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Distribution and Habitats of Marine Fish and Invertebrates in Katlian Bay, Southeastern Alaska, 1967 and 1968

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DISTRIBUTION AND HABITATS OF MARINE FISH AND INVERTEBRATES IN KATLIAN BAY, SOUTHEASTERN ALASKA, 1967 AND 1968.

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ABSTRACT

In 1967 and 1968, scientists from the National Marine Fisheries Service's Auke Bay Laboratory carried out four surveys of marine fauna in Katlian Bay, near Sitka, Alaska as part of an impact study associated with plans to build a wood pulp processing plant in the bay. Here we report the results of our surveys and also provide a broad literature review on several of the species that were captured in the bay. Fifty-nine fish species and more than 44 invertebrate species (32 identified to species level (see page 8) were captured. Habitats examined were intertidal, the steep sides of the bay, and the bay's deep central basin. Many species occupied a single habitat type but others overlapped into adjacent habitats. Five fish species were collected in the intertidal zone and major invertebrate fauna included the sunflower star (*Pycnopodia helianthoides*) and numerous members of Gastropoda. Thirty-nine fish and 23 invertebrate species were collected on the bay's sides below 5 m. Of these species, this habitat was the primary location for 29 fish and 14 invertebrate species. Twenty-three fish and 15 invertebrate species were collected in the main basin of the bay. Fauna fell into four resident categories based upon life history and other biological characteristics. Transients pass through the bay, such as anadromous Salmonidae, which leave as juveniles and return as adults. Seasonal residents like Pacific herring (*Clupea pallasi*) and Pacific halibut (*Hippoglossus stenolepis*) live part of each year in the bay, but inherently leave the bay for short or extended periods. Full-time residents have home ranges entirely inside the bay. These included 38 species of fish and all of the invertebrates. A fourth category includes species that are resident in the bay as juveniles, but emigrate to the outer coast and continental shelf when reaching or approaching sexual maturity.

While the pulp mill was never constructed, the data gathered on the marine fauna of Katlian Bay, their habitat, and aspects of life history do address the essential fish habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act as amended in 1996 which mandates that information on fauna and habitats within marine estuaries and outer shorelines be provided to fulfill requirements of the Act.

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INTRODUCTION

Katlian Bay is located 12 km north of the city of Sitka in southeastern Alaska (Fig. 1). A faunal survey was conducted in the bay during the spring, summer, and fall of 1967 and spring of 1968 as part of an impact study in association with plans to build a wood pulp processing plant at that location. The processing plant was never constructed, so the collected information became background material for other studies. The surveys were primarily qualitative and exploratory in nature but did include species counts, length and sex frequencies, and recorded information on gonad maturation. Since 1968, using this information and subsequent life history and behavioral studies, we have been able to identify fauna residence affiliation within Katlian Bay as either transient, seasonal, full-time, or resident only as juveniles. Some species were located only in the central basin of the bay; others were captured only on the sides of the bay, and some fauna used both locations. An impetus to produce this report was the Magnuson-Stevens Fishery Conservation and Management Act as amended in 1996 because of its mandates to identify essential fish habitat, primarily for commercially important fauna. These 1967-68 surveys provide information towards these mandates. Faunal distributions and residence affiliations found in Katlian Bay may also be similar in other southeastern Alaska coastal bays, fiords, and inlets. This report includes a broad review of published reports on several species that we captured to help describe their presence and habitat selection in Katlian Bay.

METHODS AND MATERIALS

Physical Features of Katlian Bay

Before survey work began in Katlian Bay, habitats in the bay were selected for study. The mouth of the bay opens onto Sitka Sound in a southwesterly direction (Fig. 2) and is 1.1 km wide. A sill, 47.5 m deep, is located on its outer side. The sill's inward face descends uniformly to about 128 m before leveling out on the bottom of the bay.

Direction of travel up the bay for the first 4.5 km is northeast and then arcs to an easterly direction for another 4.1 km to the head of the bay. Below the arc, opposite shores are nearly parallel, with the width varying to about 0.6 km, but narrowing to 0.3 km at a point south of Barrow Pit Cove.[1] Beyond the arc, toward the head of the bay, the northern side opens into Outer Cedar Cove, which contains Adobe Island and smaller Derby Island. Much of Derby Island consists of exposed rocks connected at a low tide. Outer Cedar Cove narrows to the northwest to become Cedar Cove.

The head of the bay has a 0.73 km wide delta formed by four rivers: Coxe, Katlian, West Katlian, and South Katlian-Sisters. The rivers drain approximately 148.4 km², or 86.6% of the Katlian Bay watershed, including high mountain snow fields that provide a constant source of fresh water into the bay. The deepest part of the bay is a 177 m depression (mean lower low water) located a short distance in from the sill (Fig. 2). Depth down the center of the basin is about 143 m, sloping gradually upwards on each side to about 121 m before rapidly ascending

[1]Cedar Cove, Coxe River, Katlian River, Adobe Point, and Derby Point are names of locations taken from nautical and geological survey charts (Fig. 2). All the other names were created for this report.

the sides of the bay. The rise is more gradual at the head of the bay. During the original 1967-68 study, basin sediment was mostly soft with transitions from areas of sand to locations with mud. A section of sticky clay was encountered near the center of the bay at a depth somewhere between 154 and 91 m.

Shorelines on both sides of the bay, along the southwest side of Outer Cedar Cove and on both islands in the cove, consist of steep solid rock promontories and beaches with boulders, cobbles, pebbles, and sand. Some shallow subtidal areas supported broad-bladed kelp *(Laminaria* sp.*).* Rock surfaces in the intertidal area supported barnacles *(Balanus* spp. and *Chthamalus dalli*), rockweed *(Fucus gardneri)*, and sea felt *(Pilayella littoralis)*. Boulders in the mostly shaded locations of the south side of Katlian Bay were covered with unidentified green algae. Landslide rubble was found in the vicinity of First Falls Creek. Runoff from precipitation enters the sides of the bay from the bordering hillsides, which cover 9.7 km² on the south side and 4.8 km² on the north side, and also from Lisianski Creek, which drains 2.3 km² of Lisianski Peninsula.

The north side of Outer Cedar Cove was a protected beach of rock rubble over muddy sand. The slope of this beach is gradual and runs from the mouth of Cedar Cove to Adobe Island. Rockweed and barnacles were on the rocks, and patches of eelgrass *(Zostera marina)* were found in the low intertidal area. The southwest side of Outer Cedar Cove is a sheer rock face and is protected from most of the wind and waves outside of Outer Cedar Cove. It was kept silt-free by tide water passing between it and Derby Island destined for Cedar Cove. The sea bed between Derby Island and this rock face is smooth and trawlable and slopes evenly downward

out of the cove to the main basin. Runoff into Outer Cedar Cove comes from a 4 km² area of the mountain behind the beach and from the 2.2 km² drainage of Cedar Cove Creek.

Cedar Cove is about 0.5 km long and 80 m to 110 m wide and shallow. Rock on both sides of the mouth and a short distance into the cove is also silt free due to tidal currents, but much of this cove was crowded with aquatic flora growing from a mud bottom. The intertidal zone at the head of the bay has cobble-sized rocks in muddy sand that were covered with rockweed, mussels (*Mytilus trossulus*), and barnacles.

Habitat Selection

Locations selected for the surveys were the sill, central basin, sides of bay, and Outer Cedar Cove. Locations not selected were the open water (pelagic), head of the bay, and Cedar Cove.

Fishing Gear Specifications

Sampling gear consisted of six igloo shrimp traps, six larger square shrimp traps, three trammel nets, two longlines, an invertebrate dredge, and a bottom trawl. The igloo traps were commercially available plastic shrimp pots with a base diameter of 56 cm, a height of 23 cm, and a single 14 cm diameter hole in the top of the trap. The larger shrimp traps, called cube traps, were 76 cm square and made of welded 1-cm diameter re-enforcing rod with a 7.6-cm diameter opening located in the center of each of the four side panels. Both kinds of traps were covered with 6 mm knotless nylon web to retain small fish and invertebrates. Frozen herring was used for bait in all traps.

Trammel nets were 91.3 m long by 1.8 m deep. Mesh size of the wall (middle panel) was 24.13 cm² and made of No. 9 nylon twine. Mesh size of the two side panels was 2.54 cm² and made of No. 208 nylon twine. One net was fished on the surface, and the other two were weighted to fish on the bottom. Each longline used two hook sizes, a #4 and a larger 4/0. Fifty hooks of each size alternated for a total of 100 hooks per line. Gangions were 38 cm long and tied to longline snaps. Groundlines were 3.2 mm diameter braided nylon and 91 m long with hooks 91 cm apart. Bait was frozen octopus and herring.

The dredge consisted of a heavy mesh net attached to an iron sled. Mouth size of the net was 0.6 m high and 1.4 m wide. The net's sides and top attached directly to the sled, but the net bottom dragged behind the sled with a 2.6 m long ground line weighted with heavy chain. Mesh size of the net was 2.5 cm² of No. 120 tarred nylon twine, and the net bottom was protected by a heavy nylon skirt. Sled runners were heavy gauge steel and 30 cm wide. Chain bridles led to a single tow cable from the vessel.

The bottom trawl's overall length was 4.88 m, the body was 3.2 m, mesh size was 1.6 cm², and the cod end was 1.68 m long with mesh size of 2.22 cm² throughout. The last half of the cod end was lined with 6-mm knotless nylon web. Length of the foot rope was 3.35 m, the head rope was 2.74 m, and net height was 0.46 m. Head and foot ropes extended beyond the web 61 cm to attach to the back of the doors. Their height separation on the doors was 24 cm. Doors were made of wood, had steel runners, and were 61 cm long by 27.9 cm high. Bridles that were 4.57 m long connected the doors to a single warp line from the vessel. The bottom trawl and dredge were pulled using the RV *Murre II*, a 26.2-m long power barge. An 8.2-m skiff was used to set and retrieve the longlines, trammel nets, and traps.

In lieu of fishing gear, intertidal fish and invertebrates were also collected by hand from locations all around the bay. These collections included thoroughly examined 1 m² random plots. Invertebrates from these random plots are thoroughly covered by Wing (1978). All fish collected by what ever method in Katlian Bay were identified to species level. Not all invertebrates were identified to species level.

Survey Methods

Sampling occurred in Katlian Bay during 18-22 April, 18-22 July, and 28 September-2 October 1967, and 30 March-3 April 1968. On each trip, locations of each type of fishing gear and fishing effort were repeated. Traps and trammel nets were fished for two consecutive days in Outer Cedar Cove and then moved to the main part of the bay and fished there for two consecutive days. Longlines were set only in the main bay and fished for 2 days. Duration of bottom trawl tows averaged 24 minutes. Tows were in two locations: 6 in mid-bay between Borrow Pit Cove and Outer Cedar Cove and 10 from mid-bay to the head of the bay (Fig. 2). An additional mid-bay tow went from Borrow Pit Cove in the direction of the sill and ended off Ridge Point. These 17 tows covered the width of the basin in these locations. During the first April 1967 survey, the bottom trawl was towed three times up the side of the bay from the basin and into Outer Cedar Cove. Though successful, these tows were not repeated on other trips to Katlian Bay. Also, during the April 1967 survey, the dredge was dragged on the sill at a distance of 183 m from the northwest point (Fig. 2). Depth at the location and time of the drag was 53 m. Use of the dredge was discontinued because of mechanical difficulties and no other sampling occurred on the sill.

Igloo and cube traps were paired to fish near each other. Igloo traps were set at depths between 0.5 m and 2.0 m below the prevailing low tide and were submerged up to 5 m during high tides. Depths for the cube traps ranged from 18 m to 27 m. Trammel nets and longlines were set perpendicular to shore with one end tied to or anchored close to shore. In Outer Cedar Cove, three igloo traps were set on the north side in the area with eelgrass and three on the southwest side, each with a cube trap nearby in deeper water (Fig. 2). Also on the southwest side, the surface trammel net was set near the mouth of Cedar Cove, and down the shore a weighted trammel net was set descending the steep slope from 18 m to 72 m. The other weighted trammel net was set off the northwest point of Adobe Island, at a depth of 9 m to 14 m.

In the main part of the bay, igloo traps were set mostly in locations with pebbles, sand, and often near *Laminaria*. Substrate in the upper slope for cube traps, trammel nets, and longlines was rock, either all or in part. The surface trammel net was set on the point outside Boot Cove and a weighted trammel net was set from 18 m to 49 m deep off a point in the middle of Little Island Cove (Fig. 2). The other weighted trammel net was set on the south shore, about 822 m in from the mouth of the bay, and fished the slope at depths between 7 m and 54 m. A longline was set next to the trammel net on the south side of Katlian Bay with the depth from 7 m to 90 m, and another longline was set off the south tip of Adobe Island from 27 to 90 m (Fig. 2).

Bottom trawling depths in the basin varied between 91 m and 183 m, averaging 137 m. Two tows up the slope into Outer Cedar Cove were between depths of 123 m and 48 m and 77 m and 44 m. One tow out of the cove went from a depth of 37 m to 95 m.

Fishing Records

Traps, trammel nets, and longlines were fished overnight. Fishing records for each piece of gear included location, hours fished, depth of gear at beginning and end of set, and catch. Depth data for trammel nets and longlines included depth at the shallow and deep ends. Time and depth were recorded at the beginning and end of each bottom trawl tow. Duration of the 17 tows in the basin varied between 11 and 65 (avg. 23.8) minutes. Duration of the three tows on the slope into Outer Cedar Cove were 7, 12, and 10 minutes.

Fish lengths, measured in millimeters from the tip of the snout to center of the caudal fin, were either fork length or total length depending upon the shape of the tail. Skates were measured to the end of the tail. Measurements for invertebrates included crab carapace width, sea star arm width, sea urchin shell diameter, and total length for sea cucumbers and snails. Gonad development for species examined were labeled immature (juvenile), mature (adult), or ripe (adults in spawning condition). Total numbers of shrimp in bottom trawl tows were estimated from random subsamples.

RESULTS

Habitat Locations and Associated Fauna

Fifty-nine fish species and more than 44 invertebrate species were captured in Katlian Bay. Thirty-two invertebrates were identified to species while the others were identified only to higher taxonomic classifications. Many species occupied a single habitat while others overlapped into adjacent habitats. A few could be found throughout much of the bay.

Fish found only on the sill were slim sculpin (*Radulinus asprellus*), spinycheek starsnout (*Bathyagonus infraspinatus*), pygmy poacher (*Odontopyxis trispinosa*), and a juvenile Dover sole (*Microstomus pacificus*) (Table 1). A fifth fish, gray starsnout *(Bathyagonus alascanus),* was found on the sill and in the basin. Invertebrate data for the sill were not recorded.

Five intertidal fish species were collected during the surveys. Crescent gunnel (*Pholis laeta*), high cockscomb (*Anoplarchus purpurescens*), and black prickleback (*Xiphister atropurpureus*) were found under rocks, while tidepool sculpin (*Oligocottus maculosus*) and scalyhead sculpin (*Artedius harringtoni*) were located in tide pools (Table 1). Crescent gunnel were in the rock rubble on the north side of Outer Cedar Cove. High cockscomb was the most numerous intertidal fish species and was found on all beaches. Black prickleback were in the rock areas along the sides of the bay.

Major fauna along the steep sides between low intertidal and 5 m depth were sunflower stars (*Pycnopodia helianthoides*) and Gastropoda. Two Oregon triton *(Fusitriton oregonensis*) were collected below 5 m depth; otherwise, this species and all other snails were caught in the shallow zone less than 5 m depth (Table 1). Dire whelk (*Lirabuccinum dirum*) and 11 snails thought to be *Colus* sp. (c f. *halli*) were collected. These three species are predators on other invertebrates. Some snails (131+) were not identified, but may have included dire whelk, Arctic moonsnail (*Cryptonatica affinis*), file dogwinkle (*Nucella lima*), and wrinkled amphissa (*Amphissa columbiana*). These four species frequent rocky areas and are predators and scavengers on dead algae and animals (O'Clair and O'Clair 1998).

Masked greenling (*Hexagrammos octogrammus*), which inhabit shallow rock areas (Eschmeyer et al. 1983) were the only demersal fish found exclusively along shallow rock

shorelines (Table 1). Most Pacific staghorn sculpin (*Leptocottus armatus*) were found in less than 5 m depth, but some were deeper. Nine other demersal species were also present near the surface, but were more numerous at greater depths along the sides of the bay. Pacific herring, one Dolly Varden (*Salvelinus malma*), and Scyphozoa were present near the surface.

Three fish and seven invertebrate species were collected in the eelgrass on the north side of Outer Cedar Cove (Table 1). Pacific staghorn sculpin are a shallow water species and 79% of those captured were in the cove, 45% were in the grass, and 34% were adjacent to it. One Pacific tomcod (*Microgadus proximus*) and a small red Irish lord (*Hemilepidotus hemilepidotus*) were also in the eelgrass. These three fish were also collected on the sides of the bay below 5 m depth. Invertebrates in the eel grass were 2 Dungeness crab (*Cancer magister*), 15 red rock crab (*C. productus*), 2 graceful crab (*C. gracilis*), 4 pygmy rock crab (*C. oregonensis*), 2 helmet crab (*Telmessus cheiragonus*), a Polychaeta, and 18 sunflower stars.

Outer Cedar Cove was the primary location for the four *Cancer* crab species. Carapace width of the two male Dungeness in the eelgrass was 102 and 104 mm, which is the size at transformation from juvenile to adult (O'Clair and O'Clair 1998). One 80 mm immature male and four males 104-125 (avg. 116) mm were near the eelgrass below 5 m depth. On the cove's south side, also below 5 m depth, was a 67 mm immature male, a 193 mm adult male, and two adult females, 143 and 155 mm. The smaller female was gravid. Four adult male Dungeness crab were collected in the basin. Twenty-one red rock crab were captured in the cove: 15 in the eelgrass, 2 near the eelgrass, and 4 in shallow shoreline water on the southwest shore of the cove. Four additional rock crab were taken in shallow water in the main part of the bay (Table 1).

Graceful crab were collected at depths between 2 m and 22 m. Five were in the cove, two were in the eelgrass, one was nearby at 9 m to 14 m depth, and two were at 18 m depth on the south side of the cove. Another two, in the main part of the bay, were at 2 m and 22 m depth. Distribution covered three of the habitats in Table 1. Pygmy rock crab were collected in the cove - four in eelgrass and one close by. Two helmet crab were caught in the eelgrass, and the third specimen was in igloo trap 6 on the opposite side of the bay.

Thirty-nine fish and 23 invertebrate species were collected on the sides of the bay below 5 m depth (Table 1). Of these species, this habitat was the primary location for 29 fish and 14 invertebrates. Fish included big skate (*Raja binoculata*), Pacific cod (*Gadus macrocephalus*), Pacific tomcod, wattled eelpout (*Lycodes palearis*), searcher (*Bathymaster signatus*), northern ronquil (*Ronquilus jordani*), decorated warbonnet (*Chirolophis decoratus*), snake prickleback (*Lumpenus sagitta*), 12 rockfish species (*Sebastes*), sablefish (*Anoplopoma fimbria*), kelp greenling (*Hexagrammos decagrammus*), lingcod (*Ophiodon elongatus*), red Irish lord, great sculpin (*Myoxocephalus polyacanthocephalus*), Pacific halibut, starry flounder (*Platichthys stellatus*), yellowfin sole (*Limanda aspera*), and rock sole (*Lepidopsetta bilineata*). The 14 invertebrate taxa were scallops (*Chlamys rubida* and *C. hastata*), ocean shrimp (*Pandalus jordani*), sidestripe shrimp (*Pandalopsis dispar*), ridged crangon (*Crangon dalli*), split eye argid (*Argis ovifer*), scaled crab (*Placetron wosnessenskii*), Pacific lyre crab (*Hyas lyratus*), an unidentified Asteroidea, horny sea star (*Orthasterias koehleri*), spiny starfish (*Stylasterias forreri*), sun star (*Solaster* sp.), rose star (*Crossaster papposus*), and most of the sunflower star (*Pycnopodia helianthoides*).

Species caught on the slope leading into Outer Cedar Cove by bottom trawling were shortfin eelpout (*Lycodes brevipes*), wattled eelpout, longsnout prickleback (*Lumpenella longirostris*), snake prickleback, great sculpin, blackfin poacher (*Bathyagonus nigripinis*), slender sole (*Eopsetta exilis*), flathead sole (*Hippoglossoides elassodon*), yellowfin sole, rock sole, English sole (*Parophrys vetulus*), scallop, pink shrimp (*Pandalus eous*), ocean shrimp, spot shrimp (*Pandalus platyceros*), sidestripe shrimp, ridged crangon, and split eye argid (Table 1). Thirty-four percent of the yellowfin sole were also caught on this slope.

Small numbers of Pacific cod, Pacific tomcod, copper rockfish (*Sebastes caurinus*), red Irish lord, and great sculpin were also located in the shallow 0-5 m depth zone. Nearly one-quarter of the black rockfish (*S. melanops*) and 20% of the sablefish were collected at the surface. Sablefish, yellowtail rockfish (*S. flavidus*), and a widow rockfish (*S. entomelas*) were also captured in the basin during the spring surveys. Juvenile sablefish (Haight 1981) and yellowtail rockfish (Carlson and Barr 1977) descend during the winter and are near the surface during other seasons.

Twenty-three fish and 15 invertebrate species were collected in the main basin in Katlian Bay (Table 1). This area was the primary home range of 14 fish and 10 or more invertebrates. Fish included shortfin eelpout, blackbelly eelpout (*Lycodopsis pacifica*), longsnout prickleback, whitebarred prickleback (*Poroclinus rothrocki*), dwarf wrymouth (*Lyconectes aleutensis*), rougheye rockfish (*Sebastes aleutianus*), Pacific ocean perch (*S. alutus*), spinyhead sculpin (*Dasycottus setiger*), blackfin poacher, slender sole, rex sole (*Glyptocephalus zachirus*), flathead sole, butter sole *(Isopsetta isolepis)*, and English sole. Invertebrates included *Colus jordani* and

other snails[2], pink shrimp, coonstripe shrimp *(Pandalus hypsinotus*), spot shrimp, unidentified Crangonidae and Hippolytidae, Tanner crab (*Chionoecetes bairdi*), green sea urchin (*Strongylocentrotus droebachiensis*), California sea cucumber *(Parastichopus californicus),* and an unidentified sea cucumber (possibly *Cucumaria* sp.). Specimens also distributed on the slope below Outer Cedar Cove were shortfin eelpout, longsnout prickleback, blackfin poacher, slender sole, flathead sole, English sole, pink shrimp, and spot shrimp (Table 1). Some flathead sole were also distributed elsewhere on the sides of the bay.

Specimens common to the basin and the sides of the bay were walleye pollock (*Theragra chalcogramma*), arrowtooth flounder (*Atheresthes stomias*), graceful decorator crab (*Oregonia gracilis*), Dungeness crab, and an Asteroidea *(Leptychaster* sp.) (Table 1).

Catch by Gear Type

Fishing gear used during these surveys varied in ability to capture fauna. The differences between trammel nets and longlines fished almost side-by-side were particularly notable. The small bottom trawl that we used was not very effective. Later surveys with larger nets demonstrated that catch amounts, fish size, and species numbers were significantly increased.

Fish caught exclusively with the bottom trawl were shortfin eelpout, wattled eelpout, blackbelly eelpout, longsnout prickleback, snake prickleback, whitebarred prickleback, dwarf wrymouth, rougheye rockfish, Pacific ocean perch, spinyhead sculpin, blackfin poacher, slender sole, rex sole, butter sole, and English sole (Table 2). Invertebrates included Tanner crab, green

[2]*Colus halli* is common in trawl catches throughout southeastern Alaska (Carlson et al. 1982)

urchin, California sea cucumber, and seven shrimp taxa: pink, ocean, coonstripe, sidestripe, Crangonidae including *Crangon dalli* and *Argis ovifer*, and Hippolytidae. Gray starsnout were taken in a bottom trawl and in the dredge (Table 2). The dredge also captured pygmy poacher, spinycheek starsnout, slim sculpin, and Dover sole.

Most flathead sole and arrowtooth flounder were caught with the bottom trawl; 80% of flathead sole were in the deep basin and 10% were on the slope into Outer Cedar Cove (Table 2). The remainder were on the sides of the bay, with eight caught on longlines, one in a cube trap, and one in a surface trammel net. Trawling netted 71% of the arrowtooth flounder, 26% were in trammel nets, and 3% were caught on a longline. Four of five spot shrimp were taken in the bottom trawl and one entered a cube trap.

Almost one-half (49%) of the walleye pollock were caught with a bottom trawl in the basin, and 41% were taken with the weighted trammel nets and longlines. Cube traps caught three pollock and one individual was caught in a surface trammel net. Bottom trawl tows on the side of the bay into Outer Cedar Cove were done only in April 1967, so comparisons of fauna in this location between surveys were not possible. During these trawls, 34% of all the yellowfin sole for the entire four trips were collected, but it isn't known if this species was present in this area all year or only during the winter and early spring. Most yellowfin sole were caught with longlines (42%) and weighted trammel nets (18%). One yellowfin sole was in a cube trap and another was caught with the bottom trawl in the basin (Table 2). Igloo traps captured staghorn sculpin, masked greenling, helmet crab, red rock crab, pygmy rock crab, sunflower star, and snails including Oregon triton.

Capture by cube traps, weighted trammel nets, and longlines collectively provided broader age classes of some fish species, such as Pacific cod, decorated warbonnet, copper rockfish, and kelp greenling (Table 2). Cube traps also captured scallops, scaled crab, Pacific lyre crab, graceful crab, and Asteroidea. Scallops were resting on the top of the traps, not inside.

Weighted trammel nets were most effective at capturing dusky rockfish (*Sebastes ciliatus*), yellowtail rockfish, black rockfish, juvenile sablefish, red Irish lord, Dungeness crab, and a China rockfish (*S. nebulosus*). Longlines caught more quillback rockfish (*S. maliger*), canary rockfish (*S. pinniger*), redstripe rockfish (*S. proriger*), yelloweye rockfish (*S. ruberrimus*), bocaccio (*S. paucispinis*), and searcher. Widow rockfish were equally susceptible to weighted trammel nets and longlines.

Surface trammel nets captured Pacific herring, Dolly Varden, some black rockfish, juvenile sablefish, and Scyphozoa (Table 2). They also captured a walleye pollock, masked greenling, two staghorn sculpin, and a flathead sole.

Graceful decorator crab and Dungeness crab were distributed from the subtidal zone to the bottom of the bay and were caught in igloo and cube traps, trammel nets, and bottom trawls. Four adult male Dungeness crab were caught in the basin with the bottom trawl and eight, consisting of juveniles and adults, were collected in trammel nets. Maximum carapace width for Dungeness capable of passing through the 14-cm diameter hole in the top of the igloo traps was estimated as 170 mm provided they entered the trap sideways, but the largest crab was 104 mm. Openings of 7.6 cm diameter in the cube traps limited crab width to about 96 mm.

Kinds of Residency in Katlian Bay

Resident fauna in the bay include: transient, seasonal, full-time, and resident only as a juvenile. Fauna whose resident status was not clearly evident or was not known are listed under *Probable Resident Status* in Table 3.

Transient species

Anadromous salmon, trout, and char emigrate from their natal streams as smolts and return as adults to spawn. Pink salmon and coho salmon spawn in all six Katlian Bay streams (ADF&G, 1989), while chum salmon are listed for every stream except the Coxe River. Dolly Varden occur in the Coxe, Katlian, and South Katlian-Sisters rivers. However, only one salmonid was collected during these surveys - - an adult Dolly Varden taken in Outer Cedar Cove in the spring of 1968 (Table 3).

Seasonal resident species

Adult Pacific herring and adult Pacific halibut are seasonal residents. Pacific herring migrate seasonally within their home range from summer foraging grounds to wintering areas. In spring they move to spawning grounds and then disperse to summer feeding areas (Dudnik and Usol'tsev 1964, Carlson 1980). Some Sitka Sound herring winter in Katlian Bay (Blankenbeckler and Larson 1982b), but typically leave the bay in April to spawn in Sitka Sound (Blankenbeckler and Larson 1982a).[3] After spawning, these herring disperse widely during the summer (Carlson 1977), although some remain in and near Katlian Bay. Herring were seen

[3]Herring eggs were tentatively identified from intertidal quadrate samples (Wing 1978).

during each survey (Table 3), and both ripe and spent specimens were in the bay during spring, but no spawning was observed there.

One adult female Pacific halibut and two juvenile males, ages about 4 and 5, were captured in Outer Cedar Cove during the fall survey (Table 3). Adult Pacific halibut migrate beyond the continental slope to spawn. Recent studies indicate that adults return to the same inshore locations (Hooge et al. 2002). Large halibut were more likely to show site fidelity to one area and maintain that fidelity throughout a season and between years. Size of these inshore locations were nearly all less than 0.9 km². One 92-cm halibut displaced 12 km from its home site returned within three days to within 100 m of where it was captured. Smaller halibut display less affinity to a single home site and are more likely to go on forays or to move between two or more areas. Presumably, the adult female in Katlian Bay had established a home site and seasonally left the bay to spawn. Juvenile halibut under age 7 individually migrate along the coast until apparently reaching some appropriate location (IPHC 1978). Katlian Bay may not have been the final destination of the two juveniles.

Full-time residents

Full-time residents are categorized as adult fauna who apparently live entirely inside the bay. Movement in the bay is species-dependant. Some animals restrict themselves to a home site with limited seasonal movement while other species may use a broad area of the bay. Eggs or larvae may drift into or out of the bay, and not all juveniles are offspring of resident adults. Some juvenile fish may leave the bay as they mature.

Fish - - Among the 21 fish species that we listed as full-time residents, 16 appeared in the bay as juveniles, adults, and adult spawners. These were walleye pollock, searcher, longsnout prickleback, high cockscomb prickleback, copper rockfish, quillback rockfish, kelp greenling, red Irish lord, spinyhead sculpin, great sculpin, Pacific staghorn sculpin, arrowtooth flounder, slender sole, flathead sole, yellowfin sole, and rock sole (Table 3). Inclusion of arrowtooth flounder is based on the presence of one spent female. Some Pleuronectidae migrate seasonally to spawn, the migration distances varying from short to several kilometers depending upon population and location. Should future studies determine that arrowtooth flounder migrate out of the bay, their residence in the bay would be classified seasonal rather than full time.

Shortfin eelpout are listed as full-time residents due to the presence of juveniles and adults in the bay (Table 3). A juvenile wattled eelpout and four adult blackbelly eelpout are probably also full-time residents. Common characteristics among demersal Zoarcidae are nest building (Anderson 1984), low fecundity and large eggs (Hart 1973), guarding the eggs (Matarese et al. 1989), and perhaps also guarding the young (Hart 1973). Fecundity of blackbelly eelpout is 7-52 eggs and egg diameter of wattled eelpout is 7 mm (Hart 1973), features that fit this reproductive mode. Newly hatched larvae are quite advanced and strongly resemble adults and it is believed larvae become demersal or semi-demersal soon after hatching (Matarese et al. 1989). Accelerated development such as this could keep related juveniles and adults in the same estuary.

Two Agonidae, gray starsnout and blackfin poacher, were considered full-time residents, because juveniles and adults were present (Table 3) and because Agonidae biology points to a mostly sedentary existence in specific habitats. Juvenile and adult poachers are demersal.

Species habitats differ and vary widely from soft bottom areas, rocky areas, kelp beds, eel grass, or intertidal (Mecklenberg et al. 2002). Both of these poachers are found on sand or mud bottoms. Those adult blackfin poacher with lengths between 171 and 242 mm ranged in age from 5 to 9 years (Tokranov 2000).

Area of home range for masked greenling is several hundred square meters (Gomelyuk and Leunov 1999) and for tidepool sculpin one or more tidepools (Green 1971,Yoshiyama et al. 1992, Craik 1981). Size of their home ranges indicates that both species are full-time residents.

Invertebrates - - All invertebrates were considered full-time residents based upon their limited mobility within such a large bay and because of behaviors that allow them to remain in suitable habitats. Homing behavior and clustering are very common in intertidal molluscs (Focardi et al. 1985), and limpets fleeing from starfish will eventually return to their home site (Iwasaki 1993). Many marine invertebrate larvae settle and remain in suitable habitats (Enright 1978).

Scyphomedusae *(Cyanea capillata* and *Chrysaora* sp.*)* were included as full-time residents even though they are pelagic. Hundreds were captured in the surface trammel net in July and all were captured in Outer Cedar Cove (Table 3). Such a restricted distribution suggests they were produced by local demersal scyphistoma.

Pink shrimp were numerous, indicating good habitat for this species (Table 3). Substantial numbers of unidentified Crangonidae and Hippolytidae were also present. Nine species of crab were present in the bay (Table 3). Three species with both adults and juveniles were Dungeness, Tanner, and red rock crab. Adult male and female graceful crab were also

collected. Several size classes of Asteroidea and California sea cucumber, indicated multiple generations resident in the bay.

Probable resident status - Fish only

Twenty-four species did not fit clearly into resident groups. Available knowledge on each species or closely related species was used to decide what their resident status might be. Seventeen were considered full-time residents. Of the remaining seven, one was probably a resident only as a juvenile, two were either seasonal or full-time residents, and the status of four (big skate, slim sculpin, Dover sole, and rex sole) was not determined.

The sex of the two big skate captured was not recorded. Male big skate mature near 109 cm TL and females at 130.0 cm TL (Zeiner and Wolf 1993). The smaller skate was 82.5 cm (Table 3), so was likely a juvenile. The larger 102.0-cm specimen, if female, was perhaps a juvenile or maturing, and if a male, was maturing or mature. Information on the seasonal distribution of big skate was not available.

Dover sole and rex sole occur on the shelf in the eastern Gulf of Alaska (Derrah 1990) and both species use the continental shelf and upper slope as a nursery area during early benthic life (Pearcy et al. 1977). Adult and juvenile rex sole and Dover sole are also found throughout the inside waters of southeastern Alaska (Carlson et al. 1982), though few juvenile Dover sole are collected.

Male rex sole attain 100% maturity at 210 mm, and for females, at about 300 mm (Hosie and Horton 1977). Six rex sole captured included one 125-mm juvenile, two mature males (242 and 237 mm), two questionable females (279 and 242 mm), and an unsexed 280-mm specimen.

The largest fish were perhaps one year into maturity. Absence of large adults in the bay suggests that Dover sole and rex sole may emigrate into Sitka Sound or out to the continental shelf. Specific life history information and distribution of slim sculpin in southeastern Alaska were not available.

Nine adult female Pacific cod were caught (Table 3) - one in April, near the peak spawning period, and eight in July and September. Pacific cod migrate to their spawning grounds (Matarese et al. 1989). Atlantic cod *(Gadus morhua*) migrate seasonally from a few kilometers to more than 100 km (Robichaud and Rose 2001) to the same spawning location (Gude 1984). We have collected male Pacific cod with flowing milt and ripe or spent females elsewhere in southeastern Alaska, indicating local spawning, but if Katlian Bay Pacific cod spawn outside of the bay, they would be classified as seasonal rather than full-time residents. Seasonal migrations to spawning grounds have not been described for Pacific tomcod (Matarese et al. 1989), but the presence, only during a spring survey, of two ripe males and another adult suggests tomcod are seasonal migrants.

Species considered full-time residents include those in the families Zoarcidae, Bathymasteridae, Stichaeidae, Pholididae, Hexagrammidae, and Cottidae; adults of these species guard demersal eggs and are territorial. Some species of Stichaeidae, Hexagrammidae, and Cottidae possess home sites and will return to these sites if physically displaced.

The one northern ronquil captured was probably inside its home range. Northern ronquil usually inhabit rocky areas (Eschmeyer et al. 1983) as do Alaskan ronquil (*Bathymaster caeruleofasciatus).* Alaskan ronquil establish territories around their home crevice, from which they rarely move, and which they will aggressively defend (Rosenthal 1978). Male *Rathbunella*

hypoplecta, a ronquil found in California, guard their eggs (Matarese et al. 1989). These family behaviors demonstrate site fidelity within a small home range.

Longsnout prickleback and high cockscomb collections confirmed multiple generations, and reproduction occurring in the bay (Table 3). Four other Stichaeidae: decorated warbonnet, snake prickleback, whitebarred prickleback, black prickleback; and one Pholididae, crescent gunnel, were represented by one to four adults but are probably also full-time residents. Radiated shanny (*Ulvaria subbifurcata*) are Stichaeidae that establish home ranges of at least 3 m^2, and when displaced, will return to their home site from at least 270 m away (Green and Fisher 1977). Males acquire eggs in their territory, which they guard after fertilization (Green et al. 1987). The snake blenny (*Lumpenus lampretaeformis*) maintains burrows (Nash 1980) believed used for parental care of the eggs (Gordon and Duncan 1979). Parent black prickleback, high cockscomb, and crescent gunnel also guard their eggs. These behaviors indicate home territories during egg incubation, but their nest sites may also be within a larger individual home range.

One scalyhead sculpin collected (Table 3) was probably taken from its home range. Three intertidal cottids *(Oligocottus maculosus*, *O. snydri*, and *Clinocottus globiceps*) have home sites in tidepools they return to when displaced (Green 1971, Yoshiyama et al. 1992, Craik 1981). Similarities of small size, environment, and protecting demersal eggs suggests scalyhead sculpin also possess home sites.

One adult-sized dwarf wrymouth was captured (Table 3) and was probably a full-time resident. They are relatively small, up to 270 mm in length, and reportedly live partly buried on the bottom (Hart 1973). They deposit demersal eggs and are not reported to migrate to a

spawning location (Matarese et al. 1989). One adult-sized pygmy poacher and a juvenile or maturing spinycheek starsnout were captured on the sill, which constitutes a boundary between the bay and Sitka Sound, so residency of these two poachers is unclear.

Evidence is strong that adult China and yelloweye rockfish are permanent bay residents and that they, like other nearshore rockfish studied, have home sites. Five rockfish species that have home sites and possess the ability to home if displaced are adult copper, quillback, yellowtail, black-and-yellow (*Sebastes chrysomelas*), and eastern sea-perch *(S. taczanowski*) (Mathews and Barker 1983, Matthews 1990, Carlson and Haight 1972, Pearcy 1992, Markevich 1988, Hallacher 1984). Homing is much stronger in locations of high relief than in areas of low relief (Pearcy 1992).

Adult China rockfish behavior displays all the signs of possessing a home site. They are usually solitary and occupy microhabitats among rocky outcrops, pinnacles, and boulder fields in shallow water (Rosenthal 1978). They are territorial (Eschmeyer et al. 1983) and rarely venture farther than 2 m from the protection of their crevice (Hart 1973, Rosenthal 1978). Black-and-yellow rockfish are also territorial and return to their home site when displaced (Hallacher 1984).

Yelloweye rockfish inhabit complex rocky habitats and are more abundant in areas with refuge spaces such as caves, large cracks, overhangs, or boulder fields (O'Connell et al. 1998). The limited number of yelloweye rockfish in the bay may directly reflect limited appropriate habitat. The nine taken were adults. Their size range, 376 to 745 (avg. 549) mm, covered several year classes. The two smallest, at 376 and 387 mm, were estimated as age 11 (O'Connell and Funk 1986). The two largest, at 698 and 745 mm, were females with developing eggs. The

age spread of yelloweye rockfish at sizes near 698 mm is from age 45 to 100. Specimens 745 mm are estimated somewhere between age 64 to 115.

Silvergray rockfish (*Sebastes brevispinis*) in Katlian Bay may eventually recruit to coastal locations. They are one of the largest of the rockfish, reaching lengths of 710 mm and age 70 years (Stanley 1986). Six silvergray rockfish were collected in the bay. The smallest specimen, at 346 mm, was a juvenile and less than age 9. The other five, with lengths between 467 and 483 mm, were age 10 or older, probably between ages 14 and 17. At these sizes, 9% to 21% of the fish have recruited to offshore stocks. Because no larger adult sizes were captured, it appears likely that Katlian Bay is a rearing area for this species.

One starry flounder, one butter sole, and four English sole, all adults, were considered full-time residents of the bay. English sole, yellowfin sole, and other flatfish migrate to their spawning grounds (Matarese et al. 1989). We have observed for several years the same seasonal movements of starry flounder in Stephens Passage, near Juneau, Alaska, to and from the same wintering and summer areas and conclude that all flatfish species move seasonally within their particular home ranges. These three species may have their home ranges entirely within the bay.

Residents only as juveniles

Juveniles of 11 offshore and coastal fish rear in Katlian Bay. The fish were rougheye rockfish, Pacific ocean perch, dusky rockfish, widow rockfish, yellowtail rockfish, black rockfish, bocaccio, canary rockfish, redstripe rockfish, sablefish, and lingcod (Table 4). Adult lingcod establish territories and home ranges (Matthews 1992) in shallow water along the outer coast of southeastern Alaska (Alverson et al. 1964, O'Connell 1993) and adult yellowtail

rockfish and bocaccio are situated over coastal reefs and pinnacles (Carlson and Straty 1981, Kramer and O'Connell 1986). Yellowtail rockfish are occasionally found in the inside waters of southeastern Alaska (Carlson 1986). Adults of the other eight species inhabit the continental shelf and slope (Allen and Smith 1988, Alverson et al. 1964, and Kendall and Matarese 1987). All 11 species spawn offshore. Larvae and pelagic juveniles are described by Matarese et al. (1989) except for dusky rockfish.[4]

Pelagic-young-of-the-year rockfish and lingcod become demersal near shore. Data on location, depth, substrate, and size for Pacific ocean perch, widow rockfish, yellowtail rockfish, black rockfish, China rockfish, quillback rockfish, dusky rockfish, canary rockfish, bocaccio, and lingcod have been provided by Laroche and Richardson (1980, 1981), Phillips (1964), Carlson and Straty (1981), Gascon and Miller (1982), Love et al. (1991), Moser (1967), and Cass et al. (1990). Young-of-the-year sablefish are pelagic and begin to arrive near shore in July and August (Mason et al. 1982, Kendall and Matarese 1987). Juveniles of all 11 species occur in the inside waters and coastal estuaries of southeastern Alaska (Carlson et al. 1982, Carlson and Haight 1976, Rutecki and Varosi 1997).

Juvenile sablefish in the bay came from the 1966 and 1967 year classes. Over the course of the four surveys, young-of-the-year and age-2 specimens were collected (Table 4). Age 2 fish in July are between 390 mm and 480 mm (Rutecki and Varosi 1997). A 455-mm female captured in July was the largest sablefish collected. Maturity begins at lengths above 460 mm for males and above 490 mm for females (Phillips 1954), so this specimen was one or more years

[4]Taxonomy of *Sebastes ciliatus*, light dusky rockfish and a new species, *Sebastes* sp. cf. *ciliatus*, dark dusky rockfish (Orr et al, 2000) must be cleared up before larvae and juveniles are described and life histories differentiated.

from maturity. Males reach 50% maturity near 524 mm at age 5, and females near 557 mm at age 6 (Mason et al. 1982).

Juvenile lingcod are found in coastal estuaries from the time they become demersal, near 80 mm (Phillips and Barraclough 1977), until they become sexually mature and move into adult coastal habitats (Cass et al. 1990). Maturity begins in males at age 2 and length near 330 mm. Females are age 3 and their length about 450 mm. The gonads of the 372 mm specimen captured were not examined. If it was a male, its gonads were at or close to maturation. If a female, onset of maturation was one or more years away.

All rougheye rockfish, bocaccio, and redstripe rockfish collected were juveniles. Though still juveniles, some Pacific ocean perch, widow rockfish, yellowtail rockfish, black rockfish, and canary rockfish were at size ranges when maturity can occur. Six rougheye rockfish were caught, with the smallest being 110 mm and about age 2, and the other five ranging from 223 mm to 248 mm (avg. 237 mm) and ages 3 to about age 5 (Table 4). Mean length at 50% maturity is 430 mm for males and 450 mm for females (Westrheim 1975). The 248-mm specimen was estimated to be 1 or 2 years away from the onset of maturity.

Sexual maturation of Pacific ocean perch in southeastern Alaska begins at age 6 at lengths near 280 mm (Table 4). Estimated ages of the 41 perch caught were age 3 (1), age 4 (2), age 5 (34), age 6 (3), and age 8 (1). Mean length at 50% maturity is 330 mm for males and 340 mm for females. The age 6 and age 8 (318 mm female) fish were within range of becoming mature. The remaining perch, with lengths between 148 mm and 247 mm and ages 3 to 5, were still juveniles.

Lengths and ages at initial maturity for male and female widow rockfish are 310 mm and 290 mm respectively, both age 3 (Table 4), and for yellowtail rockfish 300 mm and 270 mm respectively, both age 4 (Echeverria 1987). Widow rockfish were between ages 1 and 4 and most (69%) were immature. The other third had reached the size of initial maturity. Ages of the yellowtail rockfish were between 2 and 6 years, with the mean age near 3 years. Most had not reached the size and age of initial maturity, a few were about age 4 when maturity can begin, and 2% were ages 5 or 6 when 50% reach maturity.

Maturity begins for male black rockfish at 250 mm, is 50% at 360 mm, and 100% at 430 mm (Table 4). Female maturity begins at 300 mm, is 50% at 410 mm, and 100% at 480 mm (Echeverria 1987). Of the 79 black rockfish collected, 48 had lengths less than 250 mm and were not ready to mature. Gonads of 15 of the largest black rockfish, 9 males and 6 females, were examined. The largest male, at 363 mm, was immature although its length fell within the size range of 50% maturity. Lengths of the other eight males, from 277 to 336 mm and also immature, fell between 12% and 38% of the length range when maturity can begin. The largest fish was a 400-mm female that was also in the 50% maturity size group. Lengths of the other five females were less than 300 mm (271-298 mm) and all were juveniles.

Initial maturity for bocaccio begins at about 356 mm (Phillips 1964), so the 345-mm juvenile male collected in April might have matured later that year. Two canary rockfish, a 326-mm juvenile male and an unsexed 320-mm specimen, both estimated at age 5 (Phillips 1964) had lengths between initial and 50% maturity (Table 4). Three redstripe rockfish with lengths from 197 mm to 225 mm and caught in April, were within the season or one year from attaining lengths when initial maturity begins (Table 4).

DISCUSSION

The fishing gear selected seemed to capture a representative assortment of species in the bay. All gear was also fished inland in Limestone Inlet during this same 1967-68 survey period. Several species were common to both bays, but not necessarily caught in the same ratio. In contrast, other fauna were present in one bay and not the other, and these differences helped to define each bay.

Subsequent bottom trawling, at 25 sites in 14 other coastal estuaries located north and south of Katlian Bay, produced 26 fish and approximately 30 invertebrate species not collected in Katlian Bay (Carlson et al. 1982). In addition, the 13 identified sea stars, gastropods, and other invertebrates likely included species that were collected but not identified in Katlian Bay. Our survey methods possibly did miss some of these fauna. At the same time, some of the species collect in Katlian Bay bottom trawls were absent from trawl catches in the other 14 bays or when present, had dissimilar catch ratios from Katlian Bay and between species.

The clean rock shorelines on both sides of Katlian Bay are indicative of good tidal currents into and out of the bay. Though the northern shore of Outer Cedar Cove is protected by the two islands, the presence of eelgrass, graceful crab, and red rock crab demonstrated that high salinity water moves through this area too. Neither crab can osmoregulate, so they avoid locations of low salinity (O'Clair and O'Clair 1998). Graceful crab are generally absent from estuaries (Jensen 1995).

The single dredge haul on the sill had gravel in it, which indicates tidal currents to a depth of 50 m strong enough to remove silt from the sediment. Typical habitat preference for all five

species caught in the dredge is sand and mud[5] (Kramer et al. 1995, Mecklenburg et al. 2002); however, in this case they were captured on gravel. One dredge sample, though, does not provide an adequate species list or describe habitat on the sill.

Separating captures from the rocky sides of the bay as above and below 5 m depth was done because all three masked greenling, most species of gastropoda, a polychaete, a pandalid shrimp, and all three helmet crab were caught in depths above 5 m (Table 2). Masked greenling are reported in nearshore rocky areas, but to depths as great as 31 m (Mecklenburg et al. 2002). Helmet crab, also, are usually found subtidally, but are also reported to 110 m depth (Jensen 1995). In addition, 8 other fish and 10 invertebrate species were taken above and below 5 m depth. Setting the igloo traps in line down a slope, rather than all in shallow water, might have shown that all of the fauna had vertical distributions to depths greater than 5 m. The igloo traps had a bigger opening than the cube traps and were much easier for some bottom dwelling invertebrates such as gastropods and crab to enter. The cube traps were designed for small fish and epibenthic invertebrates like shrimp, but not necessarily small gastropods.

The total number of species captured at all depths along the rocky shoreline included 34 fish, and 24 to perhaps 28 invertebrates. Excluding Pacific herring, a Dolly Varden, and two species of Scyphomedusae, the remaining species are considered demersal. Half (29) of these species are associated with rock habitat. The fish included northern ronquil, decorated warbonnet, 12 rockfish species, kelp and masked greenling, lingcod, and red Irish lord (Mecklenburg et al. 2002). Invertebrates included snails *(Colus* sp.), Dire whelk, hairy triton, and other unidentified snails. Also, spiny scallop *(Chlamys hastata)*, spot shrimp, scaled crab,

[5]Gray starsnout habitat was originally reported as rocky areas (Eschmeyer et al. 1983).

red rock crab, pygmy rock crab, horny sea star, and one or more *Solaster* species (O'Clair and O'Clair 1998, Jensen 1995). The three *Solaster* species in southeastern Alaska are *S. endeca*, *S. dawsoni*, and *S. stimpsoni*.

Another 17 species whose primary habitat was not rock, but could include rock or a close proximity to it, were captured on the rocky shorelines. These included the three Gadidae, juvenile sablefish, great sculpin, staghorn sculpin, Pacific halibut, starry flounder, yellowfin sole, rock sole, helmet crab, rose star, sunflower star, possible unidentified sea stars, Dungeness crab, Pacific lyre crab, and graceful decorator crab. No underwater video or SCUBA observations were made subtidally, but conceivably, areas of sand and gravel may have provided the habitats for some of these species.

Pacific halibut, helmet crab, and sunflower star may reside directly on rock. Our own SCUBA observations have witnessed Pacific halibut resting on steep rock Helmet crab may also use rock with heavy algal cover (Jensen 1995). Sunflower star use a variety of bottoms in southeastern Alaska (O'Clair and O'Clair 1998). They occur in the low tide horizon on rocky shores (Ricketts and Calvin 1962) and we have observed sunflower star on beaches composed of sand, gravel, and cobbles. Rose star occasionally use these beaches too.

For 10 of the 17 species, sand is a sediment they may reside on. These species include Pacific tomcod, juvenile sablefish, great sculpin, staghorn sculpin, Pacific halibut, starry flounder, yellowfin sole, rock sole, helmet crab, and Dungeness crab (Mecklenburg et al. 2002, Kramer et al. 1995, O'Clair and O'Clair 1998). Staghorn sculpin, Dungeness crab, and helmet crab may bury themselves in sand (Mecklenburg et al. 2002, Jensen 1995). All three species as well as Pacific tomcod were also found in eelgrass habitat, which had cobbles in the sediment.

Pacific tomcod, staghorn sculpin, and Dungeness crab are not known to live on rock, so apparently there may be patches of sand or sand with cobbles scattered along the sides of the bay where these species may reside. This is a likelihood as well for great sculpin, starry flounder, yellowfin sole, and rock sole.

Pacific cod, walleye pollock, Pacific tomcod, and juvenile sablefish may forage over a wide variety of habitats and were probably seeking prey rather than a sediment to reside on. This could be the case for arrowtooth flounder and flathead sole as well, two flatfish usually found on soft bottoms (Mecklenburg et al. 2002).

Most Pacific lyre crab and graceful decorator crab were collected on the sides of the bay. Graceful decorator crab disguise themselves with algae they find on rocks. Pacific lyre crab can also decorate themselves, but generally do not. Instead, they may use algae for cover as do helmet crab.

Three species also caught on the rock shoreline were big skate, searcher, and an unidentified pandalid shrimp. Bottom sediment preference of big skate and searcher are not reported.. We have captured big skate on soft bottoms with trawls, but depth of capture on the longline may have been among or adjacent to rock. Capture location of the searchers on this shoreline strongly demonstrated their affinity to a rock-associated habitat.

Habitat preference for arrowtooth flounder is reported as soft bottom and for flathead sole is silty or muddy bottoms (Mecklenburg et al. 2002). Most were collected in the basin, yet 9.7% of the flathead sole and 29% of the arrowtooth flounder were captured on the sides of the bay. Reasons for this distribution to shallower depths and rock habitat are unknown.

The slope from the basin into Outer Cedar Cove was steep but smooth. Overall depth covered by the three bottom trawl tows was between 123 m and 37 m (avg. 68.4 m). Fauna captured on the slope suggests the bottom was mud, giving way to sand and perhaps gravel and rock near the top. Twelve fish and seven invertebrates were caught (Table 1). Slender sole, flathead sole, and pink shrimp were likely nearest to the basin, as they reside on mud bottoms and were numerous in the basin. Longsnout prickleback were probably near the basin, too, because many were collected in the basin. Their specific bottom type preference is not reported (Mecklenburg et al. 2002), but is probably soft because they are commonly taken bottom trawling in southeastern Alaska on smooth bottoms (Carlson et al. 1982). Species that reside on either sand or mud were shortfin eelpout, wattled eelpout, great sculpin, blackfin poacher, ridged crangon, sidestripe shrimp, and ocean pink shrimp. Each species may have been distributed at preferred depths on the slope from 90 m to 40 m. Near the upper one-third of the slope, the trawl passed between two rock faces of the shoreline and Derby Island. This upper area may be where we collected fauna that live on sand and harder bottoms. These species were snake prickleback, kelp greenling, yellowfin sole, rock sole, and English sole. Snake prickleback, kelp greenling, great sculpin, rock sole, and spot shrimp associate with rock, although depending upon the species, the rock will take the form of pebbles, cobbles, or larger rocks. Three scallops caught with other gear in the vicinity of this slope were spiny scallop, which are found on rocky bottoms. Two scallops captured in the tow to 37 m depth had size and visual characteristics of spiny scallop. Bottom type preference of the split-eye argid is not known.

Trawling in the basin was in areas with sticky clay and accumulations of marine and terrestrial debris indicating little water current, while other locations had cleaner sediment

pointing to higher current velocities. Sediment compositions and extent of each kind were not measured, but based on 31 demersal fish and invertebrates in the basin, there possibly were four kinds of substrate.

Eight species live over mud. They were blackbelly eelpout, rougheye rockfish, slender sole, flathead sole, butter sole, pink shrimp, and likely the unidentified Crangonidae and Hippolytidae (Mecklenburg et al. 2002, Jensen 1995, Butler 1980). Pink shrimp were numerous in the basin. On commercial grounds where they are harvested, *Crangon communis* (two-spine crangon) is the most abundant species associated with pink shrimp (Butler 1980), and was likely the principle Crangonidae in Katlian Bay. Following *C. communis* in abundance is *Spirontocaris holmesi* (slender blade shrimp), a Hippolytidae and invariably part of shrimp trawl hauls. *Spirontocaris holmesi* is apparently most abundant from 90 m to 183 m, which is the same depth as the basin. Coonstripe shrimp and sidestripe shrimp are usually incidental species.

Another three species were found over "soft" sediment, which may also be mud or mixtures of mud and sand. These were spinyhead sculpin, dwarf wrymouth, and arrowtooth flounder (Mecklenburg et al. 2002).

Six species found on either sand or mud are walleye pollock, shortfin eelpout, blackfin poacher, rex sole, coonstripe shrimp, and Tanner crab, while another four that dwell over sand are English sole, yellowfin sole, ridged crangon, and Dungeness crab (Mecklenburg et al. 2002, Jensen 1995). Fauna that do best over bottoms with mixtures of sand and pebbles are Pacific ocean perch ages 3 to 5, graceful decorator crab, and rock sole (Carlson and Haight 1976, Jensen 1995). Species associated with sand, pebbles, and rock are green urchin, California sea cucumber, whitebarred prickleback, Pacific ocean perch ages 1 to 3, gray starsnout, and spot

shrimp (O'Clair and O'Clair 1998, Carlson and Haight 1976, Mecklenburg et al. 2002, Jensen 1995).

Type of sediment preferred by longsnout prickleback, *Colus jordani*, and *Leptychaster* sp. is not reported. Sediment preference of the unidentified snails and sea stars is also unknown. Three species were not included among the 31 demersal species captured, but were collected in the basin (Table 1): juvenile sablefish, yellowtail rockfish, and a widow rockfish, which are all off bottom during the summer. Though no Pacific herring were collected in the basin, both herring and juvenile sablefish seek soft bottoms during the winter (Carlson 1980, Haight 1981).

When comparing kinds and relative numbers of fauna collected in Katlian Bay against collections in other bays and passages throughout southeastern Alaska, Katlian Bay seems to stand out for some species. The basin appeared to have exceptional habitats for longsnout prickleback, spinyhead sculpin, blackfin poacher, and slender sole. We suspect that the specific bottom type for longsnout prickleback is soft substrate as this type is reported for the other three species (Mecklenburg et al. 2002). Each species had multiple generations and all were caught in relatively high numbers (Table 1). Throughout southeastern Alaska, all four species are more or less incidental in trawl catches (Carlson et al. 1982). In the other 14 coastal bays, slender sole were present in 7 bays, longsnout prickleback were in 5 bays, spinyhead sculpin were in 5 bays, and blackfin poacher were caught in 4 bays. These species were not a major part of the catch in any location. In Katlian Bay, however, slender sole and longsnout prickleback were numerically dominant in the basin over all of the other demersal fishes, blackfin poacher were fifth highest in numbers, and spinyhead sculpin were seventh highest (Table 1). Successful year classes might

explain their numbers, yet appropriate habitat and other factors may weigh in. Usual depth ranges of all four species fall within the depth of the basin.

Species with relatively high numbers along the sides of the bay were copper rockfish, widow rockfish, yellowtail rockfish, quillback rockfish, black rockfish, and kelp greenling. Swimming behavior of these five rockfish species is to gather in numbers over or against rock formations, unlike yelloweye rockfish and China rockfish that seek refuge areas. Habitat of kelp greenling is on rocky reefs and kelp beds to a depth of about 46 m (Mecklenburg et al. 2002). Males establish territories during the breeding season and while they guard eggs (O'Clair and O'Clair 1998). Based upon greenling numbers, it would appear that many locations were available to the greenling for establishing territories.

Katlian Bay appeared to provide favorable conditions to a few species located near the end of their geographic range and also to species that are more-or-less incidental within their own range. Two species, blackbelly eelpout and butter sole, are common south of Alaska, but are incidental in Alaska. Lisianski Inlet (Carlson et al. 1982) and Katlian Bay are the only two inshore locations where blackbelly eelpout have been recorded in southeastern Alaska (Mecklenburg et al. 2002). A commonality between Katlian Bay and British Columbia for this species is their association with pink shrimp and bottom depth. The northern limit of butter sole was originally recorded as southeastern Alaska (Hart 1973), and then was extended to the Bering Sea and Aleutian Islands (Kramer et al. 1995).

Masked greenling are common in the Sea of Japan, but Sitka, Alaska was recorded as their southern limit in the eastern Pacific (Rutenberg 1962). Their range was extended into

northern British Columbia with the discovery of four juvenile specimens under 5.1 cm length (Hart 1973). Three specimens were collected in Katlian Bay.

In subsequent bottom trawling throughout southeastern Alaska, no dwarf wrymouth or whitebarred prickleback are mentioned in the catches (Carlson et al. 1982). Dwarf wrymouth occur throughout southeastern Alaska. They live on soft bottoms and are reported to bury themselves (Mecklenburg et al. 2002), which could be why they are seldom captured in trawls. Whitebarred prickleback occur on rocky bottoms, which are not intentionally trawled. Four were captured in the basin with the bottom trawl, along with juvenile Pacific ocean perch, California sea cucumber, and spot shrimp, which all live on rocky bottoms (Carlson and Haight 1976, Mecklenburg et al. 2002, O'Clair and O'Clair 1998, Jensen 1995). These tows also captured species that dwell on soft bottoms, which indicates the bottom trawl passed over both hard and soft substrates.

The pygmy poacher, collected on the sill, is one of only two confirmed in southeastern Alaska (Mecklenburg et al. 2002). Gray starsnout and spinycheek starsnout occasionally occur in bottom trawl catches, but slim sculpin are not frequently taken (Carlson et al. 1982).

Starry flounder, English sole, and sidestripe shrimp were incidental in Katlian Bay, but can be numerous in other bays in southeastern Alaska. In spring and summer starry flounder move into the shallow parts of bays and some will enter the intertidal area of river mouths. During winter they come together at deeper depths. A winter population in northern Stephens Passage that we frequently sampled (Carlson et al. 1982) is at depths between 73 m and 110 m. The most likely location of starry flounder in Katlian Bay was at the head of the bay, but no summer beach seining or winter bottom trawling took place there.

Four English sole were captured in the bay. They occur over sand bottoms and can be in commercial quantities from 27 m to 146 m (Kramer et al. 1995). At the time of these surveys, the same bottom trawl used in Katlian Bay captured numerous English sole in Silver Bay, south of Katlian Bay, at depths from 49 m to 62 m. In subsequent bottom trawling, English sole were present in 10 of 14 coastal bays and were a major species in 6 bays. Bottom trawling shallower than 100 m at the head of Katlian Bay may have captured more English sole and starry flounder.

Sidestripe shrimp and pink shrimp are captured together with bottom trawls in other estuaries in southeastern Alaska at the same depth ranges as in Katlian Bay, but no sidestripe shrimp were captured in the basin. One sidestripe shrimp was captured on the slope leading into Outer Cedar Cove (Table 1). Factors limiting their distribution in Katlian Bay are not known.

The total absence of hermit crabs in Katlian Bay was surprising. In Limestone Inlet, farther inshore, the trammel nets, cube traps, and igloo traps captured *Elassochirus gilli*, *E. cavimanus*, and *E. tenuimanus*. Capturing hermit crabs in bottom trawls in southeastern Alaska is the rule rather than the exception. *Labidochirus splendescens* is common as are several species of the genus *Pagurus*.

Most of the species caught in Katlian Bay are common throughout southeastern Alaska. Species common to the outer coast, but absent to uncommon inshore include Pacific tomcod, copper rockfish, China rockfish, bocaccio, canary rockfish, redstripe rockfish, lingcod, and red rock crab. The reverse situation occurs. For example king crab (*Paralithodes camtschatica*) are common in inshore locations in southeastern Alaska, but not on the coast. Clear explanations for differences in distribution are not known and likely vary for each species. Seasonal variations in salinity and water temperature do occur between these two regions. Glaciers and major rivers

inshore contribute to decreased surface salinities and temperatures for that region compared to the outer coast which is influenced by ocean temperature and salinity.

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Table 1. - - Numbers of fish and invertebrates caught by location in Katlilan Bay.

Name	Sill 48 m	Intertidal	Rock shoreline 0-5 m	North side OCC*	Rock shoreline 6-90 m	OCC* slope 18-121 m	Deep basin 90-183 m	Total
FISH								
Raja binoculata - big skate					2			2
Clupea pallasi - Pacific herring			33		4			37
Salvelinus malma - Dolly Varden			1					1
Gadus macrocephalus - Pacific cod			3		38			41
Microgadus proximus - Pacific tomcod				1	2			3
Theragra chalcogramma - walleye pollock			1		18		18	37
Lycodes brevipes - shortfin eelpout						2	6	8
Lycodes palearis - wattled eelpout						1		1
Lycodes pacificus - blackbelly eelpout							4	4
Bathymaster signatus - searcher					26			26
Ronquilus jordani - northern ronquil					1			1
Anoplarchus purpurescens - high cockscomb		22						22
Chirolophis decoratus - decorated warbonne					1			1
Lumpenella longirostris - longsnout prickleback						2	85	87
Lumpenus sagitta - snake prickleback						3		3
Poroclinus rothrocki - whitebarred prickleback							4	4
Xiphister atropurpureus - black prickleback		2						2
Pholis laeta - crescent gunnel		1						1
Lyconectes aleutensis - dwarf wrymouth							1	1
Sebastes aleutianus - rougheye rockfish							6	6
S. alutus - Pacific ocean perch							41	41
S. brevispinis - silvergray rockfish					6			6
S. caurinus - copper rockfish			1		104			105
S. ciliatus - dusky rockfish					9			9
S. entomelas - widow rockfish					44		1	45
S. flavidus - yellowtail rockfish					81		6	87
S. maliger - quillback rockfish					100			100
S. melanops - black rockfish			21		58			79
S. nebulosus - China rockfish					1			1
S. paucispinis - bocaccio					1			1
S. pinniger - canary rockfish					2			2
S. proriger - redstripe rockfish					3			3
S. ruberrimus - yelloweye rockfish					9			9
Anoplopoma fimbria - sablefish			26		95		10	131
Hexagrammos decagrammus - kelp greenling			9		77		1	87
Hexagrammos octogrammus - masked greenling			3					3
Ophiodon elongatus - lingcod					1			1
Artedius harringtoni - scalyhead sculpin		1						1
Dasycottus setiger - spinyhead sculpin							23	23
Hemilepidotus hemilepidotus - red Irish lord			1	1	18			20
Myoxocephalus polyacanthocephalus - great sculpin			1		18	1		20
Leptocottus armatus - Pacific staghorn sculpin			22	28	12			62
Oligocottus maculosus - tidepool sculpin		3						3
Radulinus asprellus - slim sculpen	2							2
Bathyagonus alascanus - gray starsnout	3						2	5
Bathyagonus infraspinatus - spinycheek starsnout	1							1
Bathyagonus nigripinnis - blackfin poacher						1	32	33
Odontopyxis trispinosa - pygmy poacher	1							1
Atheresthes stomias - arrowtooth flounder					10		24	34
Eopsetta exilis - slender sole						5	182	187
Glyptocephalus zachirus - rex sole							6	6
Hippoglossoides elassodon - flathead sole			1		9	13	70	93
Hippoglossus stenoplepis - Pacific halibut					3			3
Microstomus pacificus - Dover sole	1							1
Platichthys stellatus - starry flounder					1			1
Limanda aspera - yellowfin sole					24	13	1	38
Lepidopsetta bilineata - rock sole					15	2	1	18
Isopsetta isolepis - butter sole							1	1
Parophrys vetulus - English sole						1	3	4

*OCC stands for Outer Cedar Cove

Table 1 (cont.) - -

Name	Sill[1]	Intertidal[2]	Shallow shoreline	Eel grass in OCC	Deep Sides Of Bay	OCC basin	Deep Basin	Total
INVERTEBRATES								
Cyanea capillata and *Chrysaora* sp.			many					many
c.f. *Colus* sp.			11					11
Colus jordani							1	1
Lirabuccinum dirum - Dire whelk			49+					49+
Unidentified snails.		?	131+					131+
Unidentified snails.							?	?
Fusitriton oregonensis - hairy triton			5		2			7
Chlamys rubida -reddish scallop		?						?
C. hastata - spiny scallop					3			3
C. sp. Likely either species above					6	2		8
unidentified polychaeta				1				1
Pandalas eous (formerly *P. borealis)* - pink shrimp						30	16902	16932
Pandalus jordani - ocean shrimp						10		10
Pandalus hypsinotus - coonstripe shrimp							33	33
Pandalus platyceros - spot shrimp					1	1	3	5
Pandalopsis dispar -sidestripe shrimp						1		1
Crangonidae shrimp							862+	862+
Crangon dalli ridged crangon						13		13
Argis ovifer split-eye argid						1		1
Hippolytidae shrimp							993+	993+
Pandalid shrimp			1					1
Placitron wosnessenskii - scaled crab					2			2
Chionoecetes bairdi - Tanner crab							75	75
Hyas lyratus - Pacific lyre crab					5			5
Oregonia gracilis - graceful decorator crab			3		2		1	6
Telmessus cheiragonus - helmet crab			1	2				3
Cancer magister - Dungeness crab				2	9		4	15
Cancer productus - red box crab			8	14	3			25
Cancer gracilis - graceful crab			1	2	4			7
Cancer oregonesis - pygmy rock crab				4	1			5
Asteroidea - unidentified sea stars					4		1	5
Orthasterias koehleri - horny sea star					1			1
Stylasterias forreri - spiny starfish					4			4
Leptychaster sp. (c.f. *anomalus*)					1		1	2
Solaster sp., sun star					1			1
Crossaster papposus - rose star					3			3
Pycnopodia helianthoides - sunflower star			120	18	180			318
Strongylocentrotus drobachiensis - green urchin							1	1
Parastichopus californicus - sea cucumber							6	6
P. californicus or possibly *Cucumaria* sp.							12	12

* OCC stands for Outer Cedar Cove.

[1] No invertebrate data for sill was recorde

[2] See Wing (1978) for list of intertidal invertebrtes

Table 2. - - Numbers of fish and invertebrates caught by each type of gear.

Name	Dredge[1]	Bottom trawl basin	Bottom trawl OCC*	Igloo trap	Cube trap	Surface trammel	Sunken trammel	Longline	Hand	Total Fish
FISH										
Raja binoculata - big skate								2		2
Clupea pallasi - Pacific herring						33	4			37
Salvelinus malma - Dolly Varden						1				1
Gadus macrocephalus - Pacific cod				3	13		12	13		41
Microgadus proximus - Pacific tomcod				1			2			3
Theragra chalcogramma - walleye pollock		18			3	1	9	6		37
Lycodes brevipes - shortfin eelpout		6	2							8
Lycodes palearis - wattled eelpout			1							1
Lycodopsis pacifica - blackbelly eelpout		4								4
Bathymaster signatus - searcher					4		4	18		26
Ronquilus jordani - northern ronquil							1			1
Anoplarchus purpurescens - high cockscomb									22	22
Chirolophis decoratus - decorated warbonne					1					1
Lumpenella longirostris - longsnout prickleback		85	2							87
Lumpenus sagitta - snake prickleback		3								3
Poroclinus rothrocki - whitebarred prickleback		4								4
Xiphister atropurpureus - black prickleback									2	2
Pholis laeta - crescent gunnel									1	1
Lyconectes aleutensis - dwarf wrymouth		1								1
Sebastes aleutianus - rougheye rockfish		6								6
S. alutus - Pacific ocean perch		41								41
S. brevispinis - silvergray rockfish							1	5		6
S. caurinus - copper rockfish				1	23		46	35		105
S. ciliatus - dusky rockfish							8	1		9
S. entomelas - widow rockfish		1					21	23		45
S. flavidus - yellowtail rockfish		6					76	5		87
S. maliger - quillback rockfish					11		14	75		100
S. melanops - black rockfish						21	54	4		79
S. nebulosus - China rockfish							1			1
S. paucispinis - bocaccio								1		1
S. pinniger - canary rockfish								2		2
S. proriger - redstripe rockfish								3		3
S. ruberrimus - yelloweye rockfish							2	7		9
Anoplopoma fimbria - sablefish		9		10	27	16	50	18		131
Hexagrammos decagrammus - kelp greenling			1	9	33		24	20		87
Hexagrammos octogrammus - masked greenling				2		1				3
Ophiodon elongatus - lingcod							1			1
Artedius harringtoni - scalyhead sculpin									1	1

*Trawling up the slope leading into Outer Cedar Cove. Depth of tows were between 40 and 120 n

[1] Used only once in April 1967. All other gear types used throughout the four sampling period

Table 2 (cont.) - -

Name	Dredge*	Bottom trawl basin	Bottom trawl OCC*	Igloo trap	Cube trap	Surface trammel	Sunken trammel	Longline	Hand	Total Fish
Dasycottus setiger - spinyhead sculpin		23								23
Hemilepidotus hemilepidotus - red Irish lord				2	4		12	2		20
Myoxocephalus polyacanthocephalus - great sculpin			1	1	3		9	6		20
Leptocottus armatus - Pacific staghorn sculpin				48	8	2	4			62
Oligocottus maculosus - tidepool sculpin									3	3
Radulinus asprellus - slim sculpen	2									2
Bathyagonus alascanus - gray starsnout	3	2								5
Bathyagonus infraspinata - spinycheek starsnou		1								1
Bathyagonus nigripinnis - blackfin poacher		32	1							33
Odontopyxis trispinosa - pygmy poacher	1									1
Atheresthes stomias - arrowtooth flounder		24					9	1		34
Eopsetta exilis - slender sole		182	5							187
Glyptocehalus zachirus - rex sole		6								6
Hippoglossoides elassodon - flathead sole		74	9		1	1		8		93
Hippoglossus stenoplepis - Pacific halibut							3			3
Microstomus pacificus - Dover sole	1									1
Platichthys stellatus - starry flounder							1			1
Limanda aspera - yellowfin sole		1	13		1		7	16		38
Lepidopsetta bilineata - rock sole		1	2				5	10		18
Isopsetta isolepis - butter sole		1								1
Parophrys vetulus - English sole		3	1							4
INVERTEBRATES										
Cyanea capillata and *Chrysaora* sp.						many				many
c.f. *Colus* sp.				11						11
Colus jordani		1								1
Lirabuccinum dirum - Dire whelk				49+					?	49+
Unidentified snails				131+					?	131+
Unidentified snails		?								?
Fusitriton oregonensis - hairy triton				5	1			1		7
Chlamys rubida - reddish scallop									?	?
C. hastata - spiny scallop					2		1			3
C. sp. Likely either species above			2		5		1			8
unidentified polychaete				1						1
Pandalas borealis - pink shrimp		16902	30							16932
Pandalus jordani - ocean shrimp			10							10
Pandalus hypsinotus - coonstripe shrimp		33								33
Pandalus platyceros - spot shrimp		3	1		1					5
Pandalopsis dispar - sidestripe shrimp			1							1

*Trawling up the slope leading into Outer Cedar Cove. Depth of tows were between 40 and 120 n

† Used only once in April 1967. All other gear types used throughout the four sampling period

Table 2 (cont.) - -

Name	Dredge[1]	Bottom trawl basin	Bottom trawl OCC*	Igloo trap	Cube trap	Surface trammel	Sunken trammel	Longline	Hand	Total Fish
Crangonidae shrimp		862+								862+
Crangon dalli - ridged crangon			13							13
Argis ovifer - split-eye argid			1							1
Hippolytidae shrimp		993+								993+
Pandalid shrimp				1						1
Placitron wosnessenskii - scaled crab					2					2 F
Chionoecetes bairdi - Tanner crab		75								75
Hyas lyratus - Pacific lyre crab					3		2			5
Oregonia gracilis - graceful decorator crab		1		3	2					6
Telmessus cheiragonus - helmet crab				3						3
Cancer magister - Dungeness crab		4		2	1		8			15
Cancer productus - red box crab				22			3			25
Cancer gracilis - graceful crab				3	3		1			7
Cancer oregonesis - pygmy rock crab				4			1			5
Asteroidea - unidentified sea stars		1			2			2		5
Orthasterias koehleri - horny sea star					1					1
Stylasterias forreri - spiny starfish								4		4
Leptychaster sp. (c.f. *anomalus*)		1					1			2
Solaster sp. - sun star					1					1
Crossaster papposus - rose star							1	2		3
Pycnopodia helianthoides - sunflower star				138	111		7	63		318
Strongylocentrotus drobachiensis - green urchin		1								1
Parastichopus californicus - sea cucumber		6								6
P. californicus or possibly *Cucumaria* sp.		12								12

*Trawling up the slope leading into Outer Cedar Cove. Depth of tows were between 40 and 120 m.

[1] Used only once in April 1967. All other gear types used throughout the four sampling periods.

Table 3. - - Resident status and biological observations of fauna collected in Katlian Bay.

Name	Juveniles		Adults				Comments
	n	Fork lengths (avg) (mm)	n (sex)	Fork lengths (avg) (mm)	Spawners observed		
					male	female	
Transient Fish							
Salvelinus malma - Dolly Varden char			1 (F)	457			Inshore species. Between fresh and salt water seasonally
Seasonal Resident Fish							
Clupea pallasi - Pacific herring			15 (F)	196-239 (213)		8	Over wintering in Katlian Bay. Spawning and
			22 (M)	194-251 (219)	13		most summer foraging is outside of bay
Hippoglossus stenoplepis - Pacific halibut	2 (M)	484, 573	1 (F)	990			Spawning is offshore. Evidence that adults return to same summe
							home range. Juveniles migrate along the coast
Full Time Residents - Fish							
Theragra chalcogramma - walleye pollock	10	82-308 (245)	27	327-565 (395)	11	3	
Lycodes brevipes - shortfin eelpout	2	95, 95	8	185-258 (217)			Low fecundity. Egg nest guarded. Larvae development advanced
Bathymaster signatus - searcher	3	185-213 (199)	23	222-292 (253)	1	5	
Lumpenella longirostris - longsnout prickleback	32	67-181 (119)	55	219-344 (258)		1	
Anoplarchus purpurescens - high cockscomb	est.10	est. 23-49	est.12	est. 66-89		4	Egg nest guarded.
Sebastes caurinus - copper rockfish	37	172-252 (226)	68	252-415 (312)	3	8	
S. maliger - quillback rockfish	45	158-295 (233)	55	326-458 (374)	11	9	Adults possess home sites
Hexagrammos decagrammus - kelp greenling	3	170-208 (184)	85	229-439 (309)	4	22	Believe eggs guarded by male
Hexagrammos octogrammus - masked greenling			3	175-265 (215)			Eggs guarded by male.
Dasycottus setiger - spinyhead sculpin	17	61-131 (89)	6	137-224 (180)		1	
Hemilepidotus hemilepidotus - red Irish lord	4	180-205 (190)	16	202-339 (259)	1	2	Eggs guarded by either parent or both
Myoxocephalus polyacanthocephalus - great sculpin	2	215, 224	18	256-393 (321)	1	3	
Oligocottus maculosus - tidepool sculpin			3	53-68			Eggs adhesive, spawning intertidal between barnacles and mussels
Leptocottus armatus - Pacific staghorn sculpin	2	193, 202	60	212-353 (271)	4	10	Interdidal to 91 m. Eggs demersal and adhesive
Bathyagonus alascanus - gray starsnout	2	73, 81	3	112, 120, 123			Eggs demersal. Larvae pelagic. Juveniles and adults demersa
Bathyagonus nigripinnis - blackfin poacher	est. 5	72-107 (84)	est.28	136-244 (200)			Eggs demersal. Larvae pelagic. Juveniles and adults demersa
Atheresthes stomias - arrowtooth flounder	6	92-286 (212)	28	303-532 (445)		1	
Eopsetta exilis - slender sole	est.15	57-156 (129)	172	156-312 (220)	3	13	
Hippoglossoides elassodon - flathead sole	est.18	53-177 (124)	est.76	155-429 (279)	7	4	
Limanda aspera - yellowfin sole	5	181-219 (192)	33	193-347 (257)		1	
Lepidopsetta bilineata - rock sole	6	223-390 (275)	12	204-384 (299)	3		
Probable Resident Status - Fish							
Raja binoculata - big skate	1	825	1	1020			Resident status is unknown
Gadus macrocephalus - Pacific cod	32	233-483 (377)	9	497-685 (600)		1	Adults seasonal or full time residence
Microgadus proximus - Pacific tomcod			3	233, 252, 258	2		Seasonal or Full time
Lycodes palearis - wattled eelpout	1	150					Full time
Lycodopsis pacifica - blackbelly eelpout			4	238-282 (260)			Full time
Ronquilus jordani - northern ronquil			1	208			Full time

Table 3. (cont.) - -

Name	Juveniles n	Juveniles lengths (avg) (mm)	Adults n	Adults Fork lengths (avg) (mm)	Spawners observed male	Spawners observed female	Comments
Probable Resident Status - Fish (cont.)							
Chirolophis decoratus - decorated warbonne			1	299			Full time
Lumpenus sagitta - snake prickleback			3	271, 356, 372			Full time
Poroclinus rothrocki - whitebarred prickleback			4	187-233 (202)			Full time
Xiphister atropurpureus - black prickleback			4	233, 3(?)			Full time
Pholis laeta - crescent gunnel			1	147			Full time, intertidal, one or both parents guard the eggs
Lyconectes aleutensis - dwarf wrymouth			1	212			Full time
Sebastes nebulosus - China rockfish			1	276			Full time. Territorial
S. brevispinis - silvergray rockfish	6	346-483 (436)					Resident as a juvenile
S. ruberrimus - yelloweye rockfish			9	376-745 (549)		2*	Full time. *Two gravid females, eggs rip, no embryos visible
Artedius harringtoni - scalyhead sculpin			1	73			Full time. Fintertidal
Radulinus asprellus - slim sculpen	2	77, 92					Resident status is unknown
Odontopyxis trispinosa - pygmy poacher			1	73			Full time. Northern limit is southeastern Alaska
Bathyagonus infraspinata - spinycheek starsnou	1	62					Full time
Glyptocehalus zachirus - rex sole	2	125, 242	4	237-280 (260)			Resident status is unknown
Microstomus pacificus - Dover sole	1	248					Resident status is unknown
Platichthys stellatus - starry flounder			1	490			Full time
Isopsetta isolepis - butter sole			1	305			Full time
Parophrys vetulus - English sole			4	267-434 (325)			Full time
Full Time Residents - Invertebrates	n	measurements[1]	n	measurements[1] (mm)			
Cyanea capillata			many	est. < 300			Only in Outer Cedar Cove during July survey
Chrysaora sp.			many	est. < 220			Only in Outer Cedar Cove during July survey
c.f. *Colus* sp.			11	15-20			Shoreline, subtidal less than 5 m deep
Colus jordani			1	?			In deep basin 143-183 (163) m.
Lirabuccinum dirum - Dire whelk			49	15-29			Shoreline, subtidal less than 5 m deep
Unidentified snails			131+	14-30			Shoreline, subtidal less than 5 m deep
Unidentified snails			?	?			In deep basin.
Fusitriton oregonensis - Oregon triton			7	77-131			Side of bay 2-27 (4.5) m deep. Average depth 4.5 m
Chlamys rubida - reddish scallop			1	?			Low intertidal
C. hastata - spiny scallop			3	30-37			Side of bay 14-21 m deep
C. sp. c.f. *hastata*			8	29-40			Side of bay, various gear, estimated 18-30 (20) m deep
long polychaeta, c.f. pile worm *Nereis vexillosa*			1	not measured			Shoreline, 2 m. Possibly sand worm *Nephtys caeca*.
Pandalas eous (formerly borealis) - pink shrimp		16932	16932				Located in basin.
Pandalus jordani - ocean shrimp			10				Located in basin.
Pandalus hypsinotus - coonstripe shrimp			33				Located in basin.
Pandalus platyceros - spot shrimp			5				Located in basin and on sides of bay
Pandalopsis dispar - sidestripe shrimp			1				On slope leading into Outer Cedar Cove
Crangonidae shrimp			862+				Located in basin. Possibly *Crangon communis*.
Crangon dalli - ridged crangon			13				On slope leading into Outer Cedar Cove
Argis ovifer - split-eye argid			1				On slope leading into Outer Cedar Cove

[1] Measurements: Cnidaria and urchins - diameter; Sea stars - arm spread; Crab - carapace width; Snails, Sea cucumbers, Polychaetes - total length; Bivalves - valve leng

Table 3. (cont.) - -

Name	Juveniles		Adults				Comments
	n	measurements[1] (mm)	n	measurements[1] (mm)	Spawners observed		
					male	female	
Full Time Residents - Invertebrates (cont.)							
Hippolytidae shrimp			993+				In basin, possibly *Spirontocaris holmesi*.
Pandalid shrimp			1				Rocky shoreline less than 5 m
Placitron wosnessenskii - scaled crab			2F	58, 62			On steep sides of bay
Chionoecetes bairdi - Tanner crab males	21	50-69 (63)	24	73-148 (106)			All tanner crab in basin.
Chionoecetes bairdi - Tanner crab females	9	47-68 (62)	19	71-98 (80)			
Hyas lyratus - Pacific lyre crab, all males	1	30	2	52, 58			On steep sides of bay
Oregonia gracilis - graceful decorator crab			6	30-40 (36)			Shallow shoreline, steep sides, and in basin
Telmessus cheiragonus - helmet crab, all males			3	90-97 (94)			Shorelines, less than 5 m deep
Cancer magister - Dungeness crab males	3	67-102 (91)	10	104-212 (149)			
Cancer magister - Dungeness crab females			2	143, 155		1	
Cancer productus - red box crab males	2	91, 99	16	127-155 (134)			
Cancer productus - red box crab females			9	102-129 (119)			Most red rock crab along shoreline less than 5 m
Cancer gracilis - graceful crab, all males			4	72-81 (76)			Side of bay.
Cancer oregonesis - pygmy rock crab, 5 males			6	31-73 (56)			Most pygmy rock crab along shoreline less than 5 m
Asteroidea - unidentified sea stars			5	400-500 (449)			Four on side of the bay and one in the basin
Orthasterias koehleri - horny sea star			1	564			Side of bay.
Stylasterias forreri - spiny starfish			4	285-345 (308)			Side of bay.
Leptychaster sp. (c.f. *anomalus*)			2	no data			In basin and side of bay
Solaster sp. - sun star			1	185			Side of bay.
Crossaster papposus - rose star			3	64-138 (102)			Multi-generations, all on side of bay
Pycnopodia helianthoides - sunflower sea star			321	35-640 (300)			Several year classis. Sides of bay subintertidal and deepe
Strongylocentrotus drobachiensis - green urchin			1	no data			In basin.
Parastichopus californicus - sea cucumber			5	160-360 (295)			Different size classes, all in basin
P. californicus or possibly *Cucumaria* sp.			12	no data			All in basin.

[1] Measurements: Cnidaria and urchins - diameter; Sea stars - arm spread; Crab - carapace width; Snails, Sea cucumbers, Polychaetes - total length; Bivalves - valve length.

Table 4. - - Residents in Katlian Bay as juveniles only.

Name	n	Lengths (avg) (mm)	Ages	Estimated age and size at 1st, 50%, and 100% maturity												References
				Male						Female						
				1st		50%		100%		1st		50%		100%		
				yr	length	yr	length	yr	length	yr	length	yr	length	yr	length	
Sebastes aleutianus - rougheye rockfish	6	110-248 (216)	≤2 to 5			?	430					?	450			3
S. alutus - Pacific ocean perch	41	148-318 (235)	3 to ≥7	6	280	9	330	11	340	6	280	9	340	11	358	3, 8, & 9
S. ciliatus - dusky rockfish	9	160-290 (199)	2 to ≥5													
S. entomelas - widow rockfish	45	168-322 (272)	1 to 4	3	310	5	360	8	410	3	290	5	370	8	400	1 & 7
S. flavidus - yellowtail rockfish	87	130-359 (246)	2 to 6	4	300	6	350	11	430	4	270	7	360	11	420	1 & 7
S. melanops - black rockfish	79	161-400 (233)	2 to ≥6	3	250	6	360	10	430	5	300	7	410	11	480	1
S. paucispinis - bocaccio	1	345	3	3	320	3	420	7	550	3	360	4	480	8	600	1 & 7
S. pinniger - canary rockfish	2	320-326	5	4	280	7	400	9	450	4	270	9	440	13	540	1 & 7
S. proriger - redstripe rockfish	3	197, 220, 225	est. 1 to 3			?	280					?	290			3
Anoplopoma fimbria - sablefish	136	188-455 (312)	0+ to 2	?	455	5	565	?	690	?	490	7	670	?	770	2, 5, & 6
Ophiodon elongatus - lingcod	1	372	2	2	±330	2	500	<3	<600	3	±450	5	760	7	800	4

Length and age when sexually maturing are from these sources: (1) Echeverria 1987; (2) Rutecki and Varosi 1997; (3) Westrheim 1975: (4) Cass et al. 1990; (5) Low et al. 1976; (6) Phillips 1954; (7) Phillips 1964; (8) Carlson and Haight 1976; (9) Gunderson 1974

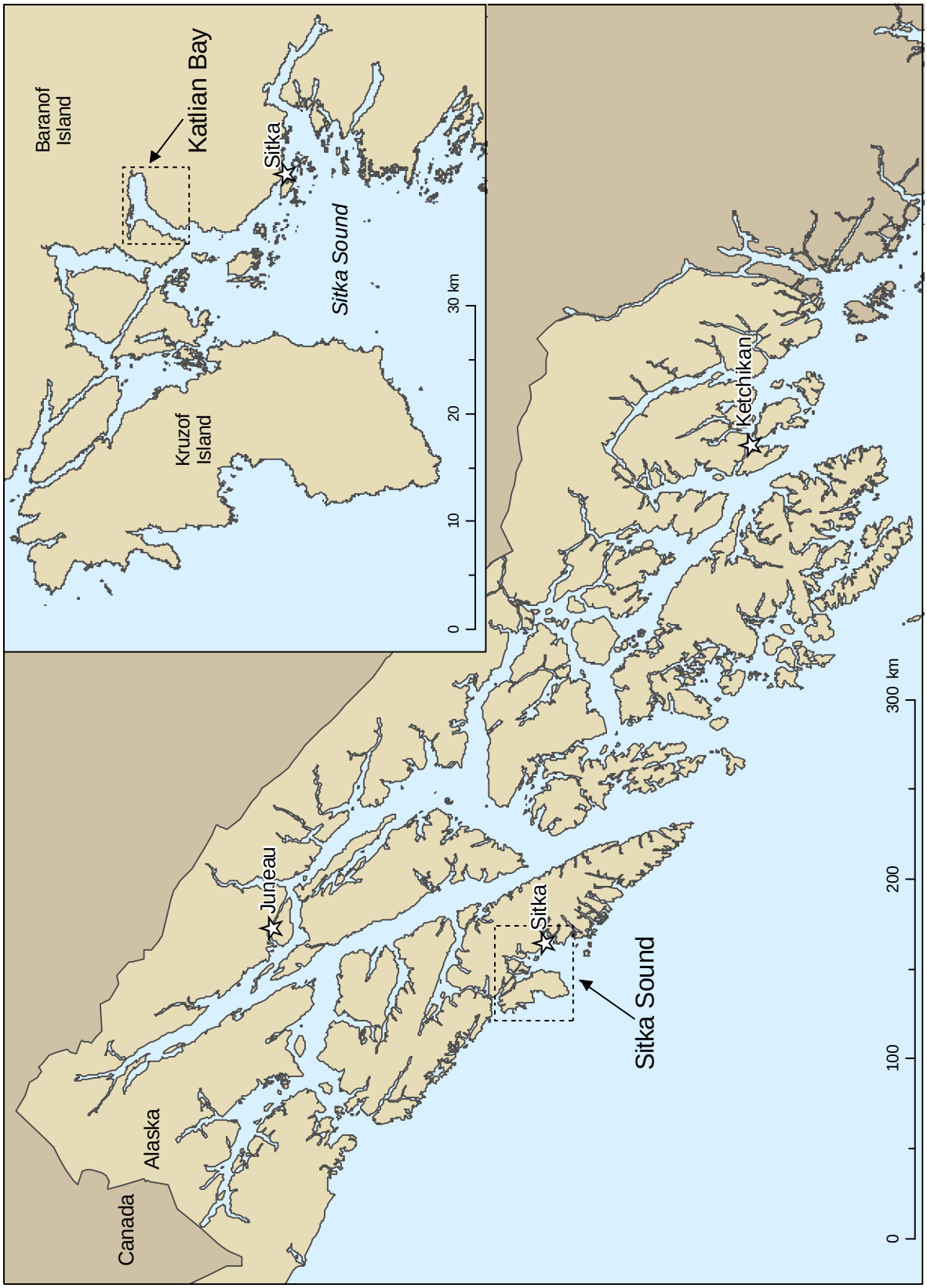

Figure 1.--Southeastern Alaska with an inset of Katlian Bay.

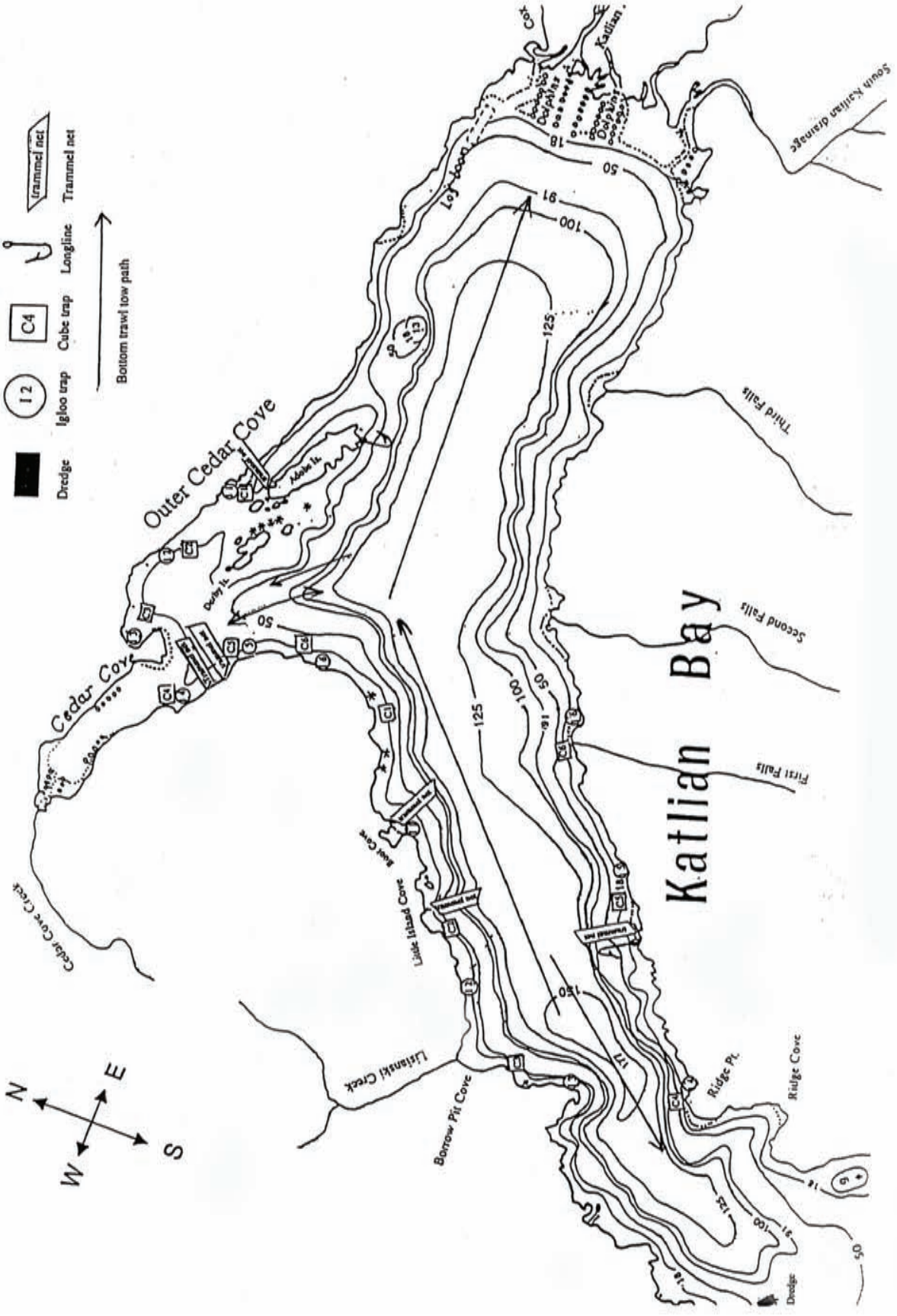

Figure 2. -- Katlian Bay bathymetry and sampling locations.