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RECRUITMENT OF JUVENILE FLATFISHES IN ALASKA: HABITAT PREFERENCE NEAR KODIAK ISLAND

Volume I. Final Study Report

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ABSTRACT

The habitat, distribution and abundance of juvenile flaffishes within the inshore waters of the Kodiak Archipelago, Alaska are examined during this *ongoing* interannual study. The overall objectives of this project are to (1) identify nursery grounds for juvenile flaffishes, (2) characterize. those areas according to physical and biological parameters, and (3) develop indices of relative abundance for as many species as the data allow. We describe distribution for ages-0 and - 1 flaffishes of each species versus location, depth distance within (+) or outside (-) a bay, temperature, salinity, sediment type, percents gravel sand, mud, organic content and carbonate content in the substrate, tidal stage and sunrise.

Data collected during 1991 and 1992 suggest the following conceptual models of flatfish distribution based primarily on depth and substrate. Age-O rock sole are found predominantly in water depths less than 50 m on sand or mixed sand substrate within 10 km of bay mouths. Age-O flathead sole are found predominantly in water depths greater than 40 m on mud or mixed mud substrate throughout bays. Age-0 Pacific halibut are found predominantly in water depths less than 40 m on mixed sand substrate near or outside mouths of bays. Age-l yellowfin sole are found predominantly in water depths less than 40 m on mixed substrate at upper reaches of bays. Based on graphical analyses, these conceptual models appear to appropriately describe Chiniak Bay collections during August 1993 and August 1994.

EXECUTIVES UMMARY OF RESULTS

This study was an interannual exarnination of the habitat parameters, distribution and abundance of juvenile flatfishes near Kodiak Island, Alaska (Figure 1), which focused on identifying flatfish nursery habitat and developing an index ofjuvenile recruitment. Five cruises were conducted in association with this study, including cruises in Chiniak Bay during 1993 (KI9301 and KI9302) and 1994 (KI9401 and KI9403, and a cruise in Kazakof Bay during 1994 (KI9402).

During prior funding, samples were collected in 1991 and 1992 within all major bays of Kodiak Island. The 1991 and 1992 trawl samples and physical data formed the basis of conceptual models of age-0 flatfish nursery habitat around Kodiak Island (Norcross et al. 1995A). Those models were modified slightly by the results of this study, as follows. Both age-0 and age-l arrowtooth flounder are found in water depth >20 m on sandy mud and muddy sand near the bay mouth. Age-O flathead sole are predominantly in water depths greater than 20 m on mud or mixed mud substrate throughout bays. Age-l flathead sole are found in greatest abundance in depths >20 m on sandy mud and muddy sand throughout the bay. Age-O Pacific halibut are found predominantly in water depths less than 40 m on mixed sand substrate near or outside mouths of bays. Age-1 yellowfin sole are found predominantly in water depths less than 40 m on mixed substrate at upper reaches of bays. Age-O rock sole are found predominantly in water depths less than 50 m on sand or mixed sand substrate within 10 km of bay mouths. Age-l rock sole are mainly in depths <40 m on sandy substrates throughout the bay.

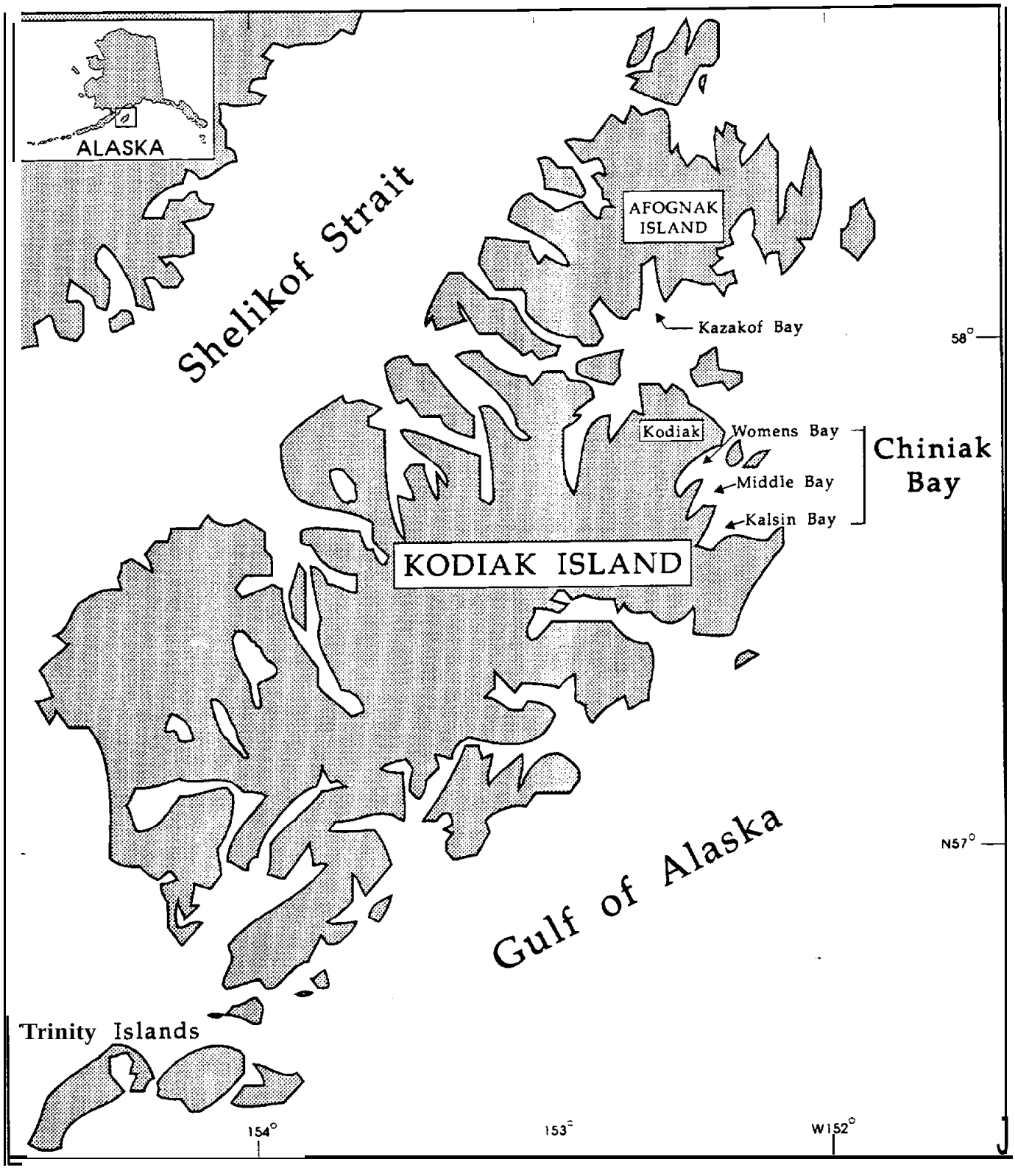


Figure 1. Regions of sample collection around Kodiak and Afognak Islands during 1993 and 1994.

Chiniak Bay/August 1993 (KI9301)

The cumulative CPUE of eleven species of flatfish captured at the 28 stations sampled during August 1993 within Cbiniak Bay (Womens, Middle and Kalsin Bays: KI9301) was 2,798, for an average CPUE of 100±101 flatfishes/station. In order of decreasing abundance, flaffishes include flathead sole (N=1342), rock sole (N=959), yellowfin sole (N=221), Pacific halibut (N=129), arrowtootb flounder (N=69), butter sole (N=39), Alaska plaice (N=16), starry flounder (N=11), English sole (N=8), Dover sole (N=3), and sand sole (N=3). Age-0 was the numerically dominant age class collected of arrowtooth flounder, Pacific halibut, rock sole, and English sole. Age-l fishes were caught most often of flathead sole, yellowfin sole, Alaska plaice and sand sole. Older specimens dominated catches of Dover sole, starry flounder and butter sole.

Arrowtooth flounder of ages-0 and -1 were distributed with similar patterns during KI9301. Age-0 arrowtooth flounder (N=46) were caught at 12% of stations. The mean number of age-0 fish/tow was 1.X2.3, and the largest catch was 12 fish/tow. Age-l arrowtooth flounder (N=18) were caught at 21% of stations. The mean number of age-l fish/tow was 0.5±1.5, and the largest catch was eight fish/tow. Age-0 fish were caught between 20 and 80 m and age-l fish were caught from 30 to 80 m water depth. Both ages were collected from outside to the head of the bay. Age-O fish were caught primarily ova sandy mud and gravel, while age-l fish were nearly always caught over sandy mud.

Ages-O and -1 flathead sole were distributed similarly during KI9301. Age-O flathead sole (N=520) were caught at 43% of stations. The mean number of age-0 fish/tow was 13.4±38.4, and the largest catch was 166 fish/tow. Age-l flathead sole (N=611) were caught at 61% of stations. The mean number of age-l fish/tow was 15.8±31.4, and the largest catch was 122 fish/tow. Both ages were captured in increasing abundances from 10 to 70 m. Age-O fish increased in abundance from outside to the head of the bay, but this pattern was not apparent for age-l flathead sole. Age-O flathead sole were primarily caught on sandy mud, while age-l fish were caught on sandy mud and muddy sand. They increased in abundance with increasing percent mud in the substrate.

Age-0 Pacific halibut (N=126) were caught at 46% of stations during KI9301. The mean number of age-0 fish/tow was 5.5±10.6, and the largest catch was 60 fish/tow. During August 1993, age-0 Pacific halibut (N=126) were all caught in <30 m depth, from 3 km inside the bay to the head. They were caught mainly over sand and muddy sandy gravel, but a few fish were caught on sandy mud and muddy sand. They were slightly more abundant with increasing percent sand in the substrate.

Age-1 Pacific halibut (N=2) were caught at 11% of stations during KI9301. The mean number of age-l fish/tow was 0.1±0.3, and the largest catch was one fish/tow.

No age-0 yellowfin sole were caught during KI9301. Age-l yellowfin sole (N=130) were caught at 50% of stations. The mean number of age-l fish/tow was 4.8±12.4, and the largest catch was 65 fish/tow. Age-l yellowfin sole were caught only in depths <30 m, from 3 km inside to the head of the bay, from 9.8 to 12.0°C and 31.2 to 32.4 PSU. They were caught primarily over muddy sandy gravel and muddy sand, with lesser abundances over sand and sandy mud. Age-l yellowfin sole increased abundance as the proportional amount of sand increased in the substrate, and decreased with increasingly muddy substrate.

Ages-0 and -1 rock sole were sometimes captured in the same strata during KI9301. Age-0 rock sole (N-687) were caught at 54% of stations. The mean number of age-0 fish/tow was 39.563.8, and the largest catch was 276 fish/tow. Age-1 rock sole (N=200) were caught at 64% of stations. The mean number of age-l fish/tow was 6.6±1 1.3, and the largest catch was 61 fish/tow. Both age-0 (N=687) and age-l (N=200) rock sole were caught from 0 to 70 m depth. Age-O fish were

most abundant deeper than 30 m, and age-l fish was most abundant between 20 and 40 m. Age-O rock sole were caught in increasing abundances from the mouth to the head of bays, while age-l rock sole were most abundant near the mouth. Age-O rock sole were most abundant over muddy sandy gravel, sand and muddy sand; age-l fish were most abundant over gravel. Both age-0 and age-l rock sole decreased slightly in abundance as the proportional amount of mud in the substrate increased.

Chiniak Bay/November 1993 (KI9302)

The cumulative CPUE of nine species of flaffish from 10 stations in Womens and Middle Bays during KI9302 was 968, for an average CPUE of 97±99 flatfishes/station. In order of decreasing abundance, these fishes include rock sole (N=352), flathead sole (N=306), yellowfin sole (N=140), arrow-tooth flounder (N=130), Pacific halibut (N=18), butter sole (N=1 1), Alaska plaice (N=5), Dover sole (N=3), starry flounder (N=2). During November 1993 catches of age-0 flatfishes were most prevalent for arrowtooth flounder, flathead sole, Pacific halibut and rock sole. Age-l fishes were most numerically dominant of Dover sole, yellowfin sole and Alaska plaice. Age-22 fishes were captured most often of starry flounder and butter sole.

Ages-O and - 1 arrowtooth flounder were distributed in a siiar manner during KI9302. Age-0 arrowtooth flounder (N=116) were caught at 40% of stations. The mean number of age-0 fish/tow was 11.6a23.4, and the largest catch was 67 fish/tow. Age-1 arrowtooth flounder (N=13) were caught at 20% of stations. The mean number of age-l fish/tow was 1.3±2.8, and the largest catch was eight fish/tow. Arrow-tooth flounder of both ages were only captured in water >30 m, near the mouth of Middle Bay.

Age-O flathead sole (N=123) were caught at 70% of stations during KI9302. The mean number of age-0 fish/tow was 12.3±26.2, and the largest catch was 85 fish/tow. Age-O flathead sole (N= 123) were captured at all depths examined and at all distances from the mouth of the bay.

Age-l flathead sole (N=119) were caught at 20% of stations during KI9302. The mean number of age-1 fish/tow was 11.9±25.6, and the largest catch was 70 fish/tow. Age-l flathead sole were only captured in water >50 m, near the mouth of Middle Bay.

Age-O Pacific halibut (N=15) were caught at 70% of stations during KI9302. The mean number of age-0 fish/tow was 1.5±1.8, and the largest catch was sii fish/tow. Age-O halibut were caught at all stations within bays, in depths less than 40 m

Age-l halibut (N=3) were caught at 10% of stations during KI9302. The mean number of age-l fish/tow was 0.3±1. 1, and the largest catch was three fish/tow. Age-l halibut were caught at one station near the mouth of Middle Bay, in 30 - 40 m depth.

Age-0 yellow-h sole (N=9) were caught at 30% of stations during KI9302. The mean number of age-0 fish/tow was 0.9±1.7, and the largest catch was 4 fish/tow. Age-O yellowfin sole (N=9) were caught in water <20 m deep, well within Middle Bay.

Age-l yellow-fin sole (N=80) were caught at 70% of stations during KI9302. The mean number of age-l fish/tow was 8.0±12.0, and the largest catch was 31 fish/tow. Age-l yellow-fin sole (N=80) were caught from 10 to 60 m depth, from outside to well within the bay. The largest catches of age-l fish were just outside the mouth of Middle Bay.

Ages-0 and-l rock sole were distributed similarly during KI9302. Age-O rock sole (N=255) were caught at 90% of stations during KI9302. The mean number of age-0 fish/tow was 25.5±28.1, and the largest catch was 86 fish/tow. Age-l rock sole (N=71) were caught at 100% of stations during KI9302. The mean number of age-l fish/tow was 7.1±5.4, and the largest catch was 21 fish/tow.

Age-O rock sole were caught at ail sampled depths from outside the mouth to the head of the bay, but were most abundant in less than 40 m water depth. inside the bay. Age-l rock sole were caught at every station during KI9302. They were most abundant in water <20 m, well within the bay.

Chiniak Bay/June 1994 (KI9401)

The cumulative flatfish CPUE from 12 stations in Womens, Middle and Kalsii Bays during KI9401 was 989, for an average CPUE of 82±56 flatfishes/station. In order of decreasing abundance, the nine species of flatfish collected during KI9401 were flathead sole (N=426), rock sole (N=354), yellowfin sole (N=135), Pacific halibut (N=55), butter sole (N=12), arrowtooth flounder (N=2), rex sole (N=2), Alaska plaice (N=1) and sand sole (N=1). During June 1994, catches of age-0 flatfishes were most prevalent only for Pacific halibut, while age-l fishes were most numerically dominant of rex sole, flathead sole and rock sole. Age-22 fishes were captured most often of yellowfin sole, butter sole, Alaska plaice and sand sole. One age-0 and one age-≥2 arrowtooth flounder were caught.

Age-O arrowtooth flounder (N= 1) were caught at 8% of stations during KI940 1, for a mean of 0.1±0.3 fish/tow. The age-0 fish was caught in 20 - 30 m, near the head of Kalsin Bay.

Ages-O and -1 flathead sole were captured in the same strata during KI9401. A single age-0 was caught during KI9401 (8% of stations during KI9401, 0.1±0.3 fish/tow). This fish was caught at the head of Kalsii Bay, in <20 m depth. Age-l flathead sole (N=265) were caught at 58% of stations during KI9401. The mean number of age-l fish/tow was 22.1S7.7, and the largest catch was 114 fish/tow. The single age-0 flathead sole was caught at the heed of Kalsin Bay, in <20 m depth. Age-l flathead sole (N=265) were primarily caught well within Kalsin Bays, in depths 20 - 60 m.

Age-O halibut (N=54) were caught at 75% of stations during KI9401. The mean number of age-0 fish/tow was 4.515.6, and the largest catch was 19 fish/tow. They were only caught in water <30 m deep and on the flood tide. No age-1 halibut were caught.

Age-O yellowfin sole (N=60) were caught at 58% of stations during KI9401. The mean number of age-0 fish/tow was 5.M8.8, and the largest catch was 31 fish/tow. Age-O yellowfin sole were only captured in <30 m water depth, from 3 km within to the head of the bay. Age-l yellowfin de could not be separated from older fishes, and are not discussed.

Age-O rock sole (N=57) were caught at 42% of stations during KI9401. The mean number of age-0 fish/tow was 4.8±8.4, and the largest catch was 26 fish/tow. Age-O rock sole were all caught in less than 40 m water depth, near the head of Kalsin Bay.

Age-l rock sole (N=172) were caught at 67% of stations during KI9401. The mean number of age-l fish/tow was 14.4±15.5, and the largest catch was 41 fish/tow. Age-1 rock sole were caught in <30 m water depth, in large abundances from the mouth to the heads of bays.

Chiniak Bay/August 1994 (KI9403)

The cumulative CPUE of 12 flatfish species at 27 stations examined during August 1994 sampling in Middle and Kalsii Bays (KI9403) was 4486, for an average CPUE of 166±182 flatfishes/station. In decreasing order of abundance, these species include rock sole (N=2,461), flathead sole (N=901), arrowtooth flounder (N=678), Pacific halibut (N=284), yellowfin sole (N=76), butter sole (N=36), English sole (29), starry flounder (N=7), sand sole (N=5), Alaska plaice (N=4), rex sole (N=3) and Dover sole (N=2). During August 1994 age-0 was the numerically dominant age class collected of arrowtooth flounder, rex sole, Pacific halibut, rock sole, and English sole. Age-l fishes were caught most often of flathead sole and yellowfin sole. Age-0 and age-l were equally dominant

age classes for starry flounder. Older specimens (age-≥2) dominated the catch of Dover sole, butter sole and sand sole. Equal numbers of age- 1 and age-≥2 Alaska plaice were captured.

Age-0 arrowtooth flounder (N=663) were caught at 55.6% of stations during KI9403. The mean number of age-0 fish/tow was 12.31t32.4, and the largest catch was 157 fish/tow. Arrowtooth flounder was the second most abundant age-0 fish. Age-O arrowtooth flounder were found in all regions of the bays (-2.5 to 6.5 km from the bay mouth), from 20 to 100 m water depth and on all substrates sampled.

Age-l arrowtooth flounder (N=3) were caught at 11.1% of stations during KI9403. The mean number of age-l fish/tow was 0.1±0.3, and the largest catch was two fish/tow. Age-l arrowtooth flounder were only found outside the mouth of the bays (- 1.8 to -2.4 km), from 50 to 80 m water depth and on sand or muddy sand substrate.

Age-O (N=358) and age-l (N=385) flathead sole were found in nearly equal abundance, and the distribution parameters of age-0 and age-l fish were nearly identical. Both ages were caught at 44.4% of stations during KI9403. The mean number of age-0 fish/tow was 10.6±41.1, and the largest catch was 271 fish/tow; the mean number of age-l fish/tow was 9.9±24.5, and the largest catch was 135 fish/tow. Flathead were found in waters 10 - 90 m, in increasing abundance to 55 m depth and in decreasing abundance with further increasing depth. They were -2.4 to 7.7 km from the mouth of the bay, but neither age was collected at the head of either Kalsin or Middle Bay. Age-O and age-l flathead were found on muddy sand and sandy mud substrate, with abundances generally increasing with increasing percent mud and decreasing with percent sand.

Age-O Pacific halibut (N= 282) were caught at 5 1.9% of stations during KI9403. The mean number of age-0 fish/tow was 20.3±18.2, and the largest catch was 68 fish/tow. Ages-O and -1 (N=1) Pacific halibut were found only in depths under 50 m, primarily under 30 m. While halibut were found throughout and outside the bays (age-0 from -1.6 to 8.2 km and age-l at 2.4 km from the bay mouth), most were found at the heads of Kalsin and Middle Bays coincident with these depths. Age-O halibut were collected over sand, muddy sand and sandy mud substrates and the age-l fish was on sand substrate.

Age-O was the least abundant group of yellowfin sole captured during KI9403 (N=3). Age-O yellowfin sole were caught at 7.4% of stations. The mean number of age-0 fish/tow was 0. 1±0.3, and the largest catch was two fish/tow. Age-O yellow-fin were found only outside the mouth of Kalsin Bay (-0.7 to -1.6 km). Age-O fish were found in 20 - 50 m on sand and gravel substrates.

Age-l yellowfin sole (N=25) were caught at 22.2% of stations during KI9403. The mean number of age-l fish/tow was 5.0±9.9 and the largest catch was 43 fish/tow. Yellowfin sole was the third most abundant (N=25) age- 1 fish. Age- 1 yellowfin were found throughout and outside the bays (-0.7 to 8.2 km from the bay mouth). Age-l fish were found in 0 - 40 m on sand and muddy sand substrates.

Ages-O and -1 rock sole had similar distributions during KI9403. Rock sole was the most abundant (N=2,219) age-0 fish and the second most abundant (N=183) age-l fish. Age-O rock sole were caught at 66.7% of stations. The mean number of age-0 fish/tow was 168.0±194.5, and the largest catch was 680 fish/tow. Age-l rock sole were caught at 5 1.9% of stations during KI9403. The mean number of age-1 fish/tow was 8.7H.8, and the largest catch was 36 fish/tow. Age-O and age-l rock sole were found outside and throughout the bays (-2.4 to 8.2 km from the bay mouth) in depths up to 80 m, but both ages were primarily concentrated in less than 50 m water depth. Both ages were

found on all substrates sampled (sand, muddy sand, sandy mud, sandy gravel and gravel). Age-O rock sole abundances increased with increasing percent of sand and decreasing percent of mud.

Kazakof Bay/August 1994 (KI9402)

The cumulative mean CPUE flatfish/station of flatfishes from quantitative tows at 29 stations examined during August 1994 within Kazakof Bay (KI9402) was 440, for an average CPUE of 15±1 8 flatfishes/station. Listed in decreasing order of abundance, these species include flathead sole (N=275), yellowfin sole (N=1 11), rock sole (N=47), Pacific halibut (N=4) and English sole (N=4). Catches of age-0 fish were most prevalent for Pacific halibut, rock sole and English sole. Age-l was the numerically dominant age captured of flathead sole and yellowfin sole.

Age-0 flathead sole (N=85) were caught at 34% of stations during KI9402. The mean number of age-0 fish/tow was 3.0i6.1, and the largest catch was 27 fish/tow. Age-0 fish were captured primarily down the center of Kazakof Bay; they were not at the head of the bay. They were caught in 20 - 90 m water depth and increased in abundance with increasing depth.

Age 1 flathead sole (N=130) were caught at 48% of stations during KI9402. The mean number of age-l fish/tow was 4.2±6.2, and the largest catch was 21 fish/tow. Distribution of age-l fish was similar to age-0 fish. Age-l fish were not captured at the head of the bay. Age-l flathead sole were caught in 20 - 100 m water depth, and were most abundant from 40 to 80 m water depth.

Age-O Pacific halibut (N=4) were caught at 3% of stations during KI9402. The mean number of age-0 fish/tow was 0.1±0.6, and the largest catch was four fish/tow. Age-O halibut were caught at a single station near the head of Kazakof Bay, in 10 - 20 m water depth. No age-l halibut were caught during KI9402.

Yellowfin sole were not caught as age-0 during KI9402. Age-l yellowfin sole (N=92) were caught at 17% of stations. The mean number of age-l fish/tow was 2.6±10.9, and the largest catch was 60 fish/tow. Age-l yellowfin were caught in 10 - 40 m water depth, from 13 to 18 km inbay.

Age-O rock sole (N=24) were caught at 17% of stations during KI9402. The mean number of age-0 fish/tow was 0.9±2.6, and the largest catch was 12 fish/tow. Age-O fish were caught from 0 to 50 m water depth, and from 12 to 20 km inbay.

Age-l rock sole (N=19) were caught at 17% of stations during KI9402. The mean number of age-l fish/tow was 0.6±2.2, and the largest catch was 12 fish/tow. Like age-0 fish, age-l rock sole were caught from 0 to 50 m water depth and 12 to 20 km inbay.

INTRODUCTION

Identification of Problem

Despite the strong economic importance of the commercial and sport fisheries in Alaska and possible future State and Federal gas and oil exploration in Cook Inlet and the Gulf of Alaska knowledge of the early life history of flatfishes in Alaskan waters has been minimal prior to this study. This study was an interannual examination of the habitat parameters. distribution and abundance of juvenile flatfishes near Kodiak Island, Alaska focused on identifying flaffish nursery habitat and developing an index of juvenile recruitment. Identification of juvenile flatfish habitat is necessary in order to protect them from habitat disruption. The index of juvenile recruitment will allow more effective and timely management by regulatory agencies and will assist with planning by members of the fishing community and oil and gas industries.

The commercial fishery for flatfish in Alaska took 267,529 mt in 1989, due to directed commercial and sport fisheries as well as to commercial bycatch. It is important to identify nursery areas in order to protect them from habitat disruption. Possible future State and Federal gas and oil exploration in Cook Inlet Sale 149 and Gulf of Alaska/Yakutat Sale 158 will benefit from this study which will identify flatfish nursery habitats which may be biologically sensitive areas. The nursery habitat is characterized by physical parameters including depth, sediment type, position in bay, temperature and salinity. The linkages between the physical and ecological processes explored here could aid in prediction of the potential effects of proposed gas and oil exploration and development in the area on the region's biological resources.

This project continued a long term study begun in 1991 to locate and characterize nursery areas for flatfishes in Alaska and to develop a juvenile recruitment index for the most abundant species. Understanding and monitoring an index of juvenile recruitment is important because it is a mechanism for testing the health of the ecosystem.

Study location

Initial selection of sampling locations and sites along the coast of Kodiak Island (Figure 1) began with the acknowledgment that the coastline of the Gulf of Alaska is more rugged and has a greater tidal range than flatfish nursery areas in many other locations around the world. Most of the Gulf coast of Alaska is completely inaccessible except by large vessel because of lack of roads and extremes of weather. Kodiak Island is representative of the coastline of the Gulf of Alaska because it provides a variety of habii from shallow, fine-grained tidal flats to deep and rocky areas. Kodiak Island was chosen as the sample site because it has (1) a UAF/SFOS lab for staging of field work, (2) sites near town which are accessible by small boat, (3) a large trawl fleet available for charter to remote areas of the island, (4) an informed and concerned citizenry who wish to protect their resources and their fishery-based economy. Chiniak Bay is near the town of Kodiak and is the only region of Kodiak Island which is easily accessible via road from the town of Kodiak. Chiniak Bay encompasses three inner bays which are protected to varying degrees (Figure 1: Womens, Middle and Kalsin Bays) as well as providing relatively accessible and unprotected zones outside the mouths of these bays.

Sample collection was continued during 1993 and 1994 as a result of this funding; collections were limited to Chiniak Bay during 1993, and to Chiniak Bay and Kazakof Bay (on Afognak Island) *during 1994.*

Previous work

Prior funding provided two years of sampling (1991 - 1992) during which all major bays of Kodiak Island were examined in order to form a broadly based characterization of flatfish nursery areas around Kodiak. We described fish distribution versus the parameters of location in the bay, depth, bottom temperature, bottom salinity and sediment type (Norcross et al. 1995A, Norcross et al. 1995B). Distributions overlapped for the most abundant juvenile flatfishes (ages-0 and 1 rock sole, yellowfin sole, flathead sole and Pacific halibut), yet patterns of peak abundance were unique to each of these species.

The following conceptual models of the physical parameters most descriptive of flatfish nursery habitat have been postulated based on 1991 - 1992 distribution of flatfishes around Kodiak Island (Norcross et al. 1995A). Age-O rock sole are found predominantly in water depths less than 50 m on sand or mixed sand substrate within 10 km of bay mouths. Age-0 flathead sole are found predominantly in water depths greater than 40 m on mud or mixed mud substrate throughout bays. Age-O Pacific halibut are found predominantly in water depths less than 40 m on mixed sand substrate near or outside mouths of bays. Age-l yellowfin sole are found predominantly in water depths leas than 40 m on mixed substrate at upper reaches of bays.

The current project describes and analyzes the recruitment of juvenile flatfishes to inshore waters of Kodiak Island, Alaska. Analysis of data collected in Chiniak Bay during 1992 was funded partially and during 1993 and 1994 was funded primarily by the Coastal Marine Institute. Dietary analysis of flatfishes captured during 1991 was funded partially by Coastal Marine Institute.

Overall Program Goals and Objectives

1. To identify nursery areas for juvenile flatfishes,

2. To characterize those nursery areas according to physical and biological parameters, and

3. To develop indices of relative abundances for as many juvenile flatfish species as the data allow.

Background Information

Populations of thirteen Alaskan species of flatfishes are found near Kodiak Island (Rogers et al. 1986, Norcross et al. 1993, 1995A). The prime targets for commercial fisheries are Pacific halibut (*Hippoglossus stenolepis*), flathead sole (*Hippoglossoides elassodon*), rock sole (*Pleuronectes bilineatus*), rex sole (*Errex zachirus*) and Dover sole (*Microstomus pacificus*). There are also directed fisheries for English sole (*Pleuronectes vetulus*) and starry flounder (*Platichthys stellatus*). By-catch includes yellowfin sole (*Pleuronectes asper*), *Alaska* plaice (*Pleuronectes quadrituberculatus*), *butter* sole (*Pleuronectes isolepis*) *and* sand sole (*Psettichthys melanostictus*) which are marketed secondarily. There is currently an attempt to develop a fishery for arrowtooth flounder (*Atheresthes stomias*) to be used in surimi. Additionally, Pacific sanddab (*Citharichthys sordidus*) has *occasionally* been captured near Kodiak (Norcross et al. 1993).

Relative abundance of species and community composition changes from bays across the Alaskan continental shelf; with most species of fish increasing in sii with depth. This indicates shallow *areas are important as nursery areas in Alaska (Rogers et al. 1986).*

Preferred conditions of nursery areas for flatfishes

Little information is available on flatfish nursery habitat in Alaskan waters. although the highest mortality of fishes is during the larval and juvenile stages (Moyle and Cech 1988). However, nursery habitat has been described for flatfishes in other regions of the world. Intertidal zones, shallow coastal areas, protected bays and estuaries are often considered vital as nursery areas for flatfishes (e.g. Tyler 1971, Giison 1973, van der Veer and Bergman 1986, Tanaka et al. 1989). Abundance and size distributions of juvenile flatfishes have been related to depth, sediment siie and food availability. Flatfish nurseries are usually in shallow waters, often in less than 10 m (Edwards and Steele 1968, Allen 1988, van der Veer et al. 1991), on substrates of silt, mud, and line to coarse sand (Poxton et al. 1982, Wyanski 1990). Shallow bays and estuaries are thought to serve as excellent nursery areas and ideal feeding habitat because of high insolation of the bottom, high water temperatures and the particular sediment types found in protected waters (Pearcy and Myers 1974), in addition to the good supply of nutrients from land drainage (Pihl and Rosenberg 1982).

Substrate type, current velocity, depth, salinity and food availability may help determine where flatfish initially settle, and may also guide the distribution of older individuals. Sediments in flatfish nursery areas are generally silt, mud or fine to coarse sand (Poxton et al. 1982, Wyanski 1990). A dominant substrate of gravel or coarser materials reduces the suitability of an area to serve as a nursery (Rogers 1985). Burying abiity of juvenile flaffishes probably depends on several factors associated with sediment in addition to grain size (e.g. particle compacting, cohesion biding by activity of benthic fauna) (Gibson and Robb 1992). Abundance of young-of-the-year flatfishes is profoundly influenced by water depth, a phenomena shown by Riley et al. (198 1) for species in the English North Sea. Newly metamorphosed plaice of the genus *Pleuronectes* were found to actively select shallow depths in the North Sea (Edwards and Steele 1968).

Depth distribution changes with age, and may limit both intra- and interspecific competition among flatfishes (Poxton et al. 1983). Competitive fish species may reduce range overlap by maintaining localized feeding. A nursery may be partitioned into areas dominated by separate species or intraspecific age groups (Edwards and Steele 1968, Harris and Hartt 1977, Smith et al. 1976, Zhang 1988). The correlation between mean length of fish and depth for some species is significant (Gibson 1973). Large quantities ofjuvenile rock sole were taken by Harris and Hartt (1977) intertidally in the Kodiak area with older individuals taken near the mouths of fjords. A reversal of this trend was exhibited by flathead sole in which larger fish were found toward the heads of Kodiak bays (Blackburn 1979).

Geologic description of the Kodiak Archipelago

The Kodiak Archipelago (Figure 1) is an island arc collision coast in the western Gulf of Alaska where oceanic crust is being thrust under a thicker, less dense continental plate. Uplifted subduction zone complexes have given Kodiak a rugged, mountainous relief The topography of the Kodiak area was strongly affected by heavy glaciation during the Pleistocene. In general, the islands are erosional, with perhaps as much as 20 to 30% of the shoreline depositional, but only 2.6% of the total shoreline consists of sheltered tidal flats and marshes (Hayes and Ruby 1979). Local conditions determine the character and behavior of the sediment, but in general, mean grain size for Kodiak and Afognak Island beach samples generally ranges between very coarse sand and pebbles, with particle size decreasing seaward, producing a graded sediment distribution (Hayes and Ruby 1979).

The western coastline of the Kodiak archipelago is backed by steep slopes of glacial till, leading to a coarse-grained beach supplied by glacial deposits. A predominance of sandy beaches is found on the western coast of Kodiak and within the Trinity Islands due to an abundance of unconsolidated glacial material with a high percentage of sand. The northwest side is a dramatic example of glaciation, having steep slopes butted up against straight shorelines with narrow gravel beaches. The northwest shore is indented by long narrow fjords. Thick deposits of glacial till blanket the southwest comer of Kodiak Island. Shorelines in this area are generally long and continuous, with glacial tii contributing sand, gravel and boulders to the beach and coastal sediments. Southwest Kodiak and the nearby Trinity Islands have fine to coarse grained sediments (Hayes and Ruby 1979).

Bedrock outcrops back the beaches on the east of Kodiak and Afognak Islands, producing beach sediments which are very coarse grained and homogeneous (Hayes and Ruby 1979). Along southeast Kodiak, short, wide estuaries tend to run northeast-southwest, a direction parallel to the major thrust faults of the island. Afognak Island and northeast Kodiak have small pocket beaches eroded by wave action, similar to the southeast of Kodiak. Northeastern Kodiak bays have fine to coarse grained sand with muddy areas in deeper portions of bays. We have observed the sediment of southeast Kodiak around Sitkinak Strait and Alitak Bay to be of shell hash and medium to fine-grained sand.

Rivers draining into the fjords dump large amounts of glacial till, creating deltas of sand and line gravel. The beaches in Kodiak fjords are variable, but tend to be coarse due to local bedrock sediment sources. Where rivers empty onto the open coast, sand and gravel beaches occur downdrift (Hayes and Ruby 1979).

METHODS

Description of sample locations

Description of Chiniak Bay

Cruises during I993 (KI9301 and KI9302), and two of three cruises during 1994 (KI9401 and KI9403) consisted of land-baaed collections conducted within Chiniak Bay, near the town of Kodiak Alaska (Figure 1). Kalsin, Middle and Womens Bays were chosen for intensive sampling because they were near town facilitating land-based operations, and thus could be sampled on repeated days at a low cost. The NMFS laboratory on the Kodiak Coast Guard Support Center was the base for sampling operations, and the Fishery Industrial Technology Center (FITC/SFOS/UAF) provided vehicles, space for office and laboratory work as well as storage space for gear and frozen samples.

Womens, Middle and Kalsin Bays are offshoots of Chiniak Bay (57°40'N, 152°30'W) approximately 10 nmi from the town of Kodiak. Tidal range in this area is approximately 2.5 m. Because these bays were sampled with a small vessel, extremely shallow collections could be made.

Womens Bay is about 7 km long, with an area of approximately 12 km^2. Womens Bay is more shallow and protected than either Kalsin or Middle Bays. Womens Bay is less than 10 m in depth at the mouth, but there is a deep hole midbay (2933 m). At the head of Womens Bay, a tidal marsh extends for nearly 1 km inland. Most of inner Womens Bay is less than 10 m deep.

Middle Bay is about 8 km long with an area of approximately 21 km^2. It is intermediate with regard to depth and protected shoreline than Womens or Kalsin Bays, and has a depth of 50 m at the mouth. Middle Bay is surrounded by cliffs and at the head of the bay there are marshes behind a sandy

beach. The shallow areas extend farther from the shoreline of Middle Bay than do the shallow areas of Kalsin Bay. Inner Middle Bay, approximately 2 km wide, is less than 10 m deep, much shallower than Kalsin Bay.

Kalsin Bay covers an area of approximately 34 km', and is 8 km from mouth to head. It is a deep bay with waters in excess of 100 m at the mouth. Nearshore waters drop off rapidly, with waters of < 10 m depth comprising a narrow zone of < 0.5 km around most of the edges of the bay to 1 km at the head. Kalsin Bay is surrounded by cliffs except at the head where a marsh extends behind a sandy beach.

Description of Kazakof Bay

Cruise KI9402 during 1994 consisted of land-based collections conducted within Kazakof Bay, Afognak Island (Figure 1). Ben A. Thomas Logging Camp was the base for sampling operations and personnel.

Kazakof Bay is a long, narrow bay, covering an area of approximately 60 km^2. It opens to the south along the southern coast of Afognak Island. Kazakof Bay is 20 km long, and the mouth of the bay is approximately 5 km wide. The bottom contour is steep in near-shore areas along the east and west sides of the bay. Near the head of the bay, stations could be occupied in depths less than 30 m.

Sample collections

General collection procedure, all cruises

Four of the cruises were a joint effort between the Institute of Marinc Science, University of Alaska Fairbanks (IMS/UAF) and the National Marine Fisheries Service, Kodiak Laboratory (NMFS/Kodiak). Collection gear and sampling vessel used in Chiniak Bay during KI9301, KI9302, KI9401 and KI9403 were identical, but were not the same as had been used during previous years (Cruises KI9101, KI9102, KI9201 and KI9202). The vessel used during cruises KI9301, KI9302, KI9401 and KI9403 was the *R/V Pumkin*, a 25 ft Boston Whaler owned and operated by NMFS/Kodiak. Identical gear was deployed from a 25 ft aluminum skiff in Kazakof Bay during KI9402. The slightly different sampling procedure used during KI9402 is explained in a following section; methods used in Chiniak Bay are described in this section. Gear is listed and described in Appendix 1.

Station numbers were assigned in consecutive order (hereafter referred to as consecutive station number or CS#) for each cruise. Consecutive station numbers were assigned for all sites at which gear was deployed. Usually, a CTD, sediment grab and trawl were deployed at each station. Trawl tow numbers were assigned consecutively at each station whether or not the tow was judged quantitative. During KI9301 and KI9403, selected stations were examined by NMFS divers using SCUBA gear.

In addition to the consecutive station numbers which were reassigned on each cruise, many siies which were sampled annually have been identified by a permanent station code. The permanent station code reflected the bay, depth range and sediment type at which the sample was taken (Table 1). The "depth" portion of the permanent station codes was assigned based on the depth at low tide; due to the broad tidal range near Kodiak, the towing depth may appear to be inconsistent with the depth of the station code. Stations within the same bay, depth and sediment type bad the same permanent station code regardless of location within a bay, and were considered as replicate stations. Within a specific bay and depth range, various sediment types were found. Sites within one bay of the same

depth range, but with different sediment types were distinguished by a siigle digit added to the depth increment (i.e. KB20, KB21 and KB22). All sampling sites in the same depth increment and sediment type had the same digit for the specific sediment type (i.e. KB31 and MB31 had the same depth and sediment type; KB50 and MB52 had the same depth, but different sediment types). With this naming system, sites for comparison among and within bays were readily apparent.

Substrate was collected for grain siie analysis usiig a 0.06 m^3 Ponar grab. Single substrate samples were taken at nearly every station. Except for dive transect stations where multiples grabs were taken, we rarely collected replicate substrate samples. Sediient was retained frozen and shipped to Fairbanks for laboratory grain size analysis. During 1991, 1992 and 1993 (KI9101, KI9102, KI9103, KI9201, KI9202 and KI9301) sediment was subsampled and preserved in 10% form&n for benthos taxonomy, but following cruise KI9301, we determined not to collect further benthos or analyze benthos collected during 1992 or 1993. KI9201, KI9202 and KI9301 benthos samples were discarded and no further benthos samples were retained during this project, due to time and fiscal limitations.

Vertical profiles of salinity and temperature were recorded with a portable SeaBird Seacat Profiler 19 (CTD). This instrument is a self-contained unit which does not have a real-tiie readout, and the data were dumped periodically to a portable computer. Replicate CTD casts were collected only in rare instances. The CTD was allowed to equilibrate for two min. at 1 m depth and was then deployed by hand until the 10 lb. weight fastened below the sensors touched bottom. The CTD recorded measurements of temperature, depth and salinity at half second intervals. The array of temperature and salinity profiles collected during each cruise indicates general patterns of water movement.

Fishes were sampled using a plumb staff beam trawl with a double tickler chain adapted from a design by Gunderson and Ellis (1986). The very small mesh (7 mm square) and codend liner (4 mm) retains flatfishes as small as 12 mm (Norcross et al. 1993). With a few exceptions, all collections in 1993 and 1994 were made with a 3.05 m (10 ft) beam rather than the 3.66 m (12 ft) beam which had been used during 1991 (KI9101, KI9102 & KI9103) and 1992 (KI9201 & KI9202). As in previous years of sampling, the trawl design was modified via the addition of floats to the ends of the beam and 150 mm lengths of chain knotted to the footrope at 150 mm intervals. In 1993 and 1994, endeavors were made to sample as slowly as possible in order to tow at a speed comparable to previous years collections. The tow speed was approximately 0.5 kt for KI9101 and KI9201, 1 .O - 2.0 kt for KI9102 and KI9202, KI9301, KI9302, KI9401, KI9402 and KI9403.

Precise measurements of distance towed were unavailable for many tows, and therefore the number of fishes captured during each tow was standardized to a 10 min. tow duration. The standardized catch-per-unit-effort (CPUE) accounts for the value of N being other than a whole number. Figures report the N of fishes as the nearest whole number (or 1). In exceptional cases the number of fish plotted on a figure may not appear to equal the N stated in the title. To avoid confusion, many of these instances are noted on the plot (i.e. *rounded value). The effective width of the tow was expected to be 0.74 * beam length (Gunderson and Ellis 1986), and was estimated as 2.257 m for the 3.05 m beam and 2.707 for the 3.66 m beam, resulting in an approximate average tow area of 1000 m^2, assuming that the net was towed over a distance of 450 m. Future analyses will be based on distance CPUE standardized to a 1000 m^2 tow area, rather than on tow duration.

While the original hypothesis was that juvenile flatfishes should be found in shallow water on relatively smooth bottoms, a variety of depths and substrates were sampled. Collections generally were

stratified in 5 m depth increments from 0 to 10 m and in 10 m increments for deeper sites. Trawling was primarily done during the rising tide and in daylight. The start time of each tow or dive was quantified by minutes after high tide and minutes after sunrise (e.g. -100 signifies 100 minutes before high tide, 10 signifies 10 minutes after high tide. The same pattern holds for minutes before and after sunrise).

One half to 5/8 in. nylon double braided line was put out to achieve a 8:1 line:depth ratio at stations less than 10 m, 5:1 ratio for depths 10 - 50 m and 3:1 ratio at depths greater than 50 m. Aboard the *R/V Pumkin*, (KI9301, KI9401 and KI9403) line was put out by hand through the crab block. The crab block was equipped with hydraulic power, was used off the starboard to deploy the grab and CTD, and was pivoted inboard to deploy, tow and retrieve the tow line off the stem. The trawl was deployed and retrieved off the starboard. A bolt held the crab block in place during starboard operations, and a line from the bow was clipped to the block during trawl operations to secure the block perpendicular to vessel motion. The tow lime was attached at the port cleat during tows. Tow speed was approximately 1.0 - 2.0 kt with an estimated 380 - 700 m covered by each tow. Tow duration was usually 10 min. When the bottom was *excessively* muddy, we reduced tow time to 5 min. to facilitate sorting and because we expected towing with a clogged net to reduce fishing efficiency.

Flatfishes and roundfishes sampled with the trawl were identified and total length (mm) was measured in the field. These data were later entered into a database using either a Linmoterra digital fish measuring board (KI9301) or manual data entry (all other cruises). Large numbers (>100) of a single species were sometimes collected during one tow, occasionally we measured a subsample of the youngest year-class, all older fishes were measured. During KI9301 and all 1994 cruises, a subsample of large (>200 mm) flatfishes was examined in the field for stomach contents, sex and maturity stage. Stomachs, sex and maturity were not examined for any fishes during KI9302. Small specimens of all flatfishes except flathead sole, yellowfin sole and rock sole were retained frozen for possible gut content analysis. Flathead sole, yellowfin sole and rock sole were not retained, because a large amount of feeding data had been collected for these species in 1991 (KI9101 & KI9102). No weight data were collected on fishes during 1993 or 1994.

Trawl/dive transects were established at two stations in 1993 and two stations in 1994. Similar to tows at all other stations, trawl/dive comparisons were conducted primarily on a flood tide and always during daylight. The beam trawl was towed parallel to, and approximately 100 ft on either side of, diver transect lines. Trawling was conducted concurrent with the dives. A transect line of 1/2 or 5/8 in. nylon line was weighted at each end by a 15 or 20 pound anchor and deployed at each station. A large buoy was fastened to each anchor with sufficient 3/16 in polypropylene line for the buoy to float freely and mark the diver transect. Two transect lines were generally laid end to end. NMFS divers worked in teams of two persons; while the first diver sampled one transect, the other diver dove on the adjacent transect. After waiting a minimum of 15 minutes, a diver surveyed the transect which had just been sampled by the other diver. During both 1993 and 1994 NMFS divers observed a 2 or 3 ft (0.61 or 0.91 m) swath (dependent upon visibility) along a 600 ft (182.9 m) transect line and reported on numbers of flatfishes and roundfishes seen concentrating their observations on flatfishes. An exception to this was KI9403 CS#6 (tows 2, 3, 5 and 7 and dives 2, 3, 5 and 8) which used a 778 ft (255.2 m) transect line.

Divers differentiated between small, medium and large flatfishes at all stations. Small flatfish were defined as 0 - 99 mm, medium as 100 - 179 mm, and large as 180 mm and larger. Flatfish data are

quantitative, but divers were able to identify only the larger flatfish to species with certainty. Divers were able to observe flatfishes as small as 10 mm total length.

Collections within Chiniak Bay/August 1993 (KI9301)

Trawling and diving surveys were conducted within Chiniak Bay during 12 - 24 August 1993 (Table 3, Figure 2). The fisheries field crew for cruise KI9301 consisted of Brenda Norcross and Brenda Holladay of IMS/UAF, both of whom had been involved in field collections of juvenile flaffishes in 1990 - 1992. The crab field crew included Eric Munk, Susan Payne, Pete Cummiskey and Bob Otto, all of NMFS/Kodiak. Braxton Dew (NMFS/Kodiak) and Eric Munk performed SCUBA dives concurrently with KI9301 trawling operations. Eric Munk usually operated the *R/V Pumkin*, but during simultaneous trawling/diving operations, Pete Cummiskey was vessel operator.

Cruise KI9301 (9 sampling days: 12 - 24 August) added to our annual August index of juvenile flatfish distribution and abundance in Womens, Middle and Kalsin Bays. Target species included flatfishes, tanner crabs and miscellaneous roundfishes and crabs. Collections occurred at new sites as well as established station sites which had been occupied during previous years. Five stations were occupied within Womens Bay during KI9301. Womens Bay was previously sampled during 1992 (KI9201), but not 1991. Ten stations were occupied in Middle Bay during KI9301. Middle Bay was examined intensively during 1991 (KI9101, KI9102 and KI9103) and 1992 (KI9201). Fifteen stations were occupied in Kalsin Bay during KI9301. Kalsm Bay was sampled intensively during 1991 (KI9101, KI9102 and KI9103) and 1992 (KI9201).

Tows during KI9301 used a 3.05 m or 3.66 m beam. At the first 26 consecutive stations, fishes and crabs were collected with a 3.05 m beam rather than the 3.66 m beam which had been used during 1991 (KI9101, KI9102 & KI9103) and 1992 (KI9201 & KI9202). At CS#27-30, tows were conducted with both the 3.05 m and 3.66 m beams in order to compare ease of deployment and catch collected using the two beams. The shorter beam was easier to manipulate both on deck and during deployment/retrieval and has since been used in 1993 and 1994 trawling operations.

Sediment was collected at each station during KI9301, and CTD profiles were recorded at all stations during KI9301 except CS#27-30. Due to operator or equipment error, no CTD data are available to relate with tows from the final four stations during KI9301. Twenty-eight stations were sampled successfully by beam trawl, including CS#2-9 and CS#1 l-30. Successful replicate tows were collected only at CS#27-30.

Consecutive stations 27-30 during KI9301 were examined repeatedly by trawl and SCUBA divers in order to create a baseline for quantifying trawl catches versus diver observations. At each station, four dives and three (CS#27) or four (CS#28-30) quantitative tows were conducted. Dive transects were always 600 ft long, and the trawl was towed for ten minutes.

Collections within Chiniak Bay/November 1993 (KI9302)

Cruise KI9302 (Table 4, Figure 3) was conducted by Eric Munk, Susan Payne and Brad Stevens (NMFS/Kodiak); IMS/SFOS/UAF was not represented. Tanner and other crabs were the target species. In addition to the target species, flatfishes were collected for this project. Five sampling days (8, 9 and 17 - 19 November) provided a seasonal component to both the flatfish length analyses and to indices of flatfish distribution and abundance. The only gear deployed successfully was the 3 .05 m beam trawl. A 1.8 m beam trawl with a net of like mesh but shorter headrope and footrope than the 3.05 m beam trawl was deployed unsuccessfully at CS# 1 and CS#2 Tow#1, after which that gear type

was abandoned. The CTD was deployed. but due to equipment malfunction, no data were retrieved. The sediment grab was not deployed. Three stations were sampled in Womens Bay, and nine stations were sampled in Middle Bay during KI9302. Kalsin Bay was not occupied during this cruise.

Collections within Chiniak Bay/June 1994 (KI9401)

Eric Munk and Susan Payne of NMFS/Kodiak and Brenda Holladay of IMS/UAF collected data within Chiniak Bay during 20 - 21 June 1994 (Table 5, Figure 4). Eric Munk operated the vessel. The 3.05 m beam trawl was deployed. The CTD was not deployed due to equipment malfunction, and the sediment grab was not deployed. During KI9401, one station in Womens Bay, four stations in Middle Bay and seven stations in Kalsin Bay were occupied.

Collections within Chiniak Bay/August 1994 (KI9403)

Similar to KI9301, trawling and diving surveys were conducted during KI9403, and target species included flatfishes, tanner crabs and miscellaneous roundfishes and crabs (Table 6, Figure 5). The fisheries field crew for cruise KI9301 consisted of Brenda Norcross, Brenda Holladay, Franz Müter and Sherri Dressel of IMS/UAF. Eric Munk collected crab data. Braxton Dew (NMFS/Kodiak) and Pete Cummiskey performed SCUBA dives concurrently with KI9403 trawling operations. Eric Munk operated the *R/V Pumkin* during all consecutive station tows, as well as during simultaneous trawling/diving operations.

Data were collected at each station by one or more of the following: beam trawl, sediment grab, CTD and SCUBA divers. Womens Bay was not sampled during KI9403. Of the 12 stations sampled in Middle Bay, all except CS#23 and 29 were sampled in previous years. CS#23 consisted of four nonquantitative tows at the head of Middle Bay with no sediment or CTD data collected and is not included in KI9403 figures. Of the 18 stations sampled in Kalsin Bay, eight were new stations (CS#13-18 and 24) and 10 had been previously sampled. In KI9403, several of the new Kalsin stations sampled were deeper and further outside the mouth of the bay than in previous years (CS#13-15, 17 and 18). Consecutive stations 22 and 28 in Kalsin Bay consisted of only non-quantitative tows, and therefore are absent from fish abundance plots. Sediment and CTD data were collected at CS#28 but not at CS#22. Sediment samples were retained from all stations except CS#22 and 23, for gram size analysis. Replicate sediment samples were taken only at CS#13 and 14, since tows were made on different days, and at dive transects CS#6 and 12.

Fii-nine successful CTD casts were recorded, including CTD casts at all stations except CS#22 and 23, where all tows were nonquantitative. Replicate CTD casts were made at consecutive station numbers 10, 13, 14, 25 and 26 where tows were made on different days (CS#13, 14, 25 and 26), when a significant amount of time passed between tows (CS#26 tow 2 and tow 3) or when location varied slightly (CS#13 tow 2). Multiple CTD casts were also made at the dive transects, CS#6 and 12.

Fishes were sampled at thirty stations with a 3.05 m beam trawl, resulting in a total of 56 quantitative tows at 27 stations (CS#1-21, CS#24-27 and CS#29-30). Replicate tows were made at CS#6, 12, 13, 25 and 26.

In addition to the trawls completed in KI9403, and as was done in 1993, two stations (CS#6 and 12) were sampled with repetitive tows and SCUBA dives in order to compare the efficiency of beam trawl versus SCUBA divers in identifying and quantifying flatfishes on different bottom types. In order to make statistical comparisons between beam trawl catches and diver observations, we

maximized the number of replicated diver observations and beam trawl catches at these two stations, Data collected at the trawl/dive stations sampled during both 1993 and 1994 will be used to determine whether SCUBA divers may be used interchangeably with beam trawl tows in areas and on substrates where trawling is ineffective or impossible.

During KI9403, CS#6 and CS#12 were each sampled with 14 quantitative tows and 12 or 16 dives, respectively, over a period of two days. Transect lines were laid end to end in the same manner as in 1993. Unlike KI9301, when the trawl was towed for 10 min. during trawl/dive comparisons, the duration of tows during KI9403 was determined by distance, using the transect lines and buoys for measurement. Unlike 1993, when the dive transects were always 600 ft, the two transects at one of the dive stations were different lengths on the first day of sampling. On the first day (9 August) at dive transect station CS#6, the east transect line measured 778 ft (tows 1, 4, 6, 8 and dives 2, 3, 5, 8). On the second day of sampling transect CS#6 (tows 9-14 and dives 9-12), two 600 ft lines were laid. The *600* ft lines were used for all tows and dives at dive transect CS#12.

All collected fishes were measured, with the following exceptions: age-0 rock sole were subsampled at CS#18, and age-0 northern sculpin (*Icelinus borealis)* were subsampled at CS#30, since more than 300 individuals of that year class were captured.

Collections within Kazakof Bay/August 1994 (KI9402)

Franz Muter, Brenda Holladay and Sheni Dressel (IMS/UAF) collected samples during 2 - 7 August 1994 in Kazakof Bay, Afognak Island using a Boston Whaler (Table 7, Figure 6). Brenda Norcross assisted with collections during 2 August. Franz Muter operated the vessel. Sampling procedure *was slightly* different from *cruises* aboard *the R/V Pumkin*. The crab block was fixed in place on the starboard, and the trawl was towed from and was tied off at the stern.

Samples were collected from 31 stations. Substrate was collected from all stations, with replicate grabs at CS#4 and 6. Substrate was observed but not retained at CS#20, where no tow was taken. Sediment grain size has not yet been examined for KI9402, and will be completed in 1995 - 96. CTD data are available for all stations except CS#20. A single CTD profile is representative of both CS#26 and CS#27 because these stations were close together and were occupied within a short time span Replicate CTD casts were collected at CS#1, 4, 6 and 13.

Tows were of variable duration (3.3 - 10 min.), and were collected on both flood and ebb tides. Tows were attempted at all stations except CS#20, but were often either questionably quantitative or not quantitative. Tows where the catch did not overflow the codend and the net appeared to have fished correctly were quantitative. Nonquantitative tows were where the gear did not fish correctly or where a portion of the catch was lost while retrieving the net. Questionable tows were where the catch overflowed the codend or where the codend was completely filled with mud or kelp.

Sample Processing

Processing of physical data

Temperature, saliity and depth data were downloaded to computer disk and processed with SeaBird CTD software. For all stations, data collected during the 2 min. temperature equilibration of the CTD were omitted to avoid erratic temperature and salinity spikes. Raw data from the down cast of the CTD were averaged on 0.1 m intervals for stations <10 m depth, and on 0.5 m intervals for

deeper stations, and profiles of temperature and salinity were plotted. The distribution of mean bottom temperatures and bottom salinities were charted for each station.

The distance (km) from the station to the nearest position at the mouth of a bay was calculated after drawing lines across the mouths of Womens, Middle, Kalsin and Kazakof Bays. The shortest distance from the station to this line was measured. Stations inside the mouth were designated as positive distances, and stations outside of bays were assigned negative distances.

Processing ofsediment data

The proportional weights of the gravel, sand and mud fractions were obtained for all substrate samples collected usiig a wet and dry sieving technique (Appendix 2). The Wentworth grade scale (Sheppard 1973) defined grain sizes of boulder, cobble, gravel (pebble + granule), sand and mud (silt + clay). Sediment samples were sieved to determine relative percent at each Phi level of gravel and sand. The mud fraction was not partitioned into Phi levels. Phi level classiications were calculated for the gravel and sand fractions, but are not reported here. Results of grain size analyses were categorized after Folk (1980) (Table 2). We employed Folk's classiications with the following exceptions. Folk's classifications of (g)sM and (g)mS (meaning less than 5% gravel) were incorporated within the categories of sM and mS for our analysis. Additionally, substrates larger than Folk had analyzed (i.e. containing cobble or boulder) were classified visually according to the Wentworth scale (Sheppard 1973).

Percent volatile matter and carbonate present in the sediment were obtained by a generally accepted method (Appendix 2) when sufficient sediment remained after grain size had been examined. Percent volatile matter provides an indirect estimate of organic content which may be available as food for benthic feeding fishes, and percent carbonate is an estimate of shell content within the substrate.

Processing of fish data

Ages of flatfishes were estimated from total length using 1) total length/frequency plots of fishes produced for each cruise, 2) total length/frequency plots of fishes collected previously in Kodiak during August (Norcross et al. 1993, 1995A), 3) analysis of regional differences in total lengths of fishes caught during August 1991 (Norcross et al. 1995B) and 4) additional literature references (e.g. Hart 1980). Length/frequency plots and tabulated flatfish lengths include lengths and counts of measured fish only. The counts therefore are not equal to catch-per-unit-effort (CPUE) values or the total number of fish captured. Ages could be assigned as 0, 1 and gt2 using this method. Without otolith aging, more precise estimates of ages are not possible.

Abundance of fish was standardized to a 10 min. towing time for all cruises. Tow CPUE values were used for comparisons of fishing efficiency between 3.05 m and 3.66 m beams and to estimate intrastation variability. All plots, charts and text reflect the average CPUE of all quantitative and questionably quantitative tows at a station, unless otherwise stated. Except for cases which are mentioned below, the number of fish (N) plotted is a cumulative value calculated from average station CPUE. Because of standardizing fish abundances to a 10 min. tow and averaging tow abundances within a single consecutive station, the actual value of N was not always a whole number. N is reported as the nearest whole number in all figures. Because of this, there are exceptional cases where the number of data points plotted may not appear to equal the N stated in the title. To avoid confusion, many of these instances are noted on plots by an asterisk after the N stated in the title. The N of fish used in CPUE plots of temperature and salinity includes only those fish captured at stations

with temperature and salinity data, and is not always equal to the cumulative CPUE of fishes caught at quantitative stations. Similarly, the N of fishes used in CPUE plots of tidal stage and light stage is the cumulative CPUE of fishes captured at each tow,

The greater quantity and variety of collections during KI9301 and KI9403 allowed analysis of fish distribution versus more parameters than for KI9302, KI9401, and KI9402. Analyses of KI9302 and KI9401 are limited to examination of length/frequency plots and scatterplots of CPUE versus average tow depth. Analysis of KI9402 includes length/frequency plots, scatterplots of CPUE versus average tow depth, distance from the mouth of the bay, bottom temperature and bottom salinity. Figures reporting data from KI9301 and KI9403 include the plots analogous to those prepared for KI9402 and additionally include histograms of fish CPUE by sediment type, and scatterplots of CPUE versus percent gravel, percent sand and percent mud. These plots report the log transformed value of CPUE (+1) for each station or tow, rather than depicting the average CPUE within a physical parameter range, as had been presented during previous years of this study. As is standard in fishery analysis, a logarithmic scale of fish abundances was used on all scatterplots to minimize the overemphasis of unusually large or small abundance values. On this a logarithmic scale, faint patterns of increasing or decreasing fish abundance may nevertheless indicate strong trends in relation to the particular parameter measured.

Data on flatfish distribution and abundance are presented for age-O, age-l and age-22 fish. Age-22 fish are not discussed in the text, since the category arbitrarily groups a wide assortment of ages. Text summarizes the presented tables, charts and graphs. Trends mentioned are limited to conceptual descriptions, as no statistical analyses have been performed.

Fish data are reported in alphabetical order by genus and species in accordance with the order used by the American Fisheries Society (1991).

Data analyses

R-Base (Microrim 1990) was used as a data base manager, but most data summaries, plots and tables were produced using EXCEL (Microsoft Corporation 1993). CTD profiles were plotted using SYSTAT (Wilkinson 1990) or EXCEL.

Table 1. Summary of permanent station codes during 1993 and 1994 within Chiniak Bay (KI9301, KI9302, KI9401 and KI9403).

Permanent station code	Depth range (m)	Substrate type	K19301 CS#	K19302 CS#	KI9401 CS#	K19403 CS#
KBO	O-5	S	22			7
KBO	O-5	S	21		2	8
KB0	O-5	S	20			9
KB5	5-10	S	30		1	6
KB10	IO-20	mS	29		3	12
KB20	20-30	mS	6			27
KB22	20-30	sM	23		5	10
KB30	30-40	SM	24		6	11
KB50	50-60	SM	25			26
KB70	60-70	sM	26		7	25
KB90	80-90	mS				16
MB0	O-5	S	16		8	3
MB5	5-10	mS	28			1
MB5	5-10	mS	27			2
MB10	1 O-20	mS		4	9	29
MB10	10-20	mS	18			4
MB20	20-30	mS	11			5
MB50	50-60					

Table 2. Sediment classification by proportional grain size (aftrr Folk 1980).

Classification Grain size (mm)	Code	% Boulder (B > 256)	% Cobble (256> C >64)	% Gravel (64> G >2)	% Sand + Mud	% Sand (2 > S > 0.07)	% Mud (0.07 > M)
Boulder	B	80< B <100	c <20	G <20			
Cobbly boulder	cB	B > C	20< c <50	G < C			
Gravelly boulder	gB	B > G	C < G	20< G <50			
Cobble	C	B=O	80< C <100	G < C			
Bouldery cobble	bC	0< B <20	80< C <100	G < B			
Gravelly cobble	gC	B=O	C > G	G < C			
Bouldery gravel	bG	0< B <20	C < B	G > B			
Cobbly gravel	cG	B=O	0< c <50	G > C			
Gravel	G	B=O	c = o	80< G <100	20> S+M		
Muddy gravel	mG	B=O	c = o	30< G <80	70> S+M >20	S < M	M > S
Muddy sandy gravel	msG	B=O	c = o	30< G <80	70> S+M >20	S > M	M < S
Sandy gravel	sG	B=O	c = o	30< G <80	70> S+M >20	S > Q(M)	Q(M) < S
Sand	S	B=O	c = o	0< G <5	100> S+M >95	S > Q(M)	Q(M) < S
Gravelly sand	gS	B=O	c = o	5< G <30	95> S+M >70	S > Q(M)	Q(M) < S
Gravelly muddy sand	gmS	B=O	c = o	5< G <30	95> S+M >70	S > M	M < S
Muddy sand	mS	B=O	c = o	0< G <5	100> S+M >95	S > M	M < S
Mud	M	B=O	c = o	0< G <5	1 00> S+M >95	9(S) < M	M > 9(S)
Gravelly mud	gM	B=O	c = o	5< G <30	95> S+M >70	S < M	M > S
Sandy mud	sM	B=O	c = o	0< G <5	100> S+M >95	S < M	M > S

Table 3. Summary of activity during 12 - 24 August 1993 within Chiniak Bay (KI9301). Activity is indexed by consecutive station number (CS#). Explanation of permanent station code is in the methods. Substrate type codes: G = gravel, S = sand, M = mud, g = gravelly, s = sandy, m = muddy. The capital letter represents the dominant sediment and lower case letters are lesser sediment types. Consecutive trawl tow numbers were assigned at each trawling station, regardless of whether the tow was quantitative (*designates non-quantitative tows). Dive transects were examined by SCUBA divers; dives were numbered consecutively for each diver at each dive station. A conductivity, temperature, depth (CTD) probe sampled salinity and temperature at most stations. ** indicates no data of this type were retained, * indicates an estimated value.

CS#	Staon code	Bay	Distance inbay (km)	Substrate type	Date YYMMDD	Tow/dive start HHMM	Duration of tow/ dive (min)	CS#	Tow/dive #	Codend mesh	Beam size (m)	Depth (m) Minimum	Depth (m) Maximum	Depth (m) Mean	Min after High tide	Min after Sunrise	Bottom Temp	Bottom Salinity	CTD file
1		Womens	5.4	mS	930812	1441	0*	1	1*	4 mm	3.05	3	3	3	239	492	15.1	29.2	81500
2		Womens	4.5	mS	930812	1636	10	2	1	4mm	305	IO	15	13	-322	607	120	32 4	81501
3		Womens	4.5	mS	930813	1257	IO	3	1'	4mm	305	18	18	18	101	386	11.5	31 2	81502
3		Womens	4.5	mS	930813	1322	10	3	2	4mm	3.05	18	20	19	126	411			
4		Womens	4.9	mS	930813	1417	10	4	1	4mm	3.05	7	10	9	181	466	11.8	32.1	81503
5		Womens	2.7	gM	930813	1602	10	5	1	4mm	3.05	21	21	21	286	571	11.8	32.0	61504
6	KB20	Kalsin	3.4	mS	930816	950	10	6	1	4mm	3.05	20	25	23	-255	192	10 1	31.7	81600
7		Kalsin	3.3	mS	930816	1029	10	7	1	4mm	3.05	32	36	34	-216	231	9.9	31.9	81601
8		Kalsin	30	mS	930816	1212	IO	8	1	4mm	305	43	46	45	-113	334	9.3	321	81602
9		Kalsin	2.7	mS	930816	1335	10	9	1	4mm	3.05	53	57	55	-30	417	91	32 0	81603
10		Kalsin	2.6	sM	930816	1513	IO	IO	1'	4mm	305	65	65	65	68	515	89	32.0	81604
11	MB20	Middle	2.3	mS	930817	919	10	11	1	4mm	3.05	23	26	25	-322	159	9.8	31.6	82000
12		Middle	-0.3	G	930817	1015	10	12	1	4mm	3.05	34	38	36	-266	215	97	31.6	82001
13	MB50	Middle	-1.2	mS	930817	1115	IO	13	1	4mm	3.05	53	59	56	-206	275	9.6	31.7	82002
14		Middle	-2.1	mS	930817	1248	10	14	1	4 mm	3.05	63	66	65	-113	368	8.3		82003
15		Middle	-3 0	mS	930817	1341	0'	15	1'	4mm	305	72	68	70	-60	421	83	31.8	82004
15		Middle	-3.0	mS	930817	1415	IO	15	2	4mm	3.05	73	77	75	-26	455			
16	MB00	Middle	7.3	S	930819	1110	10	16	1	4mm	3.05	2	3	3	-285	455	10.8	31.2	82006
16	MB00	Middle	7.3	S	930823	1940	5	16	2'	4mm	3.05	3	3	3	48	767			
17		Middle	6.3	mS	930819	1228	10	17	1	4mm	3.05	4	5	5	-207	266	10.8	31.1	82007
18	MB10	Middle	39	msG	930819	1325	10	18	1	4mm	305	13	14	14	-150	323	104	31 5	82008
19		Kalsin	5.3	mS	930619	1500	IO	19	1	4mm	305	18	20	19	-55	418	10.1	316	82009
20	KB00	Kalsin	7.7	S	930819	1536	IO	20	1	4mm	305	2	6	4	-19	454	105	31.4	82012
21	KB00	Kalsin	8.3	S	930819	1609	10	21	1	4 mm	3.05	3	4	4	14	487	107	31 1	82011
22	KB00	Kalsin	a.2	mS	930820	956	IO	22	1	4mm	3.05	2	4	3	349	190	10.7	31.2	82013
23	KB22	Kalsin	6.6	sM	930820	1124	5	23	1	4mm	3.05	23	26	25	-310	278	10.4	31.5	82014
24	KB30	Kalsin	6.3	sM	930820	1208	5	24	1	4mm	3.05	33	38	36	-266	322	10.3	31.5	82015
25	KB50	Kalsin	4.7	sM	930820	1355	10	25	1	4mm	3.05	50	56	53	-159	429	9.8	316	82016
26	KB70	Kalsin	4.0	sM	930820	1549	5	26	1	4mm	3.05	62	66	64	-45	543	9.6	31.7	82017

Table 3. Summary of activity during August 1993 within Chiniak Bay (KI9301 continued).

CS#	Station code	Bay	Distance inbay (km)	Substrate type	Date YYMMDD	Tow/dive start HHMM	Duration of tow/ dive (min)	CS#	Tow/dive #	Codend mesh	Beam size (m)	Depth (m) Minimum	Maximum	Mean	Min after High tide	Min after Sunrise	Bottom Temp	Bottom Salinity	CTD file
27	MB05	Middle	5.7	sM	930823	1312	10	27	1SE	4 mm	3.05	8	a	a	-340	379	.	.	.
27	MB05	Middle	5.7	sM	930823	1350	10	27	2NW	4 mm	3.05	10	10	10	-302	417			
27	MB05	Middle	57	sM	930823	1420	10	27	3NE	4 mm	366	IO	10	10	-272	447			
27	MB05	Middle	5.7	sM	930623	1459	10	27	4SW*	4 mm	366	10	10	10	-233	486			
27	MB05	Middle	5.7	sM	9301323	1230	35	27	DewlE			IO	IO	10	-244	344			
27	MB05	Middle	5.7	sM	930823	1230	19	27	MunklW			9	10	10	-244	344			
27	MB05	Middle	5.7	sM	930823	1348	27	27	Dew2W			11	11	11	-176	412			
27	MB05	Middle	5.7	sM	930823	1348	19	27	Munk2E			10	10	10	-176	412			
28	ME05	Middle	60	s	930823	1702	10	28	1SE	4 mm	3.66	6	6	6	-110	609	**	**	**
28	ME05	Middle	60	s	930823	1748	10	28	2NW	4 mm	366	a	a	a	-64	655			
28	MB05	Middle	60	S	930823	1810	10	28	3NE	4 mm	305	7	7	7	-42	677			
28	MB05	Middle	6.0	s	930823	1854	10	20	4SW	4 mm	305	6	6	6	2	721			
28	MB05	Middle	6.0	s	930823	1604	22	28	DewlE			7	7	7	-168	551			
28	MB05	Middle	6.0	S	930823	1604	19	28	MunklW			6	7	7	-168	551			
20	MB05	Middle	60	s	930823	1708	18	20	Dew2W			7	7	7	-104	615			
28	MB05	Middle	6.0	S	930823	1708	17	28	Munk2E			7	7	7	-104	615			
29	KB10	Kalsin	7.8	mS	930824	1323	IO	29	1NW	4 mm	3.05	13	13	13	-391	388	.	.	**
29	KB10	Kalsin	7.8	mS	930824	1433	10	29	2SE	4 mm	305	13	13	13	-321	458			
29	KB10	Kalsin	7.0	mS	930824	1506	10	29	3SW	4 mm	3.66	11	12	12	-288	491			
29	KB10	Kalsin	7.8	mS	930824	1531	10	29	4NE	4 mm	3.66	14	14	14	-263	516			
29	KB10	Kalsin	7.0	mS	930824	1254	26	29	DewlE			13	14	14	-420	359			
29	KB10	Kalsin	7.8	mS	930824	1237	18	29	MunklW			12	13	12	-437	342			
29	KB10	Kalsin	7.8	mS	930824	1414	24	29	Dew2W			13	13	13	-302	477			
29	KB10	Kalsin	7.8	mS	930824	1356	23	29	Munk2E			14	14	14	-320	459			
30	KB05	Kalsin	8.0	S	930824	1717	10	30	1NE	4 mm	3.66	IO	10	IO	-157	622	**	**	**
30	KB05	Kalsin	a.0	s	930824	1814	10	30	2sw	4 mm	3.66	5	7	6	-100	679			
30	KB05	Kalsin	a.0	s	930824	1825	10	30	3SE	4 mm	3.05	7	8	8	-89	690			
30	KB05	Kalsin	8.0	S	930824	1854	10	30	4NW	4 mm	305	7	9	8	-60	719			
30	KB05	Kalsin	a.0	S	930824	1634	15	30	DewlE			a	10	9	-200	579			
30	KB05	Kalsin	a.0	S	930824	1615	22	30	MunklW			6	a	7	-219	560			
30	KB05	Kalsin	a.0	S	930824	1734	19	30	Dew2W			6	8	7	-140	639			
30	KB05	Kalsin	8.0	S	930824	1723	18	30	Munk2E			6	10	8	-151	628			

KI9301 total	N good tows	39	N sediment grabs 30
	N rtatlons with good tows	28	N good CTD casts 27
	N dives	12	

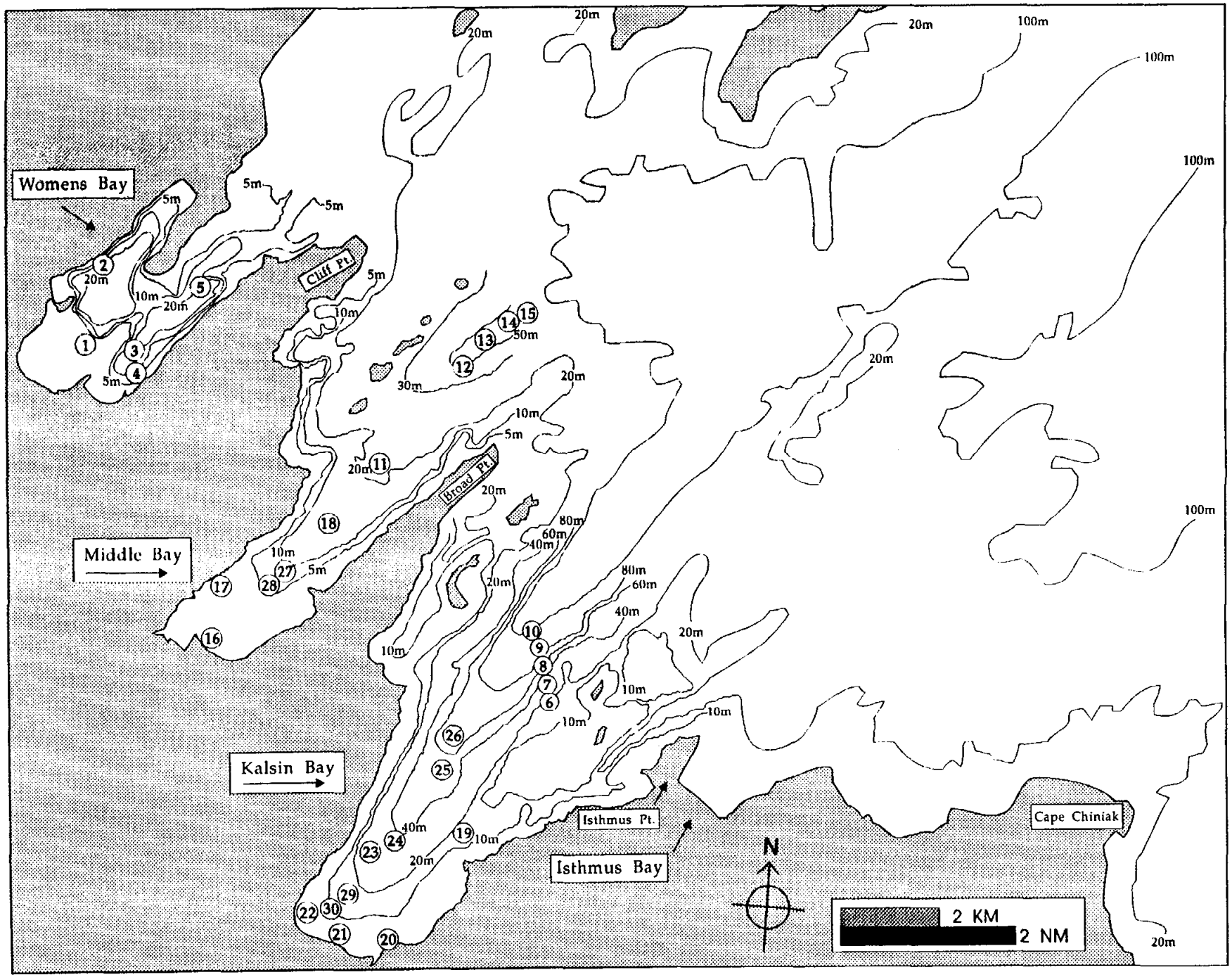


Figure 2. Bottom topography of Womens, Middle and Kalsin Bays and consecutive stations **1-30** sampled during August 1993 within Chiniak Bay **(KI9301).**

Table 4. Summary of activity during 8 - 19 November 1993 within Chiniak Bay (KI9302) Activity is indexed by consecutive station number (CS#). Explanation of permanent station code is in the methods. No dive or substrate data were collected during KI9302. CTD data were not retained. Consecutive trawl tow numbers were assigned at each trawling station, regardless of whether the tow was quantitative (*designates non-quantitative tows). ** indicates no data of this type were collected.

CS#	Permanent station code	Bay	Distance inbay (km)	Substrate type	Date YYMMDD	Tow start HHMM	Duration of tow (min)	CS#	Tow#	Codend mesh	Beam size (m)	Depth (m) Min after Minimum	Maximum	Mean	High tide	Sunrise	Bottom Temp	Salinity	CTD file
1		Womens	5.0	**	931108	1250	5	1	1'	4 mm	1.83	14	18	16	247	249	.	**	.
2		Womens	4.7	**	931108	1320	5	2	1*	4 mm	1.83	15	18	165	277	279	**	**	.
2		Womens	4.7	**	931109	1130	5	2	2	4 mm	3.05	16	18	17	127	167	.	**	**
		Womens	4 6	**	931109	1245	5	3	1'	4 mm	3.05	18	18	18	202	242	**	**	**
4	MB10	Middle	4.0	**	931117	1040	10	4	1	4 mm	3.05	14	14	14	-305		**	.	**
5		Middle	3.6	.		1125	10	5	1	4 mm	3.05	16	17	16	-260	144	**	.	**
6		Middle	3.1	**	931117	1200	10	6	1	4 mm	3.05	16	18	17	-225		.	.	.
7		Middle	4.5	**	931117	1240	10	7	1	4 mm	3.05	10	12	11	-195	209	.	**	**
8		Middle	6.1	**	931117	1330	10	8	1	4 mm	3.05	7	9	8	-145	259	.	**	.
9	MB50	Middle		.		118	1045	10	9	1	4 mm	3.05	46	55	50	-548	102	**	.	**
		Middle	-0 8	.		117	1145	10	10	1	4 mm	3 05	52	58	55	-488	162	.	.	.
		Middle		.		117	1240	3	11	1	4 mm	3.05	30	38	34	-433	217	**	**	**
12		Middle	0.7	.	931117	1310	9	12	1	4 mm	3.05	30	40	35	-403	247	.	**	**

KI9302 total	N good tows	10	N sediment grabs taken 0
	N stations with good tows	10	N good CTD casts 0

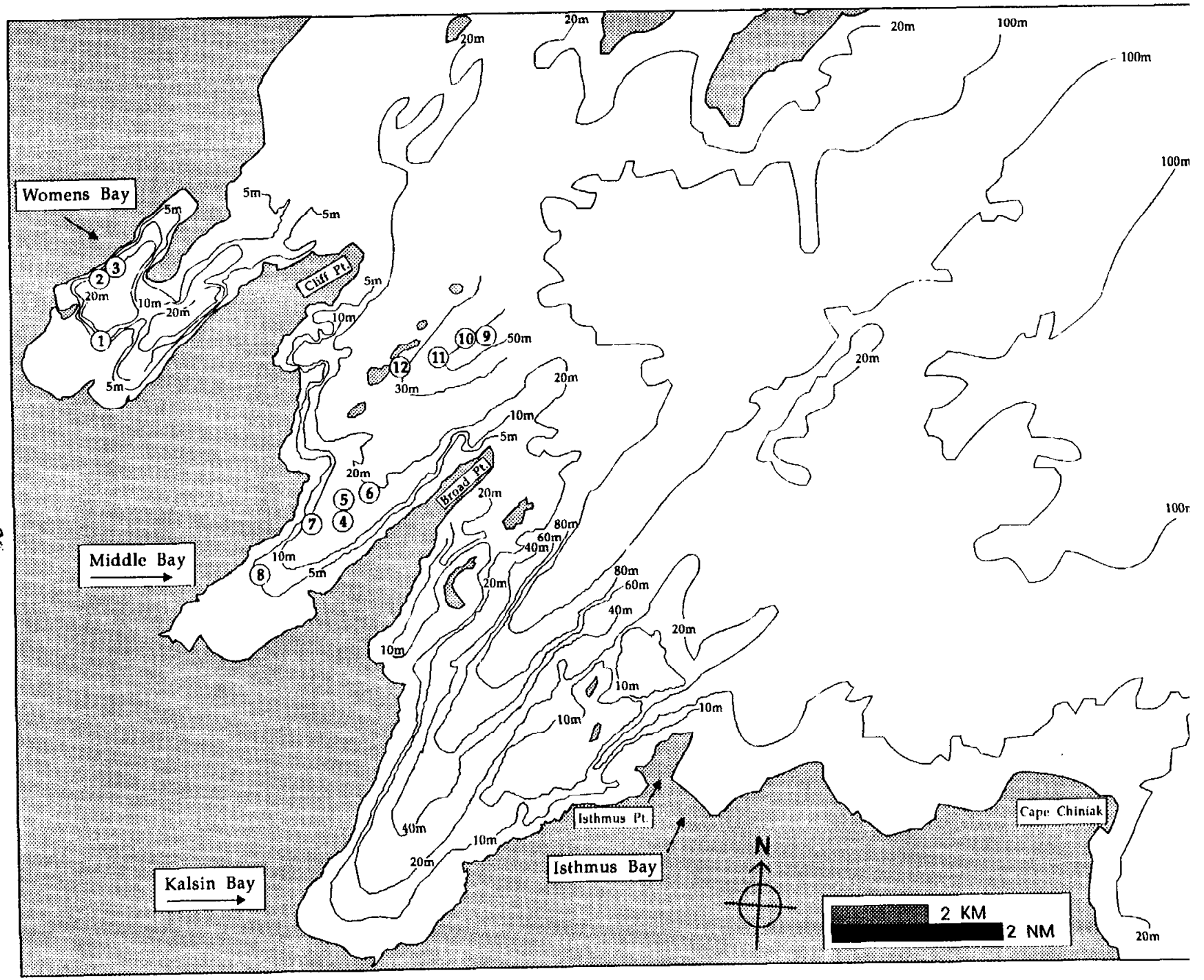


Figure 3. Bottom topography of Womens, Middle and Kalsin Bays and consecutive stations **1-12** sampled during November 1993 within Chiniak Bay **(KI9302).**

Table 6. Summary of activity during 20 - 21 June 1994 within Chiniak Bay (KI9401). Activity is indexed by consecutive station number (CS#). Consecutive trawl tow numbers were assigned at each trawling station. No dive or substrate data were collected during KI9401. CTD data were not retained. ** indicates no data of this type were collected/retained.

CS#	Station code	Bay	Distance inbay (km)	Substrate type	Date YYMMDD	Tow start HHMM	Duration of tow (min)	CS#	Tow#	Codend mesh	Beam size (m)	Depth (m) Minimum	Depth (m) Maximum	Depth (m) Mean	Min after High tide	Min after Sunrise	Bottom Temp	Bottom Salinity	CTD file
1	KB05	Kalsin	8.0	**	940820	835	10.0	1	1	4mm	3.05	11	14	12	-295	204	**	**	**
2	KB00	Kalsin	8.2	**	940820	935	10.0	2	1	4 mm	3.05	8	10	8	-235	284	.*	.*	.*
				**													**	.*	.*
4	KB10	Kalsin	7.2	**	940820	1049	10.0	4	1	4 mm	3.05	18	20	19	-101	328	**	**	**
5	KB22	Kalsin	8.5	**	940820	1308	10.0	5	1	4 mm	3.05	23	24	23	-24	475	**	**	.*
8	KB30	Kalsin	8.1	**	940820	1428	10.0	8	1	4 mm	3.05	35	44	40	58	555	**	**	.*
7	KB70	Kalsin	3.8	**	940820	1543	10.0	7	1	4 mm	3.05	50	85	80	143	842	**	.*	.*
8	MB00	Middle	7.8	**	940821	818	10.0	8	1	4 mm	3.05	8	8	7	-254	187	**	.*	**
9	MB10	Middle	4.0	**	940821	925	10.0	9	1	4 mm	3.05	11	13	12	-185	258	**	.*	**
IO		Middle	3.3	.*	940821	1017	10.0	10	1	4 mm	3.05	18	19	18	-133	308	**	.*	**
11		Middle	1.1	**	940821	1130	10.0	11	1	4 mm	3.05	27	29	28	-80	381	**	.*	.*
12		Womens	4.7	.*	940821	1250	10.0	12	1	4 mm	3.05	IO	17	14	20	481	.*	**	**

KI9401 total	N good tows	12	N sediment grabs taken 0
	N stations with good tows	12	N good CTD casts 0

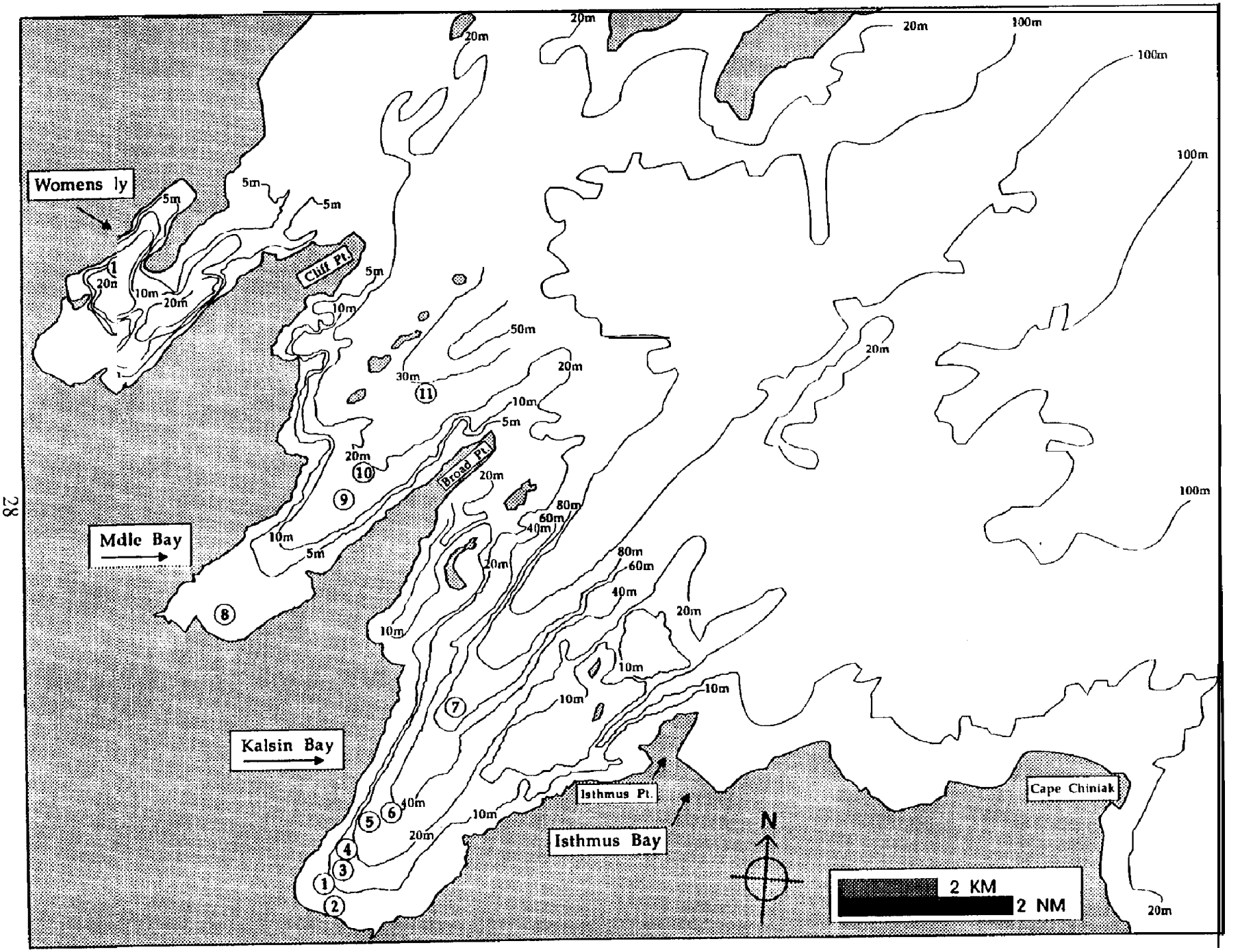


Figure4. Bottom topography of Womens, Middle and Kalsin Bays and consecutive stations 1-12 sampled during June 1994 within Chiniak Bay (KI9401).

Table 6. Summary of activity during 8 - 19 August 1994 within Chiniak Bay (K19403). Activity is indexed by consecutive station number (CS#). Explanation of permanent station code can be found In the methods. Sediment codes: G = gravel, S = sand, M = mud, g = gravelly, s = sandy, m = muddy. The capital letter represents the dominant sediment type and lower case letters are lesser sediment types. Consecutive trawl tow numbers were assigned at each trawling station, regardless of whether the tow was quantitative; *designates non-quantitative tows. Dive transects were examined by SCUBA divers; dives were numbered consecutively for each diver at each dive station. A conductivity, temperature, depth (CTD) probe sampled salinity and temperature at most stations. At trawl/dive comparison stations (CS#6 and 12) multiple CTD and sediment samples were taken at the beginning and end of the day on which the trawls/dives were made, not immediately preceding each tow. CTD files listed for CS#6 and 12, therefore, refer to all tows/dives made at that station on that particular day. *"indicates no data of this type were collected/retained. 'indicates averaged/estimated values.

CS#	Station code	Bay	Distance inbay (km)	Substrate type	Date YYMMDD	Tow/dive start HHMM	Duration of tow/ dive (min)	CS#	Tow/dive #	Codend mesh	Beam size (m)	Depth (m)			Min after		Bottom		CTD file
												Minimum	Maximum	Mean	High tide	Sunrise	Temp	Salinity	
1	MB5	Middle	6.2	sM	940808	1053	10.0	1	1	4 mm	3.05	5	5	5	-287	273	127	304	081400
2	MB5	Middle	5.6	mS	940808	1145	10.0	2	1	4 mm	3.05	8	9	8	-235	325	9.8	31.6	081401
3	MB2	Middle	7.5	mS	940808	1402	10.0	3	1	4 mm	3.05	1	3	2	-98	462	135	29.8	081402
4	MB10	Middle	4.0	mS	940808	1452	10.0	4	1	4 mm	3.05	13	14	14	-48	512	9.0	318	061403
5	MB20	Middle	2.4	S	940808	1534	10.0	5	1	4 mm	3.05	27	24	25	-6	554	8.2	32.0	081404
6	KB5	Kalsin	8.0	S	940809	1133	3.5	6	1SE	4 mm	3.05	6	6'	6	-281	311	84	31 8	081405
6	KB5	Kalsin	80	S	940809	1208	5.7	6	2SW	4 mm	3.05	7'	8'	8	-246	346	8.4	31.8	081406
6	KB5	Kalsin	8.0	S	940809	1233	45	6	3NW	4 mm	3.05	7	9	8	-221	371	8	3 31.8	081407
6	KB5	Kalsin	8.0	S	940809	1254	3.6	6	4NE	4 mm	305	7	7*	7	-200	392	8.4	31.8	081408
6	KB5	Kalsin	8.0	S	940809	1346	4.9	6	5SW	4 mm	3.05	7	8	8	-148	444	82	31.8	081410
6	KB5	Kalsin	8.0	S	940809	1516	3.9	6	6NE	4 mm	3.05	11	11	11	-58	534	8.1	31.8	081411
6	KB5	Kalsin	8.0	S	940809	1550	4.8	6	7NW	4 mm	3.05	10	12	11	-24	568	9.6	31.7	081902
6	KB5	Kalsin	8.0	S	940809	1612	3.8	6	8SE	4 mm	3.05	9	9	9	-2	590	9.5	317	081903
6	KB5	Kalsin	80	S	940815	1442	3.7	6	9SE	4 mm	3.05	6	7	7	-396	487	96	31.7	081904
6	KB5	Kalsin	80	S	940815	1519	4.1'	6	10NW	4 mm	3.05	7	9'	8	-359	524	97	317	081905
6	KB5	Kalsin	8.0	S	940815	1544	3.8	6	11SW	4 mm	3.05	5	6	6	-334	549	9.5	31.7	081906
6	KB5	Kalsin	80	S	940815	1623	4.8	6	12NE	4 mm	3.05	9	9	9	-295	588	9.2	31.7	081907
6	KB5	Kalsin	8.0	S	940815	1658	49	6	13SE	4 mm	3.05	7	7	7	-260	623	92	31.7	081908
6	KB5	Kalsin	8.0	S	940815	1727	4.3	6	14NW	4 mm	3.05	7	9	8	-231	652			
6	KB5	Kalsin	8.0	S	940809	1218	24.0	6	DEW1E			8	10	9	-236	356			
6	KB5	Kalsin	8.0	S	940809	1335	32.0	6	DEW2W			9	11	10	-159	433			
6	KB5	Kalsin	8.0	S	940809	1208	21.0	6	PETE1W			8	9	9	-246	346			
6	KB5	Kalsin	8.0	S	940809	1327	13.0	6	PETE2E			10	9	10	-167	425			
6	KB5	Kalsin	80	S	940809	1532	23.0	6	PETE3W			10	12	11	-42	550			
6	KB5	Kalsin	8.0	S	940809	1638	17.0	6	PETE4E			10	11	11	24	616			
6	KB5	Kalsin	8.0	S	940809	1541	19.0	6	DEW3E			10	11	11	-33	559			
6	KB5	Kalsin	8.0	S	940809	1647	26.0	6	DEW4W			10	12	11	33	625			
6	KB5	Kalsin	8.0	S	940815	1542	24.0	6	PETE5W			6	9	8	-336	547			

Table 6. Summary of activity during August 1994 within Chiniak Bay (KI9403 continued).

CS#	Station code	Bay	Distance in bay (km)	Substrate type	Date YYMMDD	Tow/dive start HHMM	Duration of tow/ dive (min)	CS#	Tow/dive#	Codend mesh	Beam size (m)	Depth (m) Minimum	Depth (m) Maximum	Depth (m) Mean	Min after High tide	Min after Sunrise	Bottom Temp	Bottom Salinity	CTD file
6	KB5	Kalsin	6.0	s	940815	1701	20.0	6	PETE6E			9	10	10	-257	626			
6	KB5	Kalsin	6.0	s	940815	1550	24 0	6	DEW5E			8	9	9	-328	555			
6	KB5	Kalsin	80	s	940815	1711	240	6	DEW6W			7	10	9	-247	636			
7	KB2	Kalsin	81	S	940610	1045	100	7	1	4 mm	3.05	2	3	2	-364	261	8.6	31.7	081412
8	KB2	Kalsin	6.2	s	940810	1154	100	8	1	4 mm	3.05	2	3	2	-295	330	6 2	31.9	081413
9	KB2	Kalsin	7.6	S	940810	1256	100	9	1	4 mm	3.05	3	5	4	-233	392	8.3	31 8	081414
10	KB22	Kalsin	6.5	mS	940810	1412	100	10	1'	4 mm	3.05	27	23	25	-157	468	82	31.9	081415
10	KB22	Kalsin	65	mS	940810	1444	100	10	2'	4 mm	3.05	28	24	26	-125	500			
10	KB22	Kalsin	6.5	mS	940810	1548	50	10	3'	4 mm	3 05	25	24	25	-61	564			
10	KB22	Kalsin	6.5	mS	940819	1230	1.3	10	4	4 mm	3 05	25	24	25	-78	347	9.7	31.8	082128
11	KB30	Kalsin	6.1	mS	940810	1657	5.0	11	1	4 mm	3.05	31	37	34	8	633	8 3	31.8	081416
12	KB10	Kalsin	77	mS	940811	1140	3 3	12	INE'	4 mm	305	12	13	13	-348	314	8 3	31 8	081417
12	KB10	Kalsin	7.7	mS	940811	1157	3.8	12	2sw	4 mm	305	12	12	12	-331	337	8 3	31 9	081418
12	KB10	Kalsin	7.7	mS	940811	1327	3.8	12	3SE	4 mm	3.05	12	13	13	-241	421	8.4	31 8	081419
12	KB10	Kalsin	7.7	mS	940811	1345	38	12	4NW	4 mm	3.05	12	13	13	-223	439	6.3	31 9	081420
12	KB10	Kalsin	7.7	mS	940811	1543	3.3	12	5NE	4 mm	3.05	15	15	15	-105	557	8.5	31.9	081421
12	KB10	Kalsin	7.7	mS	940811	1621	3.8	12	6NW	4 mm	305	14	15	15	-67	595	8.5	31.8	081422
12	KB10	Kalsin	7.7	mS	940811	1640	3.7	12	7SE	4 mm	3.05	15	15'	15	-48	614	9 2	31.7	081423
12	KB10	Kalsin	7.7	mS	940812	1215	3.9	12	8SE	4 mm	3.05	13	13'	13	-356	347	9.2	31.7	081424
12	KB10	Kalsin	7.7	mS	940812	1314	3.6	12	9NW	4 mm	3.05	12	13	13	-297	406	9.3	31 7	081425
12	KB10	Kalsin	7.7	mS	940812	1414	3.8	12	10SW	4 mm	3.05	11	12	12	-237	466	9.2	31 7	081426
12	KB10	Kalsin	7.7	mS	940812	1516	3.5	12	11NE	4 mm	3.05	14	14	14	-175	528	9.1	31.7	081427
12	KB10	Kalsin	7.7	mS	940812	1631	3.8	12	12SE	4 mm	3.05	14	15	15	-100	603	9.2	31.7	081428
12	KB10	Kalsin	7.7	mS	940812	1657'	5.0	12	13NW	4 mm	3.05	14	14'	14	-74	629	9.1	31 8	081429
12	KB10	Kalsin	7.7	mS	940812	1723	4.1	12	14SW	4 mm	3.05	13	14	14	-48	655			
12	KB10	Kalsin	7.7	mS	940812	1749	4.0	12	15NE	4 mm	3.05	15	16	16	-22	661			
12	KB10	Kalsin	7.7	mS	940811	1148	22.0	12	DEW1E			15	15	15	-340	322			
12	KB10	Kalsin	7.7	mS	940811	1310	23.0	12	DEW2W			14	14	14	-258	404			
12	KB10	Kalsin	7.7	mS	940811	1139	21.0	12	PETE3W			13	14	14	-349	313			
12	KB10	Kalsin	7.7	mS	940811	1259	25.0	12	PETE4E			15	15	15	-269	393			
12	KB10	Kalsin	7.7	mS	940811	1528	20.0	12	DEW5E			17	18	18	-120	542			
12	KB10	Kalsin	7.7	mS	940811	1653	20.0	12	DEW6W			16	17	17	-35	627			
12	KB10	Kalsin	7.7	mS	940811	1511	28.0	12	PETE7W			15	16	16	-137	525			
12	KB10	Kalsin	7.7	mS	940811	1645	20.0	12	PETE8E			17	18	18	-43	619			
12	KB10	Kalsin	7.7	mS	940812	1258	24.0	12	DEW9E			15	16	16	-313	390			
12	KB10	Kalsin	7.7	mS	940812	1436	230	12	DEW10W			16	14	15	-215	488			
12	KB10	Kalsin	7.7	mS	940812	1248	21.0	12	PETE11W			13	14	14	-323	280			
12	KB10	Kalsin	7.7	mS	940812	1423	18.0	12	PETE12E			16	15	16	-228	475			
12	KB10	Kalsin	7.7	mS	940812	1658	19.0	12	DEW13E			17	18	18	-73	630			
12	KB10	Kalsin	7.7	mS	940612	1819	19.0	12	DEW14W			16	17	17	8	711			

Table 6. Summary of activity during August 1994 within Chiniak Bay (KI9403 continued).

CS#	Station code	Bay	Distance inbay (km)	Substrate type	Date YYMMDD	Tow/dive start HHMM	Duration of tow/ dive (min)	CS#	Tow/dive #	Codend mesh	Beam size (m)	Depth (m) Minimum	Depth (m) Maximum	Depth (m) Mean	Min after High tide	Min after Sunrise	Bottom Temp	Bottom Salinity	CTD file
12	KB10	Kalsin	7.7	mS	940812	1646	210	12	PETE15W			15	17	16	-85	618			
12	KB10	Kalsin	77	mS	940812	1811	15.0	12	PETE16E			17	18	18	0	703			
13		Kalsin	-1.8	s	940815	1116	6.7	13	1	4 mm		50	53	52	103	281	8.3	31 9	081900
13		Kalsin	-1.8	sG	940816	1005	3.0	13	2'	4 mm		34	39	37	-58	208	8.6	31.8	081909
13		Kalsin	-1.8	S	940816	1033	8.8	13	3	4 mm		49	57	54	-30	236	85	31.9	081910
14		Kalsin	-1.4	mS	940615	1228	5.0	14	1'	4 mm		106	109	107	175	353	76	309	081901
14		Kaisin	-1.4	mS	940815	1252	50	14	2'	4 mm		105	105	105	199	377			
14		Kalsin	-1.4	mS	940816	1155	5.0	14	3	4 mm		111	111	Ill	52	318	7.6	31.9	081911
15		Kalsin	0.2	sM	940816	1302	10.0	15	1	4 mm		91	100	95	119	385	7.8	31.9	081912
16	KB90	Kalsin	1.9	mS	940816	1425	100	16	1	4 mm		a5	91	87	202	468	8.0	31.9	081913
17		Kaisin	-1.6	G	940616	1540	5.0	17	1	4 mm		40	48	44	277	543	8.4	31.8	081914
18		Kalsin	-0.7	S	940816	1632	100	18	1	4 mm	305	20	23	22	329	595	89	31.8	081915
19		Middle	-2 4	mS	940817	0921	10.0	19	1	4 mm	305	64	82	73	-171	162	76	32.0	081916
20		Middle	-1 a	mS	940817	1043	10.0	20	1	4 mm	3.05	68	69	68	-89	244	76	32.0	081917
21	MB50	Middle	-1 3	mS	940817	1132	10.0	21	1	4 mm	305	52	59	55	-40	293	78	32.0	081918
22		Middle	-0.3		940817	1158	1.5	22	1*	4 mm	305	35	37	36	-14	319	**	**	
23		Middle	**	**	940817	1426	10.0	23	1'	4 mm	3.05	1	2	2	134	467			
23		Middle			940817	1351	100	23	2'	4 mm	3.05	1	2	2	99	432			
23		Middle			940817	1321	100	23	3'	4 mm	305	1	2	2	69	402			
23		Middle			940817	1259	50	23	4*	4 mm	3.05	1	2	2	47	380			
24		Kalsin	3.2	sM	940818	0933	10.0	24	1	4 mm	305	70	78	74	-212	172	7.6	31.9	081919
25	KB70	Kalsin	3.9	sM	940818	1010	100	25	1	4 mm	3.05	63	69	66	-175	209	8.0	31.9	081920
25	KB70	Kaisin	3.9	sM	940819	1136	1.3	25	2	4 mm	305	66	69	68	-132	293	81	31 9	081927
26	KB50	Kalsin	4.7	sM	940818	1137	33	26	1	4 mm	3.05	55	57	56	-88	296	85	31.9	081921
26	KB50	Kalsin	4.7	sM	940819	1024	1.3	26	2	4 mm	3.05	54	54	54	-204	221	8.5	32.0	081926
26	KB50	Kalsin	4.7	sM	940819	1320	0.2	26	3*	4 mm	3.05	56	56	56	-28	397	8.7	31.8	081929
27	KB20	Kalsin	3.3	mS	940818	1229	1.0	27	1	4 mm	3.05	23	24	24	-36	348	9.4	317	081922
28		Kalsin	3.2	mS	940818	1248	10.0	28	1*	4 mm	3.05	32	39	36	-17	367	9.2	31.7	081923
29	MB10	Middle	49	mS	940818	1415	5.0	29	1	4 mm	3.05	IO	11	11	70	454	99	31.7	081924
30		Middle	-0.8	sG	940819	0845	10.0	30	1	4 mm	3.05	32	42	37	-303	122	9.1	32.1	081925

Ki9403 total — N good tows 42 — N good CTD casts 59

N stations with good tows 27

N dives 28

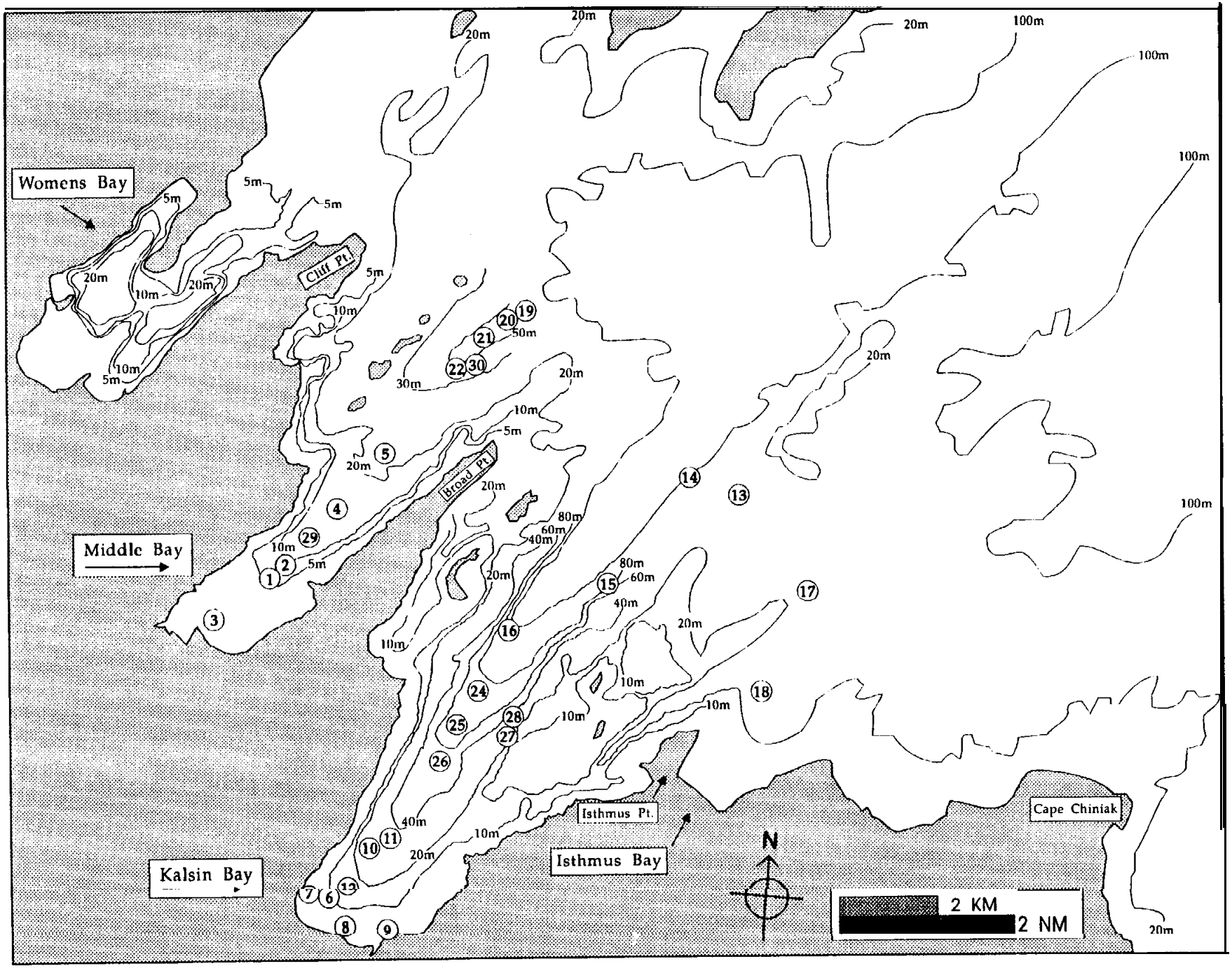


Figure 5. Bottom topography of Womens, Middle and Kalsin Bays and consecutive stations 1-30 sampled during August 1994 within Chiniak Bay (KI9403).

Table 7. Summary of activity during 2 - 7 August 1994 within Kazakof Bay (K19402). Activity is indexed by consecutive station number (CS#). Consecutive trawl tow numbers were assigned at each trawling station, regardless of whether the tow was quantitative (* designates nonquantitative tows). No dive data were collected during Kl9402. Sediment samples were retained but not examined. ** indicates no data of this type were collected/retained. *** indicates data have not been examined.

CS#	Bay	Distance inbay (km)	Substrate type	Date YYMMDD	Tow start HHMM	Duration of tow (min)	CS#	Tow#		Codend mesh	Beam size (m)	Depth (m) Minimum	Maximum	Mean	Min after High tide	Sunrise	Bottom Temp	Salinity	CTD file
1	Kazakof	19.7	***	940802	1045	10.0	1	1		4 mm	3.05	2	3	3	-77	280	14.2	30.5	80214
1	Kazakof	19.7	***	940802	1233	10.0	1	2		4 mm	3.05	3	3	3	31	388	14.2	30.5	80216
2	Kazakof	19.1	***	940802	1353	10.0	2	1		4 mm	3.05	6	7	6	111	468	9.4	33.4	80217
3	Kazakof	17.7	***	940802	1603	5.8	3	1		4 mm	3.05	13	13	13	241	598	a.5	32.8	80218
4	Kazakof	11.4		940803	851	10.0	4	1	*	4mm	3.05	110	110	110	-244	163	4.4	32.2	80400
4	Kazakof	11.4	***	940803	1103	5.0	4	2'		4mm	3.05	108	108	108	-112	295	4.4	32.2	80401
4	Kazakof	11.4	***	940803	1139	5.0	4	3		4 mm	3.05	108	108	108	-76	331			
5	Kazakof	15.9	**	940803	1416	5.0	5	1	*	4mm	3.05	37	37	37	81	488	7.5	31.9	80402
5	Kazakof	15.9	***	940803	1458	10.0	5	2	*	4mm	3.05	37	38	37	123	530			
8	Kazakof	17.5	***	940803	1555	5.0	6	1		4 mm	3.05	25	25	25	180	587	7.7	31.9	80403
6	Kazakof	17.5	***	940805	1504	3.3	6	2		4 mm	3.05	25	26	25	53	532	7.7	31.9	a0707
7	Kazakof	11.5	***	940804	736	5.0	7	1	*	4mm	3.05	94	97	96	-360	86	4.7	32.1	80405
7	Kazakof	11.5	***	940804	815	5.0	7	2		4 mm	3.05	94	97	96	-321	125			
8	Kazakof	12.4	***	940804	930	5.0	8	1		4 mm	3.05	84	85	85	-246	200	4.9	31.9	80406
9	Kazakof	13.6	***	940804	1042	5.0	9	1		4 mm	3.05	55	67	61	-174	272	5.1	31.4	80407
10	Kazakof	14.0	***	940804	1224	10.0	10	1		4 mm	3.05	40	47	43	-72	374	6.8	32.0	80408
11	Kazakof	15.5	***	940804	1351	5.0	11	1		4 mm	3.05	35	36	35	15	461	7.6	31.9	80409
12	Kazakof	16.3	***	940804	1442	5.0	12	1		4 mm	3.05	28	28	28	66	512	7.9	31.8	80410
13	Kazakof	16.2	***	940804	1547	5.0	13	1	.	4mm	3.05	29	30	30	131	577	7.7	31.3	80411
13	Kazakof	16.2	***	940804	1608	5.0	13	2	.	4mm	3.05	29	30	30	152	598			
13	Kazakof	16.2	***	940805	1412	3.3	13	3		4 mm	3.05	29	30	29	16	495	7.7	31.3	80706
14	Kazakof	15.4		940804	1645	5.0	14	1	*	4mm	3.05	34	35	34	189	635	7.6	31.9	80413
14	Kazakof	15.4		940804	1721	6.0	14	2		4 mm	3.05	34	35	34	225	671			
15	Kazakof	10.8	***	940805	852	5.0	15	1		4 mm	3.05	107	107	107	-319	160	4.6	32.1	a0700
16	Kazakof	11.7	***	940805	955	3.3	16	1		4 mm	3.05	94	94	94	-256	223	4.6	32.1	80701
17	Kazakof	12.1	***	940805	1057	3.3	17	1		4 mm	3.05	81	82	82	-194	285	4.7	31.8	a0702
18	Kazakof	13.2		940805	1211	3.3	18	1		4 mm	3.05	73	74	74	-120	359	5.0	32.2	80703
19	Kazakof		***	940805	1256	3.3	19	1		4 mm	3.05	70	75	72	-75	404	5.0	32.1	a0704
20	Kazakof	14.4	***	940805			20	**				45	45	45			•	**	**

Table 7. Summary of activity during August 1994 within Kazakof Bay (KI9402 continued).

CS#	Bay	Distance inbay (km)	Substrate type	Date YYMMDD	Tow start HHMM	Duration of tow (min)	CS#	Tow#	Codend mesh	Beam size (m)	Depth (m) Minimum	Depth (m) Maximum	Depth (m) Mean	Min after High tide	Min after Sunrise	Bottom Temp	Bottom Salinity	CTD file
21	Kazakof	17.5	***	940805			21	**			26	26	26			**	**	
22	Kazakof	18.1	***	940805	1558	5.0	22	1	4mm	3.05	12	14	13	107	586	8.2	31.8	80708
23	Kazakof	11.6	***	940806	807	5.0	23	1	4 mm	3.05	51	52	52	389	113	7.3	31.9	80709
24	Kazakof	11.5	***	940806	913	5.0	24	1	4 mm	3.05	61	65	63	-331	180	6.9	31.9	80710
25	Kazakof	12.0	. *	940806	1001	5.8	25	1	4 mm	3.05	45	46	46	-283	228	7.3	31.9	80711
26	Kazakof	13.2	***	940806	1204	3.0	26	1	4 mm	3.05	34	37	35	-160	351	7.5	31.9	80712
27	Kazakof	12.8	***	940806	1108	6.5	27	1	4 mm	3.05	27	30	29	-216	295	7.5	31.9	80712
28	Kazakof	13.1	. ⊠	940806	1258	5.0	28	1	4 mm	3.05	12	13	13	-106	405	6.1	34.0	00713
29	Kazakof	13.4	***	940806	1353	6.7	29	1	4mm	3.05	5	9	7	-51	460	11.3	31.4	80714
30	Kazakof	14.0	. **	940806	1453	5.0	30	1	4 mm	3.05	51	55	53	9	520	7.1	32.0	60715
31	Kazakof	16.3	***	940806	1800	5.0	31	1	4mm	3.05	5	5	5	76	587	12.1	31.4	80716
32	Kazakof	11.7	***	940806	1710	5.0	32	1	4mm	3.05	21	23	22	147	658	7.6	32.0	80717
KI9402 total					N good tows			31						N good CTD casts				33
					N stations with good tows			29						N sediment grabs				33

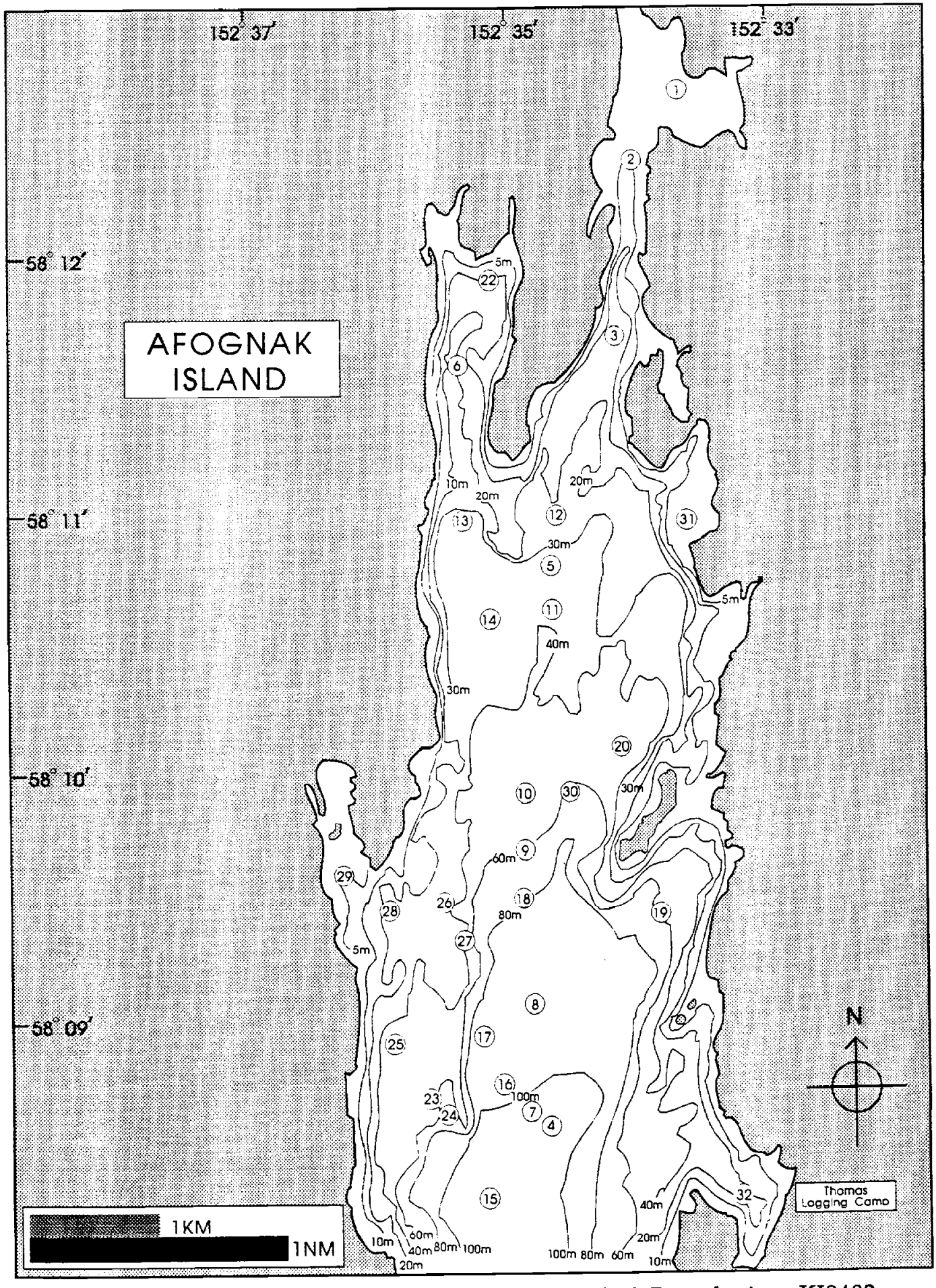


Figure 6. Consecutive station locations in Kazakof Bay during KI9402, August 1994.

RESULTS and DISCUSSION

Aging of flatfishes

Length analyses of flatfishes during August and November 1993 (KI9301 & KI9302)

Ages of flatfishes captured in August and November 1993 were estimated using total lengths (Table 8, Figure 7). Due to past collections during August near Kodiak, estimates of length-at-age were consistently reliable for age-O, age- 1 and age-12 fish.

For several species, an estimate of growth was possible for the three month time span between collections. Flaffishes of different species grew at different rates, as evidenced by the shift of the 5 mm mode and a comparison of mean length at age. The 5 mm mode of age-0 arrowtooth flounder increased by 45 mm from 45 - 49 mm to 90 - 94 mm, and the mean length at age of age-0 arrowtooth flounder shifted 44 mm during this period, from 56±12 mm to 100±11 mm. Age-l arrowtooth flounder did not have a distinct mode, but the mean length at age increased by 35 mm during August to November, from 163±25 mm to 198±22 mm. The mode of age-0 flathead sole shifted 10 mm from August (30 - 34 mm) to November (40 - 45 mm), and the average length at age increased by 14 mm from August (32±4 mm) to November (46±9 mm). The mode of age-1 flathead sole increased 5 mm (from 90 - 54 mm to 95 - 99 mm), but its mean length at age was also 14 mm larger in November (112±23 mm) than in August (98±15 mm). No mode shift could be followed for Pacific halibut, but the mean length at age increased by 38 mm for age-0 fish (from 71±11 mm to 109±16 mm) and 30 mm for age-l fish (from 174±10 mm to 204±5 mm). The 5 mm mode of age-l yellowfin sole increased by 20 mm from August (65 - 69 mm) to November (85 - 89 mm), and the mean length at age also increased by 20 mm (from 72±9 mm to 92±9 mm). The mode of age-0 rock sole increased by 20 mm, from 35 - 39 mm in August to 55 - 59 mm in November, and the average length at age of age-0 rock sole increased by 17 mm (from 41±7 mm to 58±16 mm). The mean length at age of age-l rock sole increased by 3 1 mm (from 109±22 mm to 140±20 mm). The mean length of age-l Alaska plaice increased by 54 mm from August (163±22 mm) to November (217±32 mm).

Length analyses of flatfishes during June and August 1994 (KI9401, KI9403 & KI9402)

Ages of flatfishes captured during June (KI9401) and August (KI9403) 1994 within Chiniak Bay, and flatfishes caught during August 1994 (KI9402) within Kazakof Bay were estimated using total length frequency plots (Table 9, Figures 8-10). Growth was estimated as the difference between length modes during June and August collections within Chiniak Bay. Age-l flathead sole grew 30 mm during this time, from 75 - 79 mm to 105 - 109 mm. Age-O halibut increased by 20 mm, from 35 - 39 mm to 55 - 59 mm. Age-0 yellowtin increased by 20 - 25 mm and passed a "biiday" between June and August. Age-O yellowtin sole in June were 55 - 64 mm and the same group were age-l during August (80 - 84 mm). Age-0 rock sole grew 25 mm, from 15 - 19 mm to 40 - 44 mm.

Flatfishes caught during August were consistently larger at age within Chiniak Bay (KI9403) than in Kazakof Bay (KI9402). Age-O flathead sole were 35 - 39 mm in Chiniak Bay and 5 mm smaller in Kazakof Bay (30 - 34 mm). Age-l flathead sole were 105 - 109 mm in Chiniak Bay and 15 mm smaller in Kazakof Bay (90 - 94 mm). Age 1 yellowfin sole were 20 mm larger in Chiniak Bay (80 - 84 mm) than in Kazakof Bay (60 - 64 mm). Both ages-0 and -1 rock sole were 5 mm larger in Chiniak Bay than in Kazakof Bay. Age-O rock sole were 40 - 44 mm in Chiniak Bay and 35 - 39 mm in Kazakof Bay. Age-1 rock sole were 115 - 119 mm in Chiniak Bay and 110 - 113 mm in Kazakof Bay.

Table 8. Age-at-length determinations for flatfishes captured during August (KI9301) and November (KI9302) 1993 within Chiniak Bay.

		August			November		
Species	Age	N	range 5 mm mode		N	range 5 mm mode	
All flatfishes	All	3461	22 - 595		935	27-415	
Arrowtooth	All	54	40 - 278		123	75-415	
flounder	0	37	40 - 83	45-49	109	75-126	90 - 94
	1	13	113-199	165-169	13	172-240	
	≥2	4	243-278		1	415	
Flathead sole	All	1039	22 - 358		307	34-285	
	0	376	22-42	30-34	122	34-71	40-45
	1	515	61-141	90 - 94	175	75-163	95 - 99
	≥2	148	145 - 358		10	176-285	
Pacific halibut	All	247	41 -351		17	86 - 207	
	0	50	41-111	65-69	14	86-135	
	1	3	163-183		3	199-207	
	≥2	1	351				
Dover sole	All	3	183 - 200		3	128-232	
	1	0			2	128 - 186	
	≥2	3	183 - 200		1	232	
Starry	All	12	59-595		2	171-265	
flounder	0	1	59		0		
	1	0			1	171	
	≥2	11	245-595		1	265	
Yellowfin sole	All	263	49-407		134	27 - 384	
	0	0			9	27-41	35-44
	1	186	49-105	65-69	74	75-117	85 - a9
	≥2	77	146-407		51	137 - 384	
Rock sole	All	1858	22-431		333	32-407	
	0	1524	22-61	35-39	240	32-105	55-59
	1	249	63-158		68	111-193	140 - 144
	≥2	a5	161-431		25	200-407	
Buttersole	All	36	231-395		11	155-393	
	1	0			1	155	
	≥2	36	231 - 395		10	250-393	
Alaska plaice	All	32	37-275		5	182-267	
	0	1	37		0		
	1	29	104-194		5	182 - 267	
	≥2	2	273-275				
English sole	All	9	75-116				
	0	9	75-116	85 - 89			
Sand sole	All	4	137 - 484				
	1	3	137 - 160				
	≥2	1	484				

Table 9. Age-at-length determinations for flatfishes captured during June (KI9401) and August (KI9403) 1994 within Chiniak Bay and during August (K19402) 1994 within Kazakof Bay.

		Chiniak Bav: June			Chiniak Bav: Auaust			Kazakof Bav: August		
Species	Age	N	range	5 mm mode	N	range	5 mm mode	N	range	5 mm mode
All flatfishes	All	977	23-414		6554	17-581		218	23-296	
Arrowtooth	All	2	40-242		552	33-493		0		
flounder	0	1	40		537	33 - 83	50-54	0		
	1	0			4	137 -176		0		
	≥2	1	242		11	254 -493		0		
Rex sole	All	2	77-104		2	47-115		0		
	0	0			1	47		0		
	1	2	77-104		1	115		0		
Flathead sole	All	417	24 -400		558	30-426		128	28 - 263	
	0	1	24		216	30-50	35-39	38	28 - 47	30-34
	1	262	51-117	75-79	229	56-141	105 - 109	58	68-106	90-94
	≥2	154	124-400	150-154	113	146-426		32	122-214	
Pacific halibut	All	51	23-270		707	31-296		2	32 - 48	
	0	50	23-59	35-39	704	31 - 92	55-59	2	32 - 48	
	1	0			2	192-215		0		
	≥2	1	270		1	296		0		
Dover sole	All	0			2	270-299		0		
	≥2	0			2	270-299		0		
Starry	All	0			17	27-581		0		
flounder	0	0			3	27-38		0		
	1	0			3	144-148		0		
	≥2	0			12	225-581		0		
Yellowfin sole	All	118	47 - 388		164	20-351		45	45-203	
	0	46	47-75	55-64	2	20-21		0		
	1 or ≥1	72	86 - 388		109	46107	80 - 84	26	45 - 82	60-64
	≥2				53	127-351	165-169	19	94-283	110 - 114
Rock sole	All	341	14-389		4422	17 - 383		35	23-296	
	0	53	14-36	15 - 19	4089	17-50	40-44	20	23-54	35-39
	1	165	47-114	85 - 89	239	60 - 158	115-119	12	60-113	110-113
	≥2	123	122-309	175-179	94	161 - 383		3	165-296	
Butter sole	All	44	75-414		66	18 - 402		0		
	0	0			6	18 - 25		0		
	1	1	75		0			0		
	≥2	43	280-414		60	260-402		0		
Alaska plaice	All	1	367		4	142-261		0		
	0	0			0			0		
	1	0			2	142-162		0		
	≥2	1	340		2	253-261		0		
English sole	All	0			46	64-110		a	57-97	
	0	0			46	64-110		a	57-97	
Sand sole	All	1	367		13	122-510		0		
	1	0			2	122-142		0		
	≥2	1	367		11	260-510		0		

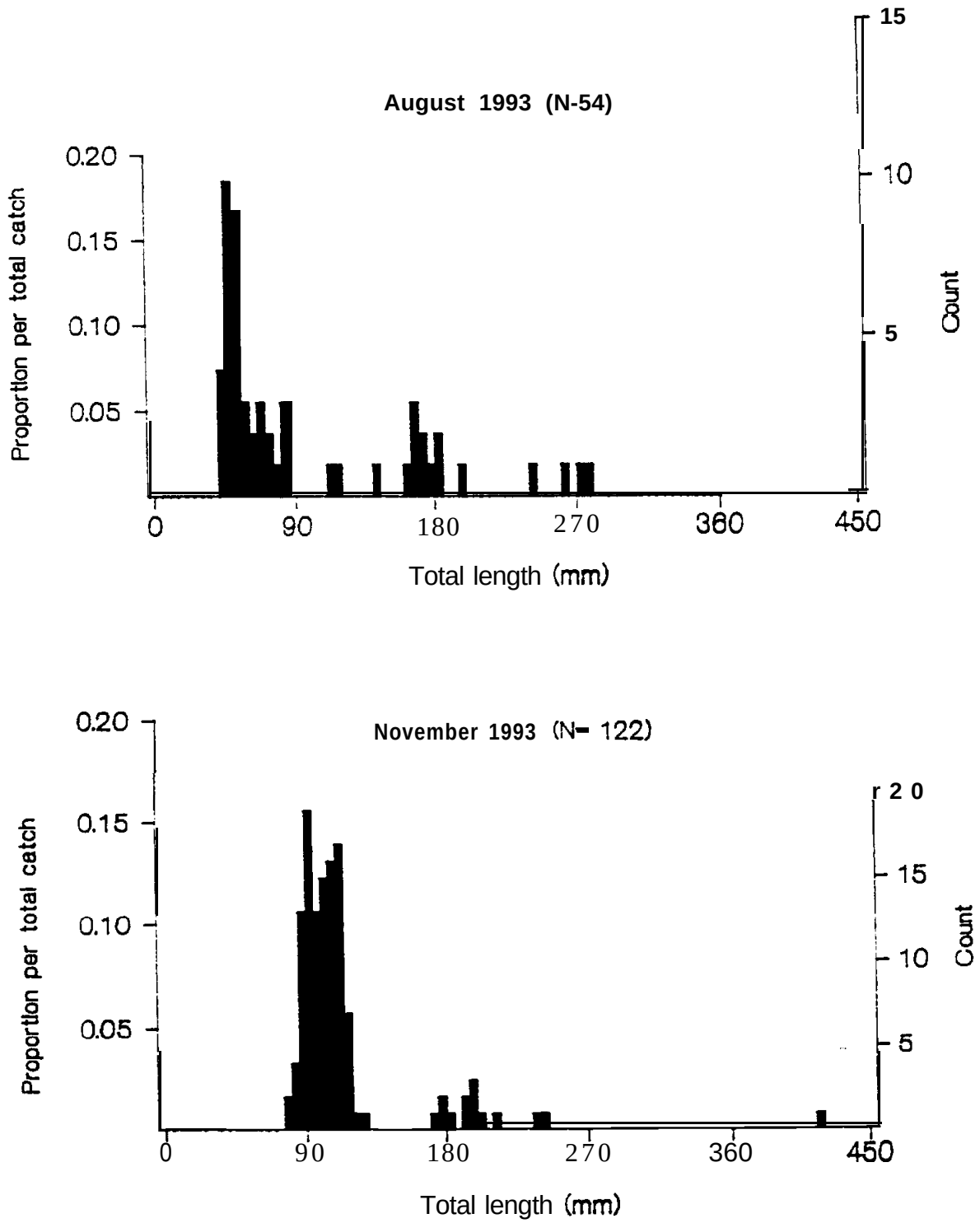


Figure 7a. Total length/frequency plots for arrowtooth flounder captured during August (KI9301) and November (KI9302) 1993 within Chiniak Bay.

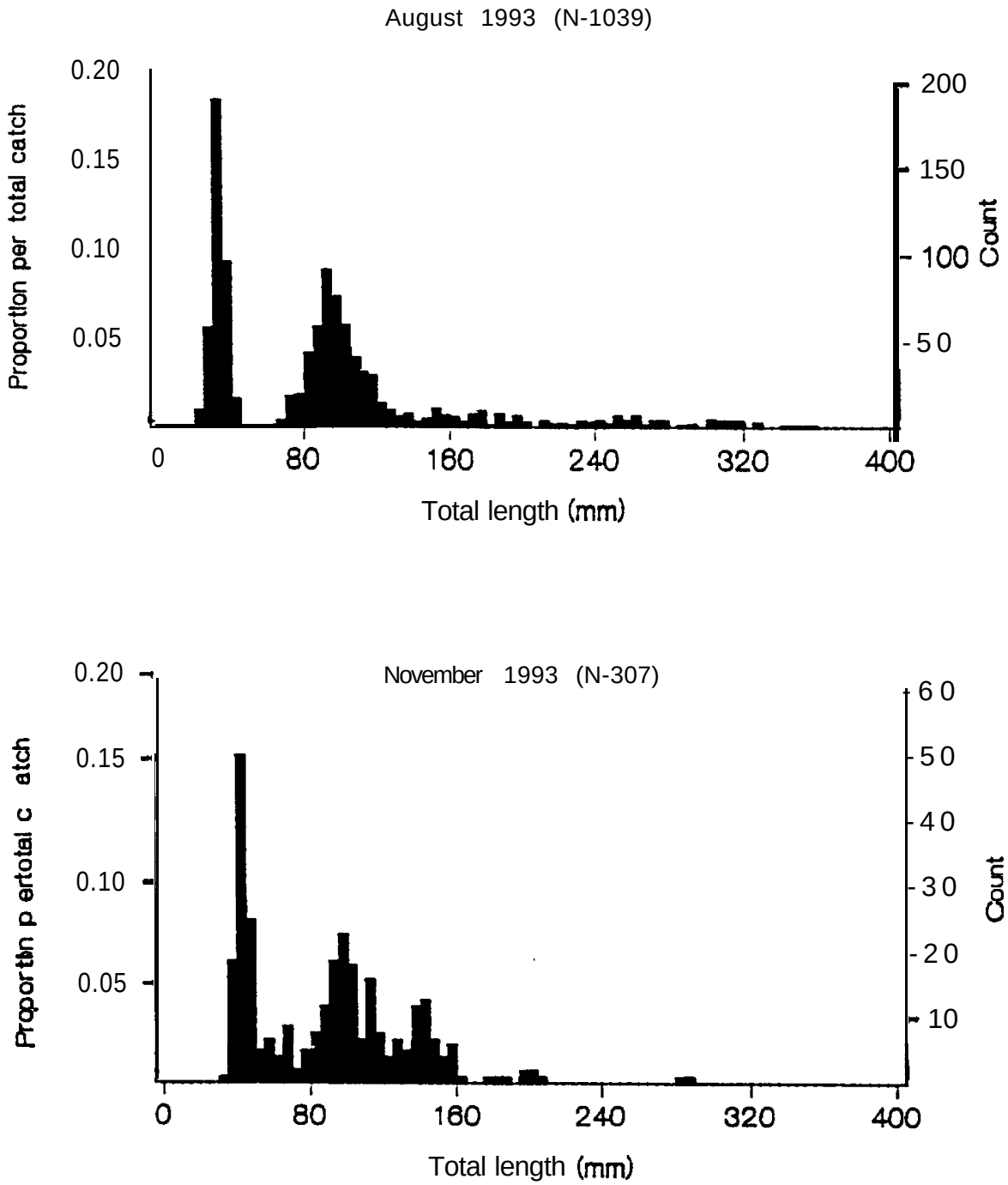


Figure 7b. Total length/frequency plots for flathead sole captured during August (Kl9301) and November (K19302) 1993 within Chiniak Bay.

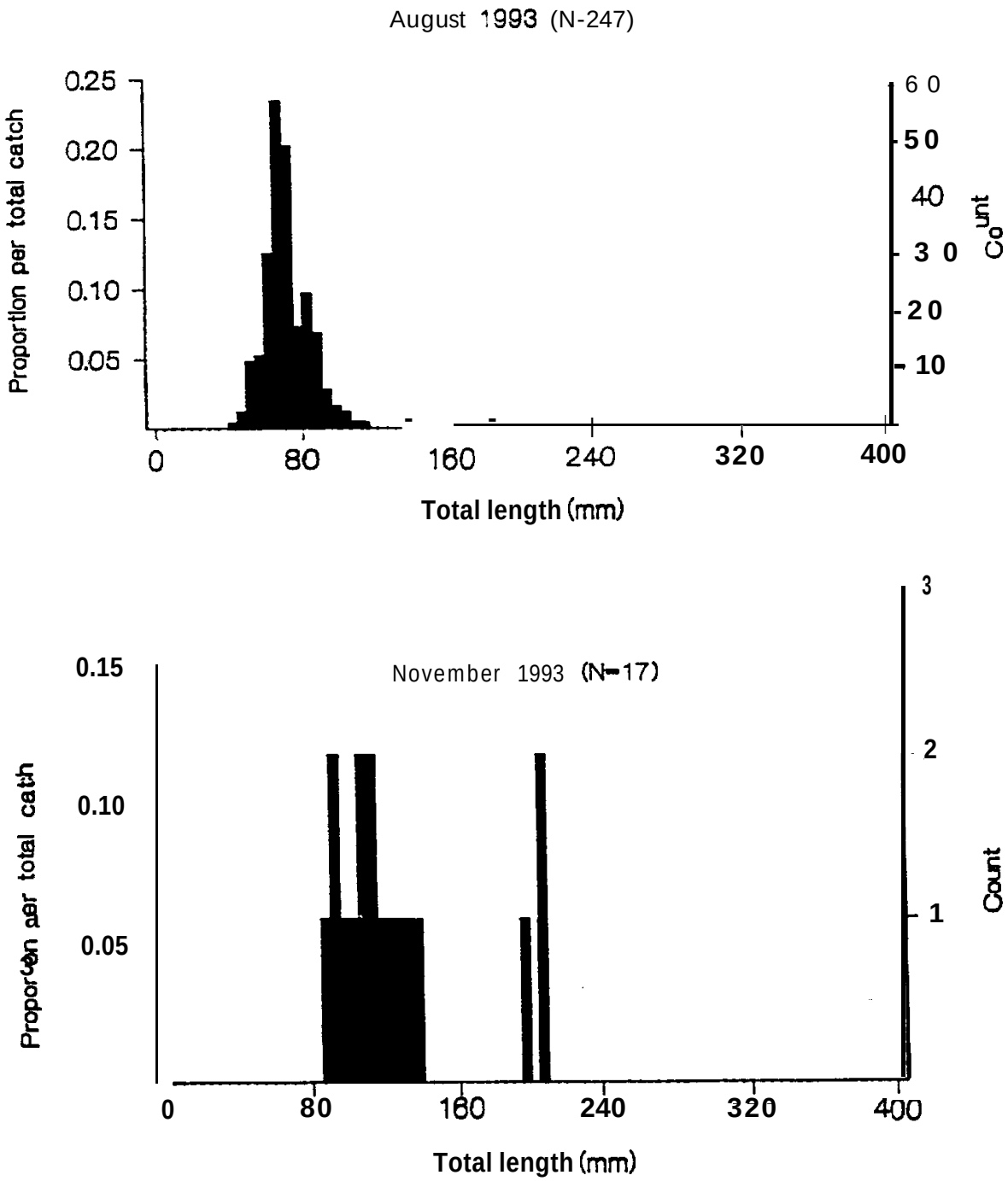
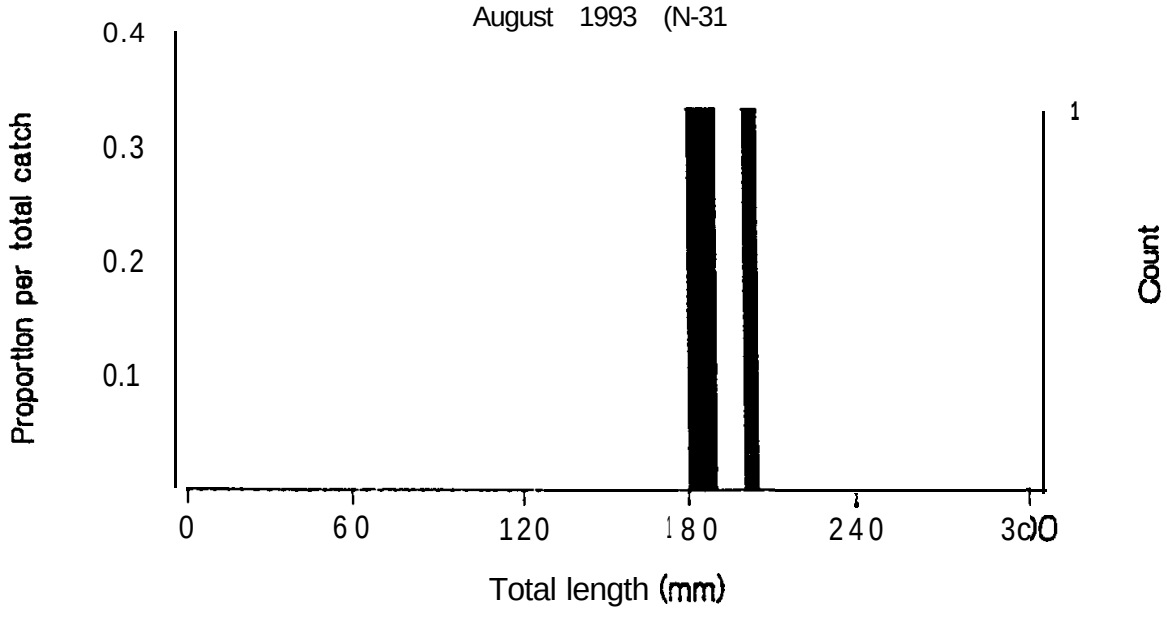


Figure 7c. **Total length/frequency plots for Pacific halibut captured during August (K19301) and November (KI9302) 1993 within Chiniak Bay.**



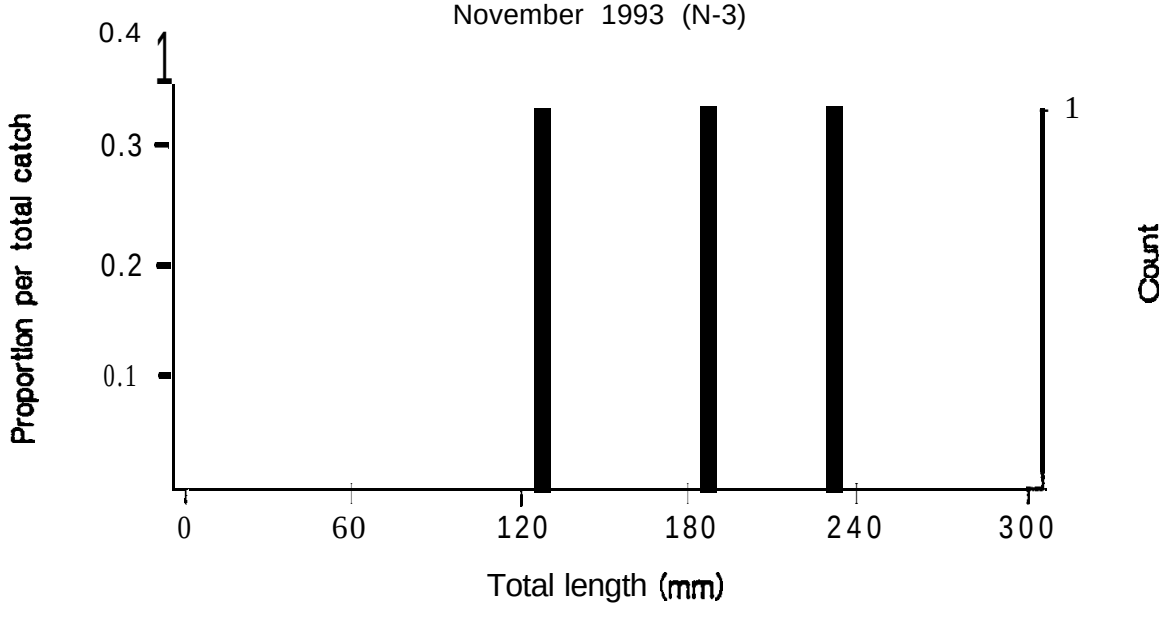
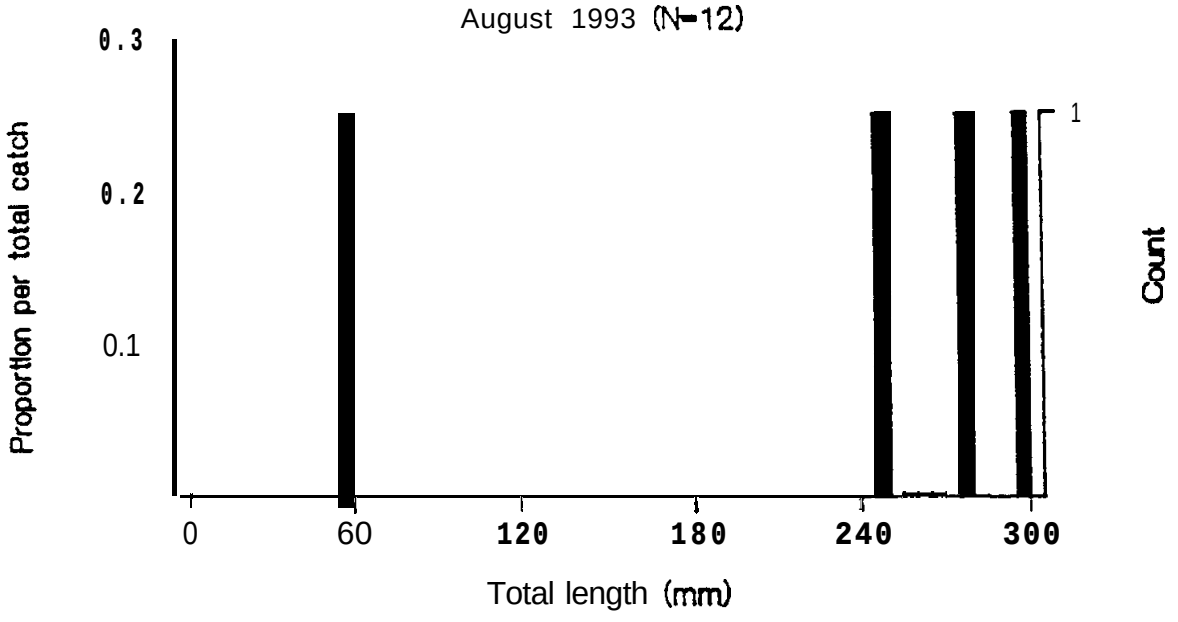


Figure 7d. Total length/frequency plots for Dover sole captured during August (Kl9301) and November (K19302) 1993 within Chiniak Bay.



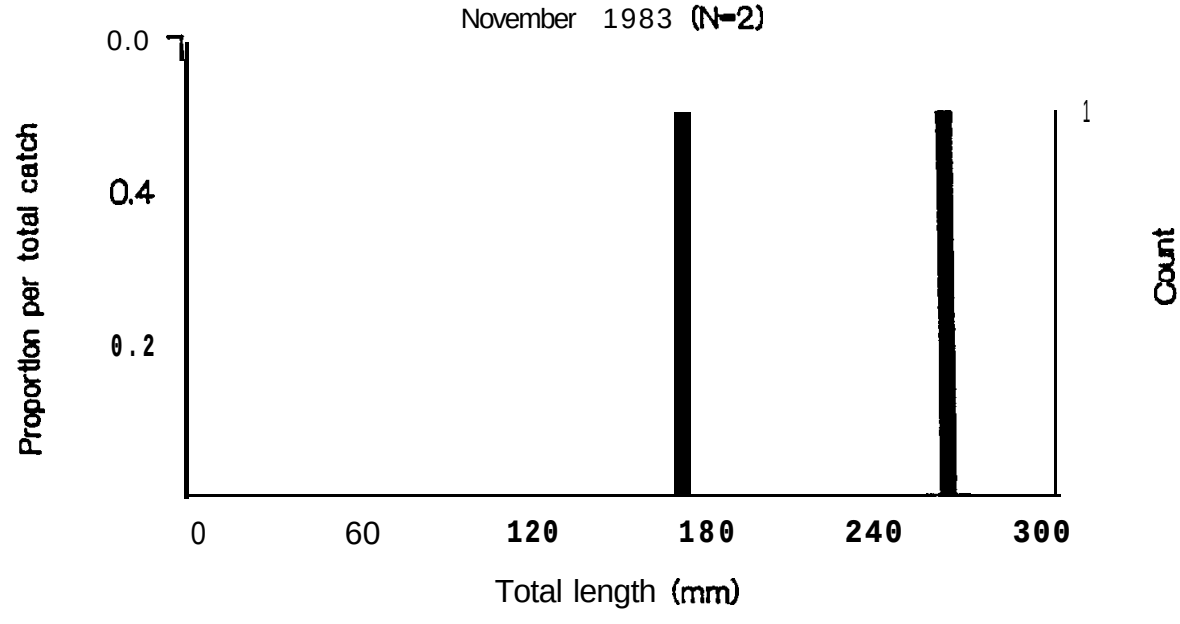


Figure 7e. Total length/frequency plots for starry flounder captured during August (Kl9301) and November (K19302) 1993 within Chiniak Bay.

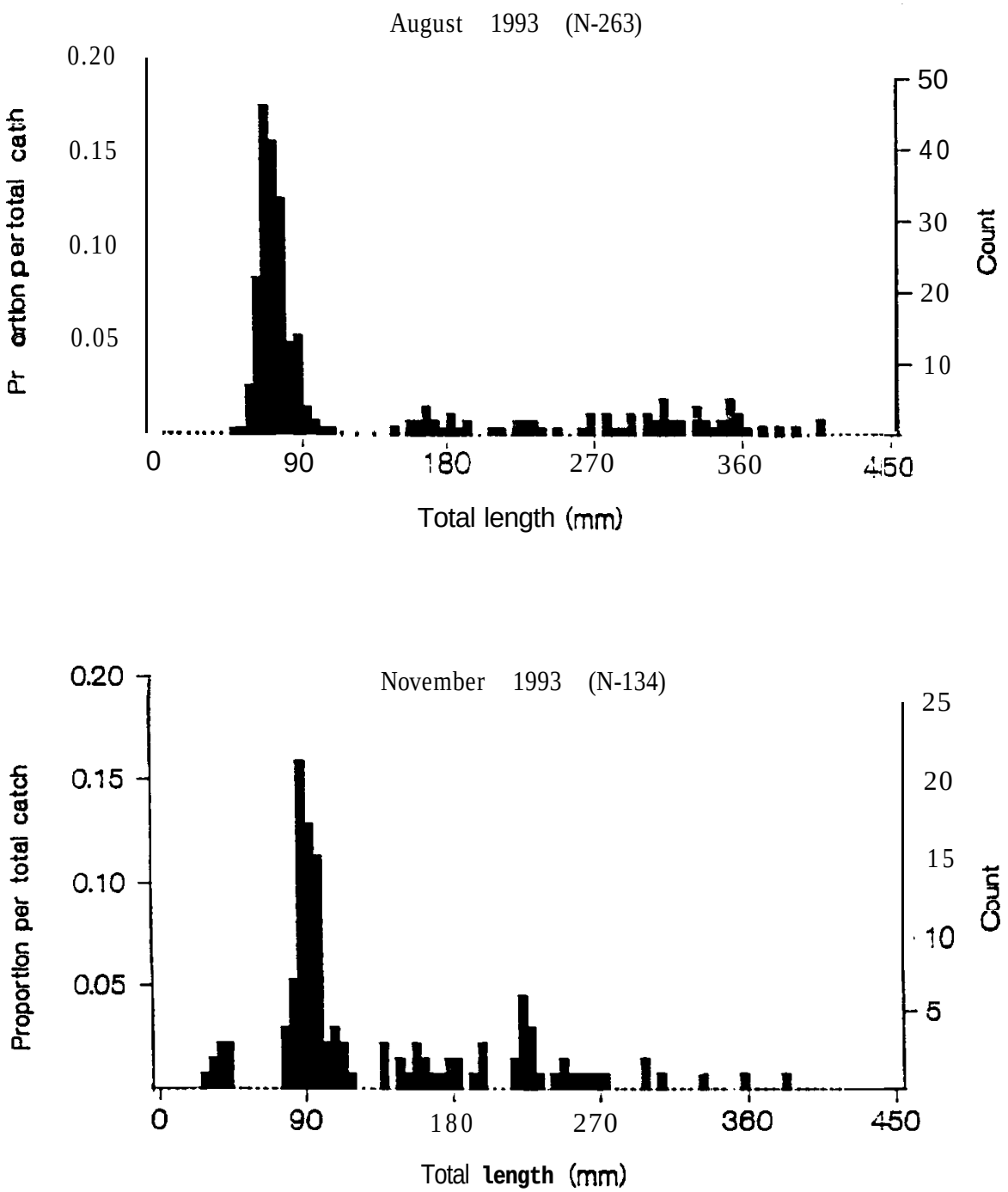
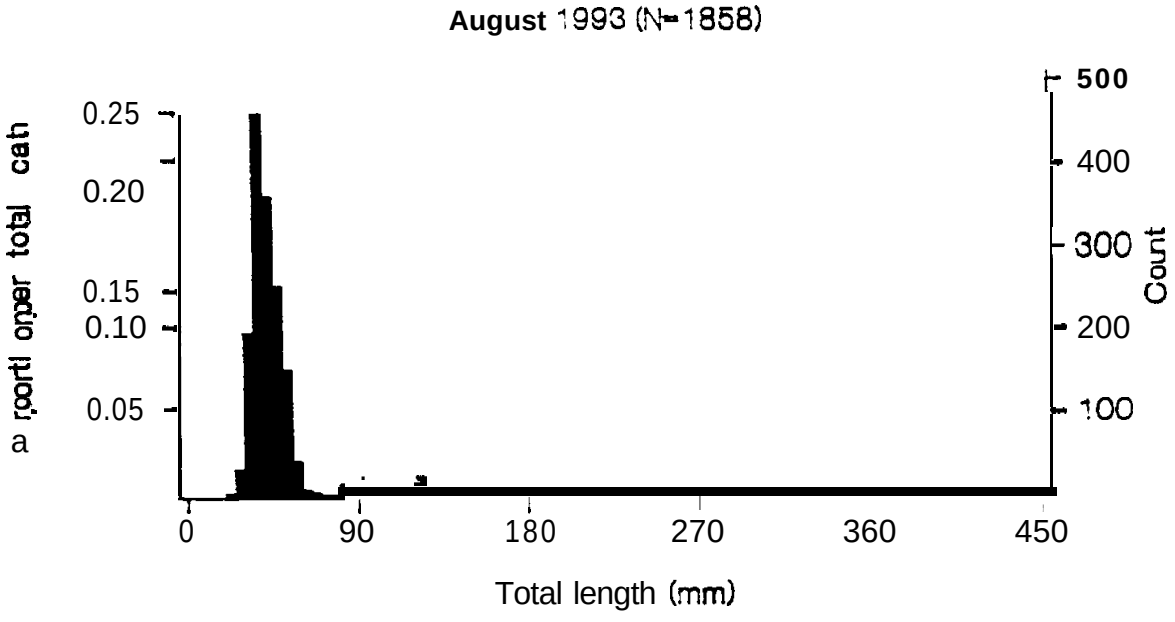


Figure 7f. Total length/frequency plots for yellowfin sole captured during August (KI9301) and November (KI9302) 1993 within Chiniak Bay.



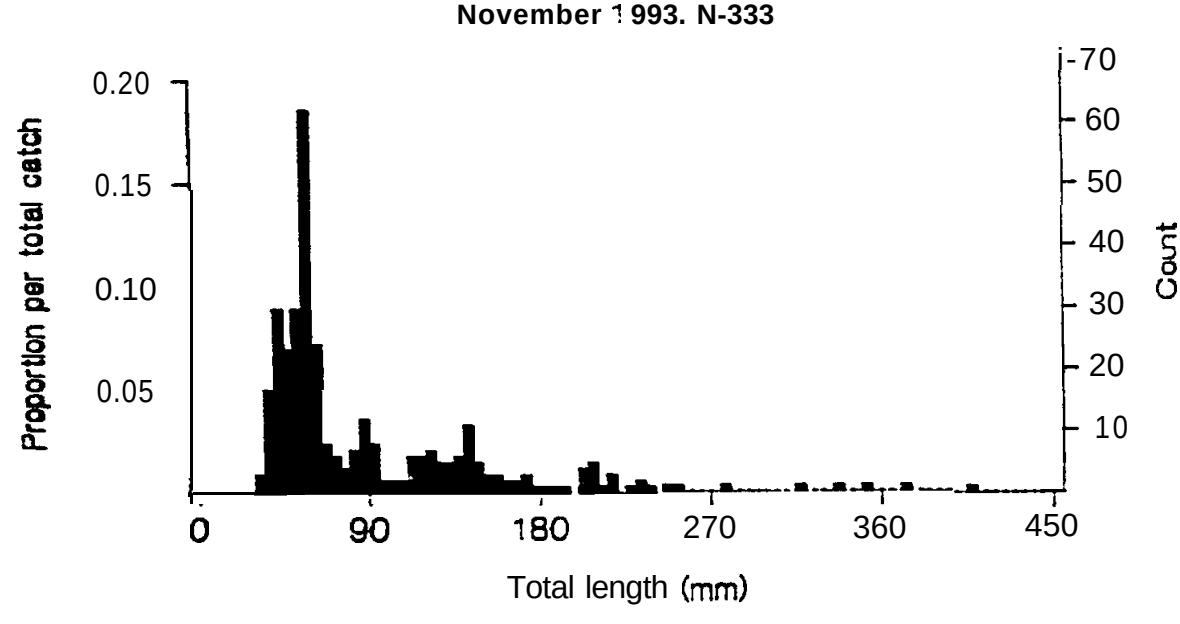


Figure 7g. Total length/frequency plots for rock sole captured during August (KI9301) and November (K19302) 1993 within Chiniak Bay.

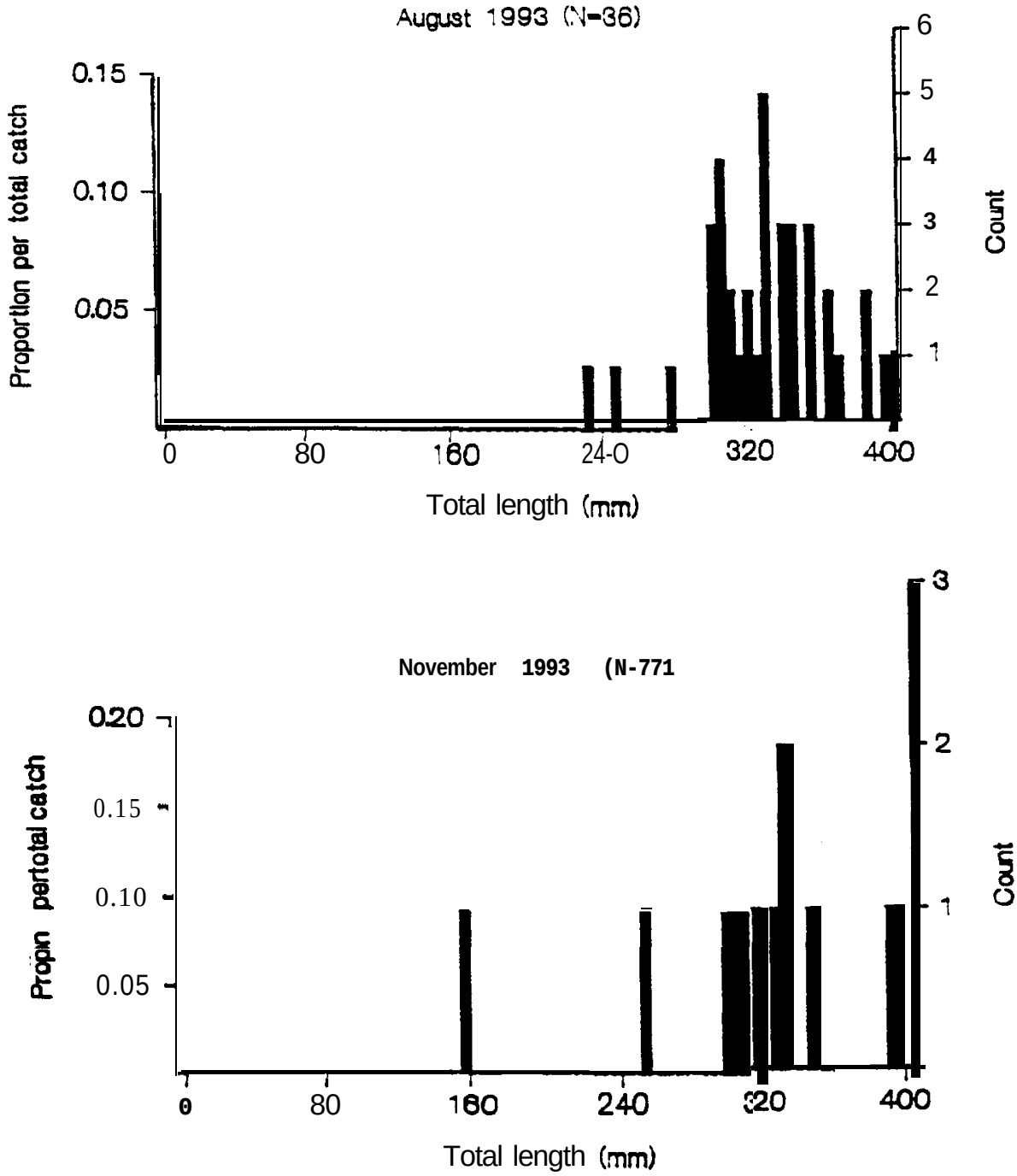


Figure 7h. Total length/frequency plots for butter sole captured during August (Kl9301) and November (Kl9302) 1993 within Chiniak Bay.

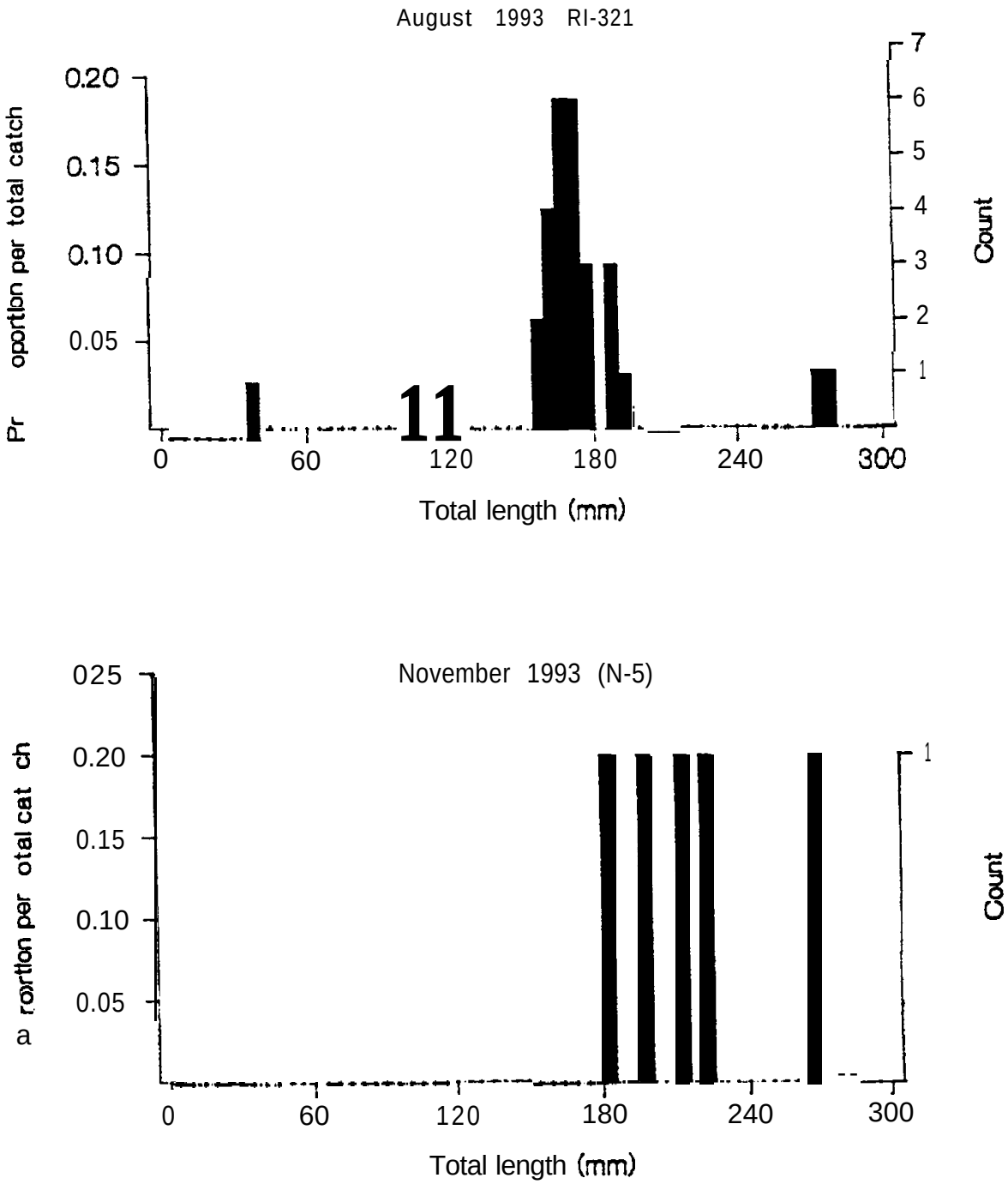


Figure 7i. Total length/frequency plots for Alaska plaice captured during August (KI9301) and November (KI9302) 1993 within Chiniak Bay.

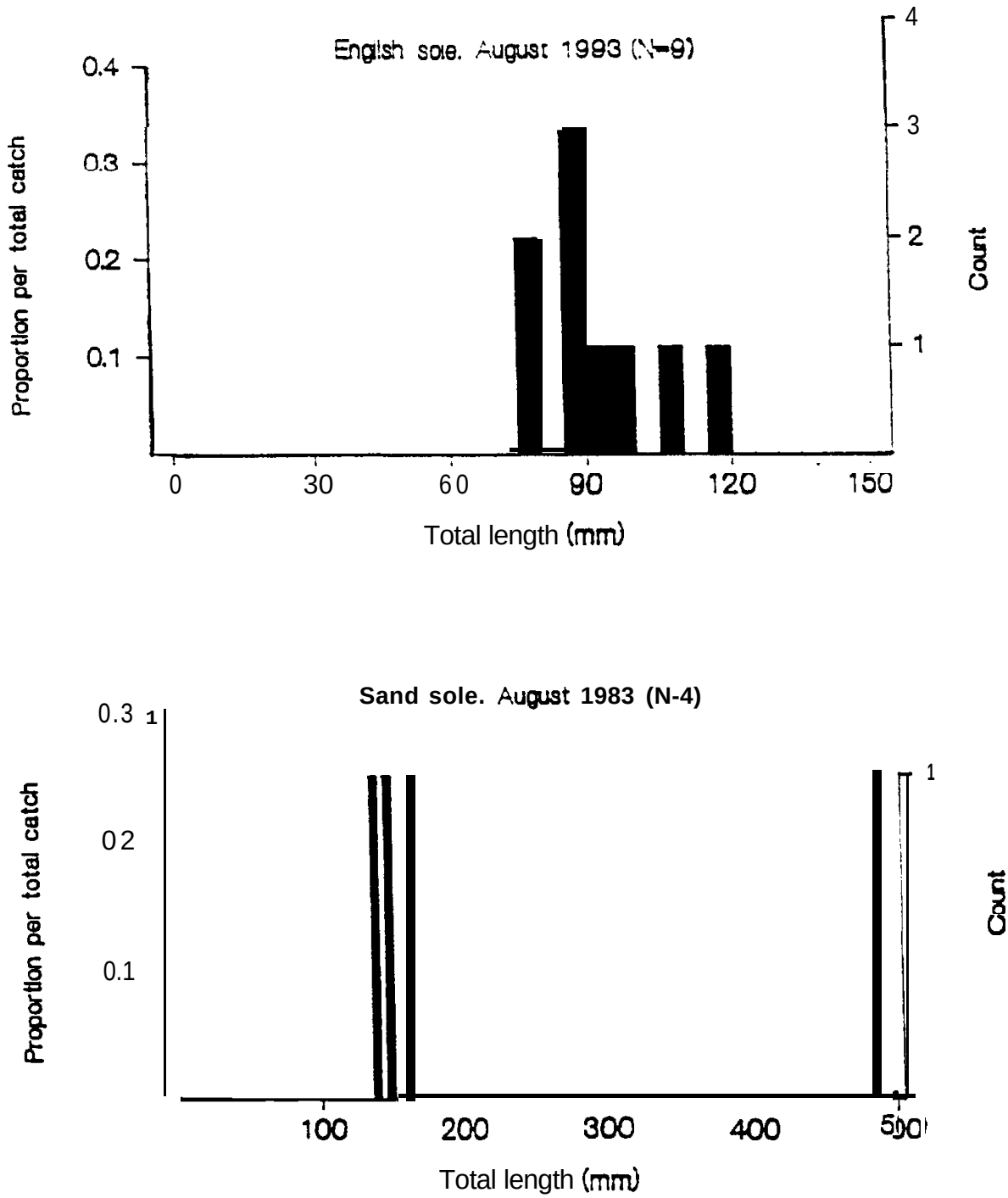


Figure 7j. Total length/frequency plots for English sole and sand sole captured during August 1993 (KI9301) within Chiniak Bay.

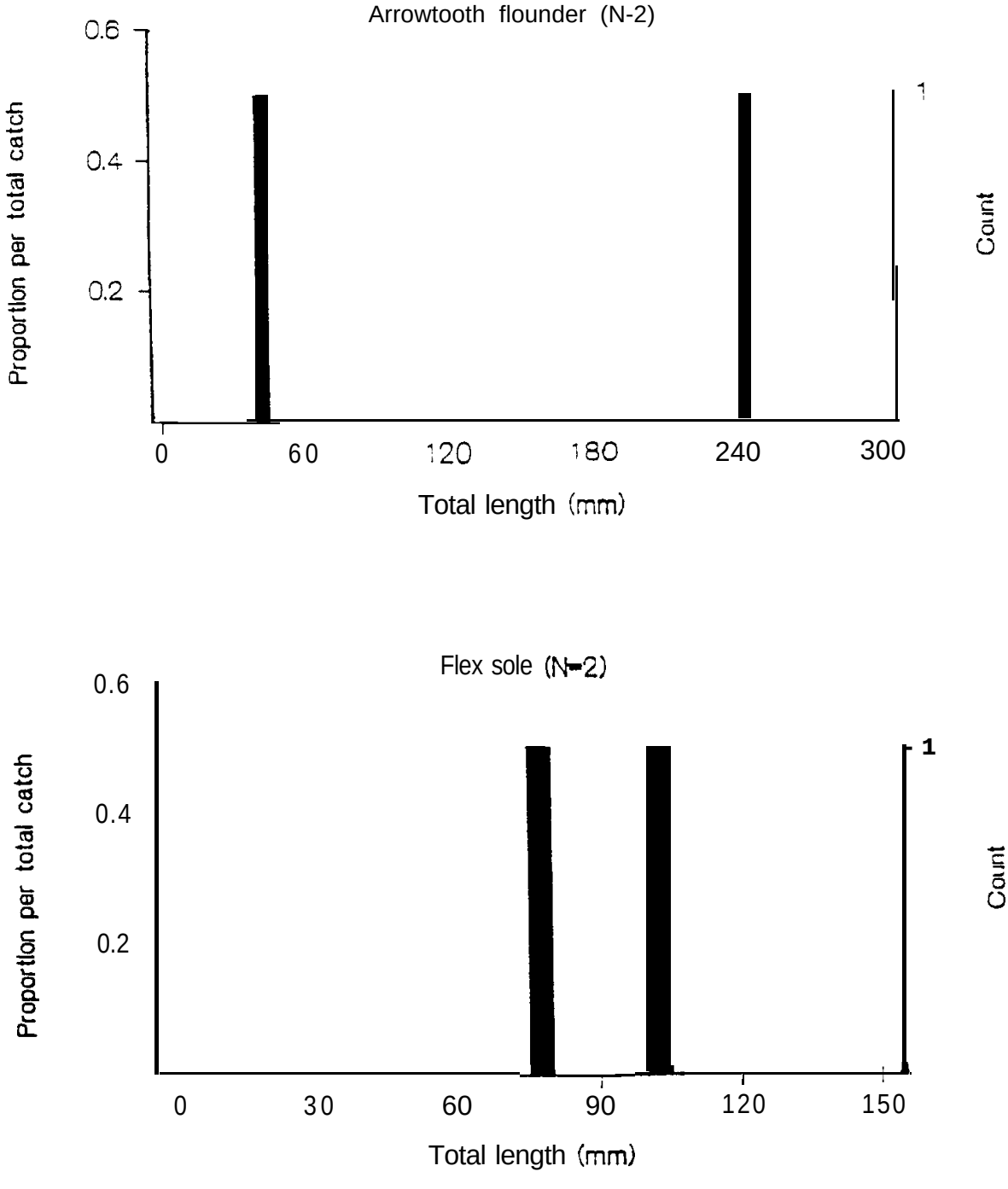


Figure 8a. Total length/frequency plots for arrowtooth flounder and rex sole captured during June 1994 within Chiniak Bay (K19401).

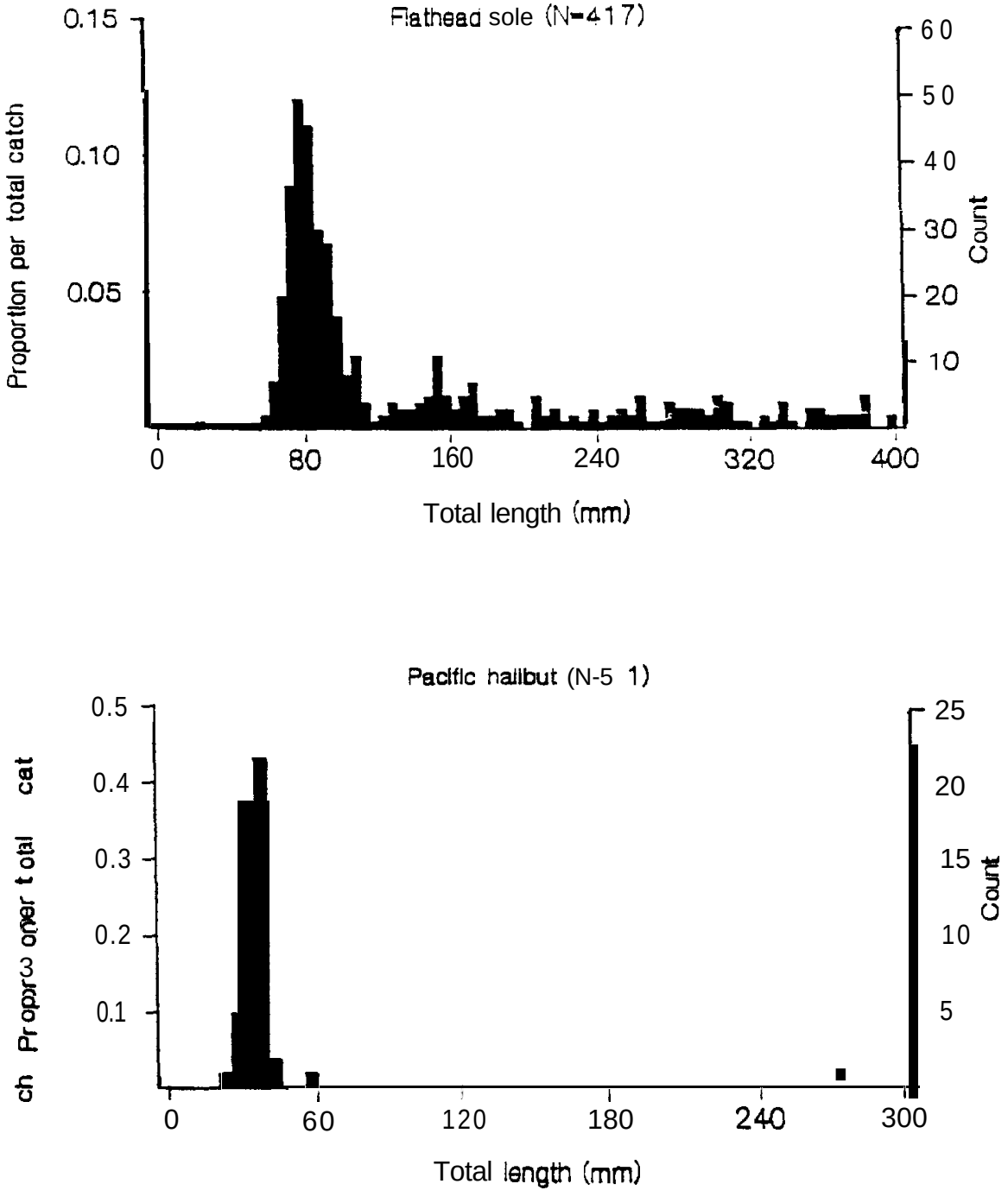


Figure 8b. Total length/frequency plots for flathead sole and Pacific halibut captured during June 1994 within Chiniak Bay (K19401).

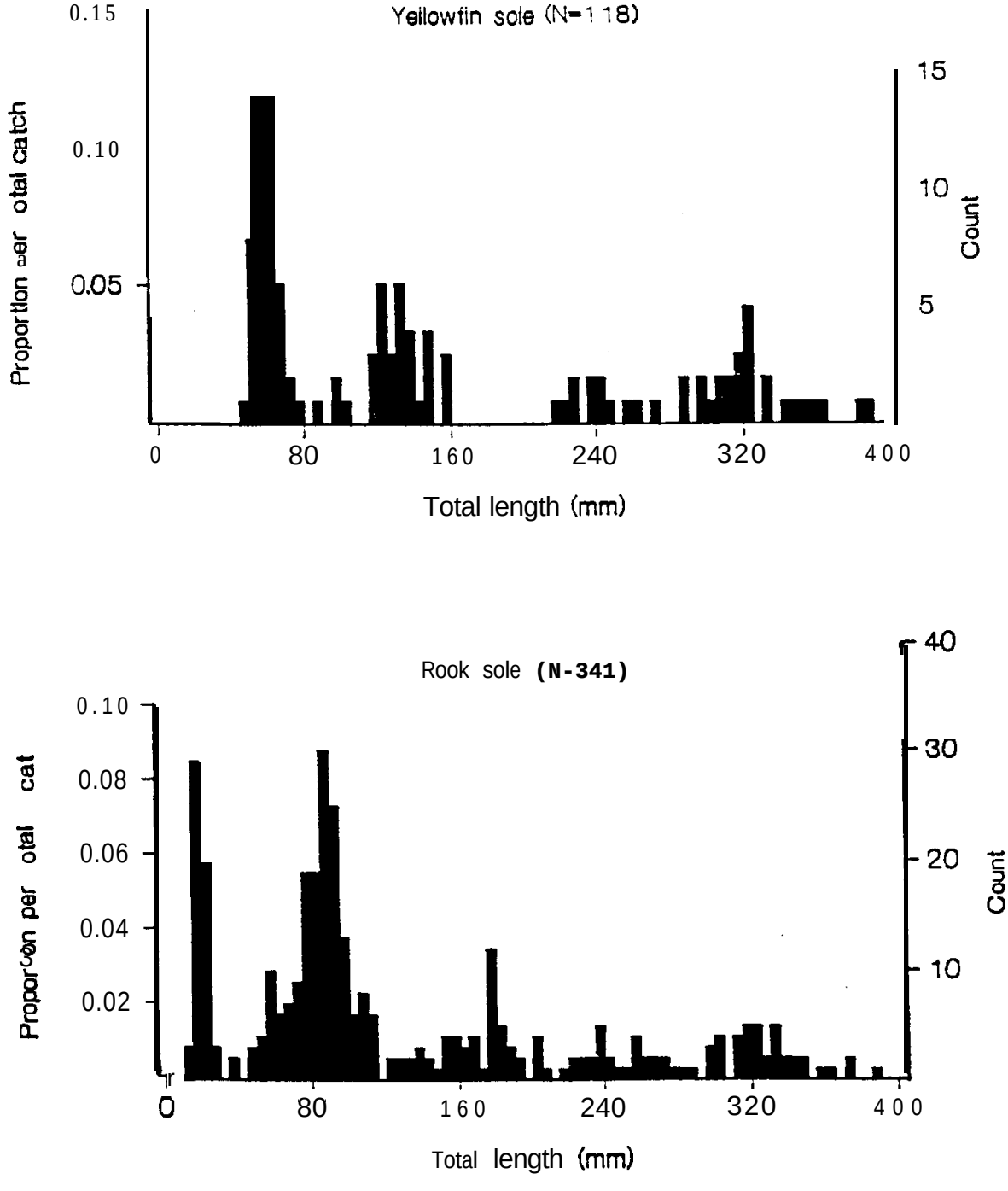
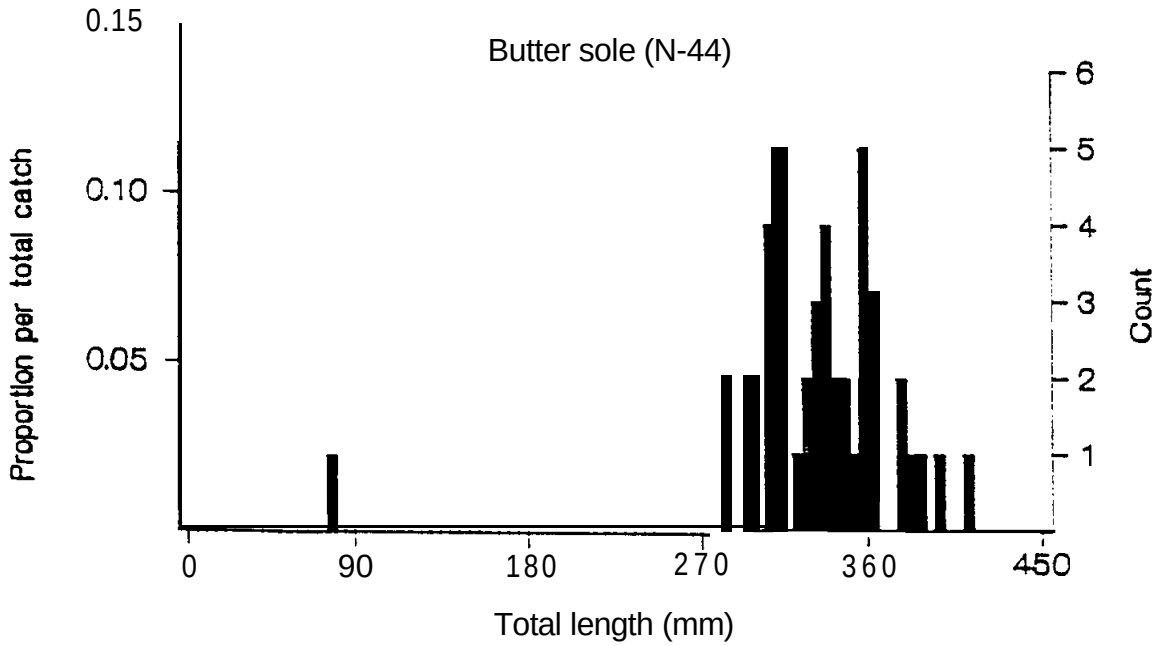


Figure 8c. Total length/frequency plots for yellowfin sole and rock sole captured during June 1994 within Chiniak Bay (K19401).



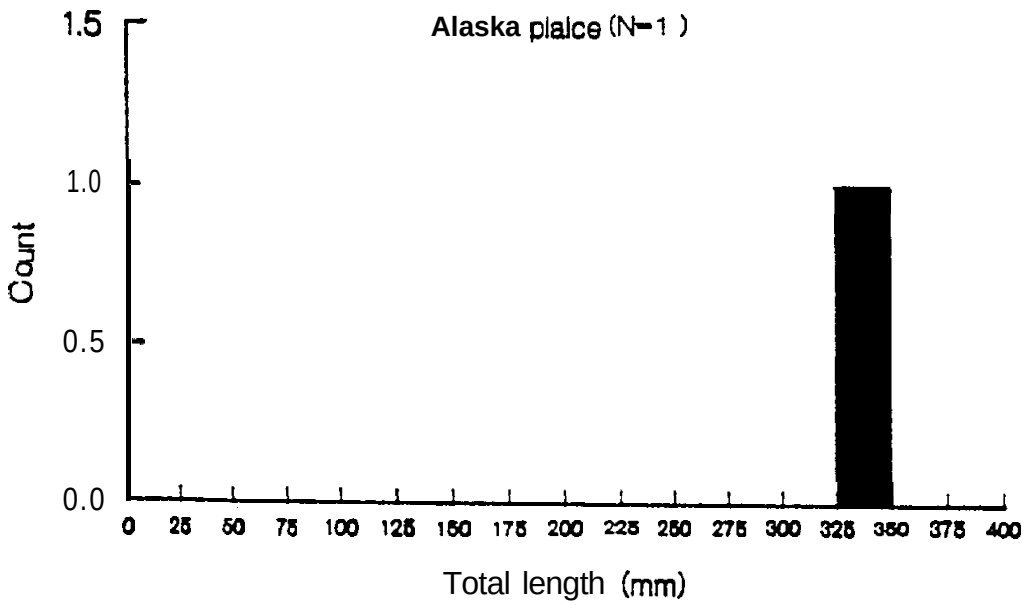


Figure 8d. Total length/frequency plots for butter sole and Alaska plaice captured during June 1994 within Chiniak Bay (K19401).

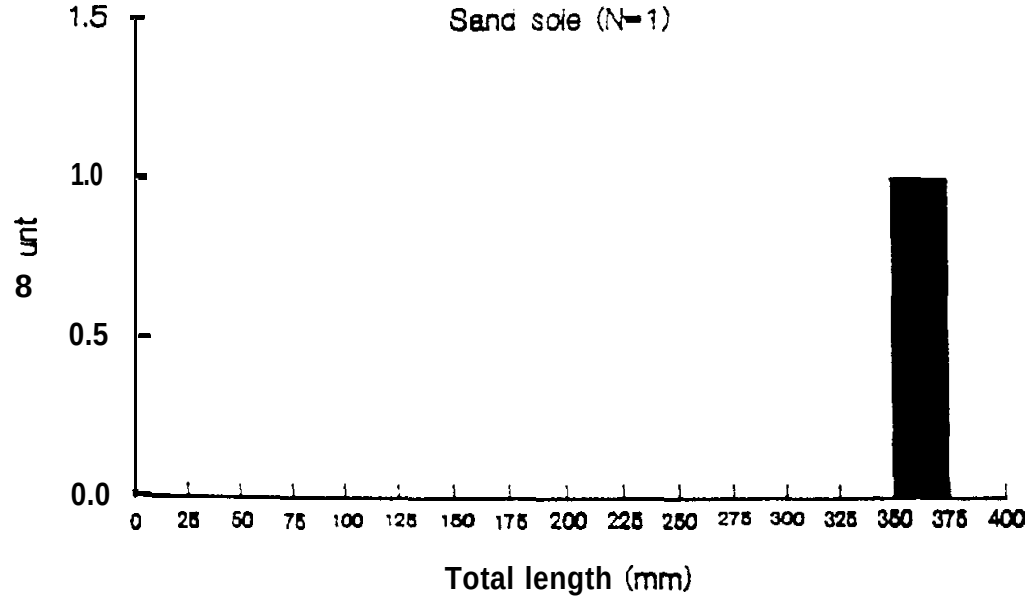
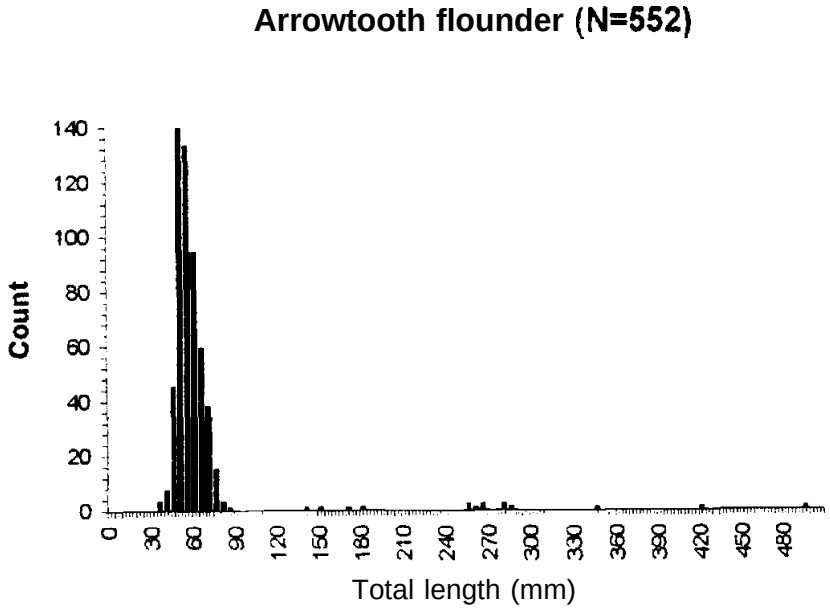


Figure 8e. **Total length/frequency plot for sand sole captured during June 1994 within Chiniak Bay (K19401).**



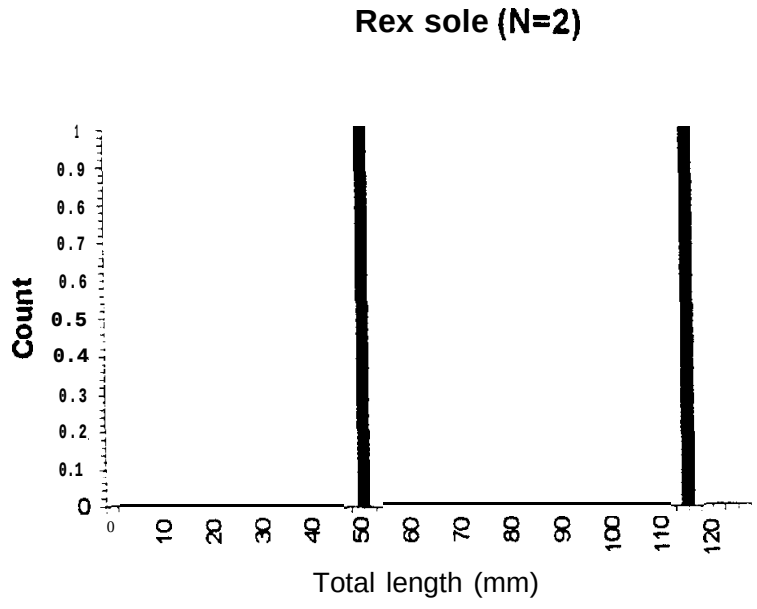
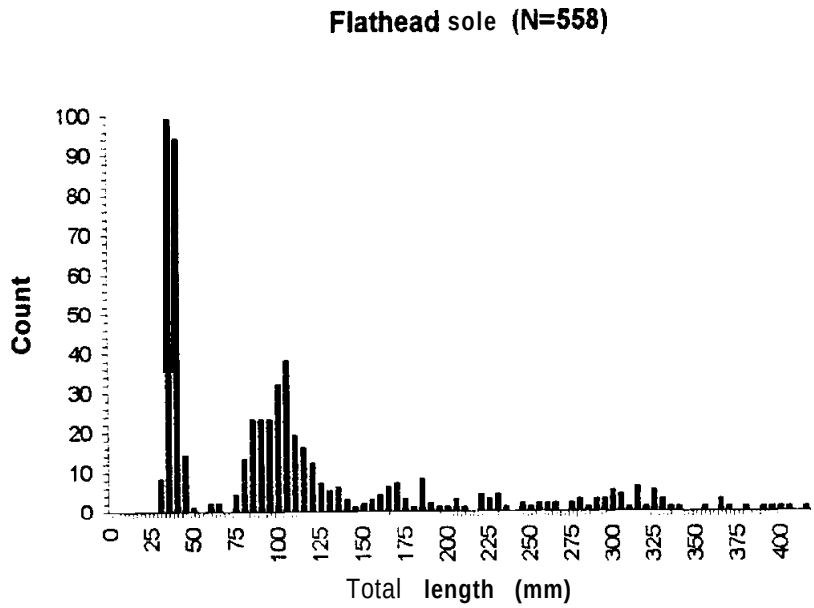


Figure 9a. Total length/frequency plots for all ages of arrowtooth flounder and rex sole captured during August 1994 within Chiniak Bay (KI9403).



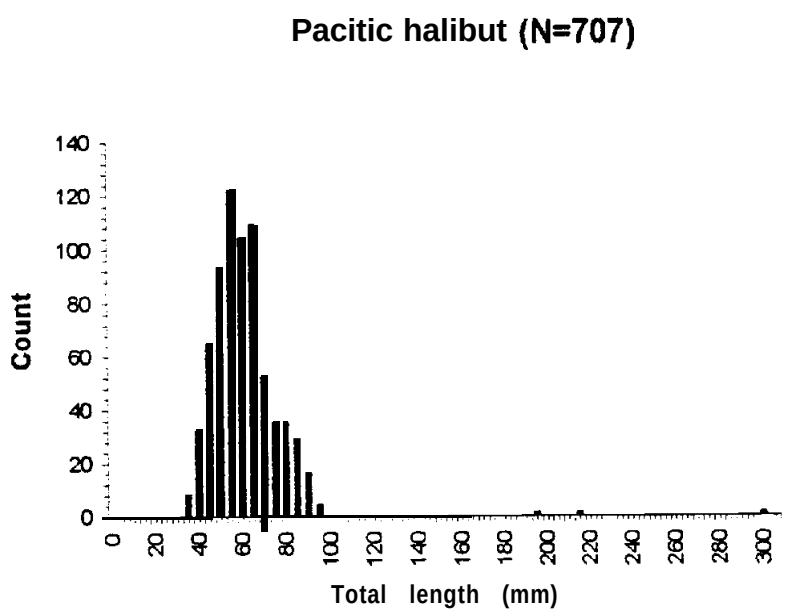
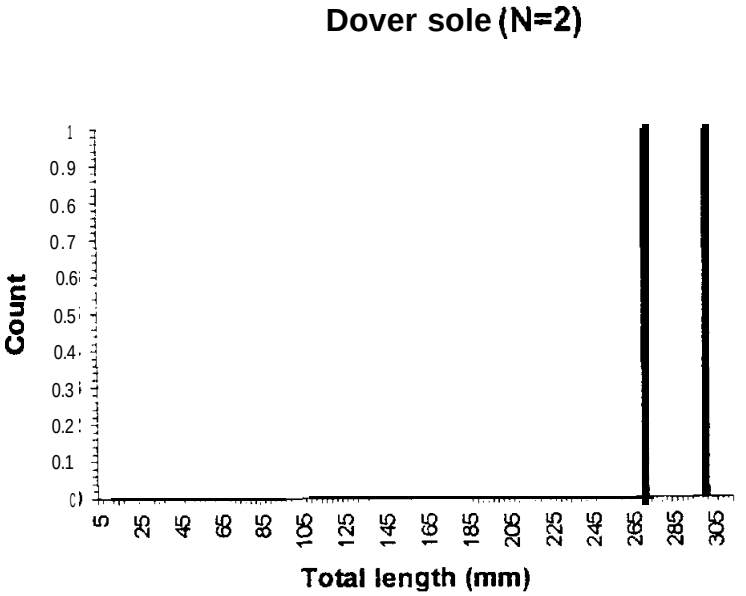


Figure 9b. Total length/frequency plots for all ages of flathead sole and Pacific halibut captured during August 1994 within Chiniak Bay (K19403).



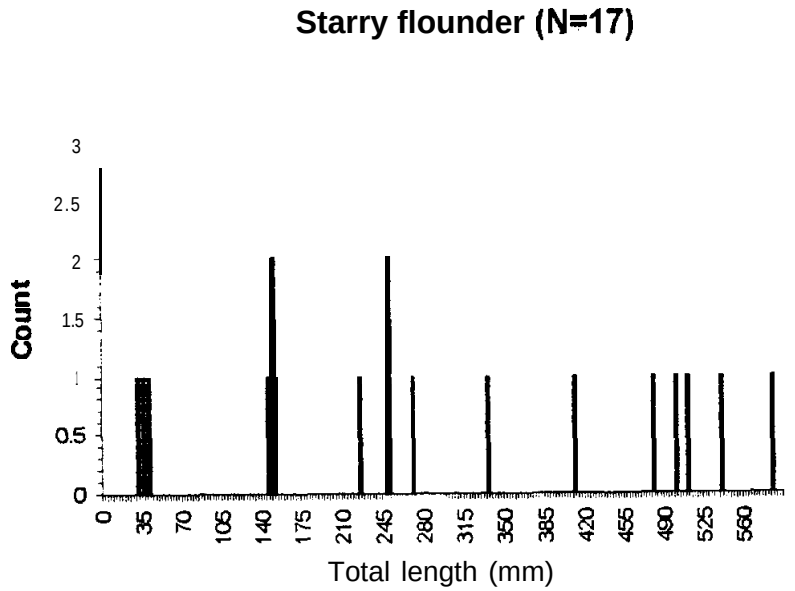
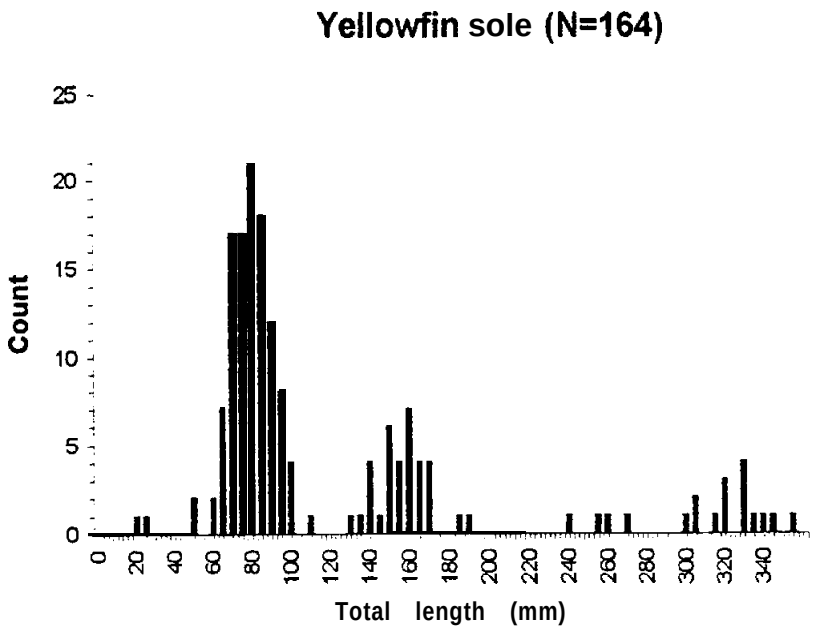


Figure 9c. Total length/frequency plots for all ages of Dover sole and starry flounder captured during August 1994 within Chiniak Bay (K19403).



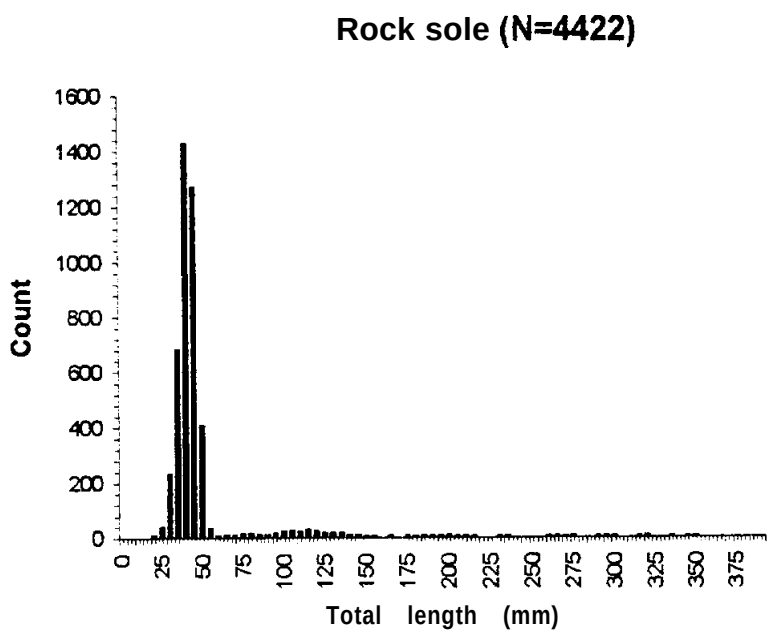
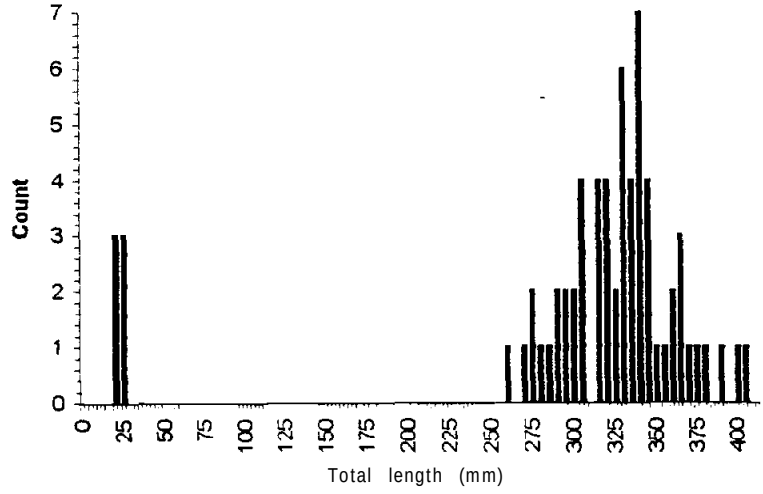


Figure 9d. Total length/frequency plots for all ages of yellowfin sole and rock sole captured during August 1994 within Chiniak Bay (KI9403).

Butter sole (N-66)



Alaska plaice (N=4)

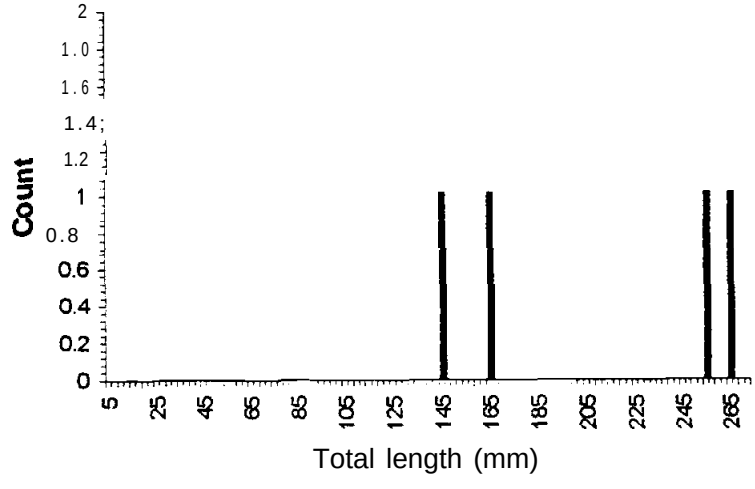
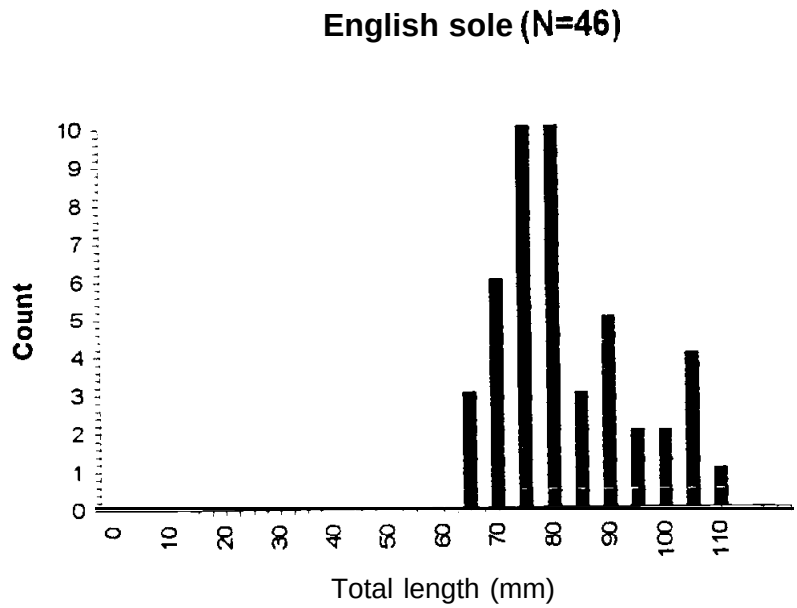


Figure 9e. Total length/frequency plots for all ages of butter sole and Alaska plaice captured during August 1994 within Chiniak Bay (K19403).



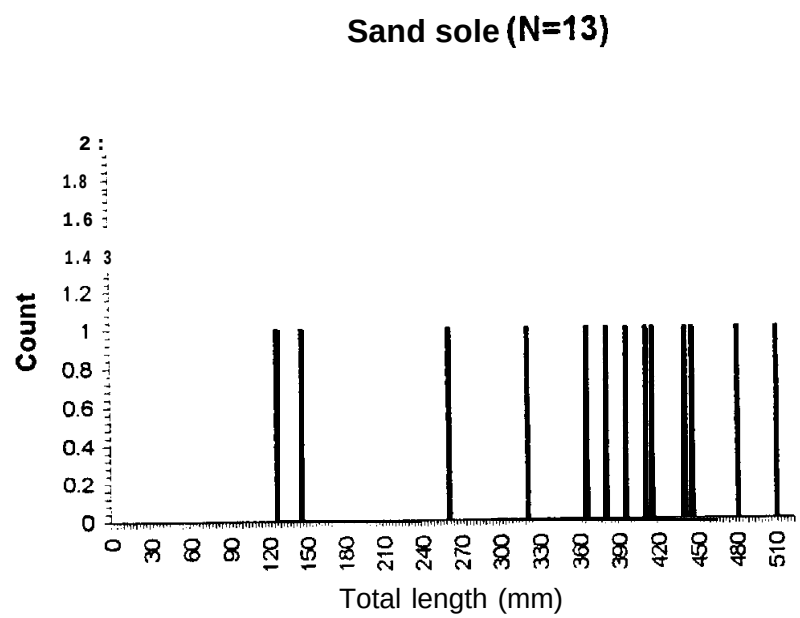


Figure 9f. Total length/frequency plots for all ages of English sole and sand sole captured during August 1994 within Chiniak Bay (K19403).

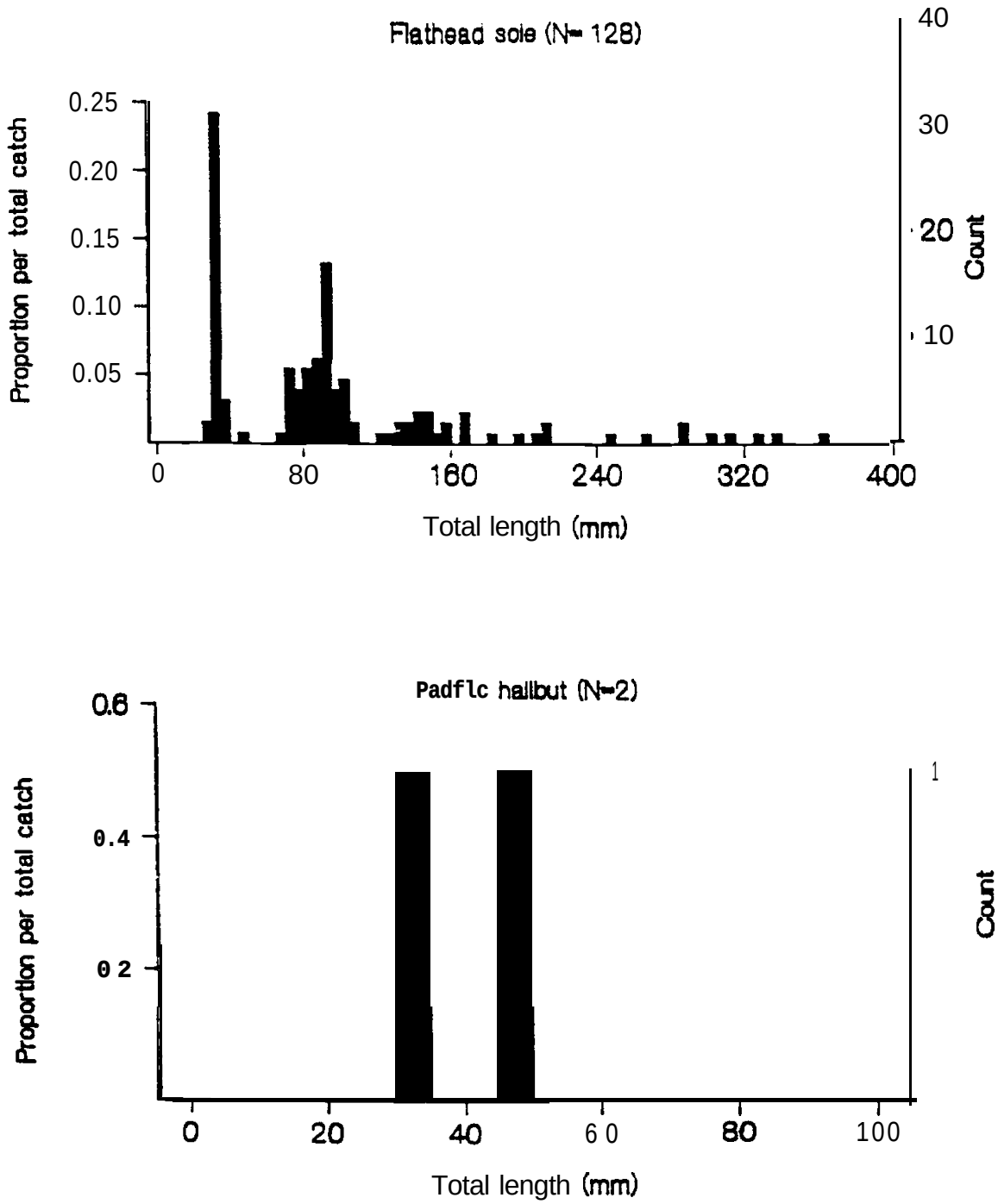


Figure 1 Oa. Total length/frequency plots for flathead sole and Pacific halibut captured during August 1994 within Kazakof Bay (KI9402).

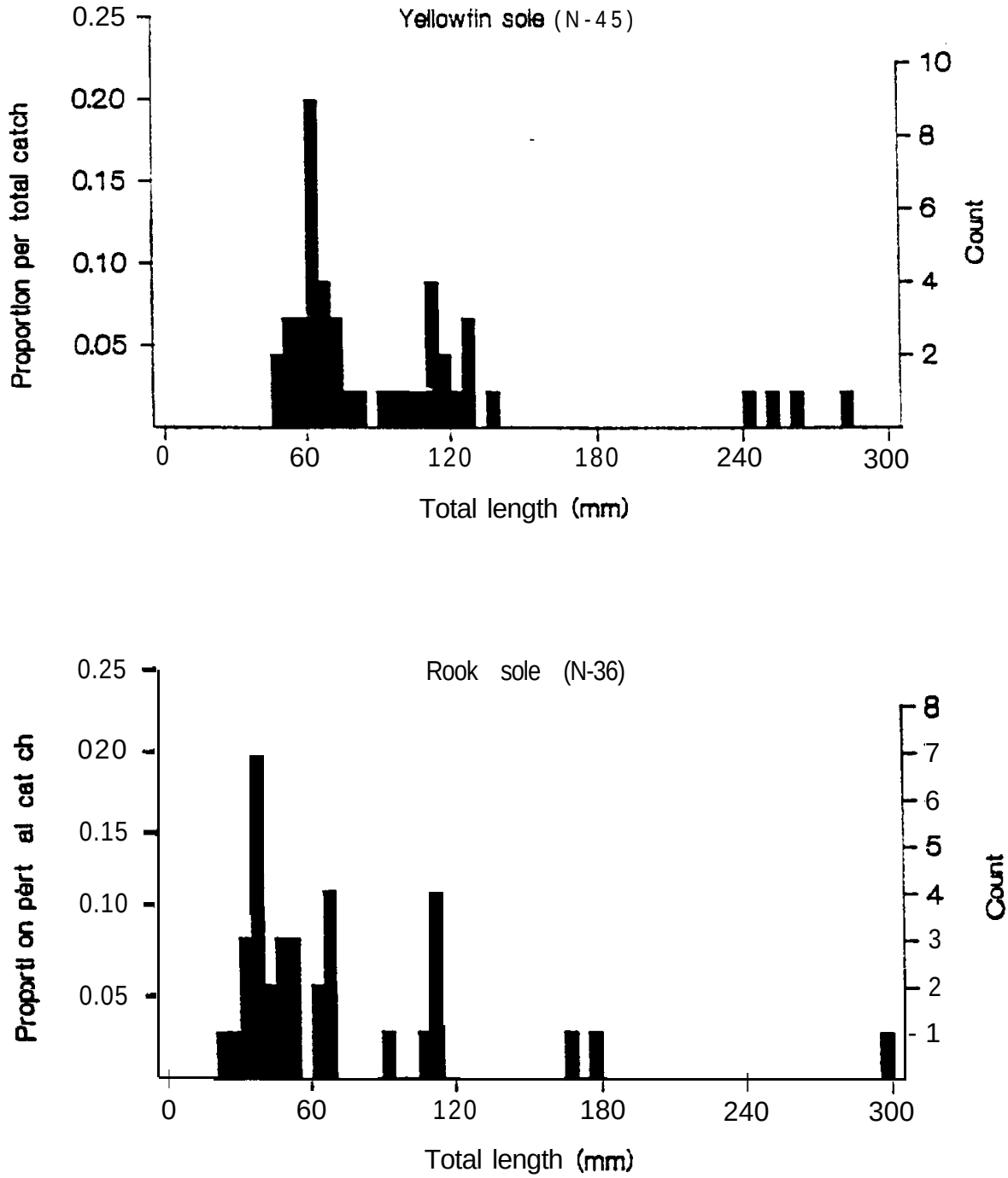


Figure 10b. Total length/frequency plots for yellowfin sole and rock sole captured during August 1994 within Kazakof Bay (K19402).

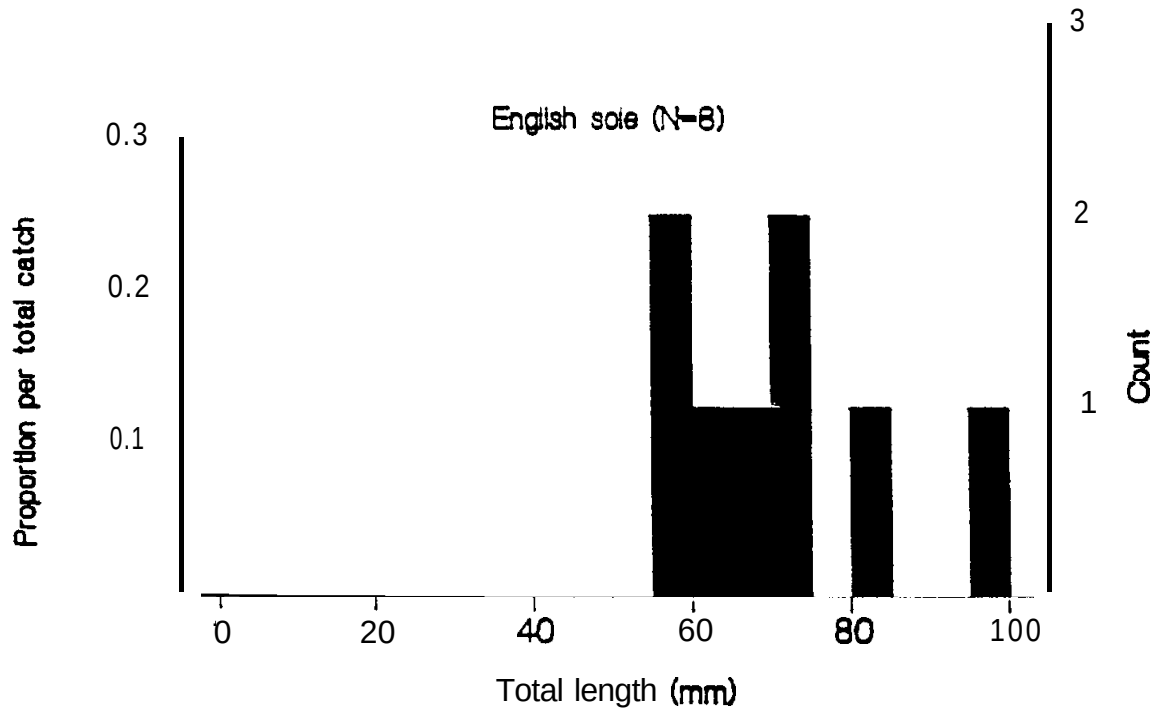


Figure 1 Oc. Total length/frequency plot for English sole captured during August 1994 within Kazakof Bay (K19402).

Chiniak Bay/August 1993 (KI9301)

Physical data within Chiniak Bay/August 1993 (KI9301)

Temperature within Chiniak Buy/August 1993 (KI9301)

The general pattern for all bays was for warmer bottom water at shallow depths and cooler water at deeper stations (Table 3, Figures 11-12). Deep central areas within bays and deep regions outside bays had colder water than was found in shallow areas.

During KI9301, all stations within Womens Bay (CS#l-5) had a thermocline in the upper 5 meters and warm bottom water (II.5 - 15.1°C). The warmest bottom water (15.1°C) examined during KI9301 was at the head of Womens Bay in water <5 m deep.

Stations near the head of Middle Bay (CS#16- 18) were usually isothermal. However, CS#27, also at the head of Middle Bay, had a 0.5°C thermocline between 3 and 5 m water depth. Within outer Middle Bay (CS#1 1-15), temperatures either decreased gradually with increasing depth (CS#1 I-15) or thermoclines were present in the top 10 m and again in the bottom 20 m (CS#12-14). The outermost station examined in Middle Bay (CS#15) had four distinct thermoclines: at 0 - 2 m, 5 - 10 m, 30 - 40 m, and 60 - 75 m. Bottom temperatures in Middle Bay ranged from 8.3 to 108°C The coldest bottom water examined during KI9301 (83°C) was outside the mouth of Middle Bay.

Stations near the head of Kalsii Bay (CS#19-23) were fairly isothermal. Stations further out the bay on the northern side (CS#24-26) and midbay (CS#6) had a thennocline in the upper 5 m. Consecutive station #6 had a second thermocline at 10 - 15 m. Temperature profiles of the outermost stations in Kalsin Bay (CS#7-10) all gradually decreased from the surface to depth. Bottom temperatures in Kalsii Bay ranged from 8.9 to 10.7°C.

Salinity within Chiniak Bay/August 1993 (KI9301)

When present, the halocline was usually in the upper 5 m (Figure 13). In general, surface salinity values were lower inside bays than outside. Conditions were usually isohaline in the mid to outer bay. Bottom salinity of stations sampled during KI9301 was within a narrow range (Table 3, Figure 14). Bottom salinity ranged from 29.2 to 32.4 PSU in Womens Bay, 3 1.1 to 31.8 PSU in Middle Bay, and 3 1.1 to 32.1 in Kalsii Bay.

Substrate within Chiniak Bay/August 1993 (KI9301)

Sites examined during KI9301 included the primary sediment types of *gravel,* sand and mud (Table 10, Figures 15-20). All three primary sediments were collected in Middle and Kalsin Bays, but gravel was not collected in Womens Bay. The predominant sediment type within Chiniak Bay was muddy sand, with pure sand at the head of both Middle and Kalsii Bays. Stations with >20% gravel were only within Middle Bay.

Fishes within Chiniak Bay/August 1993 (KI9301)

A total of 6646 fishes were entered in the database for use in CPUE (Table 11) distribution and length analyses. A subsample of the captured fishes (87%, N=5809) fishes was measured of which 3461 were flatfishes. The cumulative CPUE of flatlishes from 28 stations sampled during KI9301 was 2,798, for an average CPUE of 100±101 flatfishes/station during KI9301.

Eleven species of flatfish were collected during KI9301. Lied in decreasing order of abundance, the species composition (cumulative station CPUE of all ages) was flathead sole (N=1342),

rock sole (N=958), yellowfin sole (N=221), Pacific halibut (N=129), arrowtooth flounder (N=69), butter sole (N=39), Alaska plaice (N=16), starry flounder (N=1 I), English sole (N=8), Dover sole (N=3), and sand sole (N=3).

Flatfishes were caught at all but two trawl stations during KI930 1. Rock sole were caught at 78% of stations sampled, flathead sole were caught at 52% of stations and halibut were caught at 48% of stations. Both arrowtooth flounder and yellowfin sole were taken at 30% of stations, butter sole were taken at 27% of stations and other flatfishes were collected at 11% of stations.

During August 1993 age-0 was the numerically dominant age class collected of arrowtooth flounder, Pacific halibut, rock sole, and English sole (Table 12). Age-l fishes were caught most often of flathead sole, yellowfin sole, Alaska plaice and sand sole. Older specimens dominated the catch of Dover sole, starry flounder and butter sole.

Multiple tows were collected at four stations using a 3.66 m beam and a 3.05 m beam. Catch-per-unit-effort of flatfishes using a 3.66 m beam was very sii to CPUE using a 3.05 m beam (Table 13).

Distribution of flatfishes by age within Chiniak Bay/August 1993 (KI9301)

Arrowtooth flounder (Figures 21-33)

Age-O arrowtooth flounder (N=46) were caught at 12% of stations during KI9301. The mean number of age-0 fish/tow was 1.2±2.3, and the largest catch was 12 fish/tow. Age-O arrowtooth flounder were caught between 20 and 80 m, with peak abundance between 20 and 30 m water depth. Age-O fish were collected from outside to the head of the bay, and were caught primarily over sandy mud and gravel, although a few fish were captured over muddy sand. Age-O fish were only in the cooler temperatures sampled (8.2 - 10.2°C), and were caught in highest abundances at the warmest of these temperatures (10.2°C). Age-O arrowtooth flounder were caught in 3 1.5 to 32.1 PSU water. All were caught during flood or high slack tide.

Age-l arrowtooth flounder (N=18) were caught at 21% of stations during KI9301. The mean number of age-l fish/tow was 0.5±1.5, and the largest catch was eight fish/tow. Age-l arrowtooth flounder were caught from 30 to 80 m water depth, from well outside (-5 km) to the head of the bay. The peak abundance of age-l arrowtooth flounder was at 10.2°C. Age-l arrowtooth flounder were caught in 3 1.5 to 32.0 PSU water. Age-l fish were nearly always caught over sandy mud, with a few captured on muddy sand. Abundance decreased with decreasing percent sand, and increased with increasing percent mud. All were caught during flood or high slack tide.

Age-22 arrowtooth flounder were captured during KI9301 (N=5).

Flathead sole (Figures 21 & 34-45)

Age-O flathead sole (N=520) were caught at 43% of stations during KI9301. The mean number of age-0 fish/tow was 13.4±38.4, and the largest catch was 166 fish/tow. Age-O flathead sole were captured in increasing abundances from 10 to 70 m. They also increased in abundance from outside to the head of the bay, although one large catch 2 km outside the bay did not fit this pattern. Age-O flathead sole were captured between 8.2 and 11.5°C, and increased in abundance with increasing temperatures. They were captured in 3 1.2 - 32.1 PSU. Age-O flathead sole were primarily caught on sandy mud. and they increased in abundance with increasing percent mud in the substrate. Nearly all age-0 flathead sole were caught on a flood or high slack tide.

Age-l flathead sole (N=611) were caught at 61% of stations during KI9301. The mean number of age-l fish/tow was 15.8±31.4, and the largest catch was 122 fish/tow. Age-l flathead sole were caught between 5 and 80 m depth, and increased in abundance with increasing depth. They were caught in high abundances from outside the mouths to the heads of bays. Age-l flathead were caught between 8.2 and 11.8°C, but were most abundant in temperatures below 10.4°C. Age-l flathead sole were caught in 3 1.2 - 32.0 PSU, and were abundant from 3 1.5 to 32.0 PSU. Age-l flathead sole were nearly all captured on sandy mud and muddy sand. Age-l flathead sole were mainly captured on a flood or high slack tide.

Age-22 flathead sole were captured during KI9301 (N=211).

Pacific halibut (Figures 21 & 46-57)

Age-O Pacific haliiut (N=126) were caught at 46% of stations during KI9301. The mean number of age-0 fish/tow was 5.5±10.6, and the largest catch was 60 fish/tow. Age-O Pacific halibut were all caught in <30 m depth, from 3 km inside the bay to the head. Age-O Pacific halibut were taken where bottom temperature was between 10.0 and 12.0°C, and decreased in abundance with increasing temperature. Age-O halibut were caught mainly over sand and muddy sandy gravel, but a few fish were caught on sandy mud and muddy sand. They were slightly more abundant with increasing percent sand in the substrate. Nearly all age-0 halibut were caught on a flood tide.

Age-l Pacific halibut (N=2) were caught at 11% of stations during KI9301. The mean number of age-l fish/tow was 0.1±0.3, and the largest catch was one fish/tow. Age-l fish were collected from 5 to 30 m, 2 - 4 km within the bay, at 9.7 - 10.5°C and at 3 1.4 - 31.7 PSU. One fish was captured over each of three substrates: gravelly mud, muddy sand, and pure sand. Age-l fish were only caught at high slack tide.

Age-22 halibut were rarely captured during KI9301 (N=1).

Dover sole (Figures 21 & 58-69)

During August 1993, Dover sole were only caught as age-22 (N=3)

Starry flounder (Figures 21 & 70-81)

Age-O starry flounder (N=1) were caught at 4% of stations during KI9301. The mean number of age-0 fish/tow was 0.0M.2, and the largest catch was one fish/tow. The single age-0 starry flounder was caught at the head of Middle Bay in 5 - 10 m water depth over sand. Temperature and salinity data are missing from that station.

Age-l starry flounder were not captured during KI9301.

Age-≥2 starry flounder were occasionally captured during KI9301 (N=10).

Yellowfin sole (Figures 21 & 82-93)

No age-0 yellowfin sole were captured during KI9301.

Age-l yellowtin sole (N=130) were caught at 50% of stations during KI9301. The mean number of age-l fish/tow was 4.ti12.4, and the largest catch was 65 fish/tow. Age-l yellowfin sole were caught only in depths <30 m, from 3 km inside to the head of the bay, from 9.8 to 12.0°C and 3 1.2 to 32.4 PSU. They were caught primarily over muddy sandy gravel and muddy sand, with lesser abundances over sand and sandy mud. Age-l yellowfin sole increased abundance as the proportional amount of sand increased in the substrate, and decreased with increasingly muddy substrate.

Age->2 yellowfin sole were caught during KI9301 (N=91).

Rock sole (Figures 21 & 94-105)

Age-O rock sole (N=687) were caught at 54% of stations during KI9301. The mean number of age-0 fish/tow was 39.5±63.8, and the largest catch was 276 fish/tow. Age-O rock sole were caught from 0 to 70 m depth, and were most abundant below 30 m. They were caught in increasing abundances from the mouth to the head of bays. Age-O rock sole were captured from 9.6 to 10.8°C and from 31.1 to 3 1.7 PSU, with high abundances throughout these ranges. Rock sole were most abundant over muddy sandy gravel, sand and muddy sand, and a few fish were caught over sandy mud and gravel. Age-O rock sole decreased slightly in abundance as the proportional amount of mud in the substrate increased.

Age-l rock sole (N=200) were caught at 6!% of stations during KI9301. The mean number of age-l fish/tow was 6.6±1 1.3, and the largest catch was 61 fish/tow. Like age-0 fish, age-l rock sole were caught from 0 to 70 m, but this age was most abundant from 20 to 40 m depth. Age-l rock sole were caught from 2 km outside to the heads of bays, and their highest abundances were near the mouth. Age-l rock sole were caught within a broader range of temperature and salinity than were age-0 fish. Age-l fish were caught in 8.2 - 12.0°C and 3 1.1 - 32.4 PSU, with peaks in abundance near the midranges of these values. Age-l rock sole were most abundant over gravel, but were captured over other substrates in lesser abundances: muddy sandy gravel, muddy sand sand, gravelly mud and sandy mud. Like age-0 rock sole, abundance of age-l rock sole decreased slightly with increasingly muddy substrate.

Age-≥2 rock sole were caught during KI9301 (N=72).

Butter sole (Figures 21 & 106-117)

During KI9301, only age-22 butter sole were captured (N=39).

Alaska plaice (Figures 21 & 118-129)

Age-O Alaska plaice (N=1) were caught at 4% of stations during KI9301. The mean number of age-0 fish/tow was 0.0M.2, and the largest catch was one fish/tow. This fish was caught in <10 m water depth, near the head of Kalsin Bay, in warm (10.7°C) fresh (3 1.2 PSU) water, over muddy sand. It was caught at high slack tide.

Age-l plaice (N=15) were caught at 11% of stations during KI9301. The mean number of age- I fish/tow was 0.8±2.2, and the largest catch was 11 fish/tow. Age- 1 Alaska plaice were caught in depths £10 m, near the heads of bays. These shallow depths corresponded to warm (10.8 - 10.9°C), fresh (3 1.1 - 3 1.2 PSU) waters. All age- 1 plaice were caught over sand, at high slack tide.

Age-≥2 Alaska plaice were not caught during KI9301.

English sole (Figures 21 & 130-141)

Age-O English sole (N=8) were caught at 14% of stations during KI9301. The mean number of age-0 fish/tow was 0.2±0.7, and the largest catch was three fish/tow. Age-O English sole were in depths <20 m, well within the bay, in temperatures 10.1 - 10.7°C and 31.1 - 31.6 PSU. All fish were on sand or muddy sand.

No age- 1 or age-22 English sole were caught during KI930 1.

Sand sole (Figures 21 & 142-153)

Age-O sand sole were not caught during KI9301.

Age-l sand sole (N-2) were caught at 4% of stations during KI9301. The mean number of age-l fish/tow was 0.1±0.3, and the largest catch was two fish/tow. Age-l sand sole were caught only at the most shallow depths examined (<5 m), in warm (10.7°C) fresh (31.1 PSU) water. They were caught over muddy sand at high slack tide.

A single age-22 sand sole was captured during KI930 1.

Table 10. Sediment classification of stations examined during August 1993 within Chiniak Bay (KI9301)), indexed by bay and consecutive station number (CS#). Sediment codes: G = gravel, S = sand, M = mud, g = gravelly, s = sandy, m = muddy. The capital letter represents the dominant sediment type and lower case letters are lesser sediment types.

CS#		Bay	Distance inbay (km)	Substrate type	Mean depth (m)	% Gravel	% Sand	% Mud	% Organic material	% Carbonate
1		Womens	5.4	mS	3	1.8	65.4	32.8	5.7	1.3
2		Womens	4.5	mS	12.5	0.9	72.5	26.6	3.7	1.0
3		Womens	4.5	mS	18	0.0	67.8	32.2	5.4	1.7
4		Womens	4.9	mS	8.5	0.4	69.2	30.5	5.4	1.0
5		Womens	2.7	gM	21	13.2	41.3	45.5	6.5	2.2
11	MB20	Middle	2.3	mS	24.5	0.0	86.2	13.8	2.2	1.0
12		Middle	-0.3	G	36	82.4	17.6	0.1	0.9	5.7
13	MB50	Middle	-1.2	mS	56	0.0	89.1	10.9	2.6	1.2
14		Middle	-2.1	mS	64.5	0.0	70.3	29.7	3.7	1.5
15		Middle	-3.0	mS	72.5	0.0	83.6	16.4	3.1	1.9
16	MB00	Middle	6.3	mS	4.5	0.0	56.5	43.5	3.6	0.9
17		Middle	7.3	S	3	1.3	96.3	2.4	1.6	1.3
16	MB10	Middle	3.9	msG	13.5	72.9	24.0	3.1	6.0	1.3
27	MB05	Middle	5.7	sM	9.5	0.0	24.9	75.1	4.1	4.5
28	MB05	Middle	6.0	S	6.8	0.0	96.2	3.8	2.7	0.4
6	KB20	Kalsin	3.4	mS	22.5	0.1	73.7	26.2	3.0	1.2
7		Kalsin	3.3	mS	34	0.0	85.6	14.3	2.0	0.8
8		Kalsin	3.0	mS	44.5	0.0	50.7	49.3	3.2	0.9
9		Kalsin	2.7	mS	55	0.0	52.7	47.3	3.3	1.0
IO		Kalsin	2.6	sM	65	0.0	35.2	64.8	4.7	1.7
19		Kalsin	5.3	mS	19	0.0	83.9	16.1	2.6	0.8
20	KBOO	Kalsin	7.7	S	4	0.0	98.9	1.1	1.9	0.7
21	KBOO	Kalsin	8.3	S	3.5	0.0	98.1	1.9	2.2	0.8
22	KBOO	Kalsin	8.2	mS	3	0.0	89.9	10.1	3.7	1.5
23	KB22	Kalsin	6.6	sM	24.5	0.0	35.4	64.6	4.0	0.6
24	KB30	Kalsin	6.3	sM	35.5	0.0	17.4	82.6	4.5	0.8
25	KB50	Kalsin	4.7	sM	53	0.0	20.5	79.5	4.3	1.6
26	KB70	Kalsin	4.0	sM	64	0.0	20.9	79.1	5.6	0.6
29	KB10	Kalsin	7.8	mS	12.9	0.0	79.8	20.2	2.6	0.5
30	KB05	Kalsin	8.0	S	7.9	0.0	97.5	2.5	1.9	0.8

Table 11. Ten minute CPUE of fishes captured during August 1993 within Chiniak Bay, indexed by bay, station (CS#) and tow (-#).

CS#	Tow#	Big skate	Pacific herring	Saffron cod	Pacific cod	Walleye pollock	Shortfin eelpout	Unid. Greenlings	*White-spotted greenling*	Lingcod	Spatulate sculpin	Unid. Sculpins	Silverspotted sculpin	Spinyhead sculpin	Gymnocanthus spp. (sculpin)	Red Irish lord	Yellow Irish lord	Northern sculpin	Armorhead sculpin	Myoxocephalus spp. (sculpin)	Eyeshade sculpin	Triglops spp. (sculpin)	Tadpole sculpin
KI9301 - Womens Bay																							
2	-1	0.0	0.0	0.0	8.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.0	0.0	0.0	0.0	0.0	26.0	0.0	10.0	0.0
3	-2	0.0	0.0	0.0	5.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	8.0	0.0	2.0	0.0
4	-1	0.0	212.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
5	-1	0.0	0.0	3.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	2.0	3.0	9.0	0.0
KI9301 - Middle Bay																							
11	-1	0.0	0.0	0.0	2.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
12	-1	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	1.0	0.0	0.0	0.0	0.0	3.0	0.0
13	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	7.0	0.0	1.0	0.0	2.0	4.0
14	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	18.0	0.0	0.0	0.0	2.0	0.0
15	-2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	3.0	19.0	0.0	3.0	0.0	0.0	8.0
16	-1	0.0	18.0	17.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	22.0	0.0	1.0	0.0	0.0	4.0	0.0	2.0	0.0
17	-1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0
18	-1	0.0	0.0	2.0	19.0	30.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0
27	-1	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	50.0	1.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0
27	-2	0.0	0.0	0.0	37.0	5.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
27	-3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
28	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0
28	-2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
28	-3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	11.0	0.0	0.0	0.0
28	-4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0
KI9301 - Kalsin Bay																							
6	-1	0.0	0.0	0.0	3.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
8	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	4.0	0.0	0.0	5.0	0.0	1.0	0.0	0.0	0.0
9	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19	-1	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0
20	-1	0.0	0.0	3.0	0.0	0.0	0.0	19.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0
21	-1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0
22	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	-1	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0
24	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.0	0.0	0.0	0.0
25	-1	0.0	0.0	0.0	0.0	1.0	4.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	3.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0
26	-1	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0
29	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0
29	-2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0
29	-3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0
29	-4	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	56.0	0.0	0.0	0.0
30	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
30	-2	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	-3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
30	-4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KI9301																							
Tow total		**1.0**	**230.0**	**31.0**	**79.0**	**70.0**	**20.0**	**21.0**	**1.0**	**13.0**	**1.0**	**2.0**	**2.0**	**8.0**	**335.0**	**2.0**	**5.0**	**50.0**	**10.0**	**304.0**	**3.0**	**30.0**	**12.0**
Station total		**0.3**	**230.0**	**31.0**	**52.3**	**66.7**	**20.0**	**19.6**	**1.0**	**7.9**	**1.0**	**2.0**	**2.0**	**8.0**	**210.6**	**1.3**	**5.0**	**50.0**	**10.0**	**189.4**	**3.0**	**30.0**	**12.0**

Table 11. Ten minute CPUE of fishes caught in Chiniak Ray (KI9301 continued).

CS#	Tow#	Smooth alligatorfish	Aleutian alligatorfish	Sturgeon poacher	Tubenose poacher	Bathyagonus spp.	Unid. snailfish	Pacific sandfish	Searcher	Northern ronquil	Chirolophis spp. (prickleback)	Lumpenus spp. (prickleback)	Arctic shanny	Crescent gunnel	Pacific sandlance	Arrowtooth flounder	Flathead sole	Pacific halibut	Dover sole	Starry flounder
KI9301 - Womens Bay																				
2	-1	1.o	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	271.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
3	- 2	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	109.0	0.0	0.0	0.0	0.0	7.0	1.0	0.0	0.0
4	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	195.0	0.0	1.o	0.0	0.0	0.0	1.0	0.0	1.0
5	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
KI9301 • Middle Bay																				
11	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	4.0	0.0	1 .o	0.0	0.0
12	-1	0.0	0.0	5.0	0.0	3.0	0.0	0.0	2.0	0.0	0.0	6.0	0.0	0.0	0.0	4.0	12.0	0.0	2.0	0.0
13	-1	0.0	0.0	4.0	0.0	19.0	0.0	0.0	1	0	1.0	0.0	2.0	0.0	0.0	0.0	3.0	194.0	0.0	0.0
14	-1	0.0	0.0	9.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	7.0	35.0	0.0	0.0	0.0
15	-2	0.0	0.0	2.0	0.0	12.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	2.0	50.0	0.0	0.0	0.0
16	-1	0.0	0.0	35.0	1.0	0.0	1.0	3.0	0.0	0.0	0.0	410.0	0.0	0.0	11.0	0.0	0.0	60.0	0.0	1.0
17	-1	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	3.0	0.0	0.0	0.0	6.0	0.0	0.0
16	-1	0.0	0.0	5.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	106.0	1.0	0.0	0.0	0.0	3.0	9.0	0.0	0.0
27	-1	0.0	0.0	0.0	0.0	2.0	1.0	0.0	0.0	0.0	0.0	65.0	0.0	0.0	0.0	0.0	0.0	13.0	0.0	0.0
27	-2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0
2 7	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0
20	-1	0.0	0.0	2.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	33.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0
28	- 2	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0
28	-3	0.0	0.0	10.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	29.0	0.0	0.0	0.0	0.0	0.0	23.0	0.0	1 .o
28	-4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	0.0
KI9301 - Kaisin Bay																				
6	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	7.0	0.0	0.0	0.0	2.0	7.0	1.0	0.0	0.0
7	-1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0
6	-1	0.0	0.0	6.0	0.0	34.0	1.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	5.0	93.0	0.0	0.0	0.0
9	-1	0.0	0.0	5.0	0.0	36.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	4.0	106.0	0.0	1.0	0.0
19	-1	0.0	0.0	7.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	8.0	14.0	0 . 0	0.0
20	- 1	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0
21	-1	0.0	0.0	1.0	1.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	5.0
22	-1	0.0	0.0	2.0	0.0	0.0	0.0	1	.o	0.0	0.0	0.0	0.0	0.0	1 a	0.0	0.0	1.0	0.0	2.0
23	-1	0.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	28.0	0.0	0.0	0.0	12.0	60.0	0.0	0.0	0.0
24	-1	0.0	4.0	4.0	0.0	8.0	0.0	0.0	0.0	8.0	0.0	156.0	0.0	0.0	0.0	12.0	366.0	0.0	0.0	0.0
25	-1	0.0	0.0	2.0	0.0	26.0	0.0	0.0	0.0	0.0	0.0	71.0	0.0	0.0	0.0	6.0	208.0	0.0	0.0	1 .o
26	-1	0.0	0.0	0.0	4.0	32.0	0.0	0.0	0.0	0.0	0.0	28.0	0.0	0.0	0.0	6.0	178.0	0.0	0.0	0.0
29	-1	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	9.0	0.0	0.0
29	- 2	0.0	0.0	34.0	0.0	0.0	3.0	0.0	0.0	0.0	1.0	16.0	0.0	0.0	0.0	0.0	2.0	6.0	0.0	0.0
29	-3	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
2 9	4	0.0	0.0	41.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0	0.0	0.0
30	- 1	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	3.0	0.0	0.0
30	- 2	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
30	-3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	1.0
30	-4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KI9301																				
Tow total		1.0	4.0	326.0	16.0	192.0	9.0	6.0	5.0	21.0	1.0	1638.0	1.0	6.0	24.0	69.0	1361.0	217.0	3.0	12.0
Station total		1.0	4.0	136.0	14.6	179.4	8.1	6.0	5.0	21.0	0.3	1485.6	1.0	4.3	24.0	89.0	1342.0	128.9	3.0	10.5

Table 11. Ten minute CPUE of fishes caught in Chinisk Bay (KI9301 continued).

CS#	Tow#	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	Tow total
KI9301 - Womens Bay								
2	-1	14.0	2.0	0.0	0.0	0.0	0.0	379.0
3	-2	2.0	0.0	0.0	0.0	0.0	0.0	144.0
4	-1	0.0	10	0.0	0.0	0.0	0.0	460.0
5	-1	3.0	5.0	0.0	0.0	0.0	0.0	40.0
KI9301 - Middle Bay								
11	-1	2.0	116.0	5.0	0.0	0.0	0.0	147.0
12	-1	1.0	40.0	0.0	0.0	0.0	0.0	99.0
13	-1	2.0	2.0	0.0	0.0	0.0	0.0	249.0
14	-1	1.0	5.0	0.0	0.0	0.0	0.0	97.0
15	-2	1.0	8.0	0.0	0.0	0.0	0.0	111.0
16	-1	6.0	129.0	0.0	6.0	0.0	0.0	730.0
17	-1	0.0	0.0	0.0	0.0	0.0	0.0	22.0
16	-1	15.0	65.0	0.0	0.0	0.0	0.0	290.0
27	-1	6.0	370	0.0	0.0	0.0	0.0	187.0
27	-2	1.0	5.0	0.0	0.0	0.0	0.0	55.0
27	-3	4.0	41.0	0.0	0.0	0.0	0.0	99.0
28	-1	7.0	68.0	0.0	5.0	0.0	0.0	192.0
28	-2	0.0	16.0	0.0	1.0	0.0	0.0	53.0
2	8 3	4.0	65.0	0.0	11.0	0.0	0.0	166.0
2	6 4	0.0	13.0	0.0	4.0	0.0	0.0	45.0
KI9301 - Kalsin Bay								
6	-1	12.0	70	2.0	0.0	0.0	0.0	60.0
7	-1	0.0	0.0	0.0	0.0	0.0	0.0	7.0
6	-1	0.0	5.0	0.0	0.0	0.0	0.0	167.0
9	-1	1.0	3.0	1.0	0.0	0.0	0.0	199.0
19	-1	73.0	121.0	1.0	0.0	2.0	0.0	250.0
20	-1	1.0	4.0	0.0	0.0	0.0	0.0	44.0
21	-1	0.0	26.0	0.0	4.0	3.0	1.0	96.0
22	-1	2.0	4J.0	4.0	1.0	2.0	2.0	61.0
23	-1	14.0	46.0	6.0	0.0	0.0	0.0	236.0
24	-1	42.0	0.0	12.0	0.0	0.0	0.0	540.0
25	-1	2.0	0.0	3.0	0.0	0.0	0.0	338.0
26	-1	0.0	120	0.0	0.0	0.0	0.0	294.0
29	-1	5.0	152.0	1.0	0.0	1.0	0.0	207.0
29	-2	16.0	283.0	0.0	0.0	0.0	0.0	455.0
29	-3	6.0	147.0	1.0	0.0	0.0	0.0	207.0
2	9 4	43.0	244.0	1.0	0.0	1.0	0.0	419.0
30	-1	1.0	41.0	0.0	0.0	0.0	0.0	52.0
30	-2	0.0	36.0	0.0	0.0	0.0	0.0	42.0
30	-3	0.0	67.0	4.0	0.0	0.0	0.0	77.0
30	-4	0.0	32.0	3.0	0.0	0.0	0.0	35.0
KI9301								
Tow total		291.0	1887.0	46.0	32.0	9.0	3.0	7298.0
Station total		220.7	966.7	38.5	16.3	7.5	3.0	5638.2

Table 12a. **Ten minute CPUE of age-0 flatfishes captured during August 1993 within Chiniak Bay (KI9301), indexed by bay, station (CS#) and tow (- #). Station total is the cumulative mean CPUE per station.**

CS#	Tow#	Station code	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-0
KI9301 - Womens Bay																
2 -	1		10	0	0	0	2	0	0	0	0	0	0	0	0	2
3 -	2		10	0	0	1	1	0	0	0	0	0	0	0	0	2
4 -	1		10	0	0	0	1	0	0	0	0	0	0	0	0	1
5 -	1		10	0	0	0	0	0	0	0	0	0	0	0	0	0
KI9301 - Middle Bay																
11 -	1	MB20	IO	4	0	0	0	0	0	0	53	0	0	0	0	57
12 -	1		10	4	0	3	0	0	0	0	3	0	0	0	0	10
13 -	1	MB50	10	3	0	65	0	0	0	0	0	0	0	0	0	68
14 -	1		10	5	0	2	0	0	0	0	0	0	0	0	0	7
15 -	2		10	1	0	0	0	0	0	0	0	0	0	0	0	1
16 -	1	MB00	10	0	0	0	60	0	0	0	109	0	0	0	0	169
17 -	1		10	0	0	0	6	0	0	0	0	0	0	0	0	6
18 -	1	MB10	10	0	0	3	8	0	0	0	48	0	0	0	0	59
27 -	1	MB05	10	0	0	0	13	0	0	0	28	0	0	0	0	41
27 -	2	MB05	10	0	0	0	3	0	0	0	0	0	0	0	0	3
27 -	3	MB05	10	0	0	0	7	0	0	0	29	0	0	0	0	36
28 -	1	MB05	IO	0	0	0	14	0	0	0	51	0	0	0	0	65
28 -	2	MB05	10	0	0	0	7	0	0	0	15	0	0	0	0	22
28 -	3	MB05	IO	0	0	0	23	0	1	0	54	0	0	0	0	78
28 -	4	MB05	10	0	0	0	16	0	0	0	9	0	0	0	0	25
KI9301 - Kalsin Bay																
6 -	1	KB20	10	2	0	0	1	0	0	0	3	0	0	0	0	6
7 -	1		10	0	0	0	0	0	0	0	0	0	0	0	0	0
8 -	1		IO	3	0	31	0	0	0	0	0	0	0	0	0	34
9 -	1		10	2	0	1	0	0	0	0	0	0	0	0	0	3
19 -	1		IO	0	0	0	14	0	0	0	90	0	0	2	0	106
20 -	1	KB00	IO	0	0	0	0	0	0	0	1	0	0	0	0	1
21 -	1	KB00	10	0	0	0	0	0	0	0	20	0	0	3	0	23
22 -	1	KB00	10	0	0	0	1	0	0	0	35	0	1	2	0	39
23 -	1	KB22	5	12	0	4	0	0	0	0	32	0	0	0	0	48
24 -	1	KB30	5	2	0	166	0	0	0	0	0	0	0	0	0	168
25 -	1	KB50	10	4	0	139	0	0	0	0	0	0	0	0	0	143
26 -	1	KB70	5	4	0	104	0	0	0	0	2	0	0	0	0	110
29 -	1	KB10	10	0	0	0	9	0	0	0	145	0	0	1	0	155
29 -	2	KB10	10	0	0	0	8	0	0	0	276	0	0	0	0	284
29 -	3	KB10	10	0	0	0	2	0	0	0	144	0	0	0	0	146
29 -	4	KB10	IO	0	0	4	11	0	0	0	236	0	0	1	0	252
30 -	1	KB05	IO	0	0	0	3	0	0	0	38	0	0	0	0	41
30 -	2	KB05	10	0	0	0	1	0	0	0	30	0	0	0	0	31
30 -	3	KB05	10	0	0	0	2	0	0	0	60	0	0	0	0	62
30 -	4	KB05	IO	0	0	0	0	0	0	0	30	0	0	0	0	30
KI9301 - Tow total age-0				48.0	0.0	523.0	213.0	0.0	1.0	0.0	1541.0	0.0	1.0	9.0	0.0	2334.0
KI9301 - Station total age-0				48.0	0.0	520.0	125.7	0.0	0.3	0.0	687.0	0.0	1.0	7.5	0.0	1387.5

Table 12b. Ten minute CPUE of age-1 flatfishes captured during August 1993 within Chiniak Bay (KI9301), indexed by bay, station (CS#) and tow (- #). Station total is the cumulative mean CPUE per station.

CS#	-	Tow#	Station code	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-1
KI9301 - Womens Bay																	
2	-	1		10	0	0	0	0	0	0	12	2	0	0	0	0	14
3	-	2		10	0	0	3	0	0	0	1	0	0	0	0	0	4
4	-	1		10	0	0	0	0	0	0	0	0	0	0	0	0	0
5	-	1		10	0	0	1	0	0	0	0	5	0	0	0	0	6
KI9301 - Middle Bay																	
11	-	1	MB20	10	0	0	0	1	0	0	1	61	0	0	0	0	63
12	-	1		10	0	0	7	0	0	0	0	32	0	0	0	0	39
13	-	1	MB50	10	0	0	117	0	0	0	0	0	0	0	0	0	117
14	-	1		10	1	0	30	0	0	0	0	5	0	0	0	0	36
15	-	2		10	1	0	46	0	0	0	0	0	0	0	0	0	47
16	-	1	MB00	10	0	0	0	0	0	0	8	18	0	6	0	0	32
17	-	1		10	0	0	0	0	0	0	0	0	0	0	0	0	0
18	-	1	MB10	10	0	0	0	1	0	0	10	10	0	0	0	0	21
27	-	1	MB05	10	0	0	0	0	0	0	2	a	0	0	0	0	10
27	-	2	MB05	10	0	0	0	0	0	0	0	4	0	0	0	0	4
27	-	3	MB05	10	0	0	0	0	0	0	0	8	0	0	0	0	a
26	-	1	MB05	10	0	0	0	0	0	0	7	16	0	5	0	0	28
28	-	2	MB05	10	0	0	0	0	0	0	0	0	0	1	0	0	1
28	-	3	MB05	10	0	0	0	0	0	0	2	6	0	11	0	0	19
26	-	4	MB05	10	0	0	0	0	0	0	0	3	0	4	0	0	7
KI9301 - Kalsin Bay																	
6	-	1	KB20	10	0	0	5	0	0	0	9	3	0	0	0	0	17
7	-	1		10	0	0	4	0	0	0	0	0	0	0	0	0	4
8	-	1		10	0	0	57	0	0	0	0	3	0	0	0	0	60
9	-	1		10	2	0	81	0	0	0	0	0	0	0	0	0	63
19	-	1		10	0	0	5	0	0	0	65	22	0	0	0	0	92
20	-	1	KB00	10	0	0	0	0	0	0	1	1	0	0	0	0	2
21	-	1	KB00	10	0	0	0	0	0	0	0	1	0	4	0	0	5
22	-	1	KB00	10	0	0	0	0	0	0	2	2	0	0	0	2	6
23	-	1	KB22	5	0	0	38	0	0	0	2	14	0	0	0	0	54
24	-	1	KB30	5	a	0	122	0	0	0	0	0	0	0	0	0	130
25	-	1	KB50	10	2	0	49	0	0	0	0	0	0	0	0	0	51
26	-	1	KB70	5	4	0	44	0	0	0	0	0	0	0	0	0	48
29	-	1	KB10	10	0	0	1	0	0	0	5	7	0	0	0	0	13
29	-	2	KB10	10	0	0	2	0	0	0	17	4	0	0	0	0	23
29	-	3	KB10	10	0	0	0	0	0	0	0	2	0	0	0	0	2
29	-	4	KB10	10	0	0	4	0	0	0	42	5	0	0	0	0	51
30	-	1	KB05	10	0	0	1	0	0	0	1	3	0	0	0	0	5
30	-	2	KB05	10	0	0	0	0	0	0	0	5	0	0	0	0	5
30	-	3	KB05	10	0	0	0	1	0	0	0	5	0	0	0	0	6
30	-	4	KB05	10	0	0	0	0	0	0	0	1	0	0	0	0	1
KI9301 Tow total age-1					16.0	0.0	617.0	3.0	0.0	0.0	167.0	256.0	0.0	31.0	0.0	2.0	1114.0
K19301 Station total age-1					18.0	0.0	611.0	2.3	0.0	0.0	130.2	200.0	0.0	15.3	0.0	2.0	978.6

Table 12c. Ten minute CPUE of age-≥2 flatfishes captured during August 1993 within Chiniak Bay (KI9301), indexed by bay, station (CS#) and tow (- #). Station total is the cumulative mean CPUE per station.

CS#	- Tow#	Station code	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-≥2
KI9301 - Womens Bay																
2	- 1		10	0	0	0	0	0	0	2	0	0	0	0	0	2
3	- 2		10	0	0	3	0	0	0	1	0	0	0	0	0	4
4	- 1		10	0	0	0	0	0	1	0	1	0	0	0	0	2
5	- 1		10	0	0	0	0	0	0	3	0	0	0	0	0	3
KI9301 - Middle Bay																
11	- 1	MB20	10	0	0	0	0	0	0	1	4	5	0	0	0	10
12	- 1		10	0	0	2	0	2	0	1	5	0	0	0	0	IO
13	- 1	MB50	10	0	0	12	0	0	0	2	2	0	0	0	0	16
14	- 1		10	1	0	3	0	0	0	1	0	0	0	0	0	5
15	- 2		10	0	0	4	0	0	0	1	8	0	0	0	0	13
16	- 1	MB00	10	0	0	0	0	0	1	0	2	0	0	0	0	3
17	- 1		10	0	0	0	0	0	0	0	0	0	0	0	0	0
18	- 1	MB10	10	0	0	0	0	0	0	5	8	0	0	0	0	13
27	- 1	MB05	10	0	0	0	0	0	0	4	1	0	0	0	0	5
27	- 2	MB05	10	0	0	0	0	0	0	1	1	0	0	0	0	2
27	- 3	MB05	10	0	0	0	0	0	0	4	4	0	0	0	0	8
28	- 1	MB05	10	0	0	0	0	0	0	0	1	0	0	0	0	1
28	- 2	MB05	10	0	0	0	0	0	0	0	1	0	0	0	0	1
28	- 3	MB05	10	0	0	0	0	0	0	2	5	0	0	0	0	7
28	- 4	MB05	10	0	0	0	0	0	0	0	1	0	0	0	0	1
KI9301 - Kalsin Bay																
6	- 1	KB20	10	0	0	2	0	0	0	3	1	2	0	0	0	8
7	- 1		10	0	0	2	0	0	0	0	0	0	0	0	0	2
8	- 1		IO	2	0	10	0	0	0	0	2	0	0	0	0	14
9	- 1		10	0	0	24	0	1	0	1	3	1	0	0	0	30
19	- 1		10	0	0	3	0	0	0	8	9	1	0	0	0	21
20	- 1	KB00	10	0	0	0	0	0	0	0	2	0	0	0	0	2
21	- 1	moo	10	0	0	0	1	0	5	0	5	0	0	0	1	12
22	- 1	KB00	10	0	0	0	0	0	2	0	3	4	0	0	0	9
23	- 1	KB22	5	0	0	18	0	0	0	12	0	8	0	0	0	38
24	- 1	KB30	5	2	0	7%	0	0	0	42	0	12	0	0	0	134
25	- 1	KB50	10	0	0	20	0	0	1	2	0	3	0	0	0	26
26	- 1	KB70	5	0	0	30	0	0	0	0	10	0	0	0	0	40
29	- 1	KB10	10	0	0	0	0	0	0	0	0	1	0	0	0	1
29	- 2	KB10	10	0	0	0	0	0	0	1	3	0	0	0	0	4
29	- 3	KB10	10	0	0	0	0	0	0	6	1	1	0	0	0	8
29	- 4	KB10	10	0	0	0	0	0	0	1	3	1	0	0	0	5
30	- 1	KB05	10	0	0	0	0	0	0	0	0	0	0	0	0	0
30	- 2	KB05	10	0	0	0	0	0	0	0	1	0	0	0	0	1
30	- 3	KBo5	10	0	0	0	0	0	1	0	2	4	0	0	0	7
30	- 4	KB05	10	0	0	0	0	0	0	0	1	3	0	0	0	4
KI9301 Tow total age-≥2				5.0	0.0	211.0	1.0	3.0	11.0	104.0	90.0	46.0	0.0	0.0	1.0	472.0
KI9301 Station total age-≥2				5.0	0.0	211.0	1.0	3.0	10.3	90.5	71.8	38.5	0.0	0.0	1.0	432.0

Table 13. Ten minute CPUE of ail flatfishes captured using 3.88 m and 3.08 m beams during August 1993 within Chiniak Bay, at KI9301 consecutive stations (CS#) 27 - 30. Number of tows of each beam type is in parentheses.

		CS#27		CS#28		CS#29		CS#30		CS#27-30	
Species	Age	3.88 m (N=1)	3.05 m (N=2)	3.88 m (N=2)	3.05 m (N=2)	3.88 m (N=2)	3.06 m (N=2)	3.88 m (N=2)	3.06 m (N=2)	3.88 m (N=7)	3.05 m (N=8)
Flathead sole	0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.8	0.0
	1	0.0	0.0	0.0	0.0	2.0	1.5	0.5	0.0	0.7	0.4
Pacific halibut	0	7.0	8.0	10.5	19.5	8.5	8.5	2.0	1.0	8.4	9.3
	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.1
Starry flounder	0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.1
	≥2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.1
Yellowfin sole	1	0.0	1.0	3.5	1.0	21.0	11.0	0.5	0.0	7.1	3.3
	≥2	4.0	2.5	0.0	1.0	3.5	0.5	0.0	0.0	1.6	1.0
Rock sole	0	29.0	14.0	33.0	31.5	190.0	210.5	34.0	45.0	77.6	75.3
	1	8.0	8.0	8.0	4.5	3.5	5.5	4.0	3.0	5.6	4.8
	≥2	4.0	1.0	1.0	3.0	2.0	1.5	0.5	1.5	1.6	1.8
Butler sole	≥2	0.0	0.0	0.0	0.0	1.0	0.5	0.0	3.5	0.3	1.0
Alaska plaice	1	0.0	0.0	3.0	7.5	0.0	0.0	0.0	0.0	0.9	1.9
English sole	0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.1	0.1
Ail flatfishes	ail aaes	82.0	32.8	59.0	88.8	232.0	240.0	41.5	55.0	102.4	99.0

Chiniak Bay/November 1993 (KI9302)

Fish data within Chiniak Bay/November 1993 (KI9302)

No data on roundfishes were retained, and few data were retained for nonquantitative tows during November 1993 within Chiniak Bay (KI9302). Flatfishes were captured and measured (N=935) from each of the 10 stations with quantitative tows.

The cumulative flatfish CPUE from 10 stations during KI9302 was 968, for an average CPUE of 97±99 flatfishes/station. Nme species of flaffish were wllected during KI9302 and are listed in decreasing order of CPUE abundance (cumulative CPUE of all ages): rock sole (N=352), flathead sole (N=306), yellowfin sole (N=140), arrowtooth flounder (N=130), Pacific halibut (N=18), butter sole (N=11), Alaska plaice (N=5), Dover sole (N=3), starry flounder (N=2). During November 1993 (Table 14) catches of age-0 flatfishes were most prevalent for arrow-tooth flounder, flathead sole, Pacific halibut and rock sole. Age-l fishes were most numerically dominant of Dover sole, yellowtin sole and Alaska plaice. Age-22 fishes were captured most often of starry flounder and butter sole.

Distribution of flatfishes by age within Chiniak Bay/November 1993 (KI9302)

Arrowtooth flounder (Figures 154-158)

Age-0 arrowtooth flounder (N=116) were caught at 40% of stations during KI9302. The mean number of age-0 fish/tow was 11.6±23.4, and the largest catch was 67 fish/tow. Age-O arrowtooth flounder were- captured in water >30 m, near the mouth of Middle Bay.

Age-l arrowtooth flounder (N=13) were caught at 20% of stations during KI9302. The mean number of age-l fish/tow was 1.3±2.8, and the largest catch was eight fish/tow. Like age-0 fish, age-l arrowtooth flounder were captured in water >30 m, near the mouth of Middle Bay.

Age-≥2 arrowtooth flounder were caught during KI9302 (N=1).

Flathead sole (Figures 159-163)

Age-0 flathead sole (N=123) were caught at 70% of stations during KI9302. The mean number of age-0 fish/tow was 12.3S26.2, and the largest catch was 85 fish/tow. The largest catches of flathead sole were at the mouth of Middle Bay, but age-0 flathead sole were captured at all depths examined and at all distances from the mouth of the bay.

Age-l flathead sole (N=119) were caught at 20% of stations during KI9302. The mean number of age-l fish/tow was 11.9±25.6, and the largest catch was 70 fish/tow. Age-l flathead sole were only captured in water >50 m, near the mouth of Middle Bay.

Age-22 flathead sole were captured during KI9302 (N=64).

Pacific halibut (Figures 164-168)

Age-O Pacific halibut (N=15) were caught at 70% of stations during KI9302. The mean number of age-0 fish/tow was 1.5±1.8, and the largest catch was six fish/tow. Age-O halibut were caught at all stations within bays, in depths less than 40 m.

Age-l halibut (N=3) were caught at 10% of stations during KI9302. The mean number of age-l fish/tow was 0.3±1.1, and the largest catch was three fish/tow. Age-l halibut were caught at a single station near the mouth of Middle Bay, in 30 - 40 m depth.

Age-22 halibut were not captured during KI9302.

Dover sole (Figures 169-173)

Age-O Dover sole were not captured during KI9302.

Age-l Dover sole (N=2) were caught at 20% of stations during KI9302. The mean number of age-l fish/tow was 0.2±0.4, and the largest catch was one fish/tow. Dover sole were only caught near the mouth of Middle Bay. Age-l Dover sole was caught at two stations just outside the mouth of Middle Bay, in water >40 m.

Age-22 Dover sole were captured during KI9302 (N=1).

Starry flounder (Figures 174-178)

Age-0 starry flounder were not captured during KI9302.

Age-l starry flounder were not captured during quantitative tows, but a single age-l fish was caught during a non-quantitative tow near shore in Womens Bay.

Age-22 starry flounder were caught during KI9302 (N=2).

Yellowfin sole (Figures 179-183)

Age-O yellowfin sole (N=9) were caught at 30% of stations during KI9302. The mean number of age-0 fish/tow was 0.9±1.7, and the largest catch was 4 fish/tow. Age-0 yellowfin sole were caught in water <20 m deep, well within Middle Bay. They were caught only on the flood tide.

Age-l yellowfin sole (N=80) were caught at 70% of stations during KI9302. The mean number of age-l fish/tow was 8.M12.0, and the largest catch was 31 fish/tow. Age-1 yellowfm sole were caught from 10 to 60 m depth, from outside to well within the bay. The largest catches were just outside the mouth of Middle Bay.

Age-22 yellowfin sole were captured during KI9302 (N=51).

Rock sole (Figures 184-188)

Age-0 rock sole (N=255) were caught at 90% of stations during KI9302. The mean number of age-0 fish/tow was 25. 5±28.1, and the largest catch was 86 fish/tow. Age-0 rock sole were caught at all sampled depths, from outside to the head of the bay, but were most abundant in less than 40 m depth and inside the bay.

Age-1 rock sole (N=71) were caught at 100% of stations during KI9302. The mean number of age-l fish/tow was 7.13t5.4, and the largest catch was 21 fish/tow. Age-l rock sole were caught at every station during KI9302. They were most abundant in water <20 m, well within the bay.

Age-12 rock sole were caught during KI9302 (N=26).

Butter sole (Figures 189-193)

Age-0 butter sole were not captured during K193 02.

Age-l butter sole (N=1) were caught at 10% of stations during KI9302. The mean number of age-1 fish/tow was 0. 1±0.3, and the largest catch was one fish/tow.

Age-≥2 butter sole were captured during KI9302 (N=10).

Alaska plaice (Figures 194-198)

Age-O Alaska plaice were not caught during KI9302.

Age-l plaice (N=5) were caught at 20% of stations during KI9302. The mean number of age-1 fish/tow was 0.5±1.1, and the largest catch was three fish/tow. Age-l Alaska plaice were caught only in water <20 m depth, at stations near the head of Middle Bay, in abundances of 2 - 3 fish/station

No age-22 plaice were caught during KI9302.

Table 14a. Ten minute CPUE of age-9 flatfishes captured during November 1993 within Chiniak Bay (KI9302), indexed by bay, station (CS#) and tow (- #).

CS#	-	Tow#	Station code	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-0
KI9302 - Womens Bay																	
2	-	2		5	0.0	0.0	10.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0 0	0.0	16.0
KI9302 - Middle Bay																	
4	-	1	MB10	10	0.0	0.0	1.0	1.0	0.0	0.0	1.0	20.0	0.0	0.0	0.0	0.0	23.0
5	-	1		10	0.0	0.0	0.0	2.0	0.0	0.0	0.0	44.0	0.0	0.0	0.0	0.0	46.0
6	-	1		10	0.0	0.0	3.0	2.0	0.0	0.0	4.0	55.0	0.0	0.0	0.0	0.0	65.0
7	-	1		10	0.0	0.0	3.0	2.0	0.0	0.0	4.0	26.0	0.0	0.0	0.0	0.0	35.0
a	-	1		10	0.0	0.0	2.0	1.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	12.0
9	-	1	Ms.9	10	67.0	0.0	05.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	156.0
10	-	1		10	42.0	0.0	19.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	62.0
11	-	1		3	3.3	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	13.3
12	-	1		9	3.3	0 0	0.0	1.1	0 0	0.0	0.0	05.5	0.0	0.0	0.0	0.0	89.9
KI9302 Tow total age-0					115.7	0.0	123.0	15.1	0.0	0.0	9.0	255.5	0.0	0.0	0.0	0.0	518.2
KI9302 Station total age-0					115.7	0.0	123.0	15.1	0.0	0.0	9.0	255.5	0.0	0.0	0.0	0.0	518.2

Table 14b. Ten minute CPUE of age-I flatfishes captured during November 1993 within Chiniak Bay (KI9302). indexed by bay, station (CS#) and tow (- #).

CS#	-	Tow#	Station code	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-1
KI9302 - Womens Bay																	
2	-	2		5	0.0	0.0	0.0	0.0	0.0	0.0	6.0	2.0	0.0	6.0	0.0	0.0	14.0
KI9302 - Middle Bay																	
4	-	1	MB10	10	0.0	0.0	0.0	0.0	0.0	0.0	1.0	8.0	0.0	1.0	0.0	2.0	12.0
5	-	1		10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	2.0	0.0	0.0	6.0
6	-	1		10	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	0.0	12.0
7	-	1		10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0	0.0	2.0	0.0	0.0	23.0
8	-	1		10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	3.0	12.0
9	-	1	MB50	10	0.0	0.0	70.0	0.0	1 .0	0.0	29.0	6.0	0.0	0.0	0.0	0.0	114.0
10	-	1		10	5.0	0.0	49.0	0.0	1 .0	0.0	31.0	3.0	1.0	0.0	0.0	0.0	90.0
11	-	1		3	0.0	0.0	0.0	0.0	0.0	0.0	10.0	3.3	0.0	0.0	0.0	0.0	13.3
12	-	1		9	0.0	0.0	0.0	3.3	0.0	0.0	1.1	7.0	0.0	1 1	0.0	0.0	13.3
KI9302 Tow total age-I					13.0	0.0	119.0	3.3	2.0	0.0	80.1	71.1	1.0	15.1	0.0	5.0	303.6
KI9302 Station total age-1					13.0	0.0	119.0	3.3	2.0	0.0	80.1	71.1	1.0	15.1	a.0	5.0	309.6

Table 14c. Ten minute CPUE of age-≥2 flatfishes captured during November 1993 within Chiniak Bay (KI9302), indexed by bay, station (CS#) and tow (- #).

CS#	-	Tow#	Duration (min)	Station code	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-≥2
KI9302 - Womens Bay																	
2	-	2	5		0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0
KI9302 - Middle Bay																	
4	-	1	10	MB10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	4.0
5	-	1	10		0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.0	0.0	0.0	0.0	3.0
6	-	1	10		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	-	1	10		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	-	1	10		0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	4.0
9	-	1	10	MB50	1.0	0.0	200	0.0	0.0	0.0	19.0	6.0	2.0	0.0	0.0	0.0	66.0
10	-	1	10		0.0	0.0	25.0	0.0	1.0	0.0	32.0	4.0	6.0	0.0	0.0	0.0	69.0
11	-	1	3		0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3
12	-		19		0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	1.1	0.0	0.0	0.0	6.7
KI9302 Tow total age-≥2					1.0	0.0	64.3	0.0	1.0	2.0	51.0	26.6	10.1	0.0	0.0	0.0	166.0
KI9302 Station total age-≥2					1.0	0.0	64.3	0.0	1.0	2.0	61.0	26.6	10.1	0.0	0.0	0.0	165.0

Chiniak Bay/June 1994 (KI9401)

Fiih data within Chiniak Bay/June 1994 (KI9401)

A single quantitative tow at each of 12 stations was collected during June 1994 within Chiniak Bay (KI940 1). Flatfishes were captured at each station (Table 15), and all flatfishes were measured.

The cumulative flatfish CPUE from 12 stations during KI9401 was 989, for an average CPUE of 82±56 flatfishes/station. The nine species of flatfish collected during KI9401 are listed in decreasing order of CPUE abundance (cumulative CPUE of all ages): flathead sole (N=426), rock sole (N=354), yellowfin sole (N=135), Pacific halibut (N=55), butter sole (N=12), arrowtooth flounder (N=2), rex sole (N=2), Alaska plaice (N=1) and sand sole (N=1). During June 1994 (Table 16), catches of age-0 flatfishes were most Prevalent only for Pacific halibut, while age-l fishes were most numerically dominant of rex sole, flathead sole and rock sole. Age-≥1 was numerically dominant of yellowfin sole. *Age-22* fishes were captured most often of butter sole, Alaska plaice and sand sole. One age-0 and one age-12 arrowtooth flounder were caught.

Distribution of flatfishes by age within Chiniak Bay/June 1994 (KI9401)

Arrowtooth flounder (Figures 199-203)

Age-O arrowtooth flounder (N=1) were caught at 8% of stations during KI9401, for a mean of 0.1±0.3 fish/tow. The age-0 fish was caught in 20 - 30 m, near the head of Kalsin Bay.

No age-l arrowtooth flounder were caught during KI9401.

A single age-22 arrowtooth flounder was caught during KI9401.

Rex sole **(Figures 204-208)**

Age-O rex sole were not caught during KI940 1.

Age-l rex sole (N=2) were caught at 8% of stations during KI9401. The mean number of age-l fish/tow was 0.2±0.6, and the largest catch was two fish/tow. Both age-l rex sole were caught at a single station well within Kalsin Bay, in 50 - 60 m depth.

No age-12 rex sole were caught during KI9401.

Flathead sole (Figures 209-213)

A single age-0 was caught during KI9401 (8% of stations during KI9401, 0.1±0.3 fish/tow). This fish was caught at the head of Kalsin Bay, in <20 m depth.

Age-1 flathead sole (N=265) were caught at 58% of stations during KI9401. The mean number of age-1 fish/tow was 22.1S7.7, and the largest catch was 114 fish/tow. Age-l flathead sole were caught in Womens and Kalsin Bays, in depths 10 - 60 m. The highest abundances were well within Kalsin Bay in depths ³20 m, during high slack or ebb tide.

Age-22 flathead sole were caught during KI9401 (N=160).

Pacific halibut (Figures 214-218)

Age-O halibut (N=54) were caught at 75% of stations during KI9401. The mean number of age-0 fish/tow was 4.5G.6, and the largest catch was 19 fish/tow. Age-O halibut were caught in small numbers throughout Middle Bay, but were most abundant at the head of Kalsin Bay. They were only caught in water <30 m deep and on the flood tide.

Age- 1 Pacific halibut were not caught during KI940 1.

A siie age-≥2 halibut was caught during KI940 1.

Yellowfin sole (Figures **219-223)**

Age-O yellow-fin sole were not caught during KI940 1.

Age-O yellowfin sole (N=60) were caught at 58% of stations during KI9401. The mean number of age-0 fish/tow was 5.0±8.8, and the largest catch was 3 1 fish/tow. Age-0 yellowfin sole were only captured in <30 m water depth, from 3 km within to the head of the bay, on a flood or high slack tide.

Age-≥1 yellowfin sole were caught during KI9401 (N=75), but as age-l fish could not be separated from older fish by length frequency analysis, they are not discussed here..

Rock sole (Figures 224-228)

Age-O rock sole (N=57) were caught at 42% of stations during KI9401. The mean number of age-0 fish/tow was 4.W3.4, and the largest catch was 26 fish/tow. Age-O fish were only caught in less than 40 m water depth near the head of Kalsin Bay. All were caught on a flood or high slack tide.

Age-l rock sole (N=172) were caught at 67% of stations during KI9401. The mean number of age-l fish/tow was 14.4±15.5, and the largest catch was 41 fish/tow. Age-l rock sole were caught in <30 m water depth, in large abundances from the mouth to the heads of bays. All age-l fish were caught on the flood or high slack tide.

Age-22 rock sole were caught during KI9401 (N=125).

Butter sole (Figures 229-233)

Age-O butter sole were not caught during KI940 1.

A single age-l butter sole was caught (8% of stations during KI9401, 0.1±0.3 fish/tow). This fish was caught in 20 - 30 m water depth, near the mouth of Middle Bay, just before high tide.

Age-22 butter sole were caught during KI9401 (N=1 1).

Alaska plaice (Figures 234-238)

No age-l or age-l Alaska plaice were caught during KI9401.

A single age-≥2 Alaska plaice was captured.

Sand sole (Figures 239-243)

No age-0 or age-l fish were caught during KI9401.

A single age-≥2 sand sole was captured in Middle Bay, at the same station as the age-22 plaice was caught.

Table 16. **Ten minute CPUE of all fishes captured during June 1994 within Chiniak Bay (KI9401), indexed by station (CS#) and tow (- #).**

CS# - Tow#	Pacific herring	Cods	Walleye pollock	Spinyhead sculpin	Sculpin species	Red irish lord	Yellow irish lord	Sculpin species	Sculpin species	Sturgeon poacher	Tubenose poacher	Bathyagonus spp.	Snailfish species	Searcher	Lumpenus spp.	Slender eelblenny	Snake prickleback	Stout eelblenny	Whitebarred prickleback	Crescent gunnel	Prowfish	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	Sand sole	Tow total
1 - 1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	6.0	0.0	3.0	0 0	1.0	1.0	0.0	7.0	0.0	0.0	0.0	0 0	0.0	0.0	0.0	0.0	0.0	3 0	8 0	3 4 0	3.0	0.0	0.0	75.0
2 - 1	0.0	62.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0 0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	10.0	5.0	48.0	1.0	0 0	0.0	134 0
8 3 - 1	0.0	0.0	0.0	0.0	1.0	0.0	0.0	2.0	0.0	3.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0	19.0	11.0	25.0	7.0	0.0	0.0	101.0
4 - 1	0.0	16.4	0.0	0.0	0.0	0.0	1.8	5.5	0.0	9.1	0.0	0.0	1.6	0.0	43.6	0.0	0.0	0.0	0.0	0.0	0 0	0.0	0.0	27.3	9.1	36.2	30.9	0.0	0.0	0.0	163.7
5 - 1	0.0	1.0	0.0	0.0	2.0	0.0	0 0	5.0	0.0	2.0	0.0	4.0	0.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	67.0	2.0	46.0	4 6 0	0.0	0 0	0.0	218.0
6 - 1	0.0	0.0	0.0	0 0	0.0	0.0	0.0	0.0	0.0	3 0	0.0	21.0	0.0	0.0	127.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	131.0	0.0	6.0	1.0	0 0	0.0	0 0	290.0
7 - 1	0.0	0.0	0 0	1.0	0.0	0.0	0.0	0.0	4.0	5.0	0 0	25.0	0.0	1.0	11.0	0.0	0.0	0 0	5.0	0.0	0.0	0.0	2.0	144.0	0.0	1 0	0.0	0.0	0.0	0.0	199.0
8 - 1	0.0	3.0	0.0	0.0	0.0	1.0	0.0	16.0	0.0	1.0	0.0	0.0	7.0	0.0	5 0	0.0	0.0	0.0	0.0	0.0	0 0	0.0	0 0	0.0	2.0	1.o	17.0	0.0	0.0	0.0	53.0
9 - 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0 0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2 0	1.0	1 7 0	0.0	0.0	0 0	25.0
10 - 1	0.0	2 4 0	0.0	0.0	7.0	0 0	0.0	8.0	0.0	2.0	0 0	0.0	0.0	0 0	36.0	0.0	0.0	0.0	0.0	0 0	0 0	0.0	0.0	1.0	4 0	1 5 0	62.0	0 0	1.0	1 0	160.0
11 - 1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0 0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	4.0	0.0	50.0	1.0	0.0	0.0	58.0
12 - 1	3.0	0.0	1.0	0.0	1.0	0.0	0.0	2.0	0.0	0.0	1.0	0.0	0.0	0.0	130.0	2.0	2.0	1.0	0 0	1.0	0.0	0.0	0.0	2.0	0.0	1.o	1.0	0.0	0.0	0.0	148.0
KI9401 Tow total	**3.0**	**106.4**	**1.0**	**1.0**	**13.0**	**1.0**	**1.8**	**60.6**	**4.0**	**30.1**	**1.0**	**61.0**	**9.8**	**2.0**	**380.6**	**2.0**	**2.0**	**1.0**	**8.0**	**1.0**	**0.0**	**2.0**	**2.0**	**428.3**	**66.1**	**136.2**	**363.9**	**12.0**	**1.0**	**1.0**	**1666.7**
KI9401 Station total	**3.0**	**106.4**	**1.0**	**1.0**	**13.0**	**1.0**	**1.8**	**60.6**	**4.0**	**30.1**	**1.0**	**61.0**	**8.6**	**2.0**	**388.6**	**2.0**	**2.0**	**1.0**	**6.0**	**1.0**	**0.0**	**2.0**	**2.0**	**426.3**	**66.1**	**136.2**	**363.8**	**12.0**	**1.0**	**1.0**	**1666.7**

Table 16a. Ten minute CPUE of age-0 flatfishes captured during June 1994 within Chiniak Bay (KI9401), indexed by bay, station (CS#) and tow (- #). Station total is the cumulative CPUE per station.

CS# - Tow#	Station code	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-0
KI9401 - Womens Bay															
12 - 1		10.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
KI9401 - Middle Bay															
8 - 1	MB00	10.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
9 - 1	MB10	10.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
10 - 1		10.0	0.0	0.0	0.0	3.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	3.0
11 - 1		10.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
KI9401 - Kalsin Bay															
1 - 1	KB05	10.0	0.0	0.0	0.0	3.0	0.0	0.0	3.0	5.0	0.0	0.0	0.0	0.0	8.0
2 - 1	KB00	10.0	0.0	0.0	0.0	10.0	0.0	0.0	2.0	26.0	0.0	0.0	0.0	0.0	36.0
3 - 1	KB10	10.0	0.0	0.0	1.0	19.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	20.0
4 - 1		5.5	0.0	0.0	0.0	9.1	0.0	0.0	30.9	9.1	0.0	0.0	0.0	0.0	18.2
5 - 1	KB22	10.0	1.0	0.0	0.0	2.0	0.0	0.0	8.0	16.0	0.0	0.0	0.0	0.0	19.0
6 - 1	KB30	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0
7 - 1	KB70	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KI9401 Tow total age-0			**1.0**	**0.0**	**1.0**	**54.1**	**0.0**	**0.0**	**59.9**	**57.1**	**0.0**	**0.0**	**0.0**	**0.0**	**113.2**
KI9401 Station total age-0			**1.0**	**0.0**	**1.0**	**54.1**	**0.0**	**0.0**	**59.9**	**57.1**	**0.0**	**0.0**	**0.0**	**0.0**	**113.2**

Table 16b. Ten minute CPUE of age-1 (* designates age-≥1) flatfishes captured during June 1994 within Chiniak Bay (KI9401), indexed by bay, station (CS#) and tow (- #). Station total is the cumulative CPUE per station.

CS# - Tow#	Station code	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-1
KI9401 - Womens Bay															
12 - 1		10.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	4.0
KI9401 - Middle Bay															
8 - 1	MB00	10.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
9 - 1	MB10	10.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
10 - 1		10.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	36.0	0.0	0.0	0.0	0.0	45.0
11 - 1		10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	41.0	1.0	0.0	0.0	0.0	42.0
KI9401 - Kalsin Bay															
1 - 1	KB05	10.0	0.0	0.0	1.0	0.0	0.0	0.0	5.0	11.0	0.0	0.0	0.0	0.0	15.0
2 - 1	KB00	10.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	10.0	0.0	0.0	0.0	0.0	12.0
3 - 1	KB10	10.0	0.0	0.0	14.0	0.0	0.0	0.0	3.0	22.0	0.0	0.0	0.0	0.0	44.0
4 - 1		5.5	0.0	0.0	7.3	0.0	0.0	0.0	7.3	18.2	0.0	0.0	0.0	0.0	56.4
5 - 1	KB22	10.0	0.0	0.0	55.0	0.0	0.0	0.0	40.0	31.0	0.0	0.0	0.0	0.0	94.0
6 - 1	KB30	10.0	0.0	0.0	72.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	72.0
7 - 1	KB70	10.0	0.0	2.0	114.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	116.0
KI9401 Tow total age-1			**0.0**	**2.0**	**265.3**	**0.0**	**0.0**	**0.0**	**75.3**	**172.2**	**1.0**	**0.0**	**0.0**	**0.0**	**500.4**
KI9401 Station total age-1			**0.0**	**2.0**	**265.3**	**0.0**	**0.0**	**0.0**	**75.3**	**172.2**	**1.0**	**0.0**	**0.0**	**0.0**	**500.4**

Table 16c. Ten minute CPUE of age-≥2 flatfishes captured during June 1994 within Chiniak Bay (KI9401), indexed by bay, station (CS#) and tow (- #). Station total is the cumulative CPUE per station.

CS#	-	Tow#	Station code	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-≥2
KI9401 - Womens Bay																	
12	-	1		10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KI9401 - Middle Bay																	
8	-	1	MB00	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	0.0	0.0	0.0	0.0	18.0
9	-	1	MB10	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	0.0	0.0	0.0	0.0	18.0
10	-	1		10.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	44.0	0.0	1.0	0.0	1.0	56.0
11	-	1		10.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	10.0
KI9401 - Kalsin Bay																	
1	-	1	KB05	10.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	18.0	3.0	0.0	0.0	0.0	33.0
2	-	1	KB00	10.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	12.0	1.0	0.0	0.0	0.0	17.0
3	-	1	KB10	10.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	3.0	7.0	0.0	0.0	0.0	23.0
4	-	1		5.5	0.0	0.0	20.0	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	0.0	30.9
5	-	1	KB22	10.0	0.0	0.0	32.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	73.0
6	-	1	KB30	10.0	0.0	0.0	59.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	65.0
7	-	1	KB70	10.0	0.0	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.0
KI9401 Tow total age-≥2					**1.0**	**0.0**	**160.0**	**1.0**	**0.0**	**0.0**	**0.0**	**124.6**	**11.0**	**1.0**	**0.0**	**1.0**	**374.9**
KI9401 Station total age-≥2					**1.0**	**0.0**	**160.0**	**1.0**	**0.0**	**0.0**	**0.0**	**124.6**	**11.0**	**1.0**	**0.0**	**1.0**	**374.9**

Chiniak Bay/August 1994 (KI9403)

Physical data within Chiniak Buy/August 1994 (KI9403)

Temperature within Chiniak Buy/August 1994 (KI9403)

Bottom temperatures in Middle Bay ranged from 7.6 to 135°C (Table 6), the wide range of bottom temperatures indicative of a relatively shallow bay. Bottom temperatures decreased with increasing depth (Figures 244-245). Surface water temperatures in Middle Bay ranged from approximately 10.5 to 15°C, also decreasing with increasing depth.

In Kalsin Bay, bottom temperatures ranged from 7.6 to 9.2°C. The fairly uniform distribution of bottom temperatures in Kalsin Bay is indicative of a relatively deep bay. Kalsin Bay surface temperatures ranged from approximately 8.5 to 14°C. Unlike surface temperatures in Middle Bay, surface temperatures in Kalsm Bay did not decrease with increasing water depth. The coldest temperatures were found at the head of the bay, indicative of cold freshwater input. Temperatures in both Middle and Kalsm Bays were likely influenced not only by depth and location, but by tidal cycle and solar heating.

Salinity within Chiniak Buy/August 1994 (KI9403)

Middle Bay bottom salinities ranged from 29.8 to 32.1 PSU (Table 6, Figure 246-247) and surface salinities ranged from approximately 25 to 32 PSU. Both bottom and surface salinities in Middle Bay increased from the head to the mouth of the bay, corresponding with increasing depth. The wide range of surface salinities, in particular, display the effects of fresh water input at the head of the bay.

Kalsm Bay bottom salinities ranged from 3 1.7 to 3 1.9 PSU and surface salinities ranged from approximately 30.5 to 3 1.7 PSU. The range of both bottom and surface salinities in Kalsin Bay were small and the distribution was fairly uniform. Like temperature, salinities in both Middle and Kalsin Bays were likely influenced not only by depth and location, but by tidal cycle and solar heating.

Substrate within Chiniak Bay/August 1994 (KI9403)

Combiions of sand muddy sand and sandy mud were found throughout Middle Bay (Table 17, Figures 248-254). Substrate at the head of Kalsin Bay was pure sand, shifting to muddy sand and then sandy mud with increasing depth down the central region of the bay toward the mouth. Outside the mouths of Kalsm and Middle Bays, sand, muddy sand, sandy gravel and pure gravel were found. Areas with gravel in sediment were examined only at and outside the mouths of the bays.

Fish data within Chiniak Buy/August 1994 (KI9403)

A total of 10,659 fishes was captured during sampling in Chiniak Bay, August 1994 (Table 18). A subsample of 94% (10,034) of these fishes was measured. The cumulative CPUE of 12 flatfish species at 27 quantitative stations examined during August 1994 sampling in Chiniak Bay (KI9403) *was 4,486,* for an average CPUE of 166±182 flatfishes/station. This was the highest average CPUE of flatfishes/station for all 1993 and 1994 cruises, In addition, 208 flatfishes which were captured during non-quantitative tows were included in the database for use in length analyses only.

Twelve species of flatfish were collected in KI9403. The species composition, listed in decreasing order of CPUE abundance over all stations was rock sole (2,461) flathead sole (901),

arrowtooth flounder (678), Pacific halibut (284), yellowfin sole (76), butter sole (36), English sole (29), starry flounder (7), sand sole (5), Alaska plaice (4), rex sole (3), and Dover sole (2).

During KI9403, age-0 was the numerically dominant age class collected of arrowtooth flounder, rex sole, Pacific halibut, rock sole, and English sole (Table 19). Age- 1 fishes were caught most often of flathead sole and yellowtin sole. Age-O and age-l were equally dominant age classes for starry flounder. Older specimens (age-≥2) dominated the catch of Dover sole, butter sole and sand sole. Equal numbers of age-l and age-22 Alaska plaice were captured.

Habitats of juvenile (age-0 and age- 1) flatfishes were analyzed to characterize nursery grounds for flaffish of each species as described in the sections below.

Distribution of flatfishes by age within Chiniak Bay/August 1994 (KI9403)

Arrowtooth flounder (Figures 254-266)

Age-O arrow-tooth flounder (N=663) were caught at 55.6% of stations during KI9403. The mean number of age0 fish/tow was 12.3±32.4, and the largest catch was 157 fish/tow. Age-0 arrowtooth flounder were found in water from 20 to 100 m deep, at 7.6 - 9.7°C and 3 1.7 - 32.1 PSU. They were on all substrates sampled (sand, muddy sand, sandy mud, sandy gravel and gravel) and in all regions (-2.5 to 6.5 km from the mouth of the bay) except the shallow heads of bays. Seventy-five percent of age-0 arrowtooth were in Middle Bay and 25% were in Kalsin Bay. Age-0 arrowtooth slightly decreased in abundance relative to minutes after sunrise.

Age-l arrowtooth flounder (N=3) were caught at 11 .1% of stations during KI9403. The mean number of age-l fish/tow was 0.1±0.3, and the largest catch was two fish/tow. While age-l arrowtooth flounder were not nearly as abundant as age-0, their nursery characteristics were similar to that of age-0 arrowtooth: 50 - 80 m, 7.6 - 8.4°C, 3 I .9 - 32.0 PSU, on sand or muddy sand substrate. Unlike age-0 arrowtooth, age-l fish were found only outside the mouth of the bay (-1.8 to -2.4 from the bay mouth). Age-1 arrowtooth were found only within the range of 160 - 280 minutes after sunrise and, like age-O, over 75% were found in Middle Bay and less than 25% in Kalsin Bay.

Age-22 arrowtooth flounder were captured during KI9403 (N= 12).

Rex sole (Figures 254, 267-278)

Two age-0 rex sole were caught during a single tow at KI9403 CS#1 1 Tow#1 (corresponding to 3.7% of stations). The mean number of age-0 fish/tow was 0.0i0.3. Age-O rex sole were found 6.1 km within Kalsin Bay, between 30 and 40 m depth, at 8.3°C, 3 1.8 PSU, on muddy sand substrate.

A single age-1 rex sole was caught at KI9403 CS#20 (corresponding to 3.7% of stations). The mean number of age-l fish/tow was O.oM.l. The age-l rex sole was found -1.8 km from the mouth of Middle Bay, between 60 and 70 m, at 7.6°C, 32.0 PSU, on muddy sand substrate.

Age-22 rex sole were not caught during KI9403.

Flathead sole (Figures 254, 279-290)

Age-O flathead sole (N=358) were caught at 44.4% of stations during KI9403. The mean number of age-0 fish/tow was 10.6±41.1, and the largest catch was 271 fish/tow. Age-O flathead sole were found in waters 10 - 90 m, in increasing abundance to 55 m depth and in decreasing abundance with further increasing depth. Age-O fish were found at 7 6 - 9.7°C and 31.8 - 32.1 PSU and from -2.4 to 6.5 km from the bay mouth. Age-O flathead sole were not found at the head of either Kalsin or Middle Bay. Eighty-four percent of age-0 flathead sole were caught in Kalsii Bay. They were associated only with mixed substrates, and were primarily over muddy sand and sandy mud substrates. Fish abundances increased with increasing percent mud and decreasing percent sand, except for five fish which were caught at a sandy gravel station in Middle Bay. Age-O flathead were found in decreasing abundance with increasing time after sunrise. Although fewer samples were collected after high tide than before, it appears that age-0 flathead were found in sharply increasing numbers up to 212 minutes before high tide and in decreasing numbers through slack high tide and after.

Age-l flathead sole (N=385) were caught at 44.4% of stations during KI9403. The mean number of age-l fish/tow was 9.W24.5, and the largest catch was 135 fish/tow. Age-l flathead sole were found in greater abundance than age-0 flathead. The distribution parameters of ages-0 and -1 fish were nearly identical. Similar to age-0 fish, age-l flathead were distributed throughout bays (-2.4 to 7.7 km from the mouth of the bay) and were primarily (>80%) captured in Kalsii Bay. Age-l flathead sole were found in 10 - 90 m water (highest abundance between 20 and 60 m), 7.6 - 9.7°C, 3 1.8 - 32.1 PSU. Abundances of age-1 flathead sole paralleled the patterns discussed for age-0 flathead sole in substrate usage and catch relative to sunrise and tidal stage.

Age-22 flathead sole were captured during KI9403 (N=158).

Pacific halibut (Figures 254, 291-302)

Age-O Pacific halibut (N=282) were caught at 51.9% of stations during KI9403. The mean number of age-0 fish/tow was 20.3±18.2, and the largest catch was 68 fish/tow. Age-O Pacific halibut were found within Middle and Kalsin Bays and outside the mouth of Kalsin Bay. Age-O halibut were only in depths under 50 m and were primarily <30 m. While age-0 Pacific halibut were found throughout and outside the bay (-1.6 to 8.2 km from the bay mouth), most were at the heads of Kalsin and Middle Bays. Age-0 halibut were at 8.2 - 13.5°C, 29.8 - 32.0 PSU, and were captured over sand, muddy sand and sandy mud substrates. Age-O halibut abundance increased with increasing percent sand and decreasing percent mud. Age-O halibut were caught 261 minutes after sunrise and later.

The cumulative CPUE of age-l Pacific halibut caught during KI9403 was one fish, corresponding to 3.7% of stations and 0.1M.4 fish/tow. Fish were captured at two stations, and the largest catch was actually three fish/tow at CS#12, but due to the high number of replicates at this station and an absence of age-1 halibut during other tows at CS#12, the averaged abundance for the station was negligible (N=0. 18 fish). The presence of age- 1 Pacific halibut at CS#12 is noted at the head of Kalsii Bay (Figure 291b). The other age-l halibut was found at CS#5 in Middle Bay, 2.4 to 7.7 km from the bay mouth, in 20 - 30 m, 8.2°C, 32.0 PSU, and on sand substrate.

One age-32 Pacific halibut was captured during KI9403.

Dover sole (Figure3 254, 303-314)

No age-0 or age-l Dover sole were caught during KI9403.

Age-22 Dover sole were captured during KI9403 (N=2).

Starry flounder (Figures 254,315326)

During KI9403 we captured three age-0 and three age-l starry flounder, all in a siigle tow (CS#3 Tow#1) at the head of Middle Bay (corresponding to 3.7% of stations). The mean number caught of each age was 0.1±0.4 fish/tow. Starry flounder were captured in shallow (0 - 5 m), nearshore waters, 7.5 km from the bay mouth, at 13.5°C, 29.8 PSU, and on muddy sand sediient.

A siigle age-22 starry flounder was captured during KI9403.

Yellowfin sole (Figures 254, 327-338)

Age-O (N=3) was the least abundant group of yellowfin sole captured during KI9403. Age-O yellowfin sole were caught at 7.4% of stations. The mean number of age-0 fish/tow was 0.11to.3, and the largest catch was two fish/tow. AU age-0 yellow-fin were captured outside the mouth of Kalsin Bay (-0.7 to -1.6 km). The small number and size of age-0 yellowfin sole taken indicated that recruitment was just starting. Age-O yellowfin sole were found in 20 - 50 m, 8.4 - 8.9°C, and 31.8 PSU. Age-O yellowfin sole were captured on sand and gravel substrates.

Age-l yellowfin sole (N=25) were caught at 22.2% of stations during KI9403. The mean number of age-l fish/tow was 5.0±9.9 and the largest catch was 43 fish/tow. Due to the large number of replicate tows at the station where this large catch was collected, the calculated CPUE of the fish for the station was only 16. Age-l yellowfin sole were found throughout and outside the bay (-0.7 to 8.2 km from the bay mouth), most were found closer to the head of the bay than age-0 yellowfin sole. AU age-l yellowfin sole were collected at depths less than 40 m and in waters 8.2 - 8.9°C and 3 1.7 - 32.0 PSU. Age-l fish were found only on sand and muddy sand substrate and were only caught 330 minutes after sunrise and later. Of the 25 age-l yellow-fin sole caught, 87% were from Kalsin Bay.

Age-≥2 yellowfin sole were caught during KI9403 (N=48).

Rock sole (Figures 254, 339-350)

Rock sole was the most abundant species of flatfish captured during KI9403 (N of all ages=2,461) and was also the most abundant age-0 fish caught (N=2,219). Age-O rock sole were caught at 66.7% of stations. The mean number of age-0 fish/tow was 168.0±194.5, and the largest catch was 680 fish/tow. Eighty-one percent of age-0 rock sole were in Kalsin Bay and 21% were caught in Middle Bay. Age-O rock sole were found throughout and outside the bay (-2.4 to 8.2 km from the bay mouth) in depths up to 80 m, but were primarily wncentrated in water <50 m. Age-0 rock sole were wllected in 7.6 - 9.9°C, 3 1.6 - 32. 1 PSU, and on all substrates sampled (sand, muddy sand, sandy mud, sandy gravel, and gravel). Age-O rock sole abundances increased with increasing percent of sand and decreasing percent of mud.

Age l rock sole (N=183) were caught at 5 1.9% of stations during KI9403. The mean number of age-l fish/tow was 8.7±9.8, and the largest catch was 36 fish/tow. The abundance of age-l rock sole was spread fairly evenly throughout and outside Middle and Kalsin Bays (-1.8 to 8.1 km from the bay mouth). The abundance of age-l rock sole was split fairly evenly between the two bays, 41% in Middle Bay and 59% in Kalsii Bay. Age-l rock sole were found only in depths < 60 m, with highest abundances between 20 and 50 m and decreasing abundance at shallower and greater depths. Age-l rock sole were collected in 8.2 - 13.5°C waters and across the full range of sampled salinities (29.8 - 32.1 PSU). Like age-0 fish, age-1 rock sole were on all substrates sampled (sand, muddy sand, sandy mud, sandy gravel and gravel).

Age-22 rock sole were caught during KI9403 (N=59).

Butter sole (Figures 254, 351-362)

Age-O butter sole (N=3) were caught at 14.8% of stations during KI9403. The mean number of age-0 fish/tow was 0.2±0.7, and the largest catch was four fish/tow. The age-0 butter sole were caught outside the mouth of Middle Bay (-0.8 to -2.4 km from the bay mouth). The presence of age-0 butter sole at two stations at the head of Kalsin Bay are noted (Figure 351a), but due to the high number of replicate tows at these stations, the calculated CPUE of fish was negligible (hW.32 and N=0.14 fish at CS#6 and 12, respectively). Age-O butter sole were found in 5 - 80 m water depth, 7.6 - 9.1°C, and 3 1.7 - 32.1 PSU. They were found on sand, muddy sand. and sandy gravel substrate.

No age-l butter sole were caught during KI9403.

Age-22 butter sole were captured during KI9403 (N=33).

Alaska plaice (Figures 254, 363-374)

No age-0 Alaska plaice were caught during KI9403.

Two age-l plaice were captured at a single station during KI9403 (CS#3), corresponding to 3.7% of stations and an average of 0.0±0.3 fish/tow. The plaice were at the head of Middle Bay, 7.5 km from the bay mouth. The fish were captured in 0 - 5 m water, at 13.5°C, 29.8 PSU, and on muddy sand sediment. This station had the lowest salinity and highest temperature of all the sites sampled during KI9403

Two age-22 Alaska plaice were caught during KI9403.

English sole (Figures 254,375386)

Age-O English sole (N=29) were caught at 22.2% of stations during KI9403. The mean number of age-0 fish/tow was 1.3rt3.2, and the largest catch was 2 1 fish/tow. English sole were found only near the heads of Middle and Kalsin Bays (7.5 - 8.2 km from the bay mouth). Eighty-one percent of these fish were caught in a single station (CS#3) in Middle Bay, the station with the lowest salinity and highest temperature of all the sites examined during KI9403. Age-O English sole were found in <30 m water depth (primarily in 0 - 5 m), 8.2 - 13.5°C (primarily 13.5°C) and 29.8 - 31.9 PSU (primarily 29.8 PSU). English sole were captured over sand and muddy sand substrates.

Age- 1 and age-22 English sole were not captured during KI9403.

Sand sole (Figures 254, 387-398)

No age-0 sand sole were caught during KI9403.

A single age-l sand sole was found at the head of Kalsin Bay (CS#8), 8.2 km from the bay mouth, corresponding to 3.7% of the stations sampled during KI9403. The mean number of age-1 fish/tow was 0.0±0. 1. The sand sole was caught in 0 - 5 m water, at 8.2°C, 31.9 PSU, and on sand substrate.

Age-22 sand sole were captured during KI9403 (N=4).

Table 17. Substrate collected during August 1994 within Chiniak Bay (KI9403), indexed by consecutive station number (CS#). Sediment codes: G = gravel, S = sand, M = mud, s = sandy, m = muddy. The capital letter represents the dominant sediment type and lower case letters are lesser sediment types.

CS#	Station code	Bay	Distance inbay (km)	Substrate type	Predominant depth (m)	% Gravel	% Sand	% Mud	% Organic material	% Carbonate
1	MI35	Middle	6.2	sM	5	0.0	43.6	56.4	2.9	0.6
2	MB5	Middle	5.8	mS	8	0.0	50.2	49.8	3.9	6.3
3	MB2	Middle	7.5	mS	2	0.0	89.8	10.2	2.5	2.4
4	MB10	Middle	4.0	mS	14	0.0	63.9	36.1	3.1	1.1
5	MB20	Middle	2.4	S	25	0.0	97.1	2.9	1.9	0.9
6	KB5	Kalsin	8.0	S	7.9	0.0	97.1	3.0	2.5	0.6
7	KB2	Kalsin	8.1	S	2	0.0	98.1	1.9	2.4	0.9
6	KB2	Kalsin	8.2	S	2	0.0	98.1	1.9	12.6	5.5
9	KB2	Kalsin	7.6	S	4	0.0	99.2	0.8	0.4	1.3
IO	KB22	Kalsin	6.5	mS	25	0.0	59.0	41.0	3.8	0.6
11	KB30	Kalsin	6.1	mS	34	0.0	50.5	49.5	4.4	5.1
12	KB10	Kalsin	7.7	mS	13.6	0.0	69.6	30.4	3.9	0.9
13		Kalsin	-1.8	S	53	0.0	95.1	4.9	3.1	4.6
14		Kalsin	-1.4	mS	III	0.0	50.8	49.2	6.1	1.4
15		Kalsin	0.2	sM	95	0.0	36.6	61.4	6.7	1.1
16	KB90	Kalsin	1.9	mS	87	0.0	60.0	40.0	6.5	0.9
17		Kalsin	-1.6	G	44	88.6	10.8	0.6	2.2	7.4
18		Kalsin	-0.7	S	22	0.0	97.8	2.4	1.8	1.0
19		Middle	-2.4	mS	73	0.0	75.9	24.1	4.6	0.9
20		Middle	-1.8	mS	68	0.0	85.8	14.2	3.5	0.7
21	MB50	Middle	-1.3	mS	55	0.0	71.0	29.0	4.9	1.3
24		Kalsin	3.2	sM	74	0.0	36.0	64.0	5.5	1.5
25	KB70	Kalsin	3.9	sM	66.8	0.0	41.5	58.5	6.2	0.5
26	KB50	Kalsin	4.7	sM	55	0.0	24.6	75.4	5.7	0.7
27	KB20	Kalsin	3.3	mS	23.5	0.0	76.6	23.4	3.3	1.4
28		Kalsin	3.2	mS	36	0.0	74.9	25.1	40.4	0.9
29	MB10	Middle	4.9	mS	10.5	0.0	63.3	36.7	3.7	0.4
30		Middle	0.8	sG		51.0	47.2	1.8		

Table 18. Ten **minute CPUE** of all **fishes** captured during August 1994 within Chiniak Bay **(KI9403), indexed** by **station** and tow (-a). Station total is the **cumulative mean** CPUE per **station.**

CS#	- Tow#	Cods	Pacific cod	Walleye pollock	Shortfin eelpout	Greenlings	Rock OR kelp greenling	Kelp greenling	Masked greenling	White-spotted greenling	Lingcod	Spiny cheeked star snout	Silverspotted sculpin	Spinyhead sculpin	Sculpin species	Buffalo sculpin	Sculpin species
I-	1	a.0	168.0	0.0	0.0	0.0	4.0	0.0	2.0	3.0	0.0	0.0	2.0	0.0	1.0	0.0	0.0
2 -	1	0.0	57.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3 -	1	0.0	47.0	0.0	0.0	0.0	0.0	0.0	2.0	5.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
4 -	1	0.0	22.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	2 0
5 -	1	0.0	35.0	23.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2 0
6 -	1	0.0	71.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	2	0.0	14.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	3	0.0	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	2.2
6 -	4	0.0	16.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6
6 -	5	0.0	12.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	6	0.0	48.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	7	0.0	147.4	2.1	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	4.2
6 -	8	0.0	60.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	9	0.0	109.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	IO	0.0	185.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	11	0.0	441.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	16.3
6 -	12	4.2	138.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	13	2.0	182.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	14	0.0	80.8	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7 -	1	0.0	48.0	0.0	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	1.0
8 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
9 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
IO-	4	0.0	33.1	330.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11 -	1	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0
12 -	2	0.0	24.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	3	0.0	a.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	4	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	5	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	a.0
12 -	6	0.0	13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	7	0.0	35.4	10.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.5
12 -	8	0.0	23.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2 6
12 -	9	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	2 8
12 -	10	0.0	13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	18.3
12 -	11	0.0	34.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9
12 -	12	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3
12 -	13	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0
12 -	14	0.0	12.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4
12 -	15	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	0.0
13 -	1	0.0	3.0	22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0
13 -	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	0.0	0.0	0.0	0.0	1.1
14 -	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15 -	1	0.0	0.0	2 0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16 -	1	0.0	0.0	2 0	37.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	0.0	11.0	0.0	0.0	0.0
17 -	1	0.0	18.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	2 0
18 -	1	0.0	17.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	95.0
19 -	1	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.0	0.0	0.0	0.0	0.0	0.0
20 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0

Table 18. Ten minute CWE of all fishes (KI9403 continued).

CS#	- Tow#	Cods	Pacific cod	Walleye pollock	Shortfin eelpout	Greenlings	Rock OR kelp greenling	Kelp greenling	Masked greenling	White-spotted greenling	Lingcod	Spiny cheeked star snout	Silverspotted sculpin	Spinyhead sculpin	Sculpin species	Buffalo sculpin	Sculpin species
21 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0
24 -	1	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25 -	1	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0
25 -	2	0.0	0.0	0.0	22.6	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0
26 -	1	0.0	0.0	46.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0
26 -	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.6	0.0	0.0	0.0	0.0	0.0
27 -	1	0.0	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29 -	1	0.0	70.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0
30 -	1	0.0	16.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0
KI9403 Tow total		**8.2**	**2361.6**	**474.7**	**81.6**	**2.0**	**6.0**	**9.0**	**4.0**	**10.1**	**2.5**	**170.7**	**6.6**	**11.0**	**19.6**	**4.0**	**197.1**
KI9403 Station total		**0.4**	**746.8**	**426.2**	**62.3**	**2.0**	**5.0**	**9.0**	**4.0**	**8.2**	**0.2**	**136.8**	**4.2**	**11.0**	**12.5**	**4.0**	**110.2**

Table 18. Ten minute CPUE of all fishes (KI9403 continued).

CS#	- Tow#	Armorhead sculpin	Red Irish lord	Yellow irish lord	Northern sculpin	Pacific staghorn sculpin	Sculpin species	Sailfin sculpin	Eyeshade sculpin	Silm sculpin	Sculpin species	Ribbed sculpin	Tadpole sculpin	Soft sculpin	Smooth alligatorfish	Aleutian alligatorfish	Fourhorn poacher	Sturgeon poacher
I-	1	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 -	1	0.0	4.0	0.0	0.0	0.0	131.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3 -	1	0.0	0.0	0.0	0.0	0.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
4 -	1	0.0	0.0	0.0	1.0	0.0	63.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	8.0
5 -	1	0.0	0.0	0.0	1.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
6 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.4
6 -	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5
6 -	3	0.0	00	0.0	2.2	0.0	4.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	2.2
6 -	4	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4
6 -	5	0.0	00	0.0	0.0	0.0	6.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
6 -	6	0.0	00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1
6 -	7	0.0	0.0	0.0	0.0	0.0	4.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2
6 -	8	0.0	00	0.0	0.0	2.6	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7
6 -	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	11	0.0	0.0	0.0	0.0	0.0	13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6
6 -	12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4
6 -	13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2
6 -	14	16.2	0 0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5
7 -	1	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
8 -	1	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
9 -	1	0.0	00	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
10 -	4	7.5	0.0	0.0	112.8	0.0	30.1	0.0	0.0	0.0	0.0	0.0	7.5	0.0	0.0	0.0	0.0	0.0
11 -	1	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	2 0
12 -	2	0.0	0.0	0.0	0.0	0.0	61.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	58.7
12 -	3	0.0	2.7	0.0	0.0	0.0	56.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
12 -	4	0.0	0.0	0.0	5.3	0.0	29.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.3
12 -	5	9.0	0.0	0.0	3.0	0.0	36.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
12 -	6	0.0	2.6	0.0	70	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.9
12 -	7	2.7	5.5	0.0	16.4	0.0	220.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.9
12 -	8	2.6	0.0	0.0	5.1	0.0	38.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1
12 -	9	2.0	5.6	0.0	0.0	2.6	36.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.3
12 -	10	7.6	2.6	0.0	0.0	0.0	73.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.6
12 -	11	0.0	0.0	0.0	5.7	0.0	54.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	143
12 -	12	0.0	0.0	0.0	2.7	0.0	40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
12 -	13	0.0	0.0	0.0	6.0	0.0	88.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	40.0
12 -	14	0.0	0.0	0.0	4.9	0.0	34.3	0.0	2.5	0.0	0.0	0.0	0.0	2.5	0.0	0.0	0.0	51.5
12 - 1	5	2.5	0.0	0.0	0.0	0.0	32.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0
13 -	1	0.0	0.0	1.5	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13 -	3	0.0	0.0	0.0	14.9	0.0	0.0	0.0	0.0	4.6	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
14 -	3	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16 -	1	0.0	1.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17 -	1	0.0	0.0	0.0	160.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	2.0	0.0	2.0	0.0	10.0	0.0
18 -	1	0.0	0.0	0.0	10.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	11.0
19 -	1	0.0	0.0	1.0	42.0	0.0	0.0	0.0	0.0	36.0	0.0	0.0	62.0	0.0	0.0	0.0	0.0	12.0
20 -	1	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	4.0

CS#	Tow#	Armorhead sculpin	Red Irish lord	Yellow irish lord	Northern sculpin	Pacific staghorn sculpin	Sculpin species	Sailfin sculpin	Eyeshade sculpin	Slim sculpin	Sculpin species	Ribbed sculpin	Tadpole sculpin	Soft sculpin	Smooth alligatorfish	Aleutian alligatorfish	Fourhorn poacher	Sturgeon poacher
21 -	1	0.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	3.0
24 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
25 -	1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25 -	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26 -	1	0.0	0.0	0.0	9.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0
26 -	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5	0.0	0.0	7.5	0.0	0.0	0.0	0.0	0.0
27 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0
29 -	1	0.0	0.0	0.0	0.0	0.0	220.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
30 -	1	0.0	0.0	0.0	418.0	0.0	1.0	0.0	0.0	13.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	4.0
KI9403 Tow total		**51.1**	**23.9**	**2.5**	**876.8**	**5.4**	**1342.1**	**1.0**	**2.5**	**73.1**	**8.0**	**2.0**	**117.2**	**3.5**	**2.0**	**2.2**	**10.0**	**471.9**
KI9403 ! Station tot		**10.6**	**6.4**	**1.8**	**807.9**	**0.4**	**564.3**	**1.0**	**0.2**	**67.0**	**8.0**	**2.0**	**106.9**	**1.2**	**2.0**	**0.2**	**10.0**	**104.3**

Table 18. Ten minute CPUE of all fishes (KI9403 continued).

CS#	Tow#	Tubenose poacher	Snailfish species	Searcher	Northern ronquil	Prickleback species	Prickleback species	Slender eelblenny	Snake prickleback	Daubed shanny	Stout eelblenny	Arctic shanny	Crescent gunnel	Prowfish	Pacific sand lance
1 -	1	1.0	0.0	0.0	0.0	0.0	0.0	10.0	10.0	0.0	0.0	0.0	1.0	0.0	18.0
2 -	1	0.0	12.0	1.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	1.0	0.0	0.0	1.0
3 -	1	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	17.0
4 -	1	0.0	120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0	1.0	0.0	0.0
5 -	1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	1	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	5	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	0.0	0.0	0.0	0.0	0.0	0.0
6 -	7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	8	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	9	27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0
6 -	11	0.0	2.6	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	12	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	14	0.0	0.0	0.0	0.0	0.0	0.0	13.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	2.0
10 -	4	0.0	0.0	0.0	0.0	0.0	0.0	37.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11-	1	0.0	12.0	0.0	2.0	0.0	0.0	0.0	0.0	2.0	6.0	0.0	0.0	0.0	0.0
12 -	2	0.0	0.0	0.0	0.0	0.0	0.0	2.7	2.7	0.0	0.0	0.0	0.0	0.0	0.0
12 -	3	0.0	27	0.0	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	7	27	27	0.0	0.0	0.0	0.0	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0
12 -	6	0.0	5.1	26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	9	0.0	26	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	10	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0
12 -	12	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	13	0.0	6.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	14	0.0	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	15	0.0	25	0.0	0.0	0.0	0.0	25	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13 -	1	0.0	0.0	4.5	10.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13 -	3	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
14 -	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16 -	1	0.0	20	0.0	0.0	0.0	11.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0
17 -	1	20	4.0	10.0	20	0.0	0.0	0.0	2.0	10.0	0.0	0.0	0.0	0.0	0.0
18 -	1	1.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0
20 -	1	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	1.0	0.0

CS#	- Tow#	Tubenose poacher	Snailfish species	Searcher	Northern ronquil	Prickleback species	Prickleback species	Slender eelblenny	Snake prickleback	Daubed shanny	Stout eelblenny	Arctic shanny	Crescent gunnel	Prowfish	Pacific sand lance
21 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	2.0	0.0	0.0	0.0	0.0	0.6
24 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	1.0	0.0	0.0	0.0	0.0	0.6
25 -	1	0.0	0.0	0.0	0.0	0.0	18.0	0.6	0.0	2.0	0.0	0.0	0.0	0.0	0.6
25 -	2	0.0	0.0	0.0	0.0	0.0	52.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26 -	1	0.0	0.0	0.0	0.0	0.0	81.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26 -	2	0.0	0.0	0.0	0.0	0.0	82.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0
29 -	1	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30 -	1	1.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	6.0	10.0	10.0	1.0	38.0
KI9403 Tow total		36.0	102.3	19.2	22.5	2.0	245.4	84.9	32.1	32.1	6.0	10.0	10.0	1.0	38.0
KI9403 Station tot:		22.1	76.4	14.0	17.3	0.1	128.2	53.0	15.3	30.6	6.0	10.0	10.0	1.0	38.0

Table 18. Ten minute CPUE of all fisher (KI9403 continued).

CS#	- Tow#	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	Unidentified roundfish	Tow total
I-	1	0.0	0.0	0.0	15.0	0.0	0.0	0.0	1.0	0.0	1.0	0.0	0.0	0.0	342.0
2 -	1	0.0	0.0	0.0	10.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0	228.0
3 -	1	0.0	0.0	0.0	26.0	0.0	6.0	0.0	8.0	0.0	3.0	21.0	0.0	0.0	176.0
4 -	1	0.0	0.0	1.0	12.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	0.0	0.0	182.0
5 -	1	24.0	0.0	0.0	70.0	0.0	0.0	2.0	261 .0	120	0.0	0.0	0.0	0.0	438.0
6 -	1	0.0	0.0	0.0	11.4	0.0	0.0	0.0	i7.2	0.0	0.0	2.9	0.0	0.0	177.2
6 -	2	0.0	0.0	0.0	22.9	0.0	0.0	0.0	62.7	3.5	0.0	3.5	0.0	0.0	130.3
6 -	3	0.0	0.0	0.0	42.2	0.0	0.0	4.4	210.9	11.1	0.0	2.2	0.0	0.0	299.7
6 -	4	0.0	0.0	0.0	33.5	0.0	0.0	5.6	128.3	2.8	0.0	2.8	0.0	0.0	203.7
6 -	5	0.0	0.0	0.0	20.3	0.0	0.0	2.0	143.1	4.1	0.0	4.1	2.0	0.0	188.8
6 -	6	0.0	0.0	0.0	35.7	0.0	0.0	5.1	158.1	7.7	0.0	7.7	0.0	0.0	272.9
6 -	7	0.0	0.0	0.0	35.7	0.0	0.0	4.2	157.5	6.3	0.0	2.1	2.1	0.0	372.1
6 -	8	0.0	0.0	0.0	28.7	0.0	0.0	5.2	143.6	5.2	0.0	2.6	0.0	0.0	253.2
6 -	9	0.0	0.0	0.0	21.8	0.0	0.0	2.7	108.8	5.4	0.0	6.2	2.7	0.0	284.0
6 -	10	0.0	0.0	0.0	12.3	0.0	0.0	2.5	51.5	4.9	0.0	2.5	2.5	0.0	263.8
6 -	11	0.0	0.0	0.0	23.5	0.0	0.0	2.6	143.6	0.0	0.0	2.6	2.6	2.6	880.6
6 -	12	0.0	0.0	0.0	25.2	0.0	0.0	6.4	176.4	4.2	0.0	2.1	0.0	0.0	370.0
6 -	13	0.0	0.0	0.0	22.3	0.0	0.0	4.1	156.3	0.0	0.0	2.0	0.0	0.0	378s
6 -	14	0.0	0.0	0.0	18.5	0.0	0.0	4.6	175.6	0.0	0.0	0.0	3.0	0.0	323.4
7 -	1	0.0	0.0	0.0	16.0	0.0	0.0	0.0	69.0	0.0	0.0	1.0	0.0	1.0	152.0
a -	1	0.0	0.0	0.0	23.0	0.0	0.0	1.0	63.0	3.0	0.0	3.0	2.0	0.0	121.0
9 -	1	0.0	0.0	0.0	18.0	0.0	0.0	0.0	133.0	0.0	0.0	1 .0	2.0	0.0	178.0
IO-	4	90.2	0.0	120.3	7.5	0.0	0.0	7.5	263.2	0.0	0.0	0.0	0.0	0.0	1045.2
11 -	1	14.0	2.0	114.0	0.0	0.0	0.0	2.0	6.0	0.0	0.0	0.0	0.0	2.0	202.0
12 -	2	0.0	0.0	2 7	50.7	0.0	0.0	10.7	7129	5.3	0.0	0.0	0.0	0.0	931.6
12 -	3	0.0	0.0	10.7	37.4	0.0	0.0	29.4	365.6	5.3	0.0	0.0	2.7	0.0	833.8
12 -	4	0.0	0.0	0.0	24.0	0.0	0.0	0.0	328.4	0.0	0.0	0.0	0.0	0.0	411.1
12 -	5	0.0	0.0	12.0	36.0	0.0	0.0	57.0	408.0	3.0	0.0	0.0	0.0	0.0	882.1
12 -	6	0.0	0.0	0.0	39.2	0.0	0.0	5.2	435.9	0.0	0.0	0.0	0.0	0.0	527.2
12 -	7	0.0	0.0	5.4	57.1	0.0	0.0	29.9	641 .9	5.4	0.0	0.0	0.0	0.0	1088.8
12 -	8	0.0	0.0	5.1	48.5	0.0	0.0	43.4	300.9	10.2	0.0	0.0	0.0	0.0	492.2
12 -	9	0.0	0.0	0.0	36.3	0.0	0.0	5.6	585.9	8.4	0.0	0.0	0.0	0.0	717.1
12 -	I0	0.0	0.0	0.0	47.0	0.0	0.0	0.0	537.7	0.0	0.0	0.0	0.0	0.0	741.3
12 -	11	0.0	0.0	2.9	22.9	0.0	0.0	68.6	225.9	5.7	0.0	0.0	0.0	0.0	440.3
12 -	12	0.0	0.0	5.3	42.7	0.0	0.0	29.4	400.5	5.3	0.0	2.7	2.7	0.0	687.8
12 -	13	0.0	0.0	0.0	50.0	0.0	0.0	8.0	494.0	2.0	0.0	0.0	2.0	0.0	722.0
12 -	14	0.0	0.0	0.0	36.8	0.0	0.0	0.0	529.2	2.5	0.0	0.0	0.0	0.0	688.5
12 -	15	0.0	0.0	12.5	40.0	0.0	0.0	30.0	315.0	5.0	0.0	0.0	0.0	0.0	476.0
13 -	1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	84.0
13 -	3	49.0	0.0	1.1	0.0	0.0	0.0	0.0	17.1	0.0	0.0	0.0	0.0	0.0	08.8
14 -	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
15 -	1	3.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
16 -	1	4.0	0.0	88.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	181.0
17 -	1	36.0	0.0	0.0	2.0	0.0	0.0	2.0	104.0	0.0	0.0	0.0	0.0	4.0	438.0
18 -	1	4.0	0.0	0.0	13.0	0.0	0.0	2.0	711.0	0.0	0.0	0.0	0.0	0.0	871.0
19 -	1	163.0	0.0	31.0	0.0	1.0	0.0	1.0	2 0	1.0	0.0	0.0	0.0	0.0	388.0
20 -	1	49.0	1.0	14.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	102.0

Table 18. Ten minute CPUE of all fishes (KI9403 continued).

CS#	- Tow#	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	Unidentified roundfish	Tow total
21 -	1	143.0	0.0	41.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	2.0	228.0
24 -	1	4.0	0.0	47.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.0
25 -	1	0.0	0.0	66.0	0.0	0.0	0.0	3.0	1.0	0.0	0.0	0.0	0.0	0.0	**104.0**
25 -	2	0.0	0.0	62.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	u2.9
26 -	1	3.0	0.0	243.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	**438.2**
26 -	2	0.0	0.0	473.8	0.0	0.0	0.0	15.0	22.6	0.0	0.0	0.0	0.0	0.0	631.7
27 -	1	50.0	0.0	30.0	0.0	0.0	0.0	20.0	140.0	10.0	0.0	0.0	0.0	0.0	340.0
29 -	1	0.0	0.0	0.0	6.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	2.0	382.0
30 -	1	66.0	0.0	9.0	0.0	0.0	0.0	0.0	32.0	2.0	0.0	0.0	0.0	1.0	894.0
KI9403 Tow total		706.3	3.0	1371.6	1140.9	2.0	7.0	430.1	10090.8	**141.4**	4.0	73.8	23.3	14.6	**21003.5**
KI9403 Statiin **tot**		677.8	3.0	900.6	284.4	2.0	7.0	**75.9**	2461.0	36.1	4.0	29.4	6.4	12.2	8144-S

Table 19a. Ten minute CPUE of age-0 flatfishes captured during August 1994 within Chlniak Bay (KI9403), indexed by bay, station (CS#) and tow (- #). Station total is the cumulative mean CPUE per station.

CS#	-	Tow#	Station code	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-0
KI9403 - Middle Bay																	
1	-	1	MB5	10.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
2	-	1	MB5	10.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	16.0
3	-	1	MB2	10.0	0.0	0.0	0.0	26.0	0.0	3.0	0.0	0.0	0.0	0.0	21.0	0.0	50.0
4	-	1	MB10	10.0	0.0	0.0	1.0	12.0	0.0	0.0	0.0	9.0	0.0	0.0	00	0.0	22.0
5	-	1	MB20	10.0	24.0	0.0	0.0	68.0	0.0	0.0	0.0	2M.0	0.0	0.0	0.0	0.0	312.0
19	-	1		10.0	157.0	0.0	13.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	172.0
20	-	1		10.0	47.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0
21	-	1	MB50	10.0	142.0	0.0	14.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	156.0
KI9403 - Kalsin Bay																	
6	-	1	KB5	3.5	0.0	0.0	0.0	11.4	0.0	0.0	0.0	74.4	0.0	0.0	2.9	0.0	88.7
6	-	2	KB5	5.7	0.0	0.0	0.0	22.9	0.0	0.0	0.0	81.0	0.0	0.0	3.5	0.0	107.4
6	-	3	KB5	45	0.0	0.0	0.0	42.2	0.0	0.0	0.0	190.9	44	0.0	2.2	0.0	239.8
6	-	4	KB5	3.6	0.0	0.0	0.0	33.5	0.0	0.0	0.0	111.6	0.0	0.0	2.8	0.0	147.9
6	-	5	KB5	4.9	0.0	0.0	0.0	20.3	0.0	0.0	0.0	138.0	0.0	0.0	41	0.0	162.4
6	-	6	KB5	3.9	0.0	0.0	0.0	35.7	0.0	0.0	0.0	142.8	0.0	0.0	7.7	0.0	186.2
6	-	7	KB5	4.0	0.0	0.0	0.0	35.7	0.0	0.0	0.0	149.1	0.0	0.0	2.1	0.0	186.9
6	-	8	KB5	3.6	0.0	0.0	0.0	28.7	0.0	0.0	0.0	130.5	0.0	0.0	2.6	0.0	161.8
6	-	9	KB5	3.7	0.0	0.0	0.0	21.8	0.0	0.0	0.0	103.4	0.0	0.0	0.2	0.0	133.3
6	-	10	KB5	4.1	0.0	0.0	0.0	12.3	0.0	0.0	0.0	36.0	0.0	0.0	2.5	0.0	51.5
6	-	11	KB5	3.0	0.0	00	0.0	23.5	0.0	0.0	0.0	114.8	0.0	0.0	2.6	0.0	140.9
6	-	12	KB5	4.8	0.0	0.0	0.0	25.2	0.0	0.0	0.0	161.7	0.0	0.0	2.1	0.0	189.0
6	-	13	KB5	4.3 4.9	0.0	0.0	0.0	22.3	0.0	0.0	0.0	148.2	0.0	0.0	2.0	0.0	172.6
6	-	14			0.0	0.0	0.0	10.5	0.0	0.0	0.0	157.1	0.0	0.0	0.0	0.0	175.6
7	-	1	KB2	10.0	0.0	0.0	0.0	16.0	0.0	0.0	0.0	64.0	0.0	0.0	1.0	0.0	81.0
8		-1	KB2	10.0	0.0	0.0	0.0	23.0	0.0	0.0	0.0	80.0	0.0	0.0	3.0	0.0	ICE.0
9	-	1	KB2	10.0	0.0	0.0	0.0	18.0	0.0	0.0	0.0	132.0	0.0	0.0	1.0	0.0	151.0
10	-	4	KB22	1.3	90.2	0.0	15.0	7.5	0.0	0.0	0.0	246.2	0.0	0.0	0.0	0.0	361.0
11	-	1	KB30	5.0	140	2.0	42.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	64.0
12	-	2	KB10	3.8	0.0	0.0	0.0	50.7	0.0	0.0	0.0	675.5	0.0	0.0	0.0	0.0	726.2
12	-	3	KB10	3.8	0.0	0.0	0.0	37.4	0.0	0.0	0.0	352.4	0.0	0.0	0.0	0.0	389.8
12	-	4	KB10	3.6	0.0	0.0	0.0	24.0	0.0	0.0	0.0	312.4	0.0	0.0	0.0	0.0	336.4
12	-	5	KB10	3.3	0.0	0.0	0.0	36.0	00	0.0	0.0	396.0	0.0	0.0	0.0	0.0	432.0
12	-	6	KB10	3.6	0.0	0.0	0.0	39.2	0.0	0.0	0.0	407.2	0.0	0.0	0.0	0.0	446.3
12	-	7	KB10	3.7	0.0	0.0	0.0	57.1	0.0	0.0	0.0	606.6	0.0	0.0	0.0	0.0	663.7
12	-	8	KB10	3.9	0.0	0.0	2.6	45.9	0.0	0.0	0.0	280.5	0.0	0.0	0.0	0.0	329.0
12	-	9	KB10	3.6	0.0	0.0	0.0	36.3	0.0	0.0	0.0	5747	0.0	0.0	0.0	0.0	611.0
12	-	10	KB10	3.8	0.0	0.0	0.0	47.0	0.0	0.0	0.0	506.3	0.0	0.0	0.0	0.0	553.3
12	-	11	KB10	3.5	0.0	0.0	0.0	22.9	0.0	0.0	0.0	214.5	0.0	0.0	0.0	0.0	237.4
12	-	12	KB10	3.6	0.0	0.0	0.0	42.7	0.0	0.0	0.0	361.8	0.0	0.0	2.7	0.0	427.2
12	-	13	KB10	5.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	484.0	2.0	0.0	0.0	0.0	536.0
12	-	14	KB10	4.1	0.0	0.0	0.0	36.0	0.0	0.0	0.0	497.4	0.0	0.0	0.0	0.0	534.1
12	-	15	KB10	4.0	0.0	0.0	0.0	40.0	0.0	0.0	0.0	310.0	0.0	0.0	0.0	0.0	350.0
13	-	1		6.7	1.5	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	3.0
13	-	3		8.8	47.9	0.0	0.0	0.0	0.0	0.0	0.0	6.8	0.0	0.0	0.0	0.0	547
14	-	3		5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	-	1		10.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
16	-	1	KB90	10.0	3.0	0.0	33.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0
17	-	1		5.0	34.0	0.0	0.0	2.0	0.0	0.0	2.0	68.0	0.0	0.0	0.0	0.0	106.0
18	-	1		10.0	4.0	0.0	0.0	13.0	0.0	0.0	1.0	680.0	0.0	0.0	0.0	0.0	698.0
24	-	1		10.0	4.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
2s	-	1	KB70	10.0	0.0	0.0	21.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	22.0
25	-	2	KB70	1.3	0.0	0.0	22.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.6
26	-	1	KB50	3.3	3.0	0.0	147.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	150.0
26	-	2	KB50	1.3	0.0	0.0	270.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	270.7
27	-	1	KB20	1.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0	120.0	0.0	0.0	0.0	0.0	170.0
29	-	1	MB10	5.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	8.0
30	-	1		10.0	66.0	0.0	5.0	0.0	0.0	0.0	0.0	25.0	2.0	0.0	0.0	0.0	98.0
KI9403 Tow total age4					688.6	2.0	590.9	1136.3	0.0	3.0	3.0	9410.0	9.4	0.0	73.8	0.0	11917.1
KI9403 Station total age-g					662.5	2.0	357.9	282.2	0.0	3.0	3.0	2218.7	3.6	0.0	29.4	0.0	3562.1

Table 19b. Ten minute CPUE of age-l flatfishes captured during August 1994 within Chiniak gay (KI9403), indexed by bay, station (CS#) and tow (- #). Station total Is the cumulative mean CPUE par station.

CS#	-	Tow#	Station code	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-1
KI9403	-	Middle Bay															
1	-	1	MB5	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0
2	-	1	MB5	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	-	1	MB2	10.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	6.0	0.0	2.0	0.0	0.0	11.0
4	-	1	MB10	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	3.0
5	-	1	MB20	10.0	0.0	0.0	0.0	1.0	0.0	0.0	2.0	36.0	0.0	0.0	0.0	0.0	39.0
19	-	1		10.0	1.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0
20	-	1		10.0	1.0	1.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
21	-	1	MB50	10.0	0.0	0.0	23.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	23.0
KI9403	-	Kalsin Bay															
6	-	1	KB5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	-	2	KB5	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	1.8
6	-	3	KB5	4.5	0.0	0.0	0.0	0.0	0.0	0.0	4.4	17.8	0.0	0.0	0.0	0.0	22.2
6	-	4	KB5	3.6	0.0	0.0	0.0	0.0	0.0	0.0	5.6	11.2	0.0	0.0	0.0	0.0	16.7
6	-	5	KB5	4.9	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0	0.0	0.0	4.1
6	-	6	KB5	3.9	0.0	0.0	0.0	0.0	0.0	0.0	5.1	12.0	0.0	0.0	0.0	0.0	17.9
6	-	7	KB5	4 6	0.0	0.0	0.0	0.0	0.0	0.0	4.2	8.4	0.0	0.0	0.0	0.0	12.6
6	-	6	KB5	3.6	0.0	0.0	0.0	0.0	0.0	0.0	5.2	7.8	0.0	0.0	0.0	0.0	13.1
6	-	9	KB5	3.7	0.0	0.0	0.0	0.0	0.0	0.0	2.7	2.7	0.0	0.0	0.0	0.0	5.4
6	-	10	KB5	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	0.0	0.0	0.0	0.0	4.9
6	-	11	KB5	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.7	0.0	0.0	0.0	0.0	15.7
6	-	12	KB5	4.6	0.0	0.0	0.0	0.0	0.0	0.0	6.3	10.5	0.0	0.0	0.0	0.0	16.8
6	-	13	KB5	4.9	0.0	0.0	0.0	0.0	0.0	0.0	4.1	4.1	0.0	0.0	0.0	0.0	8.1
6	-	14	KB5	4.3	0.0	0.0	0.0	0.0	0.0	0.0	2.3	9.2	0.0	0.0	0.0	0.0	11.6
7	-	1	KB2	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	3.0
8	-	1	KB2	10.0	0.0	0.0	0.0	0.0	0.0	0.0	1 a	0.0	0.0	0.0	0.0	1.0	2.0
9	-	1	KB2	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	-	4	KB22	1.3	0.0	0.0	90.2	0.0	0.0	0.0	0.0	7.5	0.0	0.0	0.0	0.0	97.8
11	-	1	KB30	5.0	0.0	0.0	34.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	36.0
12	-	2	KB10	3.6	0.0	0.0	0.0	0.0	0.0	0.0	10.7	26.7	0.0	0.0	0.0	0.0	37.4
12	-	3	KB10	3.6	0.0	0.0	0.0	0.0	0.0	0.0	21.4	10.7	0.0	0.0	0.0	0.0	40.1
12	-	4	KB10	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	8.0
12	-	5	KB10	3.3	0.0	0.0	12.0	0.0	0.0	0.0	42.0	12.0	0.0	0.0	0.0	0.0	66.0
12	-	6	KB10	3.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	18.3	0.0	0.0	0.0	0.0	23.5
12	-	7	KB10	3.7	0.0	0.0	2.7	0.0	0.0	0.0	24.5	32.6	0.0	0.0	0.0	0.0	59.0
12	-	6	KB10	3.9	0.0	0.0	0.0	2.6	0.0	0.0	20.1	10.2	0.0	0.0	0.0	0.0	40.8
12	-	9	KB10	3.6	0.0	0.0	0.0	0.0	0.0	0.0	5.6	5.6	0.0	0.0	0.0	0.0	11.2
12	-	10	KB10	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.1	0.0	0.0	0.0	0.0	26.1
12	-	11	KB10	3.5	0.0	0.0	0.0	0.0	0.0	0.0	42.9	8.6	0.0	0.0	0.0	0.0	51.5
12	-	12	KB10	3.8	0.0	0.0	2.7	0.0	0.0	0.0	18.7	13.4	0.0	0.0	0.0	0.0	34.7
12	-	13	KB10	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	14.0
12	-	14	KB10	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.6	0.0	0.0	0.0	0.0	19.6
12	-	15	KB10	4.0	0.0	0.0	10.0	0.0	0.0	0.0	22.5	2.5	0.0	0.0	0.0	0.0	35.0
13	-	1		6.7	1.5	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	4.5
13	-	3		6.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	9.1
14	-	3		6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	-	1		10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	-	1	KB90	10.0	0.0	0.0	27.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.0
17	-	1		5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	0.0	0.0	0.0	0.0	36.0
18	-	1		10.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	25.0	0.0	0.0	0.0	0.0	26.0
24	-	1		10.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0
25	-	1	KB70	10.0	0.0	0.0	36.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0
26	-	2	KB70	1.3	0.0	0.0	22.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22.6
26	-	1	KB50	3.3	0.0	0.0	78.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	78.0
26	-	2	KB50	1.3	0.0	0.0	135.4	0.0	0.0	0.0	0.0	22.6	0.0	0.0	0.0	0.0	157.9
27	-	1	KB20	1.0	0.0	0.0	30.0	0.0	0.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	50.0
29	-	1	MB10	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	-	1		10.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	11.0
KI9403	Tow total age-1				4.6	1.0	553.6	3.6	0.0	3.0	277.4	467.0	0.0	2.0	0.0	1.0	1333.2
KI9403	Station total age-1				3.0	1.0	384.7	1.2	0.0	3.0	26.4	183.4	0.0	2.0	0.0	1.0	664.7

Table 19c. Ten minute CPUE of age-≥2 flatfishes captured during August 1994 within Chiniak Bay (KI9403), indexed by bay, station (CS#) and tow (- #). Station total is the cumulative mean CPUE per station.

CS# - Tow#	Station code	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-≥2
KI9403 - Middle Bay															
1 - 1	MB5	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0
2 - 1	MB5	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0
3 - 1	MB2	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	1.0	0.0	0.0	3.0
4 - 1	MB10	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	6.0
5 - 1	MB20	10.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	5.0	12.0	0.0	0.0	0.0	10.0
19 - 1		10.0	5.0	0.0	6.0	0.0	1.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0	14.0
M - l		10.0	1.0	0.0	5.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0
21 - 1	MB.50	10.0	1.0	0.0	4.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	6.0
KI9403 - Kalrin gay															
6 - 1	KB5	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	29
6 - 2	KB5	5.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.0	3.5
6 - 3	KB5	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	6.7	0.0	0.0	0.0	8.9
6 - 4	KB5	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	2.0	0.0	0.0	0.0	0.4
6 - 5	KB5	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	0.0	0.0	2.0	6.1
6 - 6	KB5	3.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	7.7	0.0	0.0	0.0	10.2
6 - 7	KB5	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3	0.0	0.0	2.1	0.4
6 - 8	KB5	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	5.2	0.0	0.0	0.0	10.4
6 - 9	KB5	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	5.4	0.0	0.0	2.7	lo.9
6 - 10	KB5	4.1	0.0	0.0	0.0	0.0	0.0	0.0	2.5	9.8	4.9	0.0	0.0	2.5	19.6
6 - 11	KB5	3.8	0.0	0.0	0.0	0.0	0.0	0.0	2.6	13.1	0.0	0.0	0.0	2.6	10.3
6 - 12	KB5	4.8	0.0	0.0	0.0	0.0	0.0	0.0	2.1	4.2	4.2	0.0	0.0	0.0	10.5
6 - 13	KB5	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.0	0.0	4.1
6 - 14	KB5	4.3	0.0	0.0	0.0	0.0	0.0	0.0	2.3	9.2	0.0	0.0	0.0	0.0	11.6
7 - I	KB2	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	20
8 - 1	KB2	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	1.0	7.0
9 - 1	KB2	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	2.0	3.0
10 - 4	KB22	1.3	0.0	0.0	15.0	0.0	0.0	0.0	7.5	7.5	0.0	0.0	0.0	0.0	30.1
11 - 1	KB30	5.0	0.0	0.0	38.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	38.0
12 - 2	KB10	3.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	10.7	5.3	0.0	0.0	0.0	10.7
12 - 3	KB10	3.8	0.0	0.0	2.7	0.0	0.0	0.0	a.0	2.7	5.3	0.0	0.0	2.7	21.4
12 - 4	KB10	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0
12 - 5	KB10	3.3	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	3.0	0.0	0.0	0.0	18.0
12 - 6	KB10	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.4	0.0	0.0	0.0	0.0	10.4
12 - 7	KB10	3.7	0.0	0.0	2.7	0.0	0.0	0.0	5.4	2.7	5.4	0.0	0.0	0.0	16.3
12 - 8	KB10	3.9	0.0	0.0	2.6	0.0	0.0	0.0	15.3	10.2	10.2	0.0	0.0	0.0	38.3
12 - 9	KB10	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	0.4	0.0	0.0	0.0	14.0
12 - 10	KB10	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	0.0	0.0	0.0	0.0	52
12 - 11	KB10	3.5	0.0	0.0	2.9	0.0	0.0	0.0	25.7	2.9	5.7	0.0	0.0	0.0	37.2
12 - 12	KB10	3.0	0.0	0.0	2.7	0.0	0.0	0.0	10.7	5.3	5.3	0.0	0.0	2.7	26.7
12 - 13	KB10	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	2.0	6.0
12 - 14	KB10	4.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.3	2.5	0.0	0.0	0.0	14.7
12 - 15	KB10	4.0	0.0	0.0	2.5	0.0	0.0	0.0	7.5	2.5	5.0	0.0	0.0	0.0	17.5
13 - 1		6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13 - 3		0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	3.4
14 - 3		5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15 - 1		10.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
16 - 1	KB90	10.0	1.0	0.0	9.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	11.0
17 - 1		5.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20
18 - 1		lo.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	6.0
24 - 1		10.0	0.0	0.0	26.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.0
25 - 1	KB70	10.0	0.0	0.0	9.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	120
25 - 2	KB70	1.3	0.0	0.0	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.5
26 - 1	KB50	3.3	0.0	0.0	18.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	24.0
26 - 2	KB50	1.3	0.0	0.0	67.7	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	82.7
27 - 1	KB20	1.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0	0.0	10.0	0.0	0.0	0.0	30.0
29 - l	MB10	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	12.0
30-l		10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
KI9403 Tow total age-≥2			12.0	0.0	227.0	1.0	2.0	1.0	143.7	193.8	131.9	2.0	0.0	22.3	742.7
KI9403 Station total age-≥2			120	0.0	166.0	1.0	2.0	1.0	47.5	58.9	32.6	2.0	0.0	4.4	307.6

Kazakof Bay/August 1994 (KI9402)

Physical data within Kazakof Buy/August 1994 (KI9402)

Temperature within Kazakof Bay/August 1994 (KI9402)

Temperatures recorded from most stations within Kazakof Bay decreased gradually from the surface to about 15 m below the surface (Figure 399): Profiles usually encompassed a temperature shift of several degrees within this depth range, and below 15 m depth, conditions were fairly isothermal.

Bottom temperatures in Kazakof Bay ranged from 4.4 to 14.2°C (Table 7, Figure 400). The warmest bottom temperatures (9.4 - 14.2°C) were in shallow (<10 m), nearshore water. Bottom temperatures decreased with increasing depth, and the coldest waters (4.4 - 5.0°C) were in water deeper than 70 m.

Salinity within Kazakof Bay/August 1994 (KI9402)

Conditions within Kazakof Bay were usually isohaline, except for the surface 10 m (Figure 401). At CS#9 & 18 a sharp variation in salinity occurred near the bottom. This feature was not echoed within the temperature pro&s, but since these stations were in close proximity (0.5 km apart) it is likely the salinity variation is not due to gear error.

Bottom salinities within Kazakof Bay ranged from 28.8 to 34.0 PSU (Table 7, Figure 402).

KI9402 Substrate within K&f Bay/August 1994 (KI9402)

Substrate at most stations appeared to be predominantly mud, but as sediment grain sii has not yet been analyzed for this cruise, flatfish distribution was not described relative to substrate type.

Fish data within Kazakof Bay/August 1994 (KI9402)

A total of 645 fishes were entered in the database from KI9402 for use in CPUE (Table 20), distribution and length analyses. All captured fishes were measured, of which 217 (34%) were flatfishes. The cumulative mean CPUE flatfish/station of flaffishes from quantitative tows at 29 stations was 440, for an average CPUE of 15 flatfishes/station during KI9402.

Five species of flatfish were collected during KI9402. Listed in decreasing order of abundance (dative CPUE of all ages), these species were flathead sole (N=275), yellowfin sole (N=1 1 1), rock sole (N=47), Pacific halibut (N=4) and English sole (N=4).

Flatfishes were caught at all but 17% (N=5) trawl stations during KI9402. Flathead sole were caught *at 62%* of stations, haliiut were caught at 3% of stations, yellowfin sole were caught at 21% of stations, rock sole were caught at 28% of stations sampled, and English sole were caught at 3% of stations.

During August 1994 within Kazakof Bay (Table 21), age-0 was the numerically dominant age class collected of halibut, rock sole and English sole. Age-l fishes were caught most often of flathead sole and yellowfin sole.

Distribution of flatfishes by age within Kazakof Bay/August 1994 (KI9402)

Flathead sole (Figures 403-409)

Age-0 flathead sole (N=85) were caught at 34% of stations during KI9402. The mean number of age-0 fish/tow was 3.0±6.1, and the largest catch was 27 fish/tow. Age-0 fish were captured primarily down the center of Kazakof Bay. They were caught in 20 - 90 m water depth and increased in abundance with increasing depth. Age-0 flathead sole were not caught at the head of Kazakof Bay, but were caught well within the bay, at sites 12 - 16 km from the mouth. They were captured only in cool temperatures (4.7 - 7.7°C), and in salinities from 28.8 to 32.0 PSU.

Age-1 flathead sole (N=130) were caught at 48% of stations during KI9402. The mean number of age-1 fish/tow was 4.2±6.2, and the largest catch was 21 fish/tow. Distribution of age-1 fish was similar to age-0 fish. Age-1 flathead sole were caught in 20 - 100 m water depth, and were most abundant from 40 to 80 m water depth. Age-1 flathead sole were not caught at the head of the bay. They were collected in waters of 4.6 - 7.9°C and 28.8 - 32.1 PSU.

Age-≥2 flathead sole were caught during KI9402 (N=60).

Pacific halibut (Figures 410-416)

Age-0 halibut (N=4) were caught at 3% of stations during KI9402. The mean number of age-0 fish/tow was 0.1±0.6, and the largest catch was four fish/tow. Age-0 halibut were caught at a single station near the head of Kazakof Bay, in 10 - 20 m water depth, 8.5°C, and 32.8 PSU.

No age-1 or age-≥2 Pacific halibut were caught during KI9402.

Yellowfin sole (Figures 417-423)

Age-0 yellowfin sole were not captured during KI9402.

Age-1 yellowfin sole (N=92) were caught at 17% of stations during KI9402. The mean number of age-1 fish/tow was 2.6±10.9, and the largest catch was 60 fish/tow. Age-1 yellowfin were caught in 10 - 40 m water depth, from 13 to 18 km inbay, in 7.5 - 8.2°C and 31.3 - 32.0 PSU water.

Age-≥2 yellowfin sole were caught during KI9402 (N=19).

Rock sole (Figures 424-430)

Age-0 rock sole (N=24) were caught at 17% of stations during KI9402. The mean number of age-0 fish/tow was 0.9±2.6, and the largest catch was 12 fish/tow. Age-0 fish were caught from 0 to 50 m water depth, 12 to 20 km inbay. They were caught within a wide range of temperatures (6.8 - 14.2°C). Age-0 rock sole were caught in 30.5 - 32.0 PSU water salinity.

Age-1 rock sole (N=19) were caught at 17% of stations during KI9402. The mean number of age-1 fish/tow was 0.6±2.2, and the largest catch was 12 fish/tow. Like age-0 fish, age-1 rock sole were caught from 0 to 50 m water depth and 12 to 20 km inbay. Temperature ranges where age-1 rock sole were captured were slightly narrower (7.3 - 14.2) than for age-0 fish. Salinity of capture was 30.5 - 34.0 PSU.

Age-≥2 rock sole were caught during KI9402 (N=5).

English sole (Figures 431-437)

Age-0 English sole (N=4) were caught at 3% of stations during KI9402. The mean number of age-0 fish/tow was 0.3±1.0, and the largest catch was four fish/tow. English sole were captured at a single station, in 0 - 5 m water depth, at the head of Kazakof Bay in water of 14.2°C and 30.5 PSU.

Neither age-1 nor age-≥2 English sole were caught during KI9402.

Table 20. Ten minute CPUE of fishes captured during August 1994 within Kazakof Bay (KI9402), indexed by station (CS#) and tow (- #).

CS#	Tow#	Unidentified Cods	Pacific tomcod	Walleye pollock	Unidentified Rockfishes	Pacific ocean perch	Rock OR kelp greenling	Masked greenling	White-spotted greenling	Unidentified sculpins	Spiny cheeked star snout	Spinyhead sculpin	Armorhead sculpin	Red irish lord	Yellow irish lord	Great sculpin	Slim sculpin	Sturgeon poacher	Tubenose poacher	Unidentified snailfishes	Searcher
1 -	1	1.0	0.0	0.0	0.0	1.0	9.0	4.0	0.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	0.0	7.0	0.0	0.0	0.0
1 -	2	0.0	0.0	0.0	0.0	0.0	9.0	2.0	0.0	1.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
2 -	1	0.0	1.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
3 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	1.7
4 -	3	0.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0	76.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 -	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7 -	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	22.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
11 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13 -	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14 -	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
19 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.0	6.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22 -	1	14.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	6.0	2.0	0.0	20.0	0.0	0.0	0.0	6.0	2.0	0.0
23 -	1	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	4.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0
24 -	1	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
25 -	1	0.0	0.0	6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0
26 -	1	0.0	6.7	6.7	0.0	0.0	0.0	0.0	6.7	0.0	0.0	0.0	0.0	0.0	0.0	6.7	0.0	0.0	0.0	0.0	0.0
27 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0
28 -	1	8.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29 -	1	6.0	0.0	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30 -	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	4.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31 -	1	8.0	0.0	0.0	0.0	2.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0
32 -	1	18.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	2.0	0.0	0.0	4.0	0.0	0.0	0.0	2.0	0.0	0.0
KI9402																					
Tow total		**57.0**	**9.7**	**13.5**	**2.0**	**13.5**	**48.0**	**8.0**	**61.7**	**132.0**	**1.0**	**8.0**	**5.5**	**9.0**	**38.5**	**14.4**	**1.5**	**7.0**	**8.0**	**2.0**	**3.7**
Station total		**56.5**	**9.7**	**13.5**	**2.0**	**13.0**	**39.0**	**5.0**	**61.7**	**131.5**	**0.5**	**8.0**	**5.5**	**9.0**	**37.0**	**14.4**	**1.5**	**3.5**	**8.0**	**2.0**	**3.7**

Table 20. Ten minute CPUE of all fishes (KI9402 continued).

CS#	Tow#	Northern ronquil	Longsnout prickleback	Prickleback species	Slender eelblenny	Snake prickleback	Daubed shanny	Stout eelblenny	Arctic shanny	Crescent gunnel	Prowfish	Unidentified roundfishes	Flathead sole	Pacific halibut	Yellowfin sole	Rock sole	English sole	Tow Total
1	1	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	4.0	4.0	49.0
1	2	0.0	0.0	0.0	1.0	7.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	8.0	4.0	41.0
2	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.0
3	1	5.2	0.0	0.0	0.0	5.2	0.0	0.0	3.5	0.0	0.0	0.0	0.0	3.5	0.0	1.7	0.0	31.3
4	3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	96.0
6	1	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0
6	2	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.0
7	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	44.0
8	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	4.0	0.0	0.0	0.0	0.0	24.0
9	1	0.0	0.0	4.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	24.0	0.0	0.0	0.0	0.0	48.0
10	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0	0.0	0.0	1.0	0.0	32.0
11	1	0.0	0.0	2.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	44.0
12	1	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	6.0	0.0	0.0	38.0
13	3	0.0	0.0	9.0	0.0	3.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	72.0
14	2	0.0	0.0	13.3	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.0	0.0	50.0
15	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	42.0
16	1	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	63.0
17	1	0.0	3.0	18.0	0.0	0.0	3.0	6.0	0.0	0.0	0.0	0.0	36.0	0.0	0.0	0.0	0.0	135.0
18	1	0.0	0.0	3.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	30.0	0.0	0.0	0.0	0.0	99.0
19	1	6.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	36.0	0.0	6.0	0.0	0.0	135.0
22	1	0.0	0.0	0.0	4.0	8.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	116.0
23	1	4.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	0.0	0.0	0.0	92.0
24	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	13.3	0.0	0.0	0.0	0.0	56.0
25	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.9	0.0	0.0	3.4	0.0	75.5
26	1	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.7	3.3	0.0	216.6
27	1	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.4	0.0	63.1
28	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0	2.0	0.0	0.0	2.0	0.0	84.0
29	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	63.0
30	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	0.0	0.0	0.0	0.0	110.0
31	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	18.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	124.0
32	1	0.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	14.0	0.0	24.0	14.0	0.0	156.0
KI9402																		
Tow total		**20.1**	**3.0**	**49.3**	**5.0**	**44.2**	**11.0**	**32.3**	**28.5**	**37.0**	**2.0**	**4.0**	**274.8**	**3.5**	**110.7**	**52.8**	**8.0**	**2266.5**
Station total		**20.1**	**3.0**	**49.3**	**4.5**	**36.2**	**11.0**	**30.8**	**28.5**	**31.0**	**2.0**	**4.0**	**274.8**	**3.5**	**110.7**	**47.0**	**8.0**	**2200.0**

Table 21a. Ten minute CPUE of age-0 flatfishes captured during August 1994 within Kazakof Bay (KI9402), indexed by station (CS#) and tow (- #). Station total is the cumulative mean CPUE per station.

CS#	-	Tow#	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-0
KI9402 - Kazakof Bay																
1	-	1	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	4.0	0.0	8.0
1	-	2	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	4.0	0.0	11.0
2	-	1	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	-	1	5.8	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5
4	-	3	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	-	2	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	-	2	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	-	1	5.0	0.0	0.0	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0
10	-	1	10.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	3.0
11	-	1	5.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
12	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	-	3	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	-	2	6.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3
15	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	-	1	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	-	1	3.3	0.0	0.0	27.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.0
18	-	1	3.3	0.0	0.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.0
19	-	1	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	-	1	5.0	0.0	0.0	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.3
25	-	1	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	1.7
26	-	1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	3.3
27	-	1	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	-	1	5.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
29	-	1	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	-	1	5.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
31	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	-	1	5.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	16.0
KI9402 Tow total age-0				**0.0**	**0.0**	**84.6**	**3.5**	**0.0**	**0.0**	**0.0**	**29.0**	**0.0**	**0.0**	**8.0**	**0.0**	**125.1**
KI9402 Station total age-0				**0.0**	**0.0**	**84.6**	**3.5**	**0.0**	**0.0**	**0.0**	**23.5**	**0.0**	**0.0**	**4.0**	**0.0**	**115.6**

Table 21b. **Ten minute CPUE of age-1 flatfishes captured during August 1994 within Kazakof Bay (KI9402), indexed by station (CS#) and tow (- #). Station total is the cumulative mean CPUE per station.**

CS#	-	Tow#	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-1
KI9402 - Kazakof Bay																
1	-	1	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	-	2	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	1.0
2	-	1	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	-	1	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	-	3	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	-	2	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	-	2	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	-	1	5.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
9	-	1	5.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0
10	-	1	10.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0
11	-	1	5.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
12	-	1	5.0	0.0	0.0	2.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	6.0
13	-	3	3.3	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	6.0
14	-	2	6.0	0.0	0.0	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.3
15	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	-	1	3.3	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
17	-	1	3.3	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
18	-	1	3.3	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.0
19	-	1	3.3	0.0	0.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.0
22	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	2.0
23	-	1	5.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0
24	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	-	1	5.8	0.0	0.0	12.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	13.7
26	-	1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	60.0	0.0	0.0	0.0	0.0	0.0	60.0
27	-	1	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.3	0.0	0.0	0.0	0.0	12.3
28	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	2.0
29	-	1	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	-	1	5.0	0.0	0.0	20.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	20.0
31	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	-	1	5.0	0.0	0.0	6.0	0.0	0.0	0.0	20.0	2.0	0.0	0.0	0.0	0.0	28.0
KI9402 Tow total age-1				**0.0**	**0.0**	**130.3**	**0.0**	**0.0**	**0.0**	**92.0**	**19.0**	**0.0**	**0.0**	**0.0**	**0.0**	**241.3**
KI9402 Station total age-1				**0.0**	**0.0**	**130.3**	**0.0**	**0.0**	**0.0**	**92.0**	**18.5**	**0.0**	**0.0**	**0.0**	**0.0**	**240.8**

Table 21c. **Ten minute CPUE of age-≥2 flatfishes captured during August 1994 within Kazakof Bay (KI9402), indexed by station (CS#) and tow (- #). Station total is the cumulative mean CPUE per station.**

CS#	-	Tow#	Duration (min)	Arrowtooth flounder	Rex sole	Flathead sole	Pacific halibut	Dover sole	Starry flounder	Yellowfin sole	Rock sole	Butter sole	Alaska plaice	English sole	Sand sole	All age-≥2
KI9402 - Kazakof Bay																
1	-	1	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	-	2	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	-	1	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	-	1	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	1.7
4	-	3	5.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
6	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	-	2	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	-	2	5.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
8	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	-	1	5.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0
10	-	1	10.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
11	-	1	5.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
12	-	1	5.0	0.0	0.0	2.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	4.0
13	-	3	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	-	2	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	-	1	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17	-	1	3.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18	-	1	3.3	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
19	-	1	3.3	0.0	0.0	15.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	21.0
22	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	-	1	5.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
24	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	-	1	5.8	0.0	0.0	6.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9
26	-	1	3.0	0.0	0.0	0.0	0.0	0.0	0.0	6.7	0.0	0.0	0.0	0.0	0.0	6.7
27	-	1	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0	3.1
28	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	-	1	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	-	1	5.0	0.0	0.0	12.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.0
31	-	1	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	-	1	5.0	0.0	0.0	4.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	8.0
KI9402 Tow total age-≥2				**0.0**	**0.0**	**59.9**	**0.0**	**0.0**	**0.0**	**18.7**	**4.8**	**0.0**	**0.0**	**0.0**	**0.0**	**83.4**
KI9402 Station total age-≥2				**0.0**	**0.0**	**59.9**	**0.0**	**0.0**	**0.0**	**18.7**	**4.8**	**0.0**	**0.0**	**0.0**	**0.0**	**83.4**

CONCLUSIONS

During prior funding, samples were collected in 1991 and 1992 within all major bays around Kodiak Island. The 1991 and 1992 trawl samples and physical data formed the basis of the following conceptual models of flatfish nursery habitat around Kodiak Island (Norcross et al. 1995A, 1995B). Age-0 rock sole are found predominantly in water depths less than 50 m on sand or mixed sand substrate within 10 km of bay mouths. Age-0 flathead sole are found predominantly in water depths greater than 40 m on mud or mixed mud substrate throughout bays. Age-0 Pacific halibut are found predominantly in water depths less than 40 m on mixed sand substrate near or outside mouths of bays. Age-1 yellowfin sole are found predominantly in water depths less than 40 m on mixed substrate at upper reaches of bays.

During 1991 and 1992, only age-0 rock sole, flathead sole, Pacific halibut and age-1 yellowfin sole were captured in large enough numbers to form models. The conceptual models of flatfish distribution (Norcross et al. 1995A, 1995B) based on 1991 - 1992 data were verified during collections within Chiniak Bay during 1993 and 1994. As in 1991 - 1992, station locations were selected based on depth and sediment strata, and data were analyzed using the physical parameters of location in the bay, depth, bottom temperature, bottom salinity and sediment type. Data from KI9403 suggests that flathead sole are predominantly found in >20 m water depth, a modification from the >40 m mentioned in the models.

In 1993 and 1994, age-1 of flathead sole and rock sole and ages-0 and 1 of arrowtooth flounder were captured in sufficiently large abundances for us to develop conceptual models of distribution for additional age-groups and species. Age-1 flathead sole were found in greatest abundance in depths >20 m on sandy mud and muddy sand throughout the bay. Age-1 rock sole were mainly in depths <40m on sandy substrates throughout the bay. Both age-0 and age-1 arrowtooth flounder were found in water depth >20m on sandy mud and muddy sand near the bay mouth.

We found that our conceptual models of distribution did not fit well in all seasons sampled. However, since sampling was most extensive in August, we did not have sufficient data to develop models for other seasons. This is a prime objective of a separately funded CMI project which is currently underway.

The four years of data now available on physical parameters and flatfish abundances within Chiniak Bay have enabled us to narrow the scope of future collections. In Chiniak Bay, we will sample only at "permanent" stations which have been determined based on 1991 - 1994 data. Using these "permanent" stations, we will develop indices of interannual abundance changes. In comparisons of fish abundance and distribution from 1991 through 1994, differences among species and among stations can be identified in addition to interannual variability. In particular, the distribution of rock sole and flathead sole appear to be strongly related to depth and substrate type. In the future we will examine depth and substrate patterns in more detail and will investigate other parameters which may affect the distribution of the abundant flatfishes. From this, we will discern the key habitat characteristics for each species, enabling us to monitor their abundances over time.

ADDITIONAL PRODUCTS PRODUCED

Funding from Coastal Marine Institute assisted with analysis of 1991 flatfish stomach contents and with comparisons of juvenile flatfish distribution from 1991 and 1992. Thus far, three manuscripts based on these data have been accepted for publication and another has been submitted. All are available upon request. The distribution and abundance of flatfishes captured during August 1991 was evaluated by linear discriminant function analysis in the manuscript "Nursery area characteristics of Pleuronectids in coastal Alaska, USA" (Norcross et al. 1995A), which has been accepted for publication in the Netherlands Journal of Sea Research. Multivariate analysis of distribution and abundance of flatfishes captured during 1991 and 1992 was summarized in the manuscript, "Habitat models for juvenile Pleuronectids around Kodiak Island, Alaska, USA" (Norcross et al. 1995B). Feeding diversity of juvenile flatfishes was described in "Diet diversity as a mechanism for partitioning nursery grounds of Pleuronectids" (Holladay and Norcross 1995). These last two manuscripts were presented orally at the International Symposium on North Pacific Flatfish, held 26 - 28 October 1994 in Anchorage, Alaska, and will be published in the unrefereed proceedings of that symposium. The habitat model manuscript was submitted to Fishery Bulletin (US) and has since been revised based on reviewers' comments. The information on diet diversity is the topic of Brenda Holladay's M.S. thesis. Additional sampling and analysis to develop indices of interannual flatfish abundance is Sherri Dressel's M.S. thesis.

Related projects assisted through this funding

Live juvenile flatfishes were captured during 1992 - 1994 field work for a separate lab study (Moles et al. 1994, Moles and Norcross in press) to assess sediment preferences of various juvenile flatfish species. The lab study addresses the response of flatfishes to various concentrations of petroleum hydrocarbons in sediment, submits fishes to physiological tests which assess the effect of non-avoidance of oiled sediment on the survivability of the fish, and also provides a monitor for rates of growth, feeding, and respiration during long term (chronic) exposure to low levels of oiled sediments. This research is Adam Moles' Ph.D. thesis.

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Appendix 1. Description of gear used during cruises near Kodiak and Afognak Islands during 1993 and 1994 (KI9301, KI9302, KI9401, KI9402 and KI9403) and on prior cruises near Kodiak (KI9001, KI9101, KI9102, KI9201, KI9202).

Portable Conductivity, Temperature, Density (CTD) recorder

- SeaBird SBE19 Seacat Profiler: firmware version 1.8, baudrate 600, 256 K memory, 600 m housing, 1000 psu pressure sensor, 2 scans per second
- Fish #4, with pump, S/N 260
- Fish #5, with pump, S/N 350

Limnoterra electronic fish measuring board

Loaned by Adrian Celewycz, NMFS/Auke Bay Laboratory

- FMB IV, 1.0 mm resolution, S/N F4069G
- used during KI9202, or after KI9201 and KI9301 to enter fish lengths from handwritten notes in the field data book

Global Positioning System (GPS)

- none KI9001, KI9101
- Trimble Navigation Ensign GPS model 17319 (loaned by John Kelley, PICO/UAF): typical accuracy = 25 m, maximum error = 100 m; few stations during KI9201
- make and model unknown (*F/V Big Valley*): KI9102, KI9202
- Magellan NAV 5000D (NMFS): KI9301, KI9302, KI9401, KI9403
- Trimble GPS Pathfinder (loaned by John Kelley, PICO/UAF): KI9402

KI9301 recorded one location per station near the start of tow

KI9302, KI9401, KI9402, KI9403 recorded locations of start tow, end tow, CTD and Ponar grab locations

Ponar grab

- one model had spring-loaded closure, the other model had a manual closure)
- smaller version of the VanVeen grab
- 0.06 m^3 capacity
- a 10# weight was shackled to the ring between the grab and line, resulting in the grab triggering more successfully

Remotely Operated Vehicle (ROV) (provided by UCAP/NURC)

Mini Rover MK2; NURP1 (used during KI9202 only);

- equipped with 35 mm video camera
- equipped with 35 mm camera for still photos

Damage/Alterations

- KI9202 CS#17 the leak detector registered a leak at 18 m depth. The ROV was repaired for use at CS#57.
- KI9202 CS#71 attached tickler chain (thereafter used on every dive). Tickler was of 0.37 m heavy fishing line, with lead fishing weights clamped on the line. 25 mm weights were centered at 85, 220, and 285 mm, and a 20 mm weight was centered at 148 mm from the skid. The tickler was attached at either end to the ROV skid tips.

Appendix 1. Description of gear (continued).

Accu-Weigh digital scale (provided by NMFS/Kodiak)

- accurate to 0.2 pounds
- used during KI9201 and KI9202 CS#1 - 36
- **damaged** by water during KI9202 CS#36

Plumb staff beam trawl net

- net of 7 mm square lumen nylon mesh (3/8" #126 knotless nylon netting)
- length of net 3.35 m (opening to start of codend)
- fishable length of codend 2.6 m unstretched mesh = approx 1.5 meter when stretched to widest dimension
- codend circumference (unstretched) 1.8 m
- codend mesh same as net, 7 mm square lumen nylon
- codend liner nylon mesh 4 mm or 5 mm when stretched (#9843)
- coarse chaffing gear sewn to ventral side of codend, approx. 65 mm mesh
- headrope is 5/8" poly line, 4.6 m
- headrope supported with floats, equal distance apart (i.e. 5 NY-14 floats)
- footrope is leadfilled 5/8" poly line, 4.9 m
- tickler chain of 1" links attached on both ends to footrope, one chain hangs below the other and is attached 40 cm from each edge of longer chain
  - long tickler is 0.5 m shorter than footrope
  - short tickler is 0.9 m shorter than footrope
- 6" lengths of 1" link chain hangs from footrope at approx. 6" intervals
- tow line of $\geq$3/8" wire cable or $\geq$1/2" nylon braided line with an inner core (i.e. Samson line)
- beam of 5 cm x 3.66 m OR 5 cm x 3.05 m
- beam supported on each end with -7 3/4 lb. float (sufficient to keep the buoyancy of the beam approximately neutral)
- upper net bridle 2 m
- lower net bridle 1.7 m
- 2 tip weights (approximately 39 pounds each)
- tag line float (crab pot float or 6 - 8" diameter sphere)
- tag line of floating thin line (i.e. 3/16" poly)

Appendix 2. Procedure for sediment analysis.

Part I. Wet and dry sieving technique as modified from Folk (1980).

1. Homogenize sediment sample and obtain about 30 g (wet weight) subsample.
2. Add about 200 ml deionized water to subsample and stir.
3. Wet sieve with a 4 Phi (0.0625 mm) mesh sieve to separate gravel/sand from mud. Rinse sieve contents with deionized water into a large evaporating dish until filtrate is clear. Remove any large pieces of biomass. Do not remove shells from sample.
4. Pour filtrate into a pre-weighed 500 ml beaker. Rinse dish with deionized water and add rinse-water to beaker.
5. Dry beaker at 80°C for 12 hrs. Weigh beaker for mud fraction.
6. Use tap or deionized water to rinse sieve contents into a beaker and dry at 80°C for 12 hrs.
7. Allow beaker to equilibrate to room temperature. Dry sieve contents with -1.0 Phi (2.0 mm) mesh sieve to separate gravel from sand. Use a brush to remove sediment sticking to beaker. Remove large pieces of plant detritus. Weigh both fractions.

Part II. Loss on ignition (LOI)

1. Weigh crucible and 2-4 g (dry weight) of homogenized sediment sub-sample.
2. Cook crucible and sample at 500°C for 2 hrs.
3. Allow crucible and sample to equilibrate to room temperature, then record weight. Weight loss during cooking at 500°C is organic content (organic LOI).
4. Cook crucible and sample at 850°C for 2 hrs.
5. Allow crucible and sample equilibrate to room temperature before weighing. Weight loss during cooking at 850°C is carbonate content (carbonate LOI).