

**Fish Catch Data from Offshore Sites in the
Mackenzie River Estuary and Beaufort Sea
during the Open Water Season, August 2004
aboard the CCGS *Nahidik***

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TABLE OF CONTENTS

ABSTRACT	v
RÉSUMÉ	v
INTRODUCTION	1
MATERIALS AND METHODS	2
<i>Study Area</i>	2
<i>Fishing Equipemt and Deployment</i>	2
<i>Fish Processing</i>	3
RESULTS	5
<i>Fish Catch Overview</i>	5
<i>Multi-mesh Gill Net Catches</i>	7
<i>Mid-water Trawl Catches</i>	8
ACKNOWLEDGEMENTS	9
REFERENCES	9

LIST OF TABLES

Table

1	Site names, associated physical features, gear (gill nets and trawl) deployment identifications (ID), and locations.....	11
2	Maturity quality code (MQC) descriptors.....	13
3	Catch summary for larval and early juvenile fish captured in the mid-water trawl during the CCGS <i>Nahidik</i> fishing program, August 2004. See Appendix A for explanation of species acronyms.....	14

LIST OF FIGURES

Figure

- 1 Gill net deployment locations from CCGS *Nahidik* during August 2004. Bathymetric contours represent 10m depth increments.....15
- 2 Locations of mid-water trawl deployments from CCGS *Nahidik*, August, 2004. Bathymetric contours represent 10m depth increments.....16
- 3 Relative species composition of multi-mesh gill net catches at stations sampled during leg 2 of the CCGS *Nahidik* cruise, August, 2004. Samples correspond to total catch of all species at the corresponding station. Refer to Table 1 for full station names.....17
- 4 Relative species composition of adult and late juvenile fish captured in the mid-water trawl during leg 2 of the CCGS *Nahidik* cruise, August, 2004. Sample sizes correspond to total catch, including all species, at the corresponding station. Refer to Table 1 for full station names.....18
- 5 Relative species composition of larval and early juvenile fish captured in the mid-water trawl during leg 2 of the CCGS *Nahidik* cruise, August, 2004. Sample sizes correspond to total catch, including all species, at the corresponding station. Refer to Table 1 for full station names.....19

LIST OF APPENDICIES

Appendices

- A Species codes, scientific and common names of fish captured during CCGS *Nahidik* fishing program, August 2004. Species codes cross-reference to data presented in Appendices D - F.....20
- B Specific locations and deployment data for multi-mesh gill nets. Station identification (ID) is cross-referenced in Figure 1.....21
- C Specific locations and deployment data for the mid-water trawl. Station identification (ID) is cross-referenced in Figure 2.....22
- D Basic biological data for fish caught in multi-mesh gill nets. Fish identification (ID) codes correspond to individual fish.....24
- E Basic data for adult and late juvenile fish caught in the mid-water trawl. Fish identification (ID) codes correspond to individual fish.....29
- F Basic data for larval and early juvenile fish caught in the mid-water trawl. Fish identification (ID) codes correspond to individual fish.....31

ABSTRACT

Majewski, A.R., J.D. Reist, and J.E. Sareault. 2006. Fish catch data from offshore sites in the Mackenzie River estuary and Beaufort Sea during the open water season, August 2004 aboard the CCGS *Nahidik*. Can. Manusc. Rep. Fish. Aquat. Sci. 2771: vi +37 p.

Fishing was conducted at 18 locations throughout the Canadian Beaufort Sea between the 5th and 20th of August, 2004, as part of the Northern Marine Coastal Studies Program. The objective was to provide data regarding the presence of fish in support of hydro-acoustic surveys and an ongoing multibeam mapping program, and contribute to the general biological and ecological information on offshore pelagic and benthic fish populations in the Beaufort Sea. Fishing gear included multi-mesh gill nets and a mid-water trawl. Two hundred and seventy three adult and late-juvenile fish were collected representing nine species. Two hundred and sixty-nine larval and early juvenile specimens were also collected representing 10 species. Processing involved the collection of basic biological data (fork/total lengths, weight, sex and maturity), as well as the removal of tissues for further analysis (i.e., genetic and contaminant studies). Biological data, capture locations, and basic information regarding gear deployment are provided herein.

Key Words; Beaufort Sea, Mackenzie Delta, off-shore, mid-water trawl, *Boreogadus saida*, *Clupea pallasii*, gill nets, CCGS *Nahidik*.

RÉSUMÉ

Majewski, A.R., J.D. Reist et J.E. Sareault. 2006. Données sur la prise de poissons provenant du large de l'estuaire du fleuve Mackenzie et de la mer de Beaufort pendant la saison navigable en août 2004 à bord du NGCC *Nahidik*. Can. Manusc. Rep. Fish. Aquat. Sci. 2771: vi +37 p.

On a pratiqué la pêche à 18 endroits dans la mer de Beaufort canadienne entre le 5 et le 20 août 2004 dans le cadre du programme d'études marines et côtières du Nord. L'objectif consistait à fournir des données à l'égard de la présence du poisson en soutien aux sondages hydroacoustiques et du programme continu de cartographie à plusieurs faisceaux et à contribuer aux renseignements biologiques et écologiques généraux sur les populations de poissons pélagiques et benthiques dans la mer de Beaufort. L'équipement de pêche comprenait des filets maillants à plusieurs mailles et un chalut pélagique. Deux cents soixante-treize poissons adultes et poissons jeunes à un stade avancé ont été recueillis représentant neuf espèces. Deux cent soixante-neuf larves et jeunes poissons ont également été recueillis représentant 10 espèces. Le processus comportait la cueillette de données biologiques de base (forme/longueur totale, poids, genre et maturité), ainsi que le prélèvement de tissus pour des analyses plus approfondies (c.-à-d. des études génétiques et sur les contaminants). Les données biologiques, les endroits de prises et les renseignements de base à l'égard de déploiement d'équipement sont fournis ci-après.

Mots-clés ; mer de Beaufort, delta du Mackenzie, au large, chalut pélagique, *Boreogadus saida*, *Clupea pallasii*, filets maillants, NGCC *Nahidik*

INTRODUCTION

The proposed Mackenzie Valley Pipeline Project has sparked a renewal in intensive oil and gas exploration in the Mackenzie Delta and near shore regions of the Beaufort Sea. In response to the oil and gas industry's focus in the region, governmental regulators and resource managers are tasked with the assessment of potential impacts of anthropogenic activities on the region's natural environment, including fish and fish habitat. Despite considerable research focus on the biological and physical makeup of the Mackenzie Delta/Beaufort Sea during the last period of extensive oil and gas exploration in the late 1970's and early 1980's, the complex dynamics of the Mackenzie Delta estuary and its biota are still poorly understood. Although several studies have examined fish populations within Tuktoyaktuk Harbour, Kugmallit Bay and nearshore sites throughout Mackenzie Bay, few studies have focused on offshore pelagic and benthic fish populations (Frost and Lowry 1983; Galbraith and Hunter 1975; Kavik-Axys Inc. and LGL Limited Environmental Research Associates 2001; Chipertzak et al. 2003). As such, relatively little is known about the species composition, habitat preferences, and general ecology of off-shore fish populations in the Beaufort Sea.

The data presented in this report were collected as part of the Northern Coastal Marine Studies program, which is a multidisciplinary study aimed at characterizing the physical and biological nature of the Beaufort Shelf through a multi-year habitat mapping program. In the context of this study, habitat mapping is the process of identifying, characterizing, and mapping the physical, ecological, and human variables that influence the abundance and distribution of species in an area. The program's fundamental objective is to address the Canadian Department of Fisheries and Oceans' responsibility to ensure that relevant science is conducted in order to provide scientifically defensible advice in support of regulatory decisions regarding the protection of fish and fish habitat ecosystem (Canada. Dept. of Fisheries and Oceans. Central and Arctic Region Intranet site). The integration of sea-bed mapping, and physical and biological sampling is intended to provide a comprehensive picture of the status and composition of the coastal Beaufort Sea ecosystem (Canada. Dept. of Fisheries and Oceans. Central and Arctic Region Intranet site). The central objective of the fishing component of this program was to provide data regarding the presence of fish in support of an on-going multibeam mapping program of the Beaufort Sea floor, and to contribute to the general biological and ecological information on offshore pelagic and benthic fish populations. Secondary objectives included: 1) ground-truthing data from the hydro-acoustic surveys of the biota on the sea floor and in the water column; 2) providing samples for an ongoing study of the trophic structure of Beaufort fish populations; and 3) providing samples for ongoing genetic (stock structure and variability) and contaminant studies of fishes in this area.

Fishing efforts were conducted from the Canadian Coast Guard Ship (CCGS) *Nahidik* in open water during August 2004 in order to determine the species composition of fish in areas including natural formations (e.g., ice scours, mud volcanoes, and gas vents) and features formed by anthropogenic activities (e.g., artificial islands used during oil and gas extraction). The fishing activities were exploratory in nature, and therefore equipment was selected that would target a wide range of size classes across all habitat types. This report presents fish catch data including species caught, timing, location, depth and gear type. Biological parameters presented include standard biometrics, as well as sex and maturity. Other follow-on analyses that were conducted are generally outlined herein, but those data are not presented in this report.

MATERIALS AND METHODS

STUDY AREA

The study took place in the Canadian Beaufort Sea within the south-western limit at Herschel Island, YK (Lat: 69d27.441, Long: 138d52.317) to the north-eastern limit at the Kaglulik mud volcano north of Liverpool Bay, NT (Lat: 70d52.907, Long: 130d49.586) (Figures 1 and 2). In 2004, fishing efforts were conducted at 18 locations throughout the study area between August 5th and August 20th. Locations were selected based on the presence of prominent geological features that were created by either natural processes or anthropogenic activities. One objectives of the Northern Marine Coastal Studies program is to survey bottom features, and this was a major factor in determining sampling station locations for this survey. Centre points of sampling stations are provided in Table 1. Station boundaries were defined by mapping a quadrant around the centre point measuring 2 x 2 nautical miles (nm) on north/south and east/west axis. All fishing was conducted between the 5m and 70m isobaths. Common and scientific names, and acronyms of fish species captured are summarized in Appendix A.

FISHING EQUIPMENT AND DEPLOYMENT

The main research platform of the Northern Coastal Marine Study in 2004 was the CCGS *Nahidik*. The CCGS *Nahidik* is a 53.35 m shallow draft river vessel, which has been retrofitted for the purposes of scientific study. Fishing was conducted using a combination of multi-mesh gill nets and a modified Enzenhofer and Hume mid-water trawl. Gill nets were deployed from a 4.9m Hurricane Fast-Rescue-Craft (FRC) which was launched from the CCGS *Nahidik* using the boom and winch situated on the main deck. The mid-water trawl was deployed from the main deck of the CCGS *Nahidik* using the hydraulic boom (8.93m) and winch (lifting capacity = 2273kg).

Multimesh Gill Nets

A combination of 60 and 120m long multi-mesh gill nets were used. The panel depth of all gill nets was 2m. Sixty meter nets were composed of six 10m panels with mesh sizes measuring 3.8, 5.1, 6.4, 7.6, 8.9, 10.2cm or 2.5, 3.8, 6.4, 7.6, 11.4, 11.4cm stretched. One hundred and twenty meter nets were composed of six 20m sections with mesh panels measuring 3.8, 6.4, 7.6, 8.9, 11.4, 12.7cm or 2.5, 6.4, 7.6, 8.9, 11.4, 14.0cm stretched. Gill nets were set at 10 different locations (Figure 1, Appendix B), for durations ranging between three and 18 hours.

Where the sample site consisted of a distinct natural (e.g., mud volcano) or man-made (e.g., artificial island) feature, efforts were made to sample directly on, or adjacent to, the feature. Net deployment locations were selected based on electronic bathymetric maps that were geo-referenced using HYPACK[®] Max Version 4.3 software. Net deployment locations were then manually programmed into a Garmin 12-XL Global Positioning System (GPS), which was used to locate deployment sites from the Hurricane FRC. Real-time hydro-acoustic data were referenced prior to gill net deployment in order to choose set depths where a relatively high density of targets was recorded. A combination of surface and bottom sets were used at each sampling location. Gill nets were set at depths ranging from surface (0-2m) to 70m (Appendix B) using a combination of anchored lines and floats. Net deployment coordinates were recorded using a hand held GPS (Garmin 12-XL). Due to logistical constraints, gill nets were sometimes set outside of the 2 x 2nm boundaries of the sampling stations. In these instances, efforts were made to sample as close to the station boundaries as possible (Table 1). Deployment and

removal times, net identification number, set depths, and weather conditions were recorded during each gill net deployment.

Mid-water Trawl

Trawling efforts utilized a modified Enzenhofer and Hume mid-water trawl. The trawl measured 3m x 3m at the mouth, and was 12m in length. The body of the trawl was composed of five mesh panels. The panel with the largest mesh size (7.5cm stretched) was located at the anterior end of the trawl, and mesh sizes decreased with each consecutive panel (4.38cm, 1.89cm, 1.25cm, 0.63cm stretched). Two metal bars, one at the top and one at the bottom of the mouth, connected by aircraft cable, provided structure for the mouth of the trawl. While towed, the mouth was held open by two aluminum depressor fins that were weighted with 9.1kg half-cannon balls. An additional 22.73kg was hung from the bottom bar to maximize the gape of the mouth during towing. The original Enzenhofer and Hume mid-water trawl is described in Enzenhofer and Hume (1989). The trawl was deployed on the portside, using the boom and winch on the main foredeck of the ship. Trawling speeds were typically maintained between 0.77 and 1.80m/s depending on wind speed and direction (Appendix C). Unless wind conditions allowed the ship to maintain a slow and steady drift, slow trawl speeds were accomplished by maintaining a slow port-side turn using only the starboard engine. The trawl was deployed at depths ranging from surface tows (0-2m) to 50m (Appendix C). While towing, set depths were calculated by dividing the desired set depth by the cosine of the angle of the winch cable relative to vertical, the product of which is the amount of cable that must pass through the block in order to achieve the targeted set depth.

The trawl net was deployed 31 times over 17 locations for a duration of 30 minutes per set (Figure 2, Appendix C). Real-time hydro-acoustic data were referenced prior to trawl deployment in order to choose set depths where high densities of targets were recorded. Start and finish coordinates for trawl deployments were recorded using the CCGS *Nahidik*'s on-board GPS system (Magnavox MX-200). Start and finish times, set depths, deployment details (i.e., cable angle and cable length), towing speed, and weather conditions (i.e., wind speed, cloud cover, etc.) were recorded during each deployment (Appendix C).

FISH PROCESSING

Field Processing

Gill nets were retrieved using the Hurricane FRC and brought back aboard the CCGS *Nahidik* for sorting and fish processing. Trawl catches were transferred from the cod-end of the trawl net into a 100L cooler containing sea water. Field processing of gill-netted fish included preliminary species identification, measurement of fork length (FL) or total length (TL) to the nearest millimeter (mm), measurement of total weight to the nearest 0.1 gram (g), and digital photographs of representative samples for each species. Field weight measurements are not available for all fish as the portable electronic field scale could not function properly while the ships engines were running full throttle, or when the ship was impacted by moderate to heavy waves. All fish were bagged in plastic with individual identification numbers and were placed in a freezer on-board the CCGS *Nahidik*.

For catches from the mid-water trawl, larger juvenile fish were processed the same way as gill-netted fish. Larval and post-larval fish field processing included preliminary species

identification and transfer to 5% formaldehyde (10% formaldehyde with sea water) for processing back in the lab.

Larval fish samples were only processed from trawl samples at stations where bongo nets were also deployed. Therefore, not all samples that contained larval fish were processed, and for this reason results cannot be examined on a presence/absence basis at stations visited.

Lab Processing

Lab processing was conducted at the Freshwater Institute in Winnipeg, Manitoba. Final species identifications were determined using keys found in *The Freshwater Fishes of Alaska* (Mecklenberg et al. 2002) and *The Freshwater Fishes of Western Canada and Alaska* (McPhail and Lindsay 1970). All fish were weighed to the nearest 0.1 g, and a sub-sample was again measured for FL or TL to the nearest mm. Otoliths were removed from each fish, using standard dissection techniques, and archived for future age-structure analysis. Sex was determined by visual inspection of the gonads, using a dissection microscope to examine gonad tissue from immature fish. Fully intact gonads were weighed to the nearest 0.01 g in order to calculate a Gonadal-Somatic Index (GSI) value for each fish. The following equation was used to calculate GSI:

$$\text{GSI} = (100 \times \text{Gonad Weight}) / \text{Round Weight}$$

Additionally, a Maturity Quality Code (MQC, Table 2) value was assigned to each fish based on the relative state of development of their gonads. Digital photographs were taken where anomalous specimens were identified, and also in order to record criteria for assignment of a MQC.

Epaxial muscle tissue ($\geq 0.5\text{cm}^3$) was taken from a sub-sample of each species of fish captured for stable isotope analysis (carbon, nitrogen, and sulphur), as part of an on-going study of the trophic structure of fish in the Beaufort Sea. Muscle samples were taken from below the dorsal fin on the left side of fish, and placed in aluminum sample trays. Care was taken to remove all non-muscular tissue prior to placing samples in a drying oven for a minimum of 24 hours at 50°C.

A second piece of muscle tissue was taken from a sub-sample of Pacific herring (*Clupea pallasii*, n = 30), saffron cod (*Eleginus gracilis*, n = 10), and Arctic cisco (*Coregonus autumnalis*, n = 30) for analysis of contaminants including total mercury, methyl-mercury, organo-chlorides, and fatty acid content. Stable isotope analysis was also conducted on these muscle samples. Epaxial muscle tissue was removed posterior to the dorsal fin on the left side of each fish using standard dissection techniques. Care was taken to remove all non-muscular tissue prior to placing the samples in labeled plastic bags and freezing. These samples will contribute to on-going genetic analysis (stock structure and variability) and contaminant research on arctic fishes.

Whole-fish samples of Pacific herring (n = 20), saffron cod (n = 10), and Arctic cisco (n = 20) were sub-sampled for whole body homogenate analysis of the aforementioned contaminants.

All larvae and post-larval fish were transferred to 70% ethanol. All fish were weighed to the nearest 0.0001g, and were measured to the nearest 0.5mm. Final species identifications were made at this time. Larval and post-larval Arctic cod (*Boreogadus saida*) were not fully developed and the distinguishing features that differentiate this species from Polar cod (*Arctogadus borsovi*) could not be used. The only definitive feature that the literature indicates

as useful to distinguish the two species is gill raker count. However, this feature, along with any fin ray counts, cannot be made on fish that are not developed to the juvenile stage (Moser et al. 1984). Given that there are very few specimens that have been identified in the Canadian Beaufort Sea as Polar cod, and these fish are characterized as bathypelagic, this report treats all larval and post larval cod as Arctic cod.

Similarly, the pectoral fin ray count is the only meristic character that distinguishes larval kelp snailfish (*Liparis tunicatus*) from larval variegated snailfish (*Liparis gibbus*), however, there can be overlap in the range of fin ray counts in these two species. The ecology of each species indicate that the variegated snailfish is typically found in deeper waters (> 100m) and the kelp snailfish in shallower waters (<50m) (Able et al. 1980), therefore there is a high likelihood that these larvae are kelp snailfish. Therefore, larval snailfish whose fin ray counts overlapped were identified as *Liparis tunicatus* in this report (Able et al. 1986, Mecklenburg et al. 2002).

RESULTS

In all, 272 adult and late juvenile fish, and 269 larval and early juvenile fish were captured, representing at least 14 species across 18 stations throughout the Canadian Beaufort Sea (Figures 3, 4, and 5; Appendices A, D, E, and F). Total catches were as follows:

Multimesh gill nets: Pacific herring, n=171; saffron cod, n=20; fourhorn sculpin (*Myoxocephalus quadricornis*), n=8; rainbow smelt (*Osmerus mordax*), n=2; and Arctic lamprey (*Lampetra camtschatica*), n=1 (Figure 3, Appendix D). Basic biological data for fish captured in gill nets are presented in Appendix D.

Mid-water trawl: Arctic cod, n=198; Arctic cisco, n=61; Arctic staghorn sculpin (*Gymnocanthus tricuspis*), n=31; kelp snailfish, n=20; gelatinous seasnail (*Liparis fabricii*), n=14; Arctic alligatorfish (*Ulcina olrikii*), n=7; least cisco (*Coregonus sardinella*), n=2; Arctic lamprey, n=2; ribbed sculpin (*Triglops pingelii*), n=1; fourhorn sculpin, n=1; unidentified *Icelus* sp., n=1; unidentified *coregonine* sp., n=1; and unidentified *Gadidae* sp., n=1 (Figures 4 and 5, Appendices E and F). Basic biological data for adult and late juvenile fish captured in the mid-water trawl are presented in Appendix E. Basic biological data for larval and early juvenile fish are presented in Appendix F.

Box core: One spatulate sculpin (*Icelus spatula*) was captured in a 0.5m x0.5m box core. Basic biological data for this fish is presented in Appendix D.

FISH CATCH OVERVIEW

Adult/Juvenile Fish

Pacific herring: Pacific herring comprised 31.55% of the total adult and late juvenile catch (Figure 3). Pacific herring were only captured using gill nets, and were typically captured in the 3.75cm and, to a lesser extent, 2.50cm and 6.25cm mesh panels. Pacific herring were captured at five of the nine locations where gill nets were set, making up 84.65% of gill-net catches (Figure 3). Set locations, depths and durations are presented in Appendix B. Fork lengths ranged between 185mm and 300mm. The catch was composed of 58.21% males, 39.55% females, with 2.24% unidentifiable as to sex due to damage by amphipods. GSI values are provided in Appendix D. In male Pacific herring, 39.24% had MQC values of nine, 37.97% had MQC values of 10, 18.99% had MQC values of six, and 2.53% had MQC values of seven. The majority of female pacific herring had MQC's of five (75.47%), 16.98% had MQC values of

one, and 7.55% had MQC values of four (Appendix D). These MQC values indicate that the majority of Pacific herring were sexually mature and in a post-reproductive state at the time of capture.

Arctic cisco: Arctic cisco comprised 11.25% of the total adult and late juvenile catch (Figure 4). Arctic cisco were caught at seven of the 17 locations where mid-water trawling was conducted (Figure 4), comprising 17.94% of trawl catches. Trawling locations, depths, speeds, and distances are presented in Appendix C. Fork lengths ranged from 55mm to 89mm. A sub-sample of 46 Arctic cisco were sexed, yielding 13.04% males, 67.39% females, and 19.56% unidentifiable (Appendix E). GSI values are provided in Appendix E. All male Arctic cisco had MQC = six, and all female Arctic cisco had MQC values of one (Appendix E), indicating these Arctic cisco were sexually immature at the time of capture.

Saffron cod: Saffron cod comprised 3.69% of the total adult and late juvenile catch. Saffron cod were only captured using gill nets, and were typically captured in the 6.25cm and, to a lesser extent, 3.75cm and 8.75cm mesh panels. Saffron cod were captured at four of the 10 locations where gill nets were set, making up 9.90% of gill net catches (Figure 3). Set locations, depths, and durations are presented in Appendix B. Total lengths ranged between 292mm and 340mm. The catch was composed of 50% males, 40% females, with 10% unidentifiable due to damage by amphipods. GSI values are provided in Appendix D. Sixty percent of males had MQC values of seven, and 40% had MQC values of 10. Seven of eight females (87.50%) had MQC values of five, and one female could not be assigned a MQC value due to damage by amphipods. These MQC values indicate that the saffron cod captured in this study were mature individuals in a resting or pre-spawning condition.

Fourhorn sculpin: Fourhorn sculpins comprised 1.48% of the total adult and late juvenile catch. Fourhorn sculpins were only captured in gill nets, and were captured in mesh panels ranging from 3.75cm to 13.75cm. Fourhorn sculpins were captured at two of the 10 locations where gill nets were set, making up 3.96% of gill-net catches (Figure 3). Set locations, depths and durations are presented in Appendix B. Total lengths ranged between 143mm and 253mm. The catch was composed of three (37.5%) males and five (62.5%) females. GSI values are provided in Appendix D. Maturity Quality Code values were not assigned for fourhorn sculpin, as fish were not dissected so they could be used in follow-on research.

Arctic cod: Arctic cod comprised 1.11% of the total adult and late juvenile catch. Arctic cod were caught at three of the 17 locations where mid-water trawling was conducted (Figure 4), comprising 1.76% of trawl catches. Trawling locations, depths, speeds and distances are presented in Appendix C. Fork lengths ranged from 77mm to 98mm. Three of the six Arctic cod were males, one was immature, one could not be sexed due to damage by amphipods, and another was damaged by an Arctic lamprey in the mid-water trawl (Appendix E). GSI values are provided in Appendix E. Maturity Quality Code values were not assigned for Arctic cod.

Arctic lamprey: Arctic lamprey comprised 0.55% of the total adult and late juvenile catch. Two lampreys were captured in the mid-water trawl (0.59% of total trawl catch), while one was attached to a saffron cod which was entangled in a gill net (0.50% of total gill net catch). Trawling locations, depths, speeds and distances are presented in Appendix C. Gill net set

depths, duration, and conditions are presented in Appendix B. Total lengths were 183mm, 184mm, and 208mm. The Arctic lampreys were left intact and donated to the Canadian Museum of Nature.

Rainbow smelt: Rainbow smelt comprised 0.37% of the total adult and late juvenile catch. The rainbow smelt were captured in the 3.75cm mesh panels at one of the 10 locations (Figure 3) where gill nets were set. Rainbow smelt comprised 0.99% of gill-net catches. Set depths, duration, and conditions are presented in Appendix B. Fork lengths were 156mm and 218mm. The larger rainbow smelt was a female, the other could not be sexed due to internal damage by amphipods. GSI values are provided in Appendix D. The MQC value of the female was five.

Least cisco: Least cisco comprised 0.37% of the total adult and late juvenile catch. Least cisco were caught at two of the 17 locations where mid-water trawling was conducted (Figure 4), comprising 0.59% of the total trawl catches. Trawl depths, speed, and conditions are presented in Appendix C. Fork lengths were 76mm to 81mm. Neither least cisco could be sexed accurately, and therefore no GSI or MQC values were assigned.

Larval and Early Juvenile fish

Larval and early juvenile fish were collected opportunistically at 11 of the 17 stations sampled using the mid-water trawl. Catch numbers ranged from one to 77 larvae. Station 1024 (Kopanoar) had the highest catches and station 1022 (Kugmallit Trough Center) had the second highest catch but also the highest diversity. The lowest catch was at station 1032 (Issigak) where only one larvae was captured. Larval fish catches were low (<20 larvae) at stations where the maximum depth was less than 20m and high (>20 larvae) at stations where the average maximum depth was greater than 40m (Figure 5). The majority of the fish collected were in the post-flexion stage of development; however, a few larger specimens were considered to be in the early juvenile stage (Moser et al. 1984).

Larval and early juvenile fish comprised 79.12% of trawl catches, with Arctic cod comprising 71.38%. Total number of species captured was 10, representing five families. Relative species composition of larval and early juvenile catches for individual stations is presented in Table 3 and Figure 5. Trawling locations, depths, speeds and distances are presented in Appendix C. Capture locations, trawl identification numbers, lengths, and weight of individual specimens are presented in Appendix F.

MULTI-MESH GILL NET CATCHES

Gill net soak times of five to eight hours provided the best compromise between maximizing total catch and minimizing consumption of entangled fish by isopods and amphipods. The percentage of catch that was damaged by invertebrates in eight hours or less was 8.33% (SE=8.33, n=4), compared to 52.41% (SE=12.98, n=10) for set durations longer than eight hours. Sets that were longer than eight hours in duration generally resulted in a large proportion of the catch being retrieved with only skeletons intact. Gill nets proved successful at six of the 10 locations sampled (Figure 3). All gill net catches occurred within the 15m isobath, with eight meters being the shallowest depth at which gill nets were set (Appendix B), indicating that late juvenile and adult fish densities are higher in the brackish nearshore regions of the Mackenzie Delta estuary.

MID-WATER TRAWL CATCHES

Trawling resulted in fish capture at 13 of 17 sites. The trawl net was not effective at capturing adult fish from the CCGS *Nahidik*. This is likely due to deficiencies in the size and design of the trawl, combined with the inherent characteristics of the fishing platform, and the apparent low abundance and patchy distribution of pelagic fish in the offshore regions of the Beaufort Sea. Mid-water trawls typically rely on wings (consisting of sweeplines and bridles) with trawl doors (used to spread the wings and open the mouth of the trawl), or other structures, to herd pelagic fish towards the mouth of the trawl. Once at the mouth, most strong-swimming fish will keep pace with the trawl just ahead of the main body of the net until they tire and begin to fall back towards the cod end (Wardle 1983). Aboard the CCGS *Nahidik*, trawling was conducted over the portside of the foredeck using a single warp, thus the incorporation of herding wings and trawl doors was not possible given that two warps would be necessary to operate the system. Designs exist for “try-net” shrimp trawls that use a single warp and bridle system to operate wings and their associated doors. However, given the limitations of clearance over the ship rails using the mechanical boom, and the lack of a hydraulic net retrieval system on the fishing platform, this type of net was not practical because the added length of the bridle system would have necessitated a very short net body.

Using an identical trawl, DFO fishing activities aboard the CCGS *Namao* on Lake Winnipeg, Manitoba indicate that, given the design of the experimental net, ship speeds between 0.51 and 1.03 m/s are optimum in order to avoid lead pressure effects while towing quickly enough to capture adult fish (pers. comm. Bill Franzin, DFO). For the purposes of this report, lead pressure effects are caused by a mass of water (lead-wave) that is pushed ahead of the trawl mouth or cod-end when towed at speeds that are too high for the design characteristics of the net (e.g., mesh sizes, body length). The potential effect of this lead-wave is that fish may be pushed away from the mouth of the trawl. On the CCGS *Nahidik*, trawl speeds below 1.54m/s could only be attained by shutting down the portside engine and pulsing the starboard engine in and out of gear while maintaining a slow portside turn. By cutting both engines and using the wind to maintain a slow sideways drift while towing the net on the leeward side, the CCGS *Nahidik* was able to attain trawl speed below 1.03 m/s. However, this technique could only be maintained under specific weather conditions and, as such, trawl speeds ranged between 0.72 and 1.80 m/s, with an average speed of 1.23 m/s (Appendix C). Taking into account the looping pattern that resulted from maintaining a slow portside turn while towing, the actual speed of the trawl in the water would have been slower than that of the ship. Given the relative small size of the mouth of the trawl used in this survey, and the lack of a herding effect from wings, strong swimming pelagic fish such as Pacific herring and saffron cod could have easily escaped to the sides of the trawl once confronted.

Regardless of the trawl technique, due to the shallow depths (< 15m) in the near-shore areas, it was often necessary to tow the trawl in close proximity to the ship. Given that the trawl was deployed from the foredeck, and thus the ship led the trawl while drifting and when maintaining a port-side turn, the ship could have potentially deterred surface-dwelling organisms and pelagic fish from entering the path of the trawl, thereby affecting capture efficiency.

Galbraith and Hunter (1975) conducted mid-water trawl surveys in the Canadian Beaufort Sea in 1974 and 1975 using a 2m Isaacs-Kidd mid-water trawl. Thirteen mid-water trawls were conducted in the southern Beaufort Sea in 1974 and captured mainly freshwater species in small numbers. In 1975, 22 mid-water trawls conducted between 1 and 16m depth

captured approximately 5000 larval fish including Arctic cod (n=4027), Arctic staghorn sculpin (n=870), and Arctic alligatorfish (n=216).

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Table 1. Site names, associated physical features, gear (gill nets and trawl) deployment identifications (ID), and locations.

Station Name	Station Code	Associated Feature	Station Location (Center Point)			Gill Nets Set Locations			Trawl Locations				
			Latitude	Longitude	ID	Latitude	Longitude	ID	Latitude	Longitude	ID	Latitude	Longitude
Kugmallit Vents	1001	Gas vents	69d45.04	133d21.68				TR23-04	69d44.96	133d20.97	69d45.10	133d20.56	
								TR01-04	70d05.34	132d57.62	70d05.18	132d58.48	
Kaglulik	1019	Mud volcano	70d52.60	130d50.35			GN01-04	70d52.91	70d52.91	TR02-04	70d52.54	130d49.59	70d52.66
							GN02-04	70d52.91	130d50.01	TR03-04	70d52.56	130d49.82	70d52.68
							GN03-04	70d52.20	130d51.64				
							GN04-04	70d52.20	130d51.64				
Admirals Finger	1020	Troughs	70d41.33	132d38.93			TR04-04	70d40.75	132d37.07	TR05-04	70d41.43	132d38.51	70d41.45
							TR05-04	70d41.43	132d38.51	TR06-04	70d41.91	132d39.00	70d41.81
							TR06-04	70d41.91	132d39.00	TR07-04	70d21.85	133d15.45	70d21.73
Kugmallit East	1021	Valley	70d22.27	133d21.53			TR08-04	70d21.80	133d20.79	TR09-04	70d22.01	133d21.27	70d21.95
							TR09-04	70d22.01	133d21.27				
Kugmallit Center	1022	Valley	70d19.04	133d37.84			TR10-04	70d19.84	133d38.78	TR11-04	70d19.37	133d38.65	70d19.63
							TR11-04	70d19.37	133d38.65	TR12-04	70d19.37	133d36.71	70d18.97
							TR12-04	70d19.37	133d36.71				
Kugmallit West	1023	Valley	70d17.56	133d57.68			TR13-04	70d17.85	133d57.88	TR14-04	70d17.44	133d57.66	70d17.63
							TR14-04	70d17.44	133d57.66				
Kopanoar	1024	Mud Volcano	70d23.33	135d24.63			GN05-04	70d20.74	133d41.45	GN06-04	70d20.55	133d41.59	70d19.28
							GN06-04	70d20.55	133d41.59	GN07-04	70d20.46	133d41.63	70d19.28
							GN07-04	70d20.46	133d41.63	GN08-04	70d20.80	133d41.91	
							GN08-04	70d20.80	133d41.91				
Herschel Island	1027	Basin	69d27.68	138d46.48			GN09-04	70d23.34	135.25.77	GN10-04	70d23.40	135d25.10	70d23.11
							GN10-04	70d23.40	135d25.10	GN11-04	70d23.46	135d25.26	70d23.24
							GN11-04	70d23.46	135d25.26	GN12-04	70d23.48	135d25.47	70d23.51
Herschel Island	1028	Sill	69d27.68	138d40.48			TR15-04	70d23.04	135d24.51	TR16-04	70d23.16	135d24.36	138d43.82
							TR16-04	70d23.16	135d24.36	TR17-04	70d23.37	135d24.58	70d23.51
Herschel Island	1029	Off-shore	69d31.212	138d27.528			TR17-04	70d23.37	135d24.58	TR18-04	69d27.59	138d45.51	138d45.46
							TR18-04	69d27.59	138d45.51	TR19-04	69d28.45	138d43.32	69d28.25
							TR20-04	69d30.48	138d24.70	69d29.82	138d23.59		

Table 1. Continued...

Station Name	Station Code	Associated Feature	Station Location (Center Point)			Gill Nets Set Locations			Trawl Locations			
			Latitude	Longitude	ID	Latitude	Longitude	ID	Latitude	Longitude	ID	
Paktoa	1030	Gas vents	69d37.82	136d18.72	GN15-04	69d38.10	136d17.80	TR21-04	69d37.79	136d18.30	69d37.84	136d19.66
						69d37.90	136d18.00	TR22-04	69d37.08	136d20.59	69d37.33	136d20.99
Mimuk	1031	Artificial island	69d42.29	136d26.08	GN17-04	69d42.50	136d27.10					
						69d42.60	136d27.30	GN18-04				
Issigak	1032	Sand substrate	69d44.81	135d55.91	GN21-04	69d42.22	136d02.34	TR24-04	69d44.21	135d55.13	69d44.21	135d54.66
						69d42.22	136d02.34	GN22-04	69d45.23	135d55.94	69d44.90	135d55.11
						69d42.24	135d57.05	GN19-04				
						69d42.24	135d57.05	GN20-04				
Nipterk 2	1033	Mud Volcano	69d45.21	135d29.45			TR26-04	69d45.15	135d29.60	69d44.95	135d29.81	
East Ice Scours	1034	Ice scours	70d17.94	130d58.07	GN23-04	70d17.29	130d54.94	TR27-04	70d18.24	130d57.38	70d18.23	130d56.47
						70d17.29	130d54.94	GN24-04	70d18.30	130d56.65	70d18.27	130d56.62
						70d18.08	130d57.70	GN25-04				
Toker 1	1035	N/A	69d48.89	132d50.41	GN26-04	69d48.64	132d50.44	TR29-04	69d48.48	132d51.57	69d48.45	132d52.16
					GN27-04	69d48.64	132d50.44					
Toker 2	1036	N/A	69d44.26	132d49.91	GN28-04	69d48.94	133d00.81					
					GN29-04	69d48.94	133d00.81					
Nipterk 1	1038	Mud Volcano	69d48.88	135d19.27				TR30-04	69d49.06	135d20.08	69d48.89	135d21.95
								TR31-04	69d48.84	135d22.25	69d48.32	135d22.27

Table 2. Maturity Quality Code (MQC) descriptors.

Maturity State	Female		Male	
	Code	Description	Code	Description
Immature	1	<ul style="list-style-type: none"> - Ovaries granular in texture - Hard and triangular in shape - Up to full length of body cavity - Membrane full - Eggs distinguishable 	6	<ul style="list-style-type: none"> - Testes long and thin - Tubular and scalloped shape - Up to full body length - Putty-like firmness
Mature	2	<ul style="list-style-type: none"> - Current year spawner - Ovary fills body cavity - Eggs near full size but not loose - Eggs not expelled by pressure 	7	<ul style="list-style-type: none"> - Current year spawner - Testes large and lobate - White to purplish color - Centers may be fluid - Milt not expelled by pressure
Ripe	3	<ul style="list-style-type: none"> - Ovaries fill body cavity - Eggs full size and transparent - Eggs expelled by slight pressure 	8	<ul style="list-style-type: none"> - Testes full size - White and lobate - Milt expelled by slight pressure
Spent	4	<ul style="list-style-type: none"> - Spawning complete - Ovaries ruptured and flaccid - Developing oocytes visible - Some retained eggs 	9	<ul style="list-style-type: none"> - Spawning complete - Testes flaccid with some milt - Blood vessels obvious - Testes violet-pink in color
Resting	5	<ul style="list-style-type: none"> - Ovary 40-50% of body cavity - Membrane thin, loose, and semi-transparent - Healed from spawning - Developing oocytes apparent with few atretic eggs - Some eggs may be retained in body cavity 	10	<ul style="list-style-type: none"> - Testes tubular, less lobate - Healed from spawning - No fluid in center - Usually full length - Mottled and purplish in color
		Female or Male		
Unknown	0	<ul style="list-style-type: none"> - Cannot be sexed - Gonads long or short and thin - Transparent and translucent 	11	<ul style="list-style-type: none"> - Resting Fish - Spawning complete, gonads not regenerated - Sexing not possible

Table 3. Catch summary for larval and early juvenile fish captured in the mid-water trawl during the CCGS *Nahidik* fishing program, August 2004. See Appendix A for explanation of species acronyms.

Species ID	Total Captured	% Total Catch	Station ID
<i>Icelus sp.</i>	1	0.37	1022
<i>Coregoninae sp.</i>	1	0.37	1022
<i>Gadidae sp.</i>	1	0.37	1023
FHSC	1	0.37	1023
RISC	1	0.37	1029
ARAF	7	2.60	1022, 1029
GLSS	14	5.20	1019, 1020, 1021, 1022, 1024, 1029
KESF	20	7.44	1020, 1021, 1022, 1024
ARSS	31	11.52	1020, 1021, 1022, 1027, 1028
ARCD	192	71.38	1001, 1019, 1020, 1021, 1022, 1024, 1027, 1028, 1029, 1032

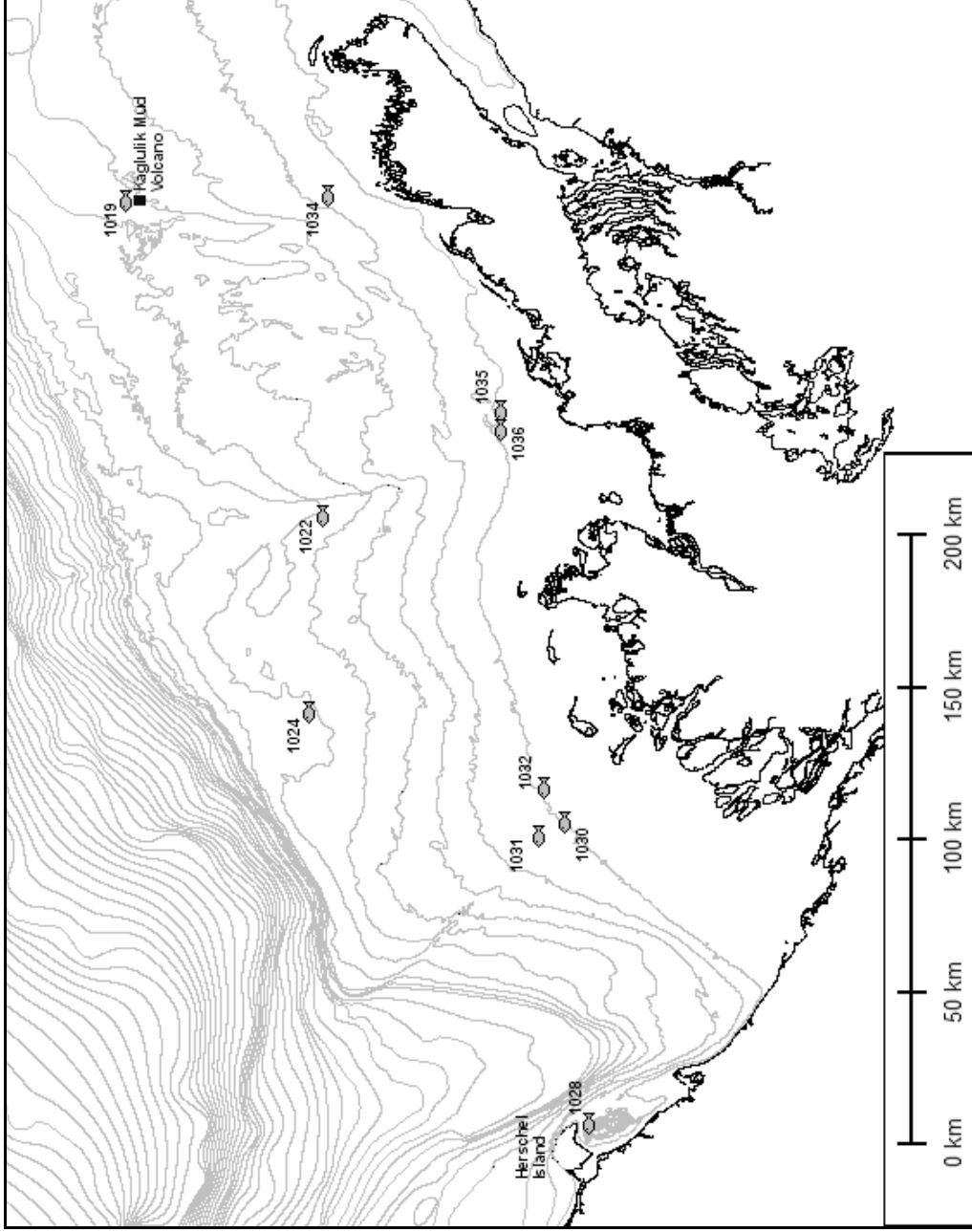


Figure 1. Gill net deployment locations from CCGS *Nahidik* during August 2004. Bathymetric contours represent 10m depth increments.

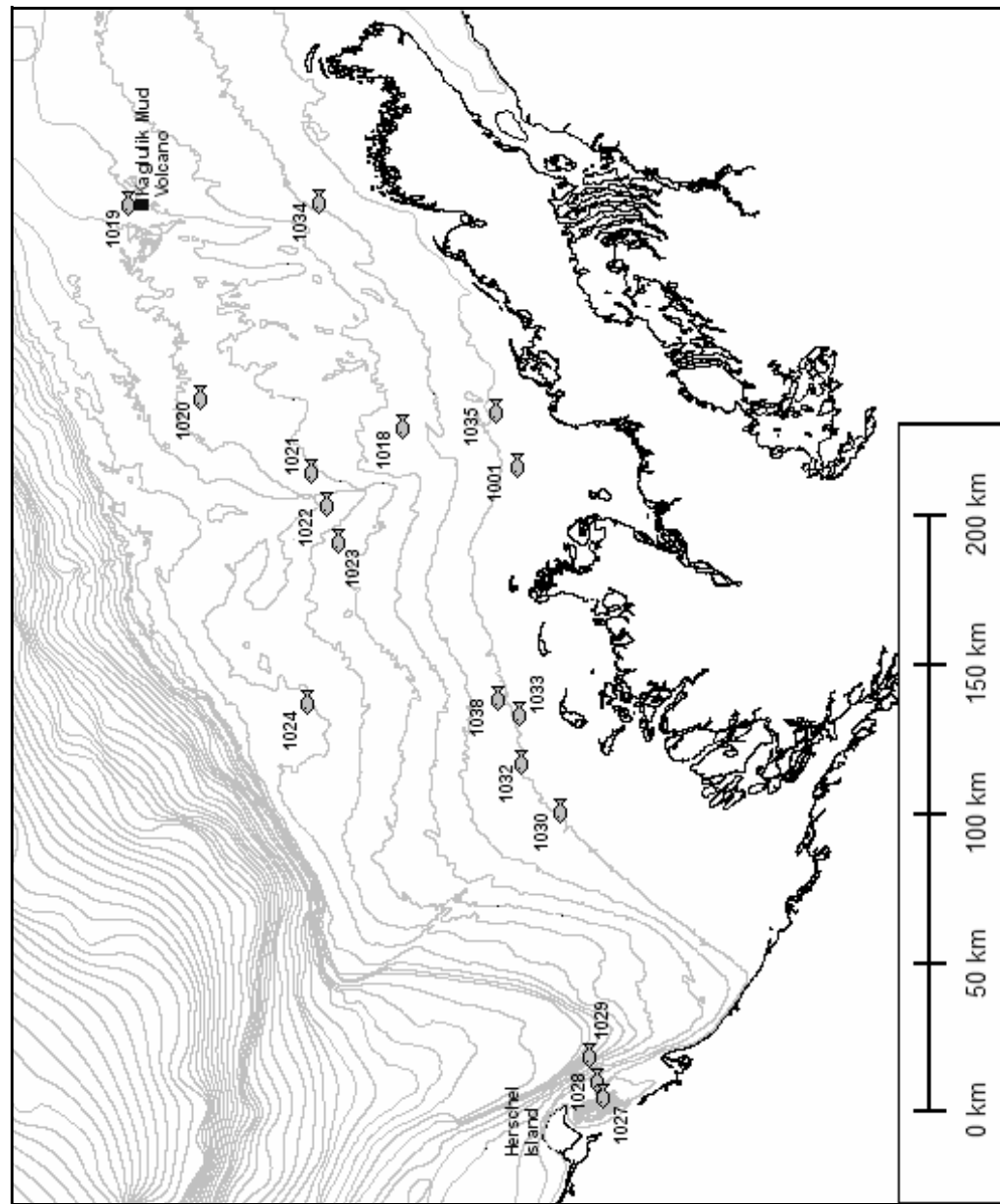


Figure 2. Locations of mid-water trawl deployments from CCGS *Nahidik*, August, 2004. Bathymetric contours represent 10m depth increments.

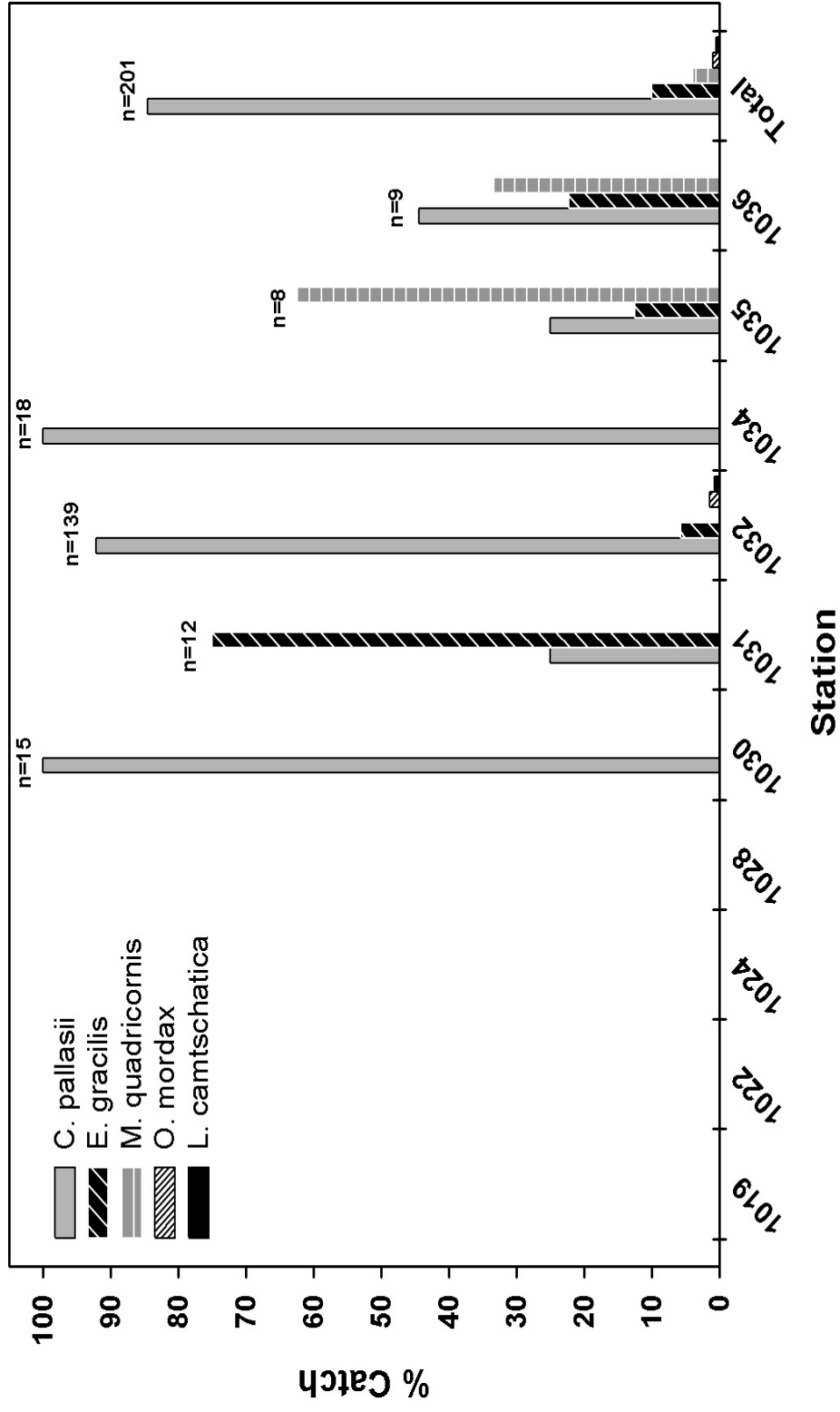


Figure 3. Relative species composition of multi-mesh gill net catches at stations sampled during leg 2 of the CCGS *Nahidik* cruise, August, 2004. Samples correspond to total catch of all species at the corresponding station. Refer to Table 1 for full station names.

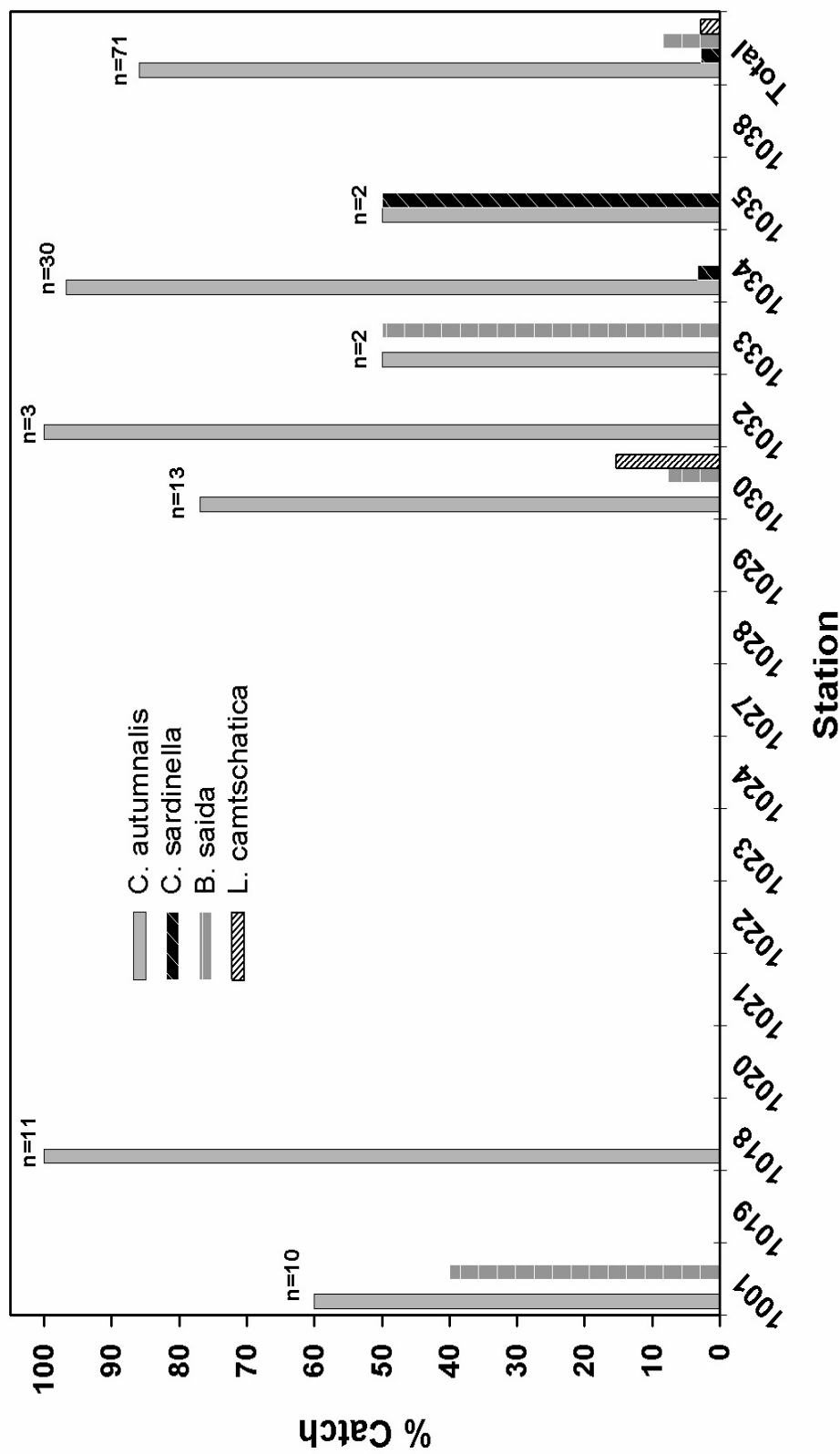


Figure 4. Relative species composition of adult and late juvenile fish captured in the mid-water trawl during leg 2 of the CCGS *Nahidik* cruise, August, 2004. Sample sizes correspond to total catch, including all species, at the corresponding station. Refer to Table 1 for full station names.

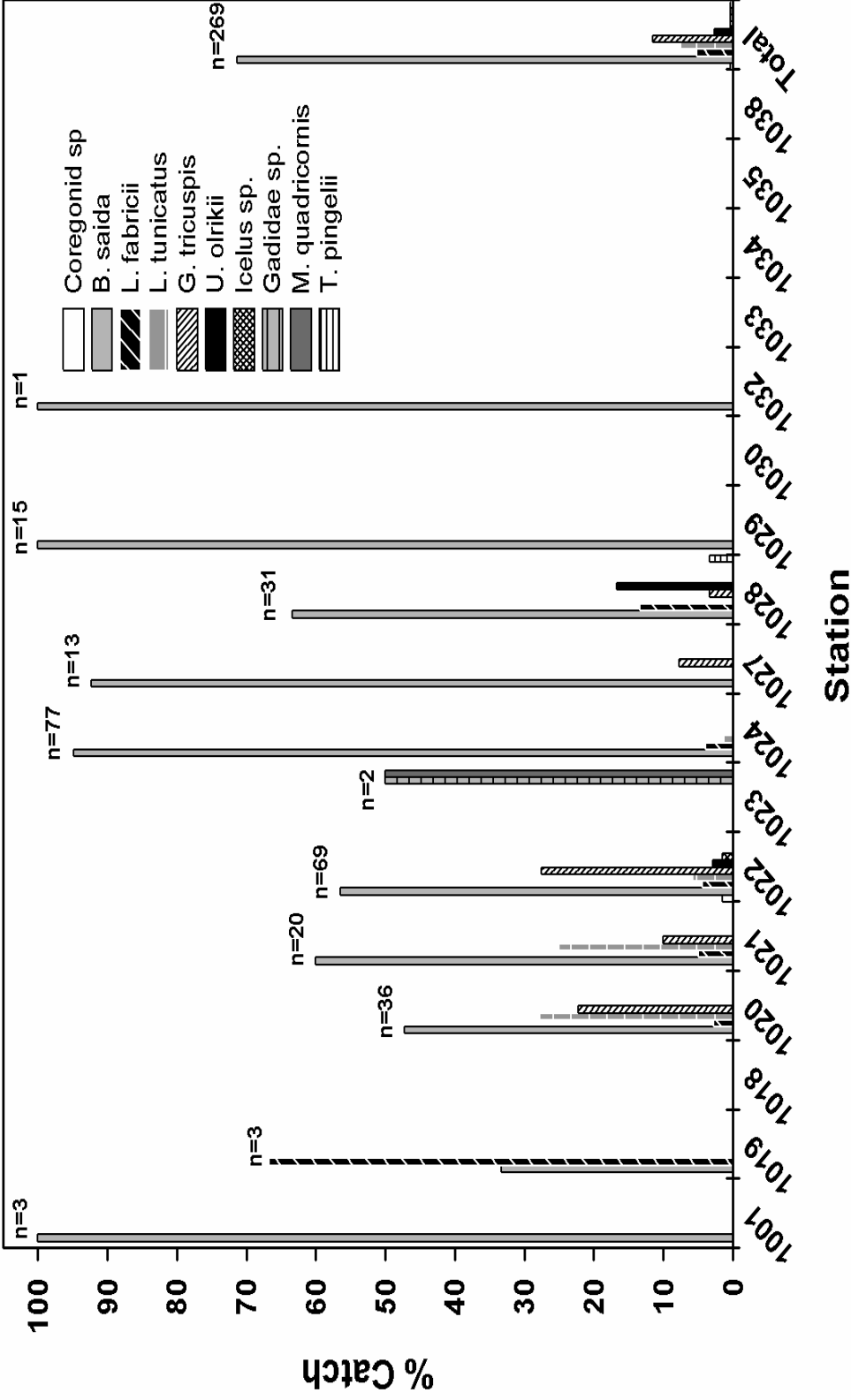


Figure 5. Relative species composition of larval and early juvenile fish captured in the mid-water trawl during leg 2 of the CCGS Nahidik cruise, August, 2004. Sample sizes correspond to total catch, including all species, at the corresponding station. Refer to Table 1 for full station names.

Appendix A. Species codes, scientific and common names of fish captured during CCGS *Nahidik* fishing program, August 2004. Species codes cross-reference to data presented in Appendices D - F.

Species Code	^a Scientific Name	Common Name
ARAF	<i>Ulcina olrikii</i> (Lütken, 1876)	Arctic alligatorfish
ARCD	<i>Boreogadus saida</i> (Lepechin, 1774)	Arctic cod
ARCS	<i>Coregonus autumnalis</i> (Pallas, 1776)	Arctic cisco
ARLP	<i>Lampetra camtschatica</i> (Tilesius, 1811)	Arctic lamprey
ARSS	<i>Gymnocanthus tricuspis</i> (Reinhardt, 1830)	Arctic staghorn sculpin
FHSC	<i>Myoxocephalus quadricornis</i> (Linnaeus, 1758)	fourhorn sculpin
GLSS	<i>Liparis fabricii</i> Krøyer, 1847	gelatinous seasnail
KESF	<i>Liparis tunicatus</i> Reinhardt, 1837	kelp snailfish
LSCS	<i>Coregonus sardinella</i> Valenciennes, 1848	least cisco
PCHR	<i>Clupea pallasii</i> Valenciennes, 1847	Pacific herring
RBSM	<i>Osmerus mordax</i> (Mitchill, 1814)	rainbow smelt
RISC	<i>Triglops pingelii</i> Reinhardt, 1837	ribbed sculpin
SFCD	<i>Eleginus gracilis</i> (Tilesius, 1810)	saffron cod
SPSC	<i>Icelus spatula</i> Gilbert & Burke, 1912	spatulate sculpin
n/a	<i>Coregoninae sp.</i>	unidentified Coregoninae
n/a	<i>Icelus sp.</i>	unidentified Icelus
n/a	<i>Gadidae sp.</i>	unidentified Gadidae

^a Scientific and common names sourced from Nelson et al. 2004.

Appendix B. Specific locations and deployment data for multi-mesh gill nets. Station identification (ID) is cross-referenced in Figure 1.

Date	Station ID	Gear Deployment ID	Deployment Location		Bottom Depth (m)	Set Depth (m)	Time In (UTC)	Time Out (UTC)	Total Soak Time
			Latitude	Longitude					
06-Aug-04	1019	GN01-04	70d52.91	130d50.01	70	70	14:40	17:05	2h25m
06-Aug-04	1019	GN02-04	70d52.91	130d50.01	70	2	14:50	17:15	2h25m
06-Aug-04	1019	GN03-04	70d52.20	130d51.64	45	45	15:25	17:50	2h25m
06-Aug-04	1019	GN04-04	70d52.20	130d51.64	45	2	15:53	18:00	2h07m
09-Aug-04	1022	GN05-04	70d20.74	133d41.45	59	59	15:50	19:06	3h16m
09-Aug-04	1022	GN06-04	70d20.55	133d41.59	59	59	14:20	17:25	3h05m
09-Aug-04	1022	GN07-04	70d20.46	133d41.63	59	2	15:30	18:50	3h20m
09-Aug-04	1022	GN08-04	70d20.80	133d41.91	59	^a 2-59	14:37	17:40	3h03m
10-Aug-04	1024	GN09-04	70d23.34	135d25.77	62	62	14:14	19:34	4h54m
10-Aug-04	1024	GN10-04	70d23.40	135d25.10	38	38	15:48	18:50	3h02m
10-Aug-04	1024	GN11-04	70d23.46	135d25.26	57	57	15:09	19:05	3h56m
10-Aug-04	1024	GN12-04	70d23.48	135d25.47	68	68	14:30	19:53	5h23m
11-Aug-04	1028	GN13-04	69d32.29	138d50.82	20	20	16:32	19:42	3h10m
11-Aug-04	1028	GN14-04	69d31.21	138d52.32	30	30	16:10	19:24	3h14m
12-Aug-04	1030	GN15-04	69d38.10	136d17.80	10	2	21:22	15:15	17h53m
12-Aug-04	1030	GN16-04	69d37.90	136d18.00	10	10	20:57	15:05	18h08m
12-Aug-04	1031	GN17-04	69d42.50	136d27.10	15	2	23:05	13:55	14h50m
12-Aug-04	1031	GN18-04	69d42.60	136d27.30	15	15	22:48	13:44	16h56m
16-Aug-04	1032	GN19-04	69d42.24	135d57.05	11	11	15:06	23:09	8h03m
16-Aug-04	1032	GN20-04	69d42.24	135d57.05	11	2	15:22	23:01	7h39m
16-Aug-04	1032	GN21-04	69d42.22	136d02.34	8	8	14:01	22:45	8h44m
16-Aug-04	1032	GN22-04	69d42.22	136d02.34	8	2	14:15	22:37	8h22m
18-Aug-04	1034	GN23-04	70d17.29	130d54.94	15	15	14:18	0:30	10h12m
18-Aug-04	1034	GN24-04	70d17.29	130d54.94	15	2	14:40	0:30	9h50m
18-Aug-04	1034	GN25-04	70d18.08	130d57.70	15	15	15:42	0:45	9h03m
19-Aug-04	1035	GN26-04	69d48.94	133d00.81	8	8	14:05	21:00	6h55m
19-Aug-04	1035	GN27-04	69d48.64	132d50.44	10	2	14:20	21:10	6h50m
19-Aug-04	1036	GN28-04	69d48.64	132d50.44	10	10	16:08	21:45	5h37m
19-Aug-04	1036	GN29-04	69d48.94	133d00.81	8	2	16:30	22:00	5h30m

^a Gill net set vertically in water column.

Appendix C: Specific locations and deployment data for the mid-water trawl. Station identification (ID) is cross-referenced in Figure 2.

Date	Station ID	Gear		Deployment Locations			Bottom		Ship				
		Deployment ID	Start Latitude	Start Longitude	End Latitude	End Longitude	Depth (m)	Set Depth (m)	Time In (UTC)	Time Out (UTC)	Speed (m/s)	Dist. (m)	Trawl Pattern
06-Aug-04	1019	TR02-04	70d52.54	130d49.59	70d52.66	130d51.71	30-70	Surf.	21:05	21:35	0.77	n/a	Drifting
06-Aug-04	1019	TR03-04	70d52.56	130d49.82	70d52.68	130d51.88	30-70	15	21:50	22:20	0.77	n/a	Drifting
05-Aug-04	1018	TR01-04	70d05.34	132d57.62	70d05.18	132d58.48	20	0-5	24:25	24:45	1.08-1.80	n/a	Test trawl
07-Aug-04	1020	TR04-04	70d40.75	132d37.07	70d41.45	132d38.46	15-45	Surf.	20:28	20:58	0.51-0.77	n/a	Drifting
07-Aug-04	1020	TR05-04	70d41.43	132d38.51	70d41.81	132d38.65	20-50	8	21:07	21:37	0.51-0.77	n/a	Drifting
07-Aug-04	1020	TR06-04	70d41.91	132d39.00	70d42.51	132d40.41	40-48	32	21:47	22:17	0.72	n/a	Drifting
08-Aug-04	1021	TR07-04	70d21.85	133d15.45	70d21.73	133d22.27	50	10	20:28	20:58	1.03	1690	Slow port turn
08-Aug-04	1021	TR08-04	70d21.80	133d20.79	70d22.01	133d21.20	40-50	Surf.	21:05	21:35	1.03	1590	Slow port turn
08-Aug-04	1021	TR09-04	70d22.01	133d21.27	70d21.95	133d21.058	40-50	31	21:41	22:11	1.03	1816	Slow port turn
09-Aug-04	1022	TR10-04	70d19.84	133d38.78	70d19.63	133d38.22	55-60	Surf.	14:10	14:40	1.80	3280	Slow port turn
09-Aug-04	1022	TR11-04	70d19.37	133d38.65	70d18.97	133d37.66	60	10	14:55	15:25	1.54	3274	Slow port turn
09-Aug-04	1022	TR12-04	70d19.37	133d36.71	70d19.28	133d37.61	60	44-50	15:50	16:20	1.29	2075	Slow port turn
09-Aug-04	1023	TR13-04	70d17.85	133d57.88	70d17.63	133d57.95	48	Surf.	21:45	22:15	1.75	3600	Slow port turn
09-Aug-04	1023	TR14-04	70d17.44	133d57.66	70d17.31	133d57.22	48	5-10	22:22	22:52	1.54-1.75	2991	Slow port turn
10-Aug-04	1024	TR15-04	70d23.04	135d24.51	70d23.11	135d23.33	60	50	16:52	17:22	1.03	1940	Slow port turn
10-Aug-04	1024	TR16-04	70d23.16	135d24.36	70d23.24	135d24.45	45-65	25	18:45	19:15	0.87	1610	Slow port turn
10-Aug-04	1024	TR17-04	70d23.37	135d24.58	70d23.51	135d24.95	40-65	Surf.	19:22	19:52	1.03	1884	Slow port turn
11-Aug-04	1027	TR18-04	69d27.59	138d45.51	69d27.44	138d45.46	66	10	19:05	19:35	1.03	2258	Slow port turn
11-Aug-04	1028	TR19-04	69d28.45	138d43.32	69d28.25	138d43.82	15	10	19:55	20:25	1.80	2316	Slow port turn
11-Aug-04	1029	TR20-04	69d30.48	138d24.70	69d29.82	138d23.59	60	15	23:45	24:15	1.03	1460	Straight line, 1 Loop
13-Aug-04	1030	TR21-04	69d37.79	136d18.30	69d37.84	136d19.66	8-10	0-2	15:52	16:22	1.80	3170	Slow port turn
13-Aug-04	1030	TR22-04	69d37.08	136d20.59	69d37.33	136d20.99	10	0-2	16:32	17:02	1.80	3010	Slow port turn
15-Aug-04	1001	TR23-04	69d44.96	133d20.97	69d45.10	133d20.56	9	0-2	23:45	24:15	1.29	2200	Slow port turn
16-Aug-04	1032	TR24-04	69d44.21	135d55.13	69d44.21	135d54.66	6-9	0-2	17:23	17:53	1.29-1.54	2151	Slow port turn
16-Aug-04	1032	TR25-04	69d45.23	135d55.94	69d44.90	135d55.11	10	0-2	18:08	18:38	1.29-1.54	2975	Slow port turn
16-Aug-04	1033	TR26-04	69d45.15	135d29.60	69d44.95	135d29.81	10	0-2	20:50	21:20	1.29-1.54	1930	Slow port turn
18-Aug-04	1034	TR27-04	70d18.24	130d57.38	70d18.23	130d56.47	15	0-2	17:50	18:20	1.29-1.54	2409	Slow port turn
18-Aug-04	1034	TR28-04	70d18.30	130d56.65	70d18.27	130d56.62	15	5	18:25	18:55	1.29-1.54	2300	Slow port turn
19-Aug-04	1035	TR29-04	69d48.48	132d51.57	69d48.45	132d52.16	7-10	0-2	22:29	22:59	1.29	2322	Slow port turn

Appendix C. Continued...

Date	Station ID	Gear Deployment ID	Deployment Locations				Bottom		Set Depth (m)	Time In (UTC)	Time Out (UTC)	Ship Speed (knots)	Dist. (m)	Trawl Pattern
			Start Latitude	Start Longitude	End Latitude	End Longitude	Depth (m)	Depth (m)						
20-Aug-04	1038	TR30-04	69d49.06	135d20.08	69d48.89	135d21.95	12	5	17:10	17:40	0.77	n/a	Drifting	
20-Aug-04	1038	TR31-04	69d48.84	135d22.25	69d48.32	135d22.27	12	0-2	17:45	18:15	1.29	2360	Slow port turn	

Appendix D. Basic biological data for fish caught in multi-mesh gill nets. Fish identification (ID) codes correspond to individual fish.

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Sex		Wt (g)	FL (mm)	TL (mm)	Gonad Wt (g)	GSI ^a	MQC ^b
				1=M	2=F						
1022	SPSC ^c	n/a	16	n/a	2.9	n/a	69	n/a	n/a	n/a	n/a
1030	PCHR	GN15-04	30	1	72.9	198	n/a	0.5	0.69	10	10
1030	PCHR	GN15-04	31	1	74.6	206	n/a	0.5	0.67	6	6
1030	PCHR	GN15-04	32	2	77.3	198	n/a	1.2	1.55	5	5
1030	PCHR	GN15-04	33	1	99.2	219	n/a	1.9	1.92	7	7
1030	PCHR	GN15-04	34	n/a	n/a	198	n/a	n/a	n/a	n/a	n/a
1030	PCHR	GN15-04	35	1	87.3	208	n/a	1.7	1.95	10	10
1030	PCHR	GN15-04	36	1	96.3	214	n/a	4.4	4.57	9	9
1030	PCHR	GN15-04	37	1	84	209	n/a	1.4	1.67	10	10
1030	PCHR	GN15-04	38	n/a	54.7	185	n/a	0.1	0.18	0	0
1030	PCHR	GN16-04	44	1	92.6	208	n/a	4.2	4.54	9	9
1030	PCHR	GN16-04	45	1	81.8	203	n/a	3.8	4.65	9	9
1030	PCHR	GN16-04	46	2	82.1	206	n/a	1.1	1.34	5	5
1030	PCHR	GN16-04	47	n/a	72.7	198	n/a	0.9	1.24	11	11
1030	PCHR	GN16-04	48	1	65.8	195	n/a	0.2	0.3	6	6
1030	PCHR	GN16-04	49	1	83.9	206	n/a	0.4	0.48	6	6
1031	PCHR	GN18-04	65	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1031	PCHR	GN17-04	67	1	84.6	204	n/a	<0.1	n/a	6	6
1031	PCHR	GN17-04	68	2	110.9	214	n/a	1.8	1.62	5	5
1031	SFCD	GN17-04	69	1	213.8	n/a	300	10	4.68	10	10
1031	SFCD	GN17-04	70	2	277.1	n/a	328	n/a		5	5
1031	SFCD	GN17-04	71	2	289.2	n/a	340	9.1	3.15	5	5
1031	SFCD	GN17-04	72	2	231.6	n/a	312	n/a	n/a	5	5
1031	SFCD	GN17-04	73	1	252.6	n/a	319	n/a	n/a	10	10
1031	SFCD	GN17-04	74	2	245.8	n/a	334	n/a	n/a	10	10
1031	SFCD	GN17-04	75	1	215	n/a	312	20.6	9.58	7	7
1031	SFCD	GN17-04	81	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1031	SFCD	GN17-04	85	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1032	ARLP	GN21-04	153	n/a	6.9	n/a	184	n/a	n/a	n/a	n/a
1032	PCHR	GN22-04	96	1	86.8	203	n/a	2.8	3.23	10	10
1032	PCHR	GN22-04	98	1	80.2	202	n/a	2.8	3.49	9	9
1032	PCHR	GN22-04	99	2	85.3	209	n/a	1.6	1.88	4	4
1032	PCHR	GN22-04	100	1	75.5	201	n/a	2.9	3.84	10	10
1032	PCHR	GN22-04	101	2	78.6	201	n/a	1.6	2.04	4	4
1032	PCHR	GN22-04	102	2	70.8	199	n/a	2.8	3.95	1	1
1032	PCHR	GN22-04	103	n/a	89	201	n/a	n/a	n/a	n/a	n/a
1032	PCHR	GN22-04	104	2	84.2	208	n/a	1.4	1.66	5	5
1032	PCHR	GN22-04	105	2	69.7	200	n/a	1.5	2.15	5	5
1032	PCHR	GN22-04	106	1	97.5	215	n/a	6.6	6.77	9	9
1032	PCHR	GN22-04	107	n/a	64	191	n/a	n/a	n/a	n/a	n/a
1032	PCHR	GN22-04	108	n/a	81	198	n/a	n/a	n/a	n/a	n/a
1032	PCHR	GN22-04	109	1	85.2	203	n/a	2	2.35	10	10
1032	PCHR	GN22-04	110	1	73.1	200	n/a	0.2	0.27	6	6

Appendix D. Continued...

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Sex		Wt (g)	FL (mm)	TL (mm)	Gonad Wt (g)	GSI ^a	MQC ^b
				1=M	2=F						
1032	PCHR	GN22-04	111	n/a		100	217	n/a	n/a	n/a	n/a
1032	PCHR	GN22-04	112	n/a		90	209	n/a	n/a	n/a	n/a
1032	PCHR	GN22-04	113	1		97.2	213	n/a	0.6	0.62	9
1032	PCHR	GN22-04	114	n/a		89	207	n/a	n/a	n/a	n/a
1032	PCHR	GN22-04	115	n/a		83	202	n/a	n/a	n/a	n/a
1032	PCHR	GN22-04	116	n/a		98	217	n/a	n/a	n/a	n/a
1032	PCHR	GN22-04	117	n/a		79	198	n/a	n/a	n/a	n/a
1032	PCHR	GN22-04	118	n/a		87	212	n/a	n/a	n/a	n/a
1032	PCHR	GN22-04	119	n/a		77	204	n/a	n/a	n/a	n/a
1032	PCHR	GN22-04	120	n/a		70	194	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	126	n/a		91	213	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	127	n/a		111	218	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	128	n/a		106	216	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	129	1		103.3	214	n/a	7.2	6.97	9
1032	PCHR	GN21-04	130	n/a		154	244	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	131	n/a		72	200	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	132	1		81.5	208	n/a	0.2	0.25	6
1032	PCHR	GN21-04	133	n/a		68	198	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	134	2		93.8	212	n/a	1.4	1.49	1
1032	PCHR	GN21-04	135	n/a		78	208	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	136	n/a		105	214	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	137	1		78.2	199	n/a	0.9	1.15	10
1032	PCHR	GN21-04	138	2		96.8	212	n/a	1.8	1.86	5
1032	PCHR	GN21-04	139	n/a		106	218	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	140	n/a		78	197	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	141	n/a		85	207	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	142	n/a		76	197	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	143	n/a		79	203	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	146	1		93.9	210	n/a	4.1	4.37	9
1032	PCHR	GN21-04	147	1		96.4	209	n/a	3.4	3.53	9
1032	PCHR	GN21-04	148	n/a		73	199	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	149	n/a		80	199	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	150	n/a		108	220	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	151	n/a		97	205	n/a	n/a	n/a	n/a
1032	PCHR	GN21-04	152	2		98.1	212	n/a	1.8	1.83	5
1032	PCHR	GN20-04	158	n/a		83.3	210	n/a	0.3	0.36	0
1032	PCHR	GN20-04	159	2		77.9	198	n/a	1.6	2.05	5
1032	PCHR	GN20-04	160	1		73.7	197	n/a	1.3	1.76	10
1032	PCHR	GN20-04	163	1		94.3	211	n/a	5.4	5.73	10
1032	PCHR	GN20-04	164	1		93.9	203	n/a	3.9	4.15	10
1032	PCHR	GN22-04	300	2		85.3	200	n/a	1.3	1.52	5
1032	PCHR	GN22-04	301	2		77.1	195	n/a	1.1	1.43	5
1032	PCHR	GN22-04	302	1		98.3	211	n/a	0.7	0.71	10
1032	PCHR	GN22-04	303	2		78.8	194	n/a	0.7	0.89	5
1032	PCHR	GN22-04	304	2		91.4	203	n/a	1.5	1.64	4
1032	PCHR	GN22-04	305	1		72.9	194	n/a	2.8	3.84	9

Appendix D. Continued...

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Sex		Wt (g)	FL (mm)	TL (mm)	Gonad Wt (g)	GSI ^a	MQC ^b
				1=M	2=F						
1032	PCHR	GN22-04	306	2	96	201	n/a	2.1	2.19	5	
1032	PCHR	GN22-04	307	1	93.8	202	n/a	4.8	5.12	9	
1032	PCHR	GN22-04	308	1	82.6	199	n/a	0.7	0.85	10	
1032	PCHR	GN22-04	309	1	68.9	186	n/a	1.9	2.76	9	
1032	PCHR	GN22-04	310	1	93.9	202	n/a	5.3	5.64	10	
1032	PCHR	GN22-04	311	1	86.4	201	n/a	3.1	3.59	9	
1032	PCHR	GN22-04	312	1	94.7	201	n/a	6.6	6.97	9	
1032	PCHR	GN22-04	313	1	76.2	194	n/a	0.3	0.39	9	
1032	PCHR	GN22-04	314	2	67.8	189	n/a	1.1	1.62	5	
1032	PCHR	GN22-04	315	2	86.3	196	n/a	1.9	2.2	4	
1032	PCHR	GN22-04	316	2	91.5	207	n/a	1.5	1.64	5	
1032	PCHR	GN22-04	317	1	80.8	202	n/a	<0.1	n/a	6	
1032	PCHR	GN22-04	318	1	84.2	202	n/a	4.1	4.87	9	
1032	PCHR	GN22-04	319	2	81.5	193	n/a	1.8	2.21	5	
1032	PCHR	GN22-04	320	1	71	191	n/a	2.1	2.96	10	
1032	PCHR	GN22-04	321	2	80	201	n/a	1.1	1.38	5	
1032	PCHR	GN22-04	322	1	63.7	187	n/a	1.8	2.83	10	
1032	PCHR	GN22-04	323	1	82	199	n/a	2.6	3.17	9	
1032	PCHR	GN22-04	324	1	76.1	199	n/a	1.1	1.45	7	
1032	PCHR	GN22-04	325	1	95.4	207	n/a	4.4	4.61	9	
1032	PCHR	GN22-04	326	2	78.8	204	n/a	1.5	1.9	5	
1032	PCHR	GN22-04	327	2	75.6	199	n/a	1.1	1.46	5	
1032	PCHR	GN21-04	328	2	81.8	202	n/a	0.7	0.86	1	
1032	PCHR	GN21-04	329	1	61.2	194	n/a	<0.1	n/a	6	
1032	PCHR	GN21-04	330	2	67.9	n/a	n/a	1.4	2.06	5	
1032	PCHR	GN21-04	331	1	83.9	n/a	n/a	1.4	1.67	10	
1032	PCHR	GN21-04	332	2	90.7	205	n/a	1.9	2.09	5	
1032	PCHR	GN21-04	333	1	80.9	194	n/a	0.7	0.87	9	
1032	PCHR	GN21-04	334	2	87.7	202	n/a	1.8	2.05	5	
1032	PCHR	GN21-04	335	2	69	189	n/a	1	1.45	5	
1032	PCHR	GN21-04	336	1	78.6	194	n/a	1.2	1.53	10	
1032	PCHR	GN21-04	337	1	101.3	212	n/a	7.2	7.11	10	
1032	PCHR	GN21-04	338	2	64.4	190	n/a	0.6	0.93	1	
1032	PCHR	GN21-04	339	1	92.9	207	n/a	0.9	0.97	10	
1032	PCHR	GN21-04	340	2	90.6	n/a	n/a	0.6	0.66	1	
1032	PCHR	GN21-04	341	1	78.5	199	n/a	<0.1	n/a	6	
1032	PCHR	GN21-04	342	2	79.5	194	n/a	1.5	1.89	5	
1032	PCHR	GN21-04	343	2	104	212	n/a	1.9	1.83	5	
1032	PCHR	GN21-04	344	1	85.5	201	n/a	3.6	4.21	9	
1032	PCHR	GN21-04	345	1	93.5	204	n/a	2.6	2.78	9	
1032	PCHR	GN21-04	346	1	68.3	185	n/a	0.5	0.73	9	
1032	PCHR	GN21-04	347	1	71.2	192	n/a	1.7	2.39	9	
1032	PCHR	GN21-04	348	2	102.2	210	n/a	2.2	2.15	5	
1032	PCHR	GN21-04	349	1	94.8	208	n/a	1.4	1.48	9	
1032	PCHR	GN21-04	350	1	76	191	n/a	0.7	0.92	9	

Appendix D. Continued...

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Sex		Wt (g)	FL (mm)	TL (mm)	Gonad Wt (g)	GSI ^a	MQC ^b
				1=M	2=F						
1032	PCHR	GN21-04	351	2	71.4	186	n/a	1.1	1.54	5	
1032	PCHR	GN21-04	352	1	119.4	222	n/a	7	5.86	10	
1032	PCHR	GN21-04	353	2	82.9	205	n/a	0.8	0.97	5	
1032	PCHR	GN21-04	354	1	91.8	203	n/a	0.2	0.22	6	
1032	PCHR	GN21-04	355	2	85.9	n/a	n/a	1.4	1.63	5	
1032	PCHR	GN21-04	356	2	82	201	n/a	0.6	0.73	1	
1032	PCHR	GN21-04	357	2	74.4	197	n/a	1.2	1.61	5	
1032	PCHR	GN21-04	358	2	85.6	198	n/a	2.2	2.57	5	
1032	PCHR	GN21-04	359	1	75.6	204	n/a	0.1	0.13	6	
1032	PCHR	GN21-04	360	1	99.1	200	n/a	4.4	4.44	9	
1032	PCHR	GN21-04	361	1	67.5	n/a	n/a	0.9	1.33	9	
1032	PCHR	GN21-04	362	2	75.1	194	n/a	1.4	1.86	5	
1032	PCHR	GN21-04	363	1	91.1	198	n/a	3.4	3.73	9	
1032	PCHR	GN21-04	364	1	97.9	202	n/a	7.2	7.35	10	
1032	PCHR	GN21-04	365	2	87.7	205	n/a	0.7	0.8	5	
1032	PCHR	GN21-04	366	2	94	204	n/a	2.2	2.34	5	
1032	PCHR	GN21-04	367	1	77.9	197	n/a	1.9	2.44	10	
1032	PCHR	GN21-04	368	1	78.8	197	n/a	1.6	2.03	10	
1032	PCHR	GN21-04	369	2	74.7	191	n/a	1.2	1.61	5	
1032	PCHR	GN21-04	370	1	76	192	n/a	2.5	3.29	9	
1032	PCHR	GN21-04	371	1	84.6	n/a	n/a	1.3	1.54	9	
1032	PCHR	GN21-04	372	2	79.2	202	n/a	1.2	1.52	5	
1032	PCHR	GN21-04	373	1	93.5	201	n/a	6.3	6.74	10	
1032	RBSM	GN22-04	125	n/a	24.1	156	n/a	n/a	n/a	n/a	
1032	RBSM	GN20-04	157	2	74.4	218	n/a	1.4	1.88	5	
1032	SFCD	GN22-04	121	1	261.9	n/a	311	28.6	10.92	7	
1032	SFCD	GN22-04	122	1	226.2	n/a	308	n/a	n/a	10	
1032	SFCD	GN22-04	123	1	225.1	n/a	303	17.8	7.91	10	
1032	SFCD	GN22-04	124	1	292.4	n/a	327	27.4	9.37	7	
1032	SFCD	GN21-04	154	2	201.4	n/a	313	n/a	n/a	5	
1032	SFCD	GN21-04	155	1	195.8	n/a	292	13.3	6.79	7	
1032	SFCD	GN21-04	156	1	218.2	n/a	302	n/a	n/a	7	
1032	SFCD	GN19-04	162	2	n/a	n/a	321	n/a	n/a	n/a	
1034	PCHR	GN24-04	197	1	90.6	199	n/a	4.6	5.08	10	
1034	PCHR	GN24-04	198	1	81	205	n/a	2.1	2.59	9	
1034	PCHR	GN24-04	199	2	108.5	216	n/a	1.6	1.47	5	
1034	PCHR	GN24-04	200	2	66	186	n/a	8.2	12.42	5	
1034	PCHR	GN24-04	201	1	64.1	300	n/a	0.4	0.62	6	
1034	PCHR	GN24-04	202	1	79.2	199	n/a	2.2	2.78	10	
1034	PCHR	GN24-04	203	2	71.6	203	n/a	0.5	0.7	1	
1034	PCHR	GN24-04	204	1	67.2	n/a	n/a	0.2	0.3	6	
1034	PCHR	GN24-04	205	2	n/a	203	n/a	1.2	n/a	5	
1034	PCHR	GN24-04	206	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1034	PCHR	GN24-04	207	n/a	n/a	194	n/a	n/a	n/a	n/a	
1034	PCHR	GN24-04	208	n/a	n/a	197	n/a	n/a	n/a	n/a	

Appendix D. Continued...

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Sex		Wt (g)	FL (mm)	TL (mm)	Gonad Wt (g)	GSI ^a	MQC ^b
				1=M	2=F						
1034	PCHR	GN23-04	209	1	67.6	200	n/a	<0.1	n/a	6	
1034	PCHR	GN23-04	210	1	68.8	195	n/a	1.6	2.33	10	
1034	PCHR	GN23-04	211	2	69.1	194	n/a	1.3	1.88	5	
1034	PCHR	GN23-04	212	1	82.8	211	n/a	0.1	0.12	6	
1034	PCHR	GN23-04	213	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1034	PCHR	GN25-04	214	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
1035	FHSC	GN26-04	215	1	102.6	n/a	247	n/a	n/a	n/a	
1035	FHSC	GN26-04	216	2	55.4	n/a	189	n/a	n/a	n/a	
1035	FHSC	GN26-04	217	1	19.2	n/a	143	n/a	n/a	n/a	
1035	SFCD	GN27-04	218	2	235.6	n/a	320	6.1	2.59	5	
1036	FHSC	GN28-04	221	2	146.5	n/a	253	n/a	n/a	n/a	
1036	FHSC	GN28-04	222	2	48.7	n/a	184	n/a	n/a	n/a	
1036	FHSC	GN28-04	223	2	61.6	n/a	203	n/a	n/a	n/a	
1036	FHSC	GN28-04	224	1	34.6	n/a	166	n/a	n/a	n/a	
1036	FHSC	GN28-04	225	2	58.4	n/a	199	n/a	n/a	n/a	
1036	PCHR	GN28-04	219	2	70.3	206	n/a	0.5	0.71	1	
1036	PCHR	GN28-04	220	1	102.6	217	n/a	3.1	3.02	10	
1036	PCHR	GN29-04	228	1	89.7	216	n/a	0.7	0.78	10	
1036	PCHR	GN29-04	229	1	91.1	207	n/a	2.1	2.31	10	
1036	PCHR	GN29-04	230	2	96.8	212	n/a	1.5	1.55	5	
1036	PCHR	GN29-04	231	2	61.9	193	n/a	0.4	0.65	1	
1036	SFCD	GN29-04	226	2	233.7	n/a	315	3.9	1.67	5	
1036	SFCD	GN29-04	227	1	215.1	n/a	296	n/a	n/a	7	

^a GSI = Gonadal Somatic Index; ^b MQC = Maturity Quality Code; ^c Specimen collected in box core sample.

Appendix E. Basic data for adult and late juvenile fish caught in the mid-water trawl. Fish identification (ID) codes correspond to individual fish.

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Sex 1=M 2=F	Wt (g)	FL (mm)	TL (mm)	Gonad Wt (g)	GSI ^a	MQC ^b
1001	ARCD	TR23-04	87	1	5.6	98	n/a	n/a	n/a	n/a
1001	ARCD	TR23-04	88	1	6.2	98	n/a	n/a	n/a	n/a
1001	ARCD	TR23-04	89	n/a	4.4	91	n/a	n/a	n/a	n/a
1001	ARCD	TR23-04	90	1	3.4	82	n/a	n/a	n/a	n/a
1001	ARCS	TR08-04	12	2	2.7	69	n/a	n/a	n/a	1
1001	ARCS	TR08-04	13	n/a	2.9	70	n/a	n/a	n/a	n/a
1001	ARCS	TR08-04	14	2	2.8	68	n/a	n/a	n/a	1
1001	ARCS	TR08-04	15	2	2.7	68	n/a	n/a	n/a	1
1001	ARCS	TR23-04	91	2	3.9	77	n/a	n/a	n/a	1
1001	ARCS	TR23-04	92	n/a	4.9	84	n/a	n/a	n/a	n/a
1018	ARCS	TR01-04	TT1	2	2	63	n/a	0.1	5	1
1018	ARCS	TR01-04	TT2	n/a	4.9	89	n/a	n/a	n/a	n/a
1018	ARCS	TR01-04	TT3	n/a	2.9	75	n/a	n/a	n/a	n/a
1018	ARCS	TR01-04	TT4	n/a	2.2	65	n/a	n/a	n/a	n/a
1018	ARCS	TR01-04	TT5	n/a	3.5	77	n/a	n/a	n/a	n/a
1018	ARCS	TR01-04	TT6	2	2.1	66	n/a	n/a	n/a	1
1018	ARCS	TR01-04	TT7	2	2.3	67	n/a	n/a	n/a	n/a
1018	ARCS	TR01-04	TT8	n/a	1.8	64	n/a	n/a	n/a	n/a
1018	ARCS	TR01-04	TT9	n/a	1.7	63	n/a	n/a	n/a	n/a
1018	ARCS	TR01-04	TT10	n/a	1.1	55	n/a	n/a	n/a	n/a
1018	ARCS	TR01-04	TT11	n/a	1.2	57	n/a	n/a	n/a	1
1030	ARCD	TR21-04	19	n/a	n/a	98	n/a	n/a	n/a	n/a
1030	ARCS	TR21-04	20	n/a	3.3	75	n/a	n/a	n/a	n/a
1030	ARCS	TR21-04	21	1	1.9	63	n/a	n/a	n/a	6
1030	ARCS	TR21-04	22	n/a	1.4	56	n/a	n/a	n/a	n/a
1030	ARCS	TR22-04	23	2	2.2	64	n/a	n/a	n/a	1
1030	ARCS	TR22-04	24	1	3.8	78	n/a	n/a	n/a	6
1030	ARCS	TR22-04	25	2	3	74	n/a	n/a	n/a	1
1030	ARCS	TR22-04	26	n/a	2	64	n/a	n/a	n/a	n/a
1030	ARCS	TR22-04	27	1	4	80	n/a	n/a	n/a	6
1030	ARCS	TR22-04	28	1	2.9	74	n/a	n/a	n/a	6
1030	ARCS	TR22-04	29	2	2.4	68	n/a	n/a	n/a	1
1030	ARLP	TR21-04	17	n/a	11.6	n/a	208	n/a	n/a	n/a
1030	ARLP	TR21-04	18	n/a	8.5	n/a	183	n/a	n/a	n/a
1032	ARCS	TR25-04	93	2	4.6	85	n/a	n/a	n/a	1
1032	ARCS	TR25-04	94	2	3.4	74	n/a	n/a	n/a	1
1032	ARCS	TR25-04	95	2	3.9	76	n/a	n/a	n/a	1
1033	ARCD	TR26-04	165	n/a	3.2	77	n/a	n/a	n/a	n/a
1033	ARCS	TR26-04	166	n/a	2.5	70	n/a	n/a	n/a	n/a
1034	ARCS	TR27-04	167	2	4.3	81	n/a	n/a	n/a	1
1034	ARCS	TR27-04	168	n/a	2.1	64	n/a	n/a	n/a	n/a
1034	ARCS	TR27-04	169	2	4.1	80	n/a	n/a	n/a	1
1034	ARCS	TR27-04	170	2	4.7	84	n/a	n/a	n/a	1

Appendix E. Continued...

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Sex 1=M 2=F	Wt (g)	FL (mm)	TL (mm)	Gonad Wt (g)	GSI ^a	MQC ^b
1034	ARCS	TR27-04	171	2	3.2	72	n/a	n/a	n/a	1
1034	ARCS	TR27-04	172	n/a	2.2	65	n/a	n/a	n/a	n/a
1034	ARCS	TR27-04	173	2	2.3	67	n/a	n/a	n/a	1
1034	ARCS	TR27-04	174	n/a	3.4	75	n/a	n/a	n/a	n/a
1034	ARCS	TR27-04	175	n/a	3.2	72	n/a	n/a	n/a	n/a
1034	ARCS	TR27-04	176	2	3.7	75	n/a	n/a	n/a	1
1034	ARCS	TR27-04	177	1	3.5	75	n/a	n/a	n/a	6
1034	ARCS	TR27-04	178	n/a	1.5	58	n/a	n/a	n/a	n/a
1034	ARCS	TR27-04	179	n/a	2	64	n/a	n/a	n/a	n/a
1034	ARCS	TR27-04	180	2	2.7	70	n/a	n/a	n/a	1
1034	ARCS	TR27-04	181	2	2.5	68	n/a	n/a	n/a	1
1034	ARCS	TR27-04	182	2	2.7	71	n/a	n/a	n/a	1
1034	ARCS	TR27-04	183	2	4.4	80	n/a	n/a	n/a	1
1034	ARCS	TR27-04	184	2	3.7	76	n/a	n/a	n/a	1
1034	ARCS	TR27-04	185	2	3.7	75	n/a	n/a	n/a	1
1034	ARCS	TR27-04	186	2	3.9	77	n/a	n/a	n/a	1
1034	ARCS	TR27-04	187	n/a	1.2	55	n/a	n/a	n/a	n/a
1034	ARCS	TR27-04	188	n/a	3.1	74	n/a	n/a	n/a	n/a
1034	ARCS	TR27-04	189	1	3.8	79	n/a	n/a	n/a	6
1034	ARCS	TR27-04	190	2	2.6	68	n/a	n/a	n/a	1
1034	ARCS	TR27-04	191	2	2.7	71	n/a	n/a	n/a	1
1034	ARCS	TR27-04	192	2	3.4	76	n/a	n/a	n/a	1
1034	ARCS	TR27-04	193	n/a	2.3	66	n/a	n/a	n/a	n/a
1034	ARCS	TR27-04	194	2	3.6	77	n/a	n/a	n/a	1
1034	ARCS	TR27-04	195	2	3.3	76	n/a	n/a	n/a	1
1034	LSCS	TR27-04	196	n/a	3.2	76	n/a	n/a	n/a	n/a
1035	ARCS	TR29-04	233	n/a	n/a	85	n/a	n/a	n/a	n/a
1035	LSCS	TR29-04	232	n/a	4.4	81	n/a	n/a	n/a	n/a

^a GSI = Gonadal Somatic Index; ^b Maturity Quality Code.

Appendix F. Basic data for larval and early juvenile fish caught in the mid-water trawl.
 Fish identification (ID) codes correspond to individual fish.

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Length (mm)		Wet Weight (g)
				Standard	Total	
1001	ARCD	TR23-04	218	43.5	47	0.5811
1001	ARCD	TR23-04	219	40	43.5	0.502
1001	ARCD	TR23-04	220	43	46.5	0.5303
1019	ARCD	TR02-04	393	33	35.5	0.2465
1019	GLSS	TR02-04	394	29	31	0.1552
1019	GLSS	TR02-04	395	29.5	32	0.1474
1020	KESF	TR04-04	239	26.5	30	0.3998
1020	KESF	TR04-04	240	24	27	0.3025
1020	KESF	TR04-04	241	28	32	0.434
1020	KESF	TR04-04	242	26	30	0.3278
1020	KESF	TR04-04	243	25	28	0.3438
1020	KESF	TR04-04	244	28	30.5	0.3402
1020	KESF	TR04-04	245	32	35.5	0.7287
1020	KESF	TR04-04	246	27	30	0.3801
1020	KESF	TR04-04	247	22	25	0.2132
1020	KESF	TR04-04	248	25	28	0.302
1020	GLSS	TR04-04	249	28.5	33	0.2081
1020	ARSS	TR04-04	250	27	31	0.3218
1020	ARSS	TR04-04	251	29	34	0.4008
1020	ARSS	TR04-04	252	25	28.5	0.3192
1020	ARSS	TR04-04	253	24	28	0.3962
1020	ARSS	TR04-04	254	26	30	0.2093
1020	ARSS	TR04-04	255	22	25	0.1929
1020	ARSS	TR04-04	256	26	30.5	0.215
1020	ARSS	TR04-04	257	25	29	0.1237
1020	ARCD	TR04-04	258	24.5	26	0.2556
1020	ARCD	TR04-04	259	27	29	0.125
1020	ARCD	TR04-04	260	28	30.5	0.1747
1020	ARCD	TR04-04	261	26	28	0.1071
1020	ARCD	TR04-04	262	25	-	0.1073
1020	ARCD	TR04-04	263	26	27	0.1154
1020	ARCD	TR04-04	264	22	23	0.0639
1020	ARCD	TR04-04	265	21	22	0.0471
1020	ARCD	TR04-04	266	28	30	0.154
1020	ARCD	TR04-04	267	29	31	0.1655
1020	ARCD	TR04-04	268	26	27.5	0.0974
1020	ARCD	TR04-04	269	26.5	28.5	0.0921
1020	ARCD	TR04-04	270	23.5	24.5	0.0968
1020	ARCD	TR04-04	271	25	-	0.0908
1020	ARCD	TR04-04	272	32	34	0.2333
1020	ARCD	TR04-04	273	25	-	0.0881
1020	ARCD	TR04-04	274	31.5	34	0.2226
1021	ARCD	TR09-04	195	31.5	34.5	0.172

Appendix F. Continued...

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Length (mm)		Wet Weight (g)
				Standard	Total	
1021	ARCD	TR09-04	196	32.5	35	0.1662
1021	ARCD	TR09-04	197	36	39	0.2739
1021	ARCD	TR09-04	198	32	34.5	0.1668
1021	ARCD	TR09-04	199	32	34.5	0.1895
1021	ARCD	TR09-04	200	37	40	0.2723
1021	ARCD	TR09-04	201	35	38	0.2814
1021	ARCD	TR09-04	202	29	31.5	0.1172
1021	ARCD	TR09-04	203	37.5	40.5	0.3368
1021	ARCD	TR09-04	204	28	30.5	0.1469
1021	ARSS	TR09-04	205	33	37.5	0.3088
1021	ARSS	TR08-04	206	24	28	0.1683
1021	ARCD	TR08-04	207	32	35	0.2105
1021	ARCD	TR08-04	208	30	32.5	0.1607
1021	KESF	TR08-04	209	24	28	0.3331
1021	KESF	TR08-04	210	26.5	20.5	0.4297
1021	KESF	TR08-04	211	28	32	0.4929
1021	KESF	TR08-04	212	28	32	0.4413
1021	KESF	TR08-04	213	25	28	0.3404
1021	GLSS	TR08-04	214	21	24.5	0.0976
1022	ARCD	TR12-04	127	31	34	0.1827
1022	ARCD	TR12-04	128	31	34	0.2067
1022	ARCD	TR12-04	129	35	38	0.2618
1022	ARCD	TR12-04	130	38.5	41.5	0.3944
1022	ARCD	TR12-04	131	32	35	0.2126
1022	ARCD	TR12-04	132	37	40.5	0.3233
1022	ARCD	TR12-04	133	31	34	0.1557
1022	ARCD	TR12-04	134	31	34	0.15
1022	ARCD	TR12-04	135	30	32.5	0.1574
1022	ARCD	TR12-04	136	30	33	0.1323
1022	ARCD	TR12-04	137	35	37.5	0.2584
1022	ARCD	TR12-04	138	29.5	32	0.1322
1022	ARCD	TR12-04	139	31	34	0.1723
1022	n/a ^a	TR12-04	140	21.5	25	0.0964
1022	GLSS	TR12-04	141	28	31.5	0.157
1022	ARSS	TR12-04	142	28	32.5	0.3132
1022	ARSS	TR12-04	143	23	26.5	0.1648
1022	ARSS	TR12-04	144	25	29.5	0.1994
1022	KESF	TR12-04	145	27	30.5	0.3473
1022	KESF	TR12-04	146	26	28.5	0.2154
1022	GLSS	TR12-04	147	22	25	0.0867
1022	ARSS	TR11-04	150	22	28	0.1648
1022	ARSS	TR11-04	151	26	31	0.2333
1022	ARSS	TR11-04	152	27.5	32.5	0.2652
1022	ARSS	TR11-04	153	25	30	0.211
1022	ARSS	TR11-04	154	29	34.5	0.3037

Appendix F. Continued...

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Length (mm)		Wet Weight (g)
				Standard	Total	
1022	ARSS	TR11-04	155	26	30.5	0.2088
1022	ARSS	TR11-04	156	25	29.5	0.2085
1022	ARSS	TR11-04	157	27.5	32	0.3174
1022	ARSS	TR11-04	158	25.5	30	0.2424
1022	ARSS	TR11-04	159	25	30	0.1954
1022	ARSS	TR11-04	160	25	29.5	0.2092
1022	ARSS	TR11-04	161	26	31	0.2111
1022	ARSS	TR11-04	162	26.5	31.5	0.2668
1022	ARSS	TR11-04	163	25	29.5	0.1941
1022	ARSS	TR11-04	164	24	28.5	0.2147
1022	KESF	TR11-04	165	32	35	0.6105
1022	KESF	TR11-04	166	30	34	0.5856
1022	ARSS	TR11-04	167	37	42	0.4791
1022	ARCD	TR11-04	168	34.5	37.5	0.2564
1022	ARCD	TR11-04	169	31.5	34	0.1564
1022	ARCD	TR11-04	170	36	39	0.2892
1022	ARCD	TR11-04	171	32	35	0.2041
1022	ARCD	TR11-04	172	36	39	0.2708
1022	ARCD	TR11-04	173	31	33.5	0.1415
1022	ARCD	TR11-04	174	33.5	36	0.1891
1022	ARCD	TR11-04	175	35.5	38	0.2704
1022	ARCD	TR11-04	176	36	39	0.2409
1022	ARCD	TR11-04	177	31	33.5	0.1735
1022	ARCD	TR11-04	178	34	36.5	0.227
1022	ARCD	TR11-04	179	35	38	0.2287
1022	ARCD	TR11-04	180	36	39	0.2806
1022	ARCD	TR11-04	181	31.5	34	0.17
1022	ARCD	TR11-04	182	32	34	0.1753
1022	ARCD	TR11-04	183	32	34	0.1756
1022	ARCD	TR11-04	184	31	33	0.1403
1022	ARCD	TR11-04	185	29	31	0.1272
1022	ARCD	TR11-04	186	29	31	0.0909
1022	ARCD	TR11-04	187	28	30	0.0927
1022	ARCD	TR11-04	188	32	35	0.1734
1022	ARCD	TR11-04	189	30	32.5	0.1248
1022	ARCD	TR11-04	190	37	41	0.3137
1022	ARCD	TR11-04	191	30	32	0.1297
1022	ARCD	TR11-04	192	30	32.5	0.1364
1022	ARAF	TR11-04	193	24.5	28.5	0.0636
1022	ARAF	TR11-04	194	27.5	32	0.1063
1022	GLSS	TR10-04	215	37.5	41.5	0.3987
1022	ARCD	TR10-04	216	33	36.5	0.1745
1022	n/a ^b	TR10-04	217	32.5	38	0.2995
1023	n/a ^c	TR13-04	148	32.5	35	0.1531
1023	FHSC	TR13-04	149	33	39	0.572

Appendix F. Continued...

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Length (mm)		Wet Weight (g)
				Standard	Total	
1024	ARCD	TR15-04	275	40	43.5	0.4715
1024	ARCD	TR15-04	276	28	30.5	0.1219
1024	ARCD	TR15-04	277	37	40.5	0.3233
1024	ARCD	TR15-04	278	33	36	0.2451
1024	ARCD	TR15-04	279	32	35	0.2295
1024	ARCD	TR15-04	280	40.5	44	0.4987
1024	ARCD	TR15-04	281	42	46	0.5955
1024	ARCD	TR15-04	282	36	39	0.2961
1024	ARCD	TR15-04	283	37	41	0.3344
1024	ARCD	TR15-04	284	44	48	0.6594
1024	ARCD	TR15-04	285	34	37.5	0.2498
1024	ARCD	TR15-04	286	35	38.5	0.3035
1024	ARCD	TR15-04	287	35	38.5	0.2844
1024	ARCD	TR15-04	288	39.5	43.5	0.4468
1024	ARCD	TR15-04	289	30	32.5	0.1759
1024	ARCD	TR15-04	290	35	38.5	0.2744
1024	ARCD	TR15-04	291	31	33	0.1662
1024	ARCD	TR15-04	292	37	41	0.372
1024	ARCD	TR15-04	293	35	38	0.2635
1024	ARCD	TR15-04	294	33.5	37	0.2361
1024	ARCD	TR15-04	295	35	38.5	0.295
1024	ARCD	TR15-04	296	29.5	32	0.1392
1024	ARCD	TR15-04	297	30	-	0.1432
1024	ARCD	TR15-04	298	31.5	34.5	0.1579
1024	ARCD	TR15-04	299	25	26.5	0.099
1024	ARCD	TR15-04	300	29	31.5	0.1709
1024	ARCD	TR15-04	301	40.5	45	0.5215
1024	ARCD	TR15-04	302	33.5	36.5	0.2484
1024	ARCD	TR15-04	303	31	34	0.1667
1024	ARCD	TR15-04	304	32.5	35	0.1896
1024	ARCD	TR15-04	305	33.5	36.5	0.256
1024	ARCD	TR15-04	306	34	37	0.2865
1024	ARCD	TR15-04	307	29	32	0.1725
1024	ARCD	TR16-04	308	35.5	38.5	0.2651
1024	ARCD	TR16-04	309	30	32.5	0.1398
1024	ARCD	TR16-04	310	30.5	33	0.1541
1024	ARCD	TR16-04	311	31	34	0.1446
1024	ARCD	TR16-04	312	31.5	34.5	0.1814
1024	ARCD	TR16-04	313	37	41	0.333
1024	ARCD	TR16-04	314	31.5	34	0.1667
1024	ARCD	TR16-04	315	33.5	36.5	0.2275
1024	ARCD	TR16-04	316	28	30.5	0.1273
1024	ARCD	TR16-04	317	36.5	40	0.2757
1024	ARCD	TR16-04	318	32	35	0.1788
1024	ARCD	TR16-04	319	36.5	39	0.2494

Appendix F. Continued...

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Length (mm)		Wet Weight (g)
				Standard	Total	
1024	ARCD	TR16-04	320	33.5	36.5	0.21
1024	ARCD	TR16-04	321	25	27	0.0724
1024	ARCD	TR16-04	322	30	32	0.1441
1024	ARCD	TR16-04	323	31	33	0.1429
1024	ARCD	TR16-04	324	35	37.5	0.2045
1024	ARCD	TR16-04	325	33.5	36.5	0.2168
1024	ARCD	TR16-04	326	28	30	0.1066
1024	ARCD	TR16-04	327	39	42.5	0.3092
1024	ARCD	TR16-04	328	26	28	0.0763
1024	ARCD	TR16-04	329	33	35.5	0.1841
1024	ARCD	TR16-04	330	35	38	0.2801
1024	ARCD	TR16-04	331	28.5	31	0.1316
1024	ARCD	TR16-04	332	35	38	0.2435
1024	ARCD	TR16-04	333	28.5	31	0.1283
1024	ARCD	TR16-04	334	26	27.5	0.0899
1024	ARCD	TR16-04	335	31	34	0.1495
1024	ARCD	TR16-04	336	35	38.5	0.2283
1024	ARCD	TR16-04	337	29.5	31.5	0.1307
1024	ARCD	TR16-04	338	31	34.5	0.159
1024	ARCD	TR16-04	339	25	27	0.0728
1024	ARCD	TR16-04	340	25	27	0.0718
1024	ARCD	TR16-04	341	29	31.5	0.148
1024	KESF	TR16-04	342	26	30	0.3724
1024	GLSS	TR16-04	343	27.5	31	0.1582
1024	GLSS	TR16-04	344	23.5	26	0.0864
1024	ARCD	TR17-04	345	32	34	0.1743
1024	ARCD	TR17-04	346	28	30.5	0.1307
1024	ARCD	TR17-04	347	32	34.5	0.1908
1024	ARCD	TR17-04	348	27.5	30	0.1096
1024	ARCD	TR17-04	349	27	29	0.1122
1024	ARCD	TR17-04	350	29	31.5	0.1166
1024	GLSS	TR17-04	351	32	36	0.2901
1028	ARSS	TR19-04	221	25.5	30.5	0.2554
1028	ARCD	TR19-04	222	32	35	0.1962
1028	ARCD	TR19-04	223	37	40	0.3685
1028	ARCD	TR19-04	224	34	37	0.3131
1028	ARCD	TR19-04	225	29	31	0.1536
1027	ARCD	TR18-04	226	38.5	42	0.4494
1027	ARCD	TR18-04	227	48	51	0.9617
1027	ARCD	TR18-04	228	40	42	0.5373
1027	ARCD	TR18-04	229	41.5	45.5	0.5663
1027	ARCD	TR18-04	230	43.5	46	0.681
1027	ARCD	TR18-04	231	57	61	1.6671
1027	ARCD	TR18-04	232	43	47	0.6268
1027	ARCD	TR18-04	233	35	37.5	0.3117

Appendix F. Continued...

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Length (mm)		Wet Weight (g)
				Standard	Total	
1027	ARCD	TR18-04	234	40	43	0.5007
1027	ARCD	TR18-04	235	37	40.5	0.3556
1027	ARCD	TR18-04	236	44.5	48.5	0.7944
1027	ARCD	TR18-04	237	34	37	0.2988
1027	ARSS	TR18-04	238	27	32	0.2758
1029	ARCD	TR20-04	352	43	48	0.5487
1029	ARCD	TR20-04	353	34.5	37.5	0.2566
1029	ARCD	TR20-04	354	32.5	35	0.1951
1029	ARCD	TR20-04	355	40	43.5	0.3953
1029	ARCD	TR20-04	356	37.5	40.5	0.3207
1029	ARCD	TR20-04	357	36	40	0.2947
1029	ARCD	TR20-04	358	30	32.5	0.1874
1029	ARCD	TR20-04	359	41	45	0.4677
1029	ARCD	TR20-04	360	34	37.5	0.2737
1029	ARCD	TR20-04	361	43.5	47	0.5476
1029	ARCD	TR20-04	362	30	32	0.1612
1029	ARCD	TR20-04	363	32	35	0.2199
1029	ARCD	TR20-04	364	33	36	0.2533
1029	ARCD	TR20-04	365	31.5	34	0.1995
1029	ARCD	TR20-04	366	30	32.5	0.1724
1028	ARCD	TR20-04	367	27.5	30	0.1102
1028	ARCD	TR20-04	368	36.5	40	0.3202
1028	ARCD	TR20-04	369	29.5	31.5	0.1396
1028	ARCD	TR20-04	370	41	45	0.4954
1028	ARCD	TR20-04	371	31	34	0.1971
1028	ARAF	TR20-04	372	25	29	0.0764
1028	ARAF	TR20-04	373	25	29.5	0.0761
1028	ARAF	TR20-04	374	25	29	0.0707
1028	ARAF	TR20-04	375	24.5	29	0.0712
1028	ARAF	TR20-04	376	22	26	0.0434
1028	GLSS	TR20-04	377	28	30.5	0.2113
1028	GLSS	TR20-04	378	28	30.5	0.1899
1028	GLSS	TR20-04	379	24	26	0.1123
1028	GLSS	TR20-04	380	33	36.5	0.2843
1028	RISC	TR20-04	381	42	47	0.7432
1028	ARCD	TR20-04	383	41.5	45	0.4978
1028	ARCD	TR20-04	384	39	42	0.3537
1028	ARCD	TR20-04	385	38	42	0.3538
1028	ARCD	TR20-04	386	37.5	41	0.3266
1028	ARCD	TR20-04	387	39	43	0.4007
1028	ARCD	TR20-04	388	35	38	0.2541
1028	ARCD	TR20-04	389	38	41	0.3677
1028	ARCD	TR20-04	390	28.5	30.5	0.1452
1028	ARCD	TR20-04	391	39.5	43	0.4438
1028	ARCD	TR20-04	392	38.5	41.5	0.386

Appendix F. Continued...

Station ID	Species Code	Gear Deploy. ID	Fish ID (N-04-X)	Length (mm)		Wet Weight (g)
				Standard	Total	
1032	ARCD	TR24-04	382	39.5	43	0.2986

^a Unidentified Icelus species; ^b Unidentified Coregonine species; ^c Unidentified Gadidae species.