	-131.706
2004	HL	2004030	B5	1	69.402	-131.656
2004	HL	2004031	B5	10	69.452	-131.599
2004	HL	2004032	B5	4	69.437	-131.571
2004	HL	2004033	B5	5	69.437	-131.519
2004	HL	2004034	B5	1	69.433	-131.465
2004	HL	2004035	OF	10	69.421	-131.438
2004	HL	2004036	OF	3	69.421	-131.405
2004	HL	2004037	OF	1	69.410	-131.385
2004	HL	2004038	OF	9	69.452	-131.418
2004	HL	2004039	OF	1	69.432	-131.402
2004	HL	2004040	OF	1	69.424	-131.431
2004	HL	2004041	B5	2	69.447	-131.468
2004	HL	2004042	B5	0	69.474	-131.431
2004	HL	2004043	B4	2	69.388	-131.936
2004	HL	2004044	B4	12	69.375	-131.895
2004	HL	2004045	B4	4	69.348	-131.876
2004	HL	2004046	B4	1	69.348	-131.829
2004	HL	2004047	B5	1	69.414	-131.686
2004	HL	2004048	B5	0	69.435	-131.693
2004	HL	2004049	B5	0	69.456	-131.671
2004	HL	2004050	B5	2	69.443	-131.633
2004	HL	2004051	B5	15	69.432	-131.610
2004	HL	2004052	B5	4	69.418	-131.651
2002	SL	SL20021	SL	2	68.588	-132.724
2002	SL	SL20022	SL	2	68.580	-132.547
2002	SL	SL20023	SL	3	68.587	-132.566
2002	SL	SL20024	SL	1	68.592	-132.576
2002	SL	SL20025	SL	8	68.600	-132.587
2002	SL	SL20026	SL	1	68.606	-132.597
2002	SL	SL20027	SL	0	68.611	-132.612
2002	SL	SL20028	SL	6	68.618	-132.648
2002	SL	SL20029	SL	3	68.630	-132.652
2002	SL	SL200210	SL	2	68.640	-132.655
2002	SL	SL200211	SL	5	68.651	-132.665
2002	SL	SL200212	SL	0	68.655	-132.689
2002	SL	SL200213	SL	4	68.662	-132.697

Appendix 1. Continued.

Year	Location	Net_key	Basin	Catch	Lat (^{o}N)	Lon (^{o}W)
2002	SL	SL200214	SL	10	68.671	-132.713
2002	SL	SL200215	SL	0	68.675	-132.758
2002	SL	SL200216	SL	1	68.676	-132.790
2002	SL	SL200217	SL	0	68.671	-132.822
2002	SL	SL200218	SL	0	68.656	-132.831
2002	SL	SL200219	SL	1	68.644	-132.822
2002	SL	SL200220	SL	0	68.635	-132.820
2002	SL	SL200221	SL	1	68.620	-132.818
2002	SL	SL200222	SL	1	68.606	-132.819
2003	SL	SL20031	SL	1	68.408	-132.748
2003	SL	SL20032	SL	0	68.408	-132.768
2003	SL	SL20033	SL	0	68.418	-132.707
2003	SL	SL20034	SL	7	68.430	-132.680
2003	SL	SL20035	SL	17	68.447	-132.659
2003	SL	SL20036	SL	5	68.460	-132.639
2003	SL	SL20037	SL	4	68.476	-132.641
2003	SL	SL20038	SL	0	68.496	-132.599
2003	SL	SL20039	SL	0	68.511	-132.574
2003	SL	SL200310	SL	1	68.525	-132.543
2003	SL	SL200311	SL	0	68.539	-132.518
2003	SL	SL200312	SL	2	68.549	-132.491
2003	SL	SL200313	SL	1	68.567	-132.463
2003	SL	SL200314	SL	2	68.419	-132.810
2003	SL	SL200315	SL	1	68.425	-132.831
2003	SL	SL200316	SL	1	68.430	-132.871
2003	SL	SL200317	SL	4	68.445	-132.862
2003	SL	SL200318	SL	0	68.458	-132.851
2003	SL	SL200319	SL	4	68.470	-132.840
2003	SL	SL200320	SL	2	68.483	-132.830
2003	SL	SL200321	SL	0	68.497	-132.944
2003	SL	SL200322	SL	0	68.510	-132.852
2003	SL	SL200323	SL	1	68.522	-132.853
2003	SL	SL200324	SL	0	68.533	-132.853
2003	SL	SL200325	SL	0	68.547	-132.851
2003	SL	SL200326	SL	2	68.566	-132.839
2003	SL	SL200327	SL	0	68.579	-132.835
2003	SL	SL200328	SL	0	68.599	-132.714
2003	SL	SL200329	SL	0	68.589	-132.728
2003	SL	SL200330	SL	0	68.589	-132.698
2003	SL	SL200331	SL	4	68.572	-132.698
2003	SL	SL200332	SL	1	68.626	-132.604
2003	SL	SL200333	SL	4	68.571	-132.547

Appendix 2. Lake Trout maturity scale.

Sex	Visual cue	Visual descriptor	Code
Female	Eggs larger than ●	Eggs large, loose and yellow in colour	F1
	Eggs smaller than ●	Eggs small, tightly packed and whitish-yellow in colour	F2
Male	Testes thicker than finger	Testes thick and creamy-white in colour	M3
	Testes thicker than finger	Testes ribbon-like and reddish-pink in colour	M4

Appendix 3. Total concentrations of trace elements (m•g L^{-1}) in water samples from Husky Lakes sorted by basins, stations (n=10), and water strata. Values in red indicate half detection limit in lieu of "less than detectable".

Basin	Station	Water strata	Depth (m)	Silver (Ag)	Aluminium (Al)	Arsenic (As)	Boron (B)	Barium (Ba)	Beryllium (Be)	Bismuth (Bi)	Cadmium (Cd)
B1	A	surf	2	0.000050	0.0130			0.0581	0.025000		(0.00005)
		inter	8	0.000050	0.0090			0.0637	0.025000		(0.00005)
		bottom	20	0.000050	0.0070			0.0682	0.025000		(0.00005)
B2	B	surf	2	0.000100	0.0033			0.0672	0.025000		(0.00005)
		inter	10	0.000050	0.0180			0.0726	0.025000		(0.00005)
		bottom	20	0.000050	0.0220			0.0774	0.025000		(0.00005)
	C	surf	2	0.000050	0.0160			0.0780	0.050000		(0.00005)
		inter	10	0.000050	0.0220			0.0820	0.025000		(0.00005)
		bottom	18	0.000050	0.0430			0.0786	0.025000		(0.00005)
	D	surf	2	0.000050	0.1880			0.0567	0.050000		(0.00005)
		inter	7	0.000100	0.1440			0.0704	0.070000		(0.00005)
		bottom	13	0.000400	0.1260			0.0803	0.050000		(0.00005)
B3	E	surf	1	0.000015	0.0361		1.84	0.0830	0.000003	(0.0000050)	0.000119
IF	F	surf	1	0.000016	0.0439		1.98	0.0779	0.000006	(0.0000050)	0.000113
B4	G	surf	2	0.000027	0.0234		2.15	0.0743	0.000004	(0.0000050)	0.000114
		inter	8	0.000028	0.0409		2.26	0.0713	0.000007	(0.0000050)	0.000115
		bottom	17	0.000030	0.0200		2.30	0.0798	0.000013	(0.0000050)	0.000174
B5	H	surf	2	0.000215	0.0251	0.00036	2.36	0.0706	0.000002	(0.0000005)	0.000100
		inter_1	10	0.000307	0.0236	0.00041	2.42	0.0712	0.000002	(0.0000010)	0.000106
		inter_2	15	0.000310	0.0190	0.00030	2.39	0.0703	0.000002	(0.0000005)	0.000110
		bottom	25	0.000347	0.0220	0.00037	2.53	0.0730	0.000002	(0.0000005)	0.000106
OF	I	surf	2	0.000029	0.0199	0.00032	2.15	0.0623	0.000001	(0.0000005)	0.000137
		inter_1	5	0.000094	0.0172	0.00028	2.11	0.0621	0.000001	(0.0000005)	0.000100
		inter_2	10	0.000198	0.0167	0.00029	2.10	0.0625	0.000002	(0.0000005)	0.000087
		bottom	18	0.000251	0.0191	0.00032	2.25	0.0658	0.000001	(0.0000005)	0.000106
KG	J	surf	2	0.000227	0.2440	0.00062	1.75	0.0660	0.000017	(0.0000030)	0.000085
		inter_1	5	0.000246	0.1980	0.00063	1.83	0.0639	0.000012	(0.0000030)	0.000096
		inter_2	10	0.000232	0.2620	0.00062	1.83	0.0660	0.000015	(0.0000030)	0.000100
		bottom	18.5	0.000229	0.3120	0.00061	1.87	0.0658	0.000018	(0.0000040)	0.000131

Appendix 3. Continued.

Basin	Station	Water strata	Depth (m)	Cerium (Ce)	Cobalt (Co)	Chromium (Cr)	Caesium (Cs)	Copper (Cu)	Iron (Fe)	Gallium (Ga)	Lanthanum (La)
B1	A	surf	2		0.000300	(0.0001)		0.00050	0.0631		
		inter	8		0.000100	(0.0001)		(0.0001)	0.0979		
		bottom	20		0.000300	0.029800		(0.0001)	0.0228		
B2	B	surf	2		0.000300	(0.0001)		(0.0001)	0.0340		
		inter	10		0.000200	(0.0001)		(0.0001)	0.0363		
		bottom	20		0.000200	(0.0001)		(0.0001)	0.0341		
	C	surf	2		0.000200	0.000400		0.00250	0.0403		
		inter	10		0.000200	(0.0001)		(0.0001)	0.0467		
		bottom	18		0.000300	(0.0001)		(0.0001)	0.0491		
	D	surf	2		0.000300	(0.0001)		0.00110	0.2960		
		inter	7		0.000300	(0.0001)		0.00130	0.2090		
		bottom	13		0.000300	(0.0001)		0.00020	0.1690		
B3	E	surf	1	0.000066	0.000075	0.000110	0.000080	0.00081	0.0540	0.000061	0.000039
IF	F	surf	1	0.000080	0.000082	0.000110	0.000092	0.00083	0.0610	0.000050	0.000043
B4	G	surf	2	0.000040	0.000084	0.000100	0.000097	0.00083	0.0390	0.000040	0.000029
		inter	8	0.000052	0.000103	0.000130	0.000109	0.00096	0.0560	0.000043	0.000031
		bottom	17	0.000048	0.000076	0.000100	0.000108	0.00082	0.0360	0.000065	0.000031
B5	H	surf	2	0.000061	0.000059	0.000253	0.000111	0.00163	0.0562	0.000054	0.000050
		inter_1	10	0.000057	0.000061	0.003190	0.000111	0.00139	0.0543	0.000066	0.000069
		inter_2	15	0.000420	0.000045	0.000092	0.000108	0.00080	0.0430	0.000071	0.000052
		bottom	25	0.000041	0.000048	0.000225	0.000113	0.00144	0.0467	0.000082	0.000054
OF	I	surf	2	0.000045	0.000067	0.001160	0.000105	0.00298	0.0440	0.000023	0.000030
		inter_1	5	0.000041	0.000050	0.000135	0.000113	0.00076	0.0336	0.000035	0.000041
		inter_2	10	0.000041	0.000053	0.000152	0.000109	0.00085	0.0327	0.000033	0.000043
		bottom	18	0.000049	0.000060	0.000196	0.000114	0.00101	0.0409	0.000039	0.000047
KG	J	surf	2	0.000686	0.000370	0.000661	0.000117	0.00188	0.6050	0.000063	0.000324
		inter_1	5	0.000514	0.000304	0.000510	0.000117	0.00158	0.5150	0.000057	0.000247
		inter_2	10	0.000675	0.000368	0.000560	0.000121	0.00132	0.6230	0.000073	0.000315
		bottom	18.5	0.000814	0.000426	0.000719	0.000121	0.00183	0.6960	0.000072	0.000390

Appendix 3. Continued.

Basin	Station	Water strata	Depth (m)	Lithium (Li)	Manganese (Mn)	Molybdenum (Mo)	Niobium (Nb)	Nickel (Ni)	Lead (Pb)	Platinum (Pt)	Rubidium (Rb)
B1	A	surf	2	0.0446	0.00720	0.00040		0.00090	(0.0001)		
		inter	8	0.0544	0.00350	0.00050		0.00110	(0.0001)		
		bottom	20	0.0635	0.00260	0.00060		0.00050	(0.0001)		
B2	B	surf	2	0.0610	0.00310	0.00070		0.00050	(0.0001)		
		inter	10	0.0711	0.00230	0.00080		0.00040	(0.0001)		
		bottom	20	0.0964	0.00190	0.00060		0.00040	(0.0001)		
	C	surf	2	0.0697	0.00350	0.00080		0.00120	(0.0001)		
		inter	10	0.0784	0.00350	0.00070		0.00080	(0.0001)		
		bottom	18	0.0867	0.00530	0.00060		0.00050	(0.0001)		
	D	surf	2	0.0967	0.01030	0.00090		0.00030	(0.0001)		
		inter	7	0.1510	0.00850	0.00100		0.00080	(0.0001)		
		bottom	13	0.1990	0.01810	0.00110		0.00010	(0.0001)		
B3	E	surf	1	0.1290	0.01180	0.00546	0.000005	0.00107	0.000081	(0.0000010)	0.0432
IF	F	surf	1	0.1520	0.01090	0.00629	0.000005	0.00110	0.000049	(0.0000010)	0.0475
B4	G	surf	2	0.1880	0.01160	0.00710	0.000003	0.00119	0.000065	(0.0000010)	0.0515
		inter	8	0.2310	0.01540	0.00765	0.000004	0.00149	0.000089	(0.0000020)	0.0536
		bottom	17	0.1650	0.01240	0.00697	0.000006	0.00118	0.000226	(0.0000010)	0.0535
B5	H	surf	2	0.1180	0.00996	0.00674	0.000005	0.00137	0.000037	(0.0000005)	0.0593
		inter_1	10	0.1200	0.01010	0.00684	0.000005	0.00138	0.000038	(0.0000005)	0.0599
		inter_2	15	0.1190	0.00911	0.00658	0.000006	0.00122	0.000014	(0.0000005)	0.0598
		bottom	25	0.1230	0.00902	0.00685	0.000006	0.00132	0.000034	(0.0000010)	0.0626
OF	I	surf	2	0.1080	0.00978	0.00608	0.000004	0.00182	0.000110	(0.0000010)	0.0517
		inter_1	5	0.1080	0.00887	0.00618	0.000004	0.00121	0.000018	(0.0000010)	0.0515
		inter_2	10	0.1070	0.00901	0.00629	0.000004	0.00124	0.000019	(0.0000005)	0.0513
		bottom	18	0.1140	0.01140	0.00674	0.000005	0.00137	0.000025	(0.0000010)	0.0557
KG	J	surf	2	0.0873	0.05400	0.00564	0.000012	0.00227	0.000286	(0.0000005)	0.0444
		inter_1	5	0.0899	0.04910	0.00572	0.000009	0.00208	0.000270	(0.0000005)	0.0461
		inter_2	10	0.0893	0.05460	0.00577	0.000012	0.00207	0.000223	(0.0000005)	0.0453
		bottom	18.5	0.0924	0.06190	0.00568	0.000013	0.00235	0.000583	(0.0000005)	0.0474

Appendix 3. Continued.

Basin	Station	Water strata	Depth (m)	Antimony (Sb)	Selenium (Se)	Tin (Sn)	Strontium (Sr)	Thallium (Tl)	Uranium (U)	Vanadium (V)	Tungsten (W)	Yttrium (Y)	Zinc (Zn)
B1	A	surf	2				0.62			0.000100			0.00400
		inter	8				0.73			(0.00005)			0.01060
		bottom	20				0.85			(0.00005)			0.00120
B2	B	surf	2				0.82			(0.00005)			0.00820
		inter	10				0.93			(0.00005)			0.01490
		bottom	20				1.19			(0.00005)			0.00440
	C	surf	2				0.93			0.000100			0.01070
		inter	10				1.01			(0.00005)			0.00760
		bottom	18				1.09			(0.00005)			0.02030
	D	surf	2				1.20			0.000400			0.00280
		inter	7				1.70			0.000500			0.00370
		bottom	13				2.09			0.000100			0.00360
B3	E	surf	1	0.000430		0.000022	3.12	0.000018	0.00126	0.000140	(0.000001)	0.000143	0.01150
IF	F	surf	1	0.000440		0.000020	3.37	0.000019	0.00141	0.000180	0.000002	0.000135	0.00432
B4	G	surf	2	0.000380		0.000018	3.65	0.000019	0.00152	0.000130	0.000002	0.000118	0.00520
		inter	8	0.000290		0.000076	3.73	0.000021	0.00158	0.000190	0.000003	0.000129	0.00400
		bottom	17	0.000420		0.000031	3.77	0.000021	0.00154	0.000120	0.000002	0.000180	0.00174
B5	H	surf	2	0.000415	0.00388	0.000033	4.28	0.000018	0.00178	0.000206	0.000004	0.000116	0.00867
		inter_1	10	0.000546	0.00073	0.000039	4.36	0.000018	0.00182	0.000194	0.000007	0.000115	0.01150
		inter_2	15	0.000610	0.00427	0.000039	4.33	0.000017	0.00182	0.000172	0.000002	0.000108	0.00055
		bottom	25	0.000712	0.01420	0.000047	4.55	0.000018	0.00190	0.000179	0.000006	0.000114	0.01700
OF	I	surf	2	0.000282	0.00054	0.000030	3.71	0.000016	0.00155	0.000170	0.000009	0.000087	0.01470
		inter_1	5	0.000261	0.00139	0.000028	3.70	0.000016	0.00155	0.000163	0.000003	0.000090	0.00080
		inter_2	10	0.000295	0.00283	0.000031	3.68	0.000016	0.00156	0.000155	0.000004	0.000092	0.00118
		bottom	18	0.000326	0.00056	0.000034	3.99	0.000017	0.00168	0.000171	0.000004	0.000102	0.02470
KG	J	surf	2	0.000286	0.00114	0.000045	3.10	0.000018	0.00134	0.001070	0.000005	0.000423	0.03340
		inter_1	5	0.000352	0.00106	0.000069	3.24	0.000017	0.00136	0.000926	0.000006	0.000359	0.02710
		inter_2	10	0.000303	0.00146	0.000035	3.20	0.000018	0.00140	0.001190	0.000005	0.000438	0.01120
		bottom	18.5	0.000458	0.00176	0.000102	3.32	0.000017	0.00140	0.001380	0.000009	0.000486	0.00357

Appendix 4. Summary of GLM (Poisson/NB) and ZIM (ZIP/ZINB) procedures used to assess basin effects on CPUE. Selected models are underlined. NB = negative binomial, ZINB = zero inflation negative binomial, ZIP = zero-inflation Poisson, LRT = likelihood ratio test statistic (assumed to be chi-square distributed).

Response	Model terms	distribution/model	df	AIC	Notes
$CPUE_{T}$	Basin,Year	Poisson	12	6728	overdispersion present
	Basin,Year	NB	13	3741	year effect not significant (LRT=5.25, p = 0.1545)
	Basin	**NB**	**10**	**3740**	
	Basin	ZINB	19	3754	
$CPUE_{LWF}$	Basin,Year	Poisson	12	3135	overdispersion present
	Basin,Year	NB	13	1990	year effect present (LRT = 51.78, p < 0.001)
	Basin	NB	10	2035	
	Basin	**ZINB**	**19**	**1964**	
$CPUE_{LC}$	Basin,Year	Poisson	12	2330	overdispersion present
	Basin,Year	***NB***	***13***	***1576***	year effect present (LRT = 76.16, p < 0.001)
	Basin	NB	10	1642	
	Basin	ZINB	19	1635	
$CPUE_{AC}$	Basin,Year	Poisson	12	1905	overdispersion present
	Basin,Year	NB	13	1172	no year effect (LRT = 6.86, p =0.076)
	Basin	NB	10	1173	
	Basin	**ZINB**	**19**	**1165**	
$CPUE_{PH}$	Basin,Year	Poisson	11	3013	overdispersion present
	Basin,Year	NB	12	1245	no year effect (LRT = 4.53, p=0.21)
	Basin	NB	9	1244	
	Basin	**ZINB**	**17**	**1237**	
$CPUE_{SF}$	Basin,Year	Poisson	10	1863	overdispersion present
	Basin,Year	NB	11	906	no year effect (LRT=4.75, p=0.19)
	Basin	NB	8	904	
	Basin	**ZINB**	**15**	**898**	
$CPUE_{AF}$	Basin,Year	Poisson	6	694	overdispersion present
	Basin,Year	NB	7	363	no year effect (LRT=0.68, p=0.71)
	Basin	**NB**	**5**	**359**	
	Basin	ZINB	9	367	
$CPUE_{LT}$	Basin,Year	Poisson	7	515	slight overdispersion
	Basin,Year	NB	8	508	no year effect (LRT=0.005,p=0.998)
	Basin	NB	6	504	
	Basin	ZINB	11	495	
	Basin	**ZIP**	**10**	**493**	no overdispersion
$CPUE_{NP}$	Basin,Year	Poisson	9	409	slight overdispersion
	Basin,Year	**NB**	**10**	**325**	year effect present (LRT=17.12, p=0.001)
	Basin	NB	7	335	
	Basin	ZINB	13	347	
	Basin	ZIP	12	368	slight overdispersion
$CPUE_{RWF}$	Basin,Year	Poisson	11	643	overdispersion present
	Basin,Year	**NB**	**12**	**475**	year effect present (LRT=14.44, p=0.002)
	Basin	NB	9	483	
	Basin	ZINB	17	483	
$CPUE_{COD}$	Basin,Year	Poisson	7	429	slight overdispersion
	Basin,Year	**NB**	**8**	**378**	year effect present (LRT=159, p<0.001)
	Basin	NB	6	389	
	Basin	ZINB	11	392	
	Basin	ZIP	10	404	slight overdispersion
$CPUE_{FHS}$	Basin,Year	Poisson	11	491	slight overdispersion
	Basin,Year	NB	12	414	no year effect (LRT=2.08, p=0.35)
	Basin	**NB**	**9**	**409**	
	Basin	ZINB	17	420	
	Basin	ZIP	16	422	slight overdispersion

Appendix 4-A.

Total CPUE ($CPUE_T$)

Selected model (NB) coefficients values (including standard errors (SE), z-statistics (z) and p-values).

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	1.588531	0.193969	8.190	2.62e-16 ***
fBasinB2	0.495365	0.222853	2.223	0.026227 *
fBasinB3	-0.007493	0.243878	-0.031	0.975490
fBasinB4	0.189408	0.223709	0.847	0.397180
fBasinB5	0.029822	0.231990	0.129	0.897715
fBasinIF	-0.216626	0.232200	-0.933	0.350857
fBasinKG	2.537066	0.283946	8.935	< 2e-16 ***
fBasinOF	0.553833	0.207929	2.664	0.007732 **
fBasinSL	-0.859666	0.250042	-3.438	0.000586 ***
Theta:	1.1276	0.0764		

Appendix 4-B.

LAKE WHITE FISH CPUE ($CPUE_{LWF}$)

Selected model (ZINB) coefficients values (including standard errors (SE), z-statistics (z) and p-values).

Count model coefficients (negbin with log link):

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	1.5329	0.2895	5.295	1.19e-07 ***
fBasinB2	0.3218	0.3178	1.012	0.311305
fBasinB3	-0.1968	0.3497	-0.563	0.573638
fBasinB4	-0.7182	0.3712	-1.935	0.052991 .
fBasinB5	0.1931	0.6313	0.306	0.759645
fBasinIF	-1.1565	0.3308	-3.496	0.000473 ***
fBasinKG	0.1664	0.4078	0.408	0.683203
fBasinOF	-0.7087	0.3395	-2.088	0.036832 *
fBasinSL	-0.6828	0.4546	-1.502	0.133137
Log(theta)	-0.1015	0.1863	-0.545	0.585796

Zero-inflation model coefficients (binomial with logit link):

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-0.7768	0.5773	-1.345	0.1785
fBasinB2	-1.3986	0.8795	-1.590	0.1118
fBasinB3	-0.9705	0.9486	-1.023	0.3063
fBasinB4	0.9016	0.6475	1.392	0.1638
fBasinB5	3.3373	0.7763	4.299	1.72e-05 ***
fBasinIF	-12.3942	254.8602	-0.049	0.9612
fBasinKG	-1.0534	1.2045	-0.875	0.3818
fBasinOF	1.3092	0.6021	2.174	0.0297 *
fBasinSL	1.5371	0.6915	2.223	0.0262 *

Theta = 0.9035

Appendix 4-C.

LEAST CISCO CPUE ($CPUE_{LC}$)

Selected model (NB) coefficients values (including standard errors (SE), z-statistics (z) and p-values).

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-3.367	1.030	-3.270	0.001077 **
fBasinB2	2.463	1.054	2.337	0.019464 *
fBasinB3	2.674	1.715	1.559	0.118899
fBasinB4	6.414	2.003	3.202	0.001367 **
fBasinB5	6.665	2.095	3.181	0.001470 **
fBasinIF	5.432	2.011	2.701	0.006920 **
fBasinKG	6.513	2.126	3.063	0.002191 **
fBasinOF	7.377	2.103	3.508	0.000451 ***
fBasinSL	3.901	2.098	1.859	0.063049 .
fYear2002	-3.178	1.708	-1.861	0.062762 .
fYear2003	-2.552	1.830	-1.394	0.163174
fYear2004	-27.653	15428.389	-0.002	0.998570
Theta:	0.5682	0.0649		

Appendix 4-D.

ARCTIC CISCO CPUE ($CPUE_{AC}$)

Selected model (ZINB) coefficients values (including standard errors (SE), z-statistics (z) and p-values).

Count model coefficients (negbin with log link):

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-2.6746	0.7636	-3.502	0.000461 ***
fBasinB2	0.5618	1.3876	0.405	0.685586
fBasinB3	2.6753	1.3473	1.986	0.047074 *
fBasinB4	3.1877	0.7863	4.054	5.03e-05 ***
fBasinB5	3.6524	0.8127	4.494	6.99e-06 ***
fBasinIF	2.8268	0.9017	3.135	0.001719 **
fBasinKG	1.0164	0.9731	1.045	0.296231
fBasinOF	3.4162	0.8059	4.239	2.24e-05 ***
fBasinSL	-1.3328	1.2754	-1.045	0.296019
Log(theta)	-0.8712	0.2157	-4.040	5.35e-05 ***

Zero-inflation model coefficients (binomial with logit link):

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-9.109	202.195	-0.045	0.964
fBasinB2	8.742	202.211	0.043	0.966
fBasinB3	11.307	202.197	0.056	0.955
fBasinB4	-4.812	529.043	-0.009	0.993
fBasinB5	7.207	202.199	0.036	0.972
fBasinIF	9.649	202.195	0.048	0.962
fBasinKG	-5.487	NA	NA	NA
fBasinOF	9.376	202.195	0.046	0.963
fBasinSL	-6.582	14674.007	0.000	1.000

Theta = 0.4185

Appendix 4-E.

PACIFIC HERRING CPUE ($CPUE_{PH}$)

Selected model (ZINB) coefficients values (including standard errors (SE), z-statistics (z) and p-values).

Count model coefficients (negbin with log link):

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-3.3673	1.0421	-3.231	0.001233 **
fBasinB2	3.2158	1.3980	2.300	0.021429 *
fBasinB3	-0.5447	1.4615	-0.373	0.709363
fBasinB4	4.1568	1.0866	3.826	0.000130 ***
fBasinB5	3.5012	1.1107	3.152	0.001620 **
fBasinIF	3.4183	1.1016	3.103	0.001916 **
fBasinKG	6.9062	1.0982	6.289	3.20e-10 ***
fBasinOF	4.4597	1.0739	4.153	3.28e-05 ***
Log(theta)	-0.9131	0.2516	-3.630	0.000284 ***

Zero-inflation model coefficients (binomial with logit link):

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-12.567	2219.584	-0.006	0.995
fBasinB2	14.799	2219.584	0.007	0.995
fBasinB3	-5.137	37840.028	0.000	1.000
fBasinB4	11.964	2219.584	0.005	0.996
fBasinB5	11.819	2219.584	0.005	0.996
fBasinIF	11.087	2219.585	0.005	0.996
fBasinKG	-10.647	36683.725	0.000	1.000
fBasinOF	12.899	2219.584	0.006	0.995

Theta = 0.4013

Appendix 4-F.

STARRY FLOUNDER CPUE ($CPUE_{SF}$)

Selected model (ZINB) coefficients values (including standard errors (SE), z-statistics (z) and p-values).

Count model coefficients (negbin with log link):

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-3.7375	0.7208	-5.185	2.16e-07 ***
fBasinB3	3.5821	0.8251	4.342	1.41e-05 ***
fBasinB4	2.9584	0.7497	3.946	7.95e-05 ***
fBasinB5	3.1665	1.0012	3.163	0.001564 **
fBasinIF	3.1401	0.8251	3.806	0.000141 ***
fBasinKG	6.9777	0.8377	8.329	< 2e-16 ***
fBasinOF	3.6547	0.7690	4.752	2.01e-06 ***
Log(theta)	-0.3596	0.2801	-1.284	0.199161

Zero-inflation model coefficients (binomial with logit link):

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-8.818	342.757	-0.026	0.979
fBasinB3	7.732	342.759	0.023	0.982
fBasinB4	-14.871	39506.317	0.000	1.000
fBasinB5	9.842	342.757	0.029	0.977
fBasinIF	7.029	342.764	0.021	0.984
fBasinKG	9.166	342.757	0.027	0.979
fBasinOF	8.754	342.757	0.026	0.980

Theta = 0.6979

Appendix 4-G.

LAKE TROUT CPUE ($CPUE_{LT}$)

Selected model (ZIP) coefficients values (including standard errors (SE), z-statistics (z) and p-values).

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-0.3349	0.4759	-0.704	0.482
fBasinB2	-0.3117	0.4992	-0.624	0.532
fBasinB3	0.5137	0.5595	0.918	0.359
fBasinIF	0.6463	0.6304	1.025	0.305
fBasinSL	0.2005	0.5545	0.362	0.718

Zero-inflation model coefficients (binomial with logit link):

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-0.73011	1.27423	-0.573	0.5667
fBasinB2	-9.90090	180.78837	-0.055	0.9563
fBasinB3	1.12967	1.35357	0.835	0.4040
fBasinIF	2.76977	1.36605	2.028	0.0426 *
fBasinSL	-0.05288	1.49102	-0.035	0.9717

Appendix 4-H.

NORTHERN PIKE CPUE ($CPUE_{NP}$)
Selected model (NB) coefficients values (including standard errors (SE), z-statistics (z) and p-values).

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-1.7579	0.5649	-3.112	0.00186 **
fBasinB2	1.4702	0.6133	2.397	0.01652 *
fBasinB3	1.0647	1.7455	0.610	0.54187
fBasinB4	17.6660	2243.2756	0.008	0.99372
fBasinIF	17.1188	2243.2757	0.008	0.99391
fBasinSL	20.9843	2243.2755	0.009	0.99254
fYear2002	-19.6094	2243.2754	-0.009	0.99303
fYear2003	-22.7230	2243.2757	-0.010	0.99192
fYear2004	-36.2107	8088.2426	-0.004	0.99643
Theta	0.2894	0.0807		

Appendix 4-I.

BROAD WHITEFISH CPUE ($CPUE_{BWF}$)

Selected model (NB) coefficients values (including standard errors (SE), z-statistics (z) and p-values).

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-2.033e+00	4.396e-01	-4.624	3.76e-06 ***
fBasinB3	1.340e+00	2.344e+00	0.572	0.5676
fBasinB4	2.608e+00	2.635e+00	0.990	0.3223
fBasinB5	5.433e+00	2.856e+00	1.902	0.0571 .
fBasinIF	1.656e+00	2.701e+00	0.613	0.5399
fBasinKG	6.605e+00	2.952e+00	2.238	0.0252 *
fBasinOF	5.566e+00	2.885e+00	1.930	0.0536 .
fBasinSL	2.420e+00	2.757e+00	0.878	0.3801
fYear2002	-3.178e+00	2.545e+00	-1.249	0.2118
fYear2003	-4.620e+00	2.839e+00	-1.628	0.1036
fYear2004	-4.024e+01	9.306e+06	0.000	1.0000
Theta	0.1163	0.0272		

Appendix 4-J.

ARCTIC FLOUNDER CPUE ($CPUE_{AF}$)

Selected model (NB) coefficients values (including standard errors (SE), z-statistics (z) and p-values).

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-2.4967	0.4346	-5.744	9.22e-09 ***
fBasinB5	-0.3217	0.7052	-0.456	0.648
fBasinKG	4.1250	0.6202	6.651	2.91e-11 ***
fBasinOF	0.7751	0.4920	1.575	0.115
Theta	0.2555	0.0701		

Appendix 4-K.

COD spp. CPUE ($CPUE_{COD}$)
Selected model (NB) coefficients values (including standard errors (SE), z-statistics (z) and p-values).

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-1.9169	0.3403	-5.633	1.77e-08 ***
fBasinB5	0.6361	0.9335	0.681	0.49563
fBasinIF	-1.6385	0.8108	-2.021	0.04330 *
fBasinKG	3.4342	1.1970	2.869	0.00412 **
fBasinOF	1.2032	1.1039	1.090	0.27575
fYear2003	-1.6715	1.1132	-1.502	0.13322
fYear2004	0.6361	0.9335	0.681	0.49563
Theta	0.343	0.110		

Appendix 4-L.

FOUR HORNED SCULPIN CPUE ($CPUE_{FHS}$)
Selected model (NB) coefficients values (including standard errors (SE), z-statistics (z) and p-values).

Coefficient	Estimate	SE	z	p-value (>|z|)
(Intercept)	-2.2687	0.7764	-2.922	0.00348 **
fBasinB2	-1.4690	1.0935	-1.343	0.17916
fBasinB3	1.1292	0.9064	1.246	0.21282
fBasinB4	-1.0754	1.0139	-1.061	0.28888
fBasinB5	-0.8374	1.0260	-0.816	0.41442
fBasinIF	0.5051	0.8932	0.566	0.57173
fBasinKG	1.3036	1.0488	1.243	0.21387
fBasinOF	0.3771	0.8267	0.456	0.64826
Theta	0.1280	0.0366		

Appendix 5. Summary of GLM model evaluating variations in Lake Trout fork length with age depending on fishing location (basin) and sex. The model was run using harvest samples of Lake Trout caught in Husky Lakes during the spring subsistence fishery (May samples only).

Model: Log (Fork Length) ~ Log(Age) + Basin + Sex
Null deviance: 5.9801 on 438 degrees of freedom
Residual deviance: 4.1855 on 434 degrees of freedom
AIC: -784.78

Coefficient	Estimate	Std. Error	t-value	Pr(>|t|)
(Intercept)	3.65996	0.05537	66.096	<2e-16
Log (Age)	0.16439	0.0184	8.934	<2e-16
Basin B2	0.01339	0.01112	1.204	0.229
Basin B3	0.14106	0.01366	10.331	<2e-16
Sex (Male)	-0.01196	0.00939	-1.273	0.204

Terms significance	df	Deviance	AIC	F-value	Pr(>F)
Null Model	4.1855	-784.78			
Log (Age)	1	4.9553	-712.67	79.8212	<2e-16
Basin	2	5.469	-671.36	66.5436	<2e-16
Sex	1	4.2011	-785.15	1.6211	0.2036

Appendix 6. Organic contaminants concentrations (ng•L^{-1}) in surface water samples from three stations in Husky Lakes. Values in red indicate half detection limit in lieu of "less than detectable".

Organics	Station		
	E (B3)	G (IF)	H (B4)
ALPHA-1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE	0.46	0.5	0.56
HEXACHLOROBENZENE	0.31	0.31	0.31
GAMMA-1,2,3,4,5,6-HEXACHLOROCYCLOHEXANE	0.62	0.075	0.21
HEPTACHLOR	0.41	0.41	0.41
ALDRIN	0.305	0.305	0.305
HEPTACHLOR EPOXIDE	0.085	0.085	0.085
GAMMA-CHLORDANE	0.165	0.165	0.165
ALPHA-ENDOSULFAN	0.11	0.11	0.11
ALPHA-CHLORDANE	0.155	0.155	0.155
DIELDRIN	0.175	0.175	0.175
1,1-DICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHYLENE	0.64	0.64	0.64
ENDRIN	0.275	0.275	0.275
BETA-ENDOSULFAN	0.44	0.44	0.44
2,2-BIS(P-CHLOROPHENYL)-1,1-DICHLOROETHANE	1.12	1.12	1.12
1,1,1-TRICHLORO-2-(O-CHLOROPHENYL)-2-(P-CHLOROPHENYL)ETHANE	0.375	0.375	0.375
1,1,1-TRICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHANE	0.65	0.65	0.65
p,p-METOXYCHLOR	0.705	0.705	0.705
MIREX	3.95	3.95	3.95
INDENE	7.25	7.25	7.25
1,2,3,4-TETRAHYDRONAPHTHALENE	8.5	8.5	8.5
NAPHTHALENE	10	10	10
2-METHYLNAPHTHALENE	13.2	13.2	13.2
1-METHYLNAPHTHALENE	10.8	10.8	10.8
2-CHLORONAPHTHALENE	11.15	11.15	11.15
ACENAPHTHYLENE	8.1	8.1	8.1
ACENAPHTHENE	11.95	11.95	11.95
FLUORENE	12.55	12.55	12.55
PHENANTHRENE	16.9	16.9	16.9
ANTHRACENE	10	10	10
FLUORANTHENE	4.35	4.35	4.35
PYRENE	3.91	3.91	3.91
BENZO(a)ANTHRACENE	10	10	10
CHRYSENE	10	10	10
BENZO(b)FLUORANTHENE	41.95	41.95	41.95
BENZO(k)FLUORANTHENE	40.7	40.7	40.7
BENZO(e)PYRENE	35	35	35
BENZO(a)PYRENE	34.3	34.3	34.3
PERYLENE	50	50	50
INDENO(1,2,3-CD)PYRENE	66.5	66.5	66.5
DIBENZ(a,h)ANTHRACENE	50	50	50
BENZO(g,h,i)PERYLENE	57	57	57