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Annual Survey of Juvenile Salmon, Ecologically-Related Species, and Environmental Factors in the Marine Waters of Southeastern Alaska, May–August 2010

by

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ABSTRACT

Juvenile Pacific salmon (*Oncorhynchus* spp.), ecologically-related species, and associated environmental (biophysical) data were collected from the marine waters of the northern region of southeastern Alaska in 2010. This annual survey, conducted by the Southeast Coastal Monitoring (SECM) project, marks 14 consecutive years of systematically monitoring how juvenile salmon utilize in marine ecosystems, and was implemented to identify the relationships among biophysical parameters that influence habitat use, marine growth, predation, stock interactions, and year-class strength of juvenile salmon. This report also contrasts the 2010 findings with selected biophysical parameters from the prior 13 sampling years. Up to 13 stations were sampled in epipelagic waters monthly, totaling 21 sampling days, from May to August. Fish, zooplankton, surface water samples, and physical profile data were typically collected during daylight at each station using a surface rope trawl, conical and bongo nets, a water sampler, and a conductivity-temperature-depth profiler. Surface (3-m) temperatures and salinities ranged from approximately 9 to 14 ºC and 17 to 32 PSU from May to August. More than 39,000 fish, representing 26 taxa, were captured in 67 rope trawl hauls fished from June to August. Juvenile salmon comprised about 97% of the total fish catch. Juvenile pink (*O. gorbuscha*), chum (*O. keta*), sockeye (*O. nerka*), and coho (*O. kisutch*) salmon occurred in 71-87% of the trawls, while juvenile Chinook salmon (*O. tshawytscha*) occurred in 9% of the hauls. Unusually high numbers of juvenile salmon were captured in strait habitat in both June and July, although CPUE was greatest in June for all species except sockeye salmon. Coded-wire tags were recovered from 15 juvenile coho salmon and one juvenile Chinook salmon from hatchery and wild stocks originating in southeastern Alaska and Washington. Alaska enhanced stocks were also identified by thermal otolith marks from 67% of the chum and 16% of the sockeye salmon examined. Onboard stomach analysis revealed predation on highly abundant juvenile salmon by adult coho salmon, a common predator, and adult pink salmon, a rare predator. Biophysical measures from 2010 differed from prior years, in many respects. May integrated (20-m) temperature anomalies were generally positive and salinity anomalies were generally negative; in particular, the positive May temperature anomaly was the highest on record. Zooplankton monthly total densities were near longterm averages, reversing the trend for strongly positive anomalies over the past four years. For juvenile pink, chum, and sockeye salmon, low condition residuals in June were followed by small size and low energy density in July. Regional biophysical data from SECM are used in conjunction with basin-scale biophysical parameters to forecast pink salmon harvest in southeastern Alaska. Longterm monitoring of key stocks of juvenile salmon, on seasonal and interannual time scales, will enable researchers to understand how growth, abundance, and ecological interactions affect year-class strength of salmon and to better understand their roles in North Pacific marine ecosystems.

INTRODUCTION

The Southeast Coastal Monitoring (SECM) project, an ecosystem study focused in the northern region of southeastern Alaska (SEAK), was initiated in 1997 to annually study the early marine ecology of Pacific salmon (*Oncorhynchus* spp.) and associated epipelagic ichthyofauna and to better understand effects of environmental change on salmon production. Salmon are a keystone species that constitute an important ecological link between marine and terrestrial habitats, and therefore play a significant, yet poorly understood, role in marine ecosystems. Fluctuations in the survival of this important living marine resource have broad ecological and socio-economic implications for coastal localities throughout the Pacific Rim.

Evidence for relationships between production of Pacific salmon and shifts in climate conditions has renewed interest in processes governing salmon year-class strength (Downton and Miller 1998; Beauchamp et al. 2007; Farley et al. 2007; Taylor 2007). In particular, climate variables such as temperature have been associated with ocean production and survival of salmon; for example, warming trends benefited many wild and hatchery stocks of Alaskan salmon or enhanced their food supplies (Wertheimer et al. 2001; Beauchamp et al. 2007). Biophysical attributes of climate and habitat, such as temperature, salinity, and mixed layer depth, affect primary and secondary production (Bathen 1972; Kara et al. 2000; Alexander et al. 2001) and therefore may influence the trophic links leading to variable growth and survival of salmon (Mann and Lazier 1991; Francis et al. 1998; Brodeur et al. 2007). However, research is lacking on the links between salmon production and climate variability, intra- and interspecific competition and carrying capacity, and biological interactions among stock groups. In addition, past research has not provided adequate time series data to explain these links (Pearcy 1997; Beamish et al. 2008). Regional salmon production has increased over the last few decades, emphasizing the importance of understanding the consequences of population changes and potential interactions on the growth, distribution, migratory rates, and survival of all salmon stock groups.

A goal of the SECM project is to identify mechanisms linking salmon production to climate change using a time series of synoptic data on salmon and the ocean conditions they experience, including salmon stock-specific life history characteristics. The SECM project obtains stock information from coded-wire tags (CWT; Jefferts et al. 1963) and otolith thermal marks (Hagen and Munk 1994; Courtney et al. 2000) from five Pacific salmon species: pink (*O. gorbuscha*), chum (*O. keta*), sockeye (*O. nerka*), coho (*O. kisutch*), and Chinook (*O. tshawytscha*). Portions of wild and hatchery salmon stocks are tagged or marked prior to ocean entry by enhancement facilities or state and federal agencies in southeastern Alaska, Canada, and the Pacific Northwest. Catches of these marked fish by the SECM project in the northern, southern, and coastal regions of SEAK have provided information on habitat use, migration rates, and timing (e.g., Orsi et al. 2004, 2007a, b); in addition, interceptions in the regional common property fisheries have documented substantial contributions of enhanced fish to commercial harvests (ADFG 2008). Therefore, examining trends in early marine ecology of these marked stock groups provides an opportunity to link increasing salmon production to climate change, particularly in the context of increased enhancement.

The extent of interactions between stock groups in marine ecosystems is also important to examine with regard to carrying capacity. For example, increased hatchery production of juvenile chum salmon has coincided with declines of some wild chum salmon stocks, suggesting the potential for stock interactions in the marine environment (Seeb et al. 2004; Reese et al. 2009). In SEAK, however, SECM and other studies have shown that growth is not food limited and that stocks interact extensively with little negative impact (Bailey et al., 1975; Orsi et al. 2004; Sturdevant et al. 2004, 2011). Zooplankton prey fields are more likely to be cropped by the more abundant planktivores forage fish, including walleye pollock (*Theragra chalcogramma*) and Pacific herring (*Clupea pallasi*) (Orsi et al. 2004; Sigler and Csepp 2007), than by juvenile salmon. Companion studies in Icy Strait have also suggested that food quantity may be more important than food type for growth and survival of juvenile salmon con-specifics (Weitkamp and Sturdevant 2008) and that predation events can affect salmon year-class strength (Sturdevant et al. 2009). Monitoring jellyfish abundance is also important because of their potential competition with salmon and forage fish (Purcell and Sturdevant 2001), and their association with environmental change (Brodeur et al. 2008; Cieciel et al. 2009). Seasonal and interannual changes in planktivorous jellyfish abundance have been reported by SECM (Orsi et al. 2009). Similarly, regional differences in composition, abundance, and timing of zooplankton taxa with different life history strategies are important to document because of their dependence on environmental conditions which vary seasonally and interannually (Coyle and Paul 1990; Paul et al. 1990; Park et al. 2004). These findings stress the importance of comparing ecological processes between different areas that produce salmon and consistently examining the entire epipelagic community in the context of trophic interactions.

In 2010, SECM sampling was conducted in the northern region of SEAK for the 14th consecutive year to continue annual monitoring, explore juvenile salmon abundance relationships with biophysical parameters, and support models to forecast adult pink salmon returns. This document summarizes data on juvenile salmon, ecologically-related species, and associated biophysical parameters collected by the SECM project in 2010, and contrasts key parameters from 2010 with the entire 14-yr time series.

METHODS

Up to 13 stations were sampled in SEAK monthly from May to August 2010 (Table 1). Sampling was conducted in the northern region, extending 250 km from inshore waters of the Alexander Archipelago along Chatham and Icy Straits to coastal waters 64 km offshore from Icy Point into the Gulf of Alaska (GOA) and over the shelf break (Figure 1). At each station, the physical environment, zooplankton, and fish were typically sampled during daylight hours. Oceanographic sampling was conducted in May, while both trawling and oceanographic sampling were conducted June through August. The NOAA research vessel RV *Quest*, a 7 m work vessel, was used for oceanographic sampling in May in the strait and inshore habitats. The chartered fishing vessel, FV *Northwest Explorer* (*NWE*), a 52 m stern trawler with twin engines producing 1,800 HP, was used for sampling June through August.

Sampling stations (Table 1; Figure 1) were originally selected by: 1) the presence of historical time series of biophysical data, 2) the intent to sample primary seaward migration corridors used by juvenile salmon, and 3) logistical constraints of the vessel operations. Historical data existed for the inshore station and the four Icy Strait stations (e.g., Bruce et al. 1977; Jaenicke and Celewycz 1994; Orsi et al. 1997). The four Upper Chatham Strait stations were selected to intercept wild and hatchery juvenile salmon entering Icy Strait from both the north and the south. Historically, sampling operations in the different localities were constrained to 1.5-65 km off shore and bottom depths > 75 m, sea conditions < 2.5 m, and winds < 12.5 m/sec. Bottom depth at the Auke Bay station did not meet the depth criterion, being too shallow to permit trawling (Table 1). Stations in the strait habitat were approximately 3 or 6 km from shore, whereas stations in the coastal habitat were approximately 7, 23, 40, and 65 km from shore. The northern hatchery stocks intercepted in the straits typically originate from the Douglas Island Pink and Chum Hatchery (DIPAC) near Juneau and the Hidden Falls Hatchery (HF) operated by the Northern Southeast Alaska Regional Aquaculture Association (NSRAA) on eastern Baranof Island (Figure 1). Past monitoring has also documented the migration of salmon stocks from the southern region of SEAK through the northern region, primarily from facilities operated by the Southern Southeast Alaska Regional Aquaculture Association (SSRAA); this facility's largest releases are from the Neets Bay (NB) site near Ketchikan, Alaska. Fewer releases from Armstrong Keta Incorporated (AKI), located in central SEAK, have been recovered during monitoring. Stocks from these facilities and from the Pacific Northwest and Canada have also been intercepted at coastal stations off Icy Point.

Oceanographic sampling

The oceanographic data collected at each visit to a station generally consisted of one conductivity-temperature-depth profiler (CTD) cast, one Secchi depth, one surface water sample, one ambient light reading, one or two plankton tows.

The CTD data were collected with a Sea-Bird[1] SBE 19 plus Seacat profiler deployed to 200 m or within 10 m of the bottom. The CTD data profiles were used to determine the 3-m sea surface temperature (SST, °C) and salinity (PSU), the average 20-m integrated water column temperature and salinity, and the mixed layer depth (MLD, m). The average 20-m integrated water column data was used to characterize the upper water column that typically brackets seasonal pycnoclines and MLD. The MLD is the depth where temperature was ≥ 0.2°C colder than the water at 5 m, and established the active mixing layer (Kara et al. 2000).

Additional physical data included water clarity (Secchi depth), surface nutrients and chlorophyll, and ambient light. Secchi depths were estimated as the disappearance depth (m) of the CTD during deployment. Surface water samples for nutrient and chlorophyll analysis were taken once at each station per month. Ambient light (W/m^2) was quantified using a Li-Cor Model LI-250A light meter.

Zooplankton was sampled monthly with two net types. One shallow (20-m) vertical NORPAC haul was made with a 50-cm, single ring frame with 243-µm mesh net. One double oblique bongo haul was made at stations along the Icy Strait and Icy Point transects and at ABM (≤ 200 m or within 20 m of bottom) using a 60-cm diameter tandem frame with 333-µm and 505-µm mesh nets. A VEMCO ML-08-TDR time-depth recorder was attached to the bongo frame to record the maximum sampling depth of each haul. General Oceanics Model 2031 flow meters were placed inside the bongo for calculation of filtered water volumes.

Zooplankton samples were immediately preserved in a 5% formalin-seawater solution. In the laboratory, zooplankton settled volumes (ZSV, ml), total settled volumes (TSV, ml),

[1]Reference to trade names does not imply endorsement by the Auke Bay Laboratories, National Marine Fisheries Service, NOAA Fisheries.

displacement volumes (DV, ml), standing stock (DV/m^3), and density (number/m^3) were determined for various samples (Omori and Ikeda 1984). For Norpac samples, ZSV and TSV were measured after a 24-hr period in Imhof cones. Mean SVs were determined for pooled stations by habitat and month. For bongo samples (both 333- and 505-µm mesh), DVs were measured and standing stock was calculated using DV and filtered water volumes. Detailed zooplankton species composition from the 333-µm samples was determined microscopically from subsamples obtained using a Folsom splitter. Densities were then estimated using the subsample counts, split fractions, and filtered water volumes. Percent total composition was summarized across species by major taxa, including small calanoid copepods ($\leq$ 2.5 mm total length, TL), large calanoid copepods (> 2.5 mm TL), euphausiids (principally larval and juvenile stages), oikopleurans (Larvacea), decapod larvae, amphipods, chaetognaths, and combined minor taxa.

Fish sampling

Fish sampling was accomplished with a Nordic 264 rope trawl modified to fish the surface water directly astern of the trawl vessel. The trawl was 184 m long and had a mouth opening of approximately 24 m wide by 30 m deep, with actual fishing dimensions of 18 m wide by 24 m deep (unpub. net mensuration data). A pair of 3-m foam-filled Lite trawl doors, each weighing 544 kg (91 kg submerged), was used to spread the trawl open. Trawl mesh sizes from the jib lines aft to the cod end were 162.6 cm, 81.3 cm, 40.6 cm, 20.3 cm, 12.7 cm, and 10.1 cm over the 129.6-m meshed length of the rope trawl. A 6.1-m long, 0.8-cm knotless liner mesh was sewn into the cod end. The trawl also contained a small mesh panel of 10.2-cm mesh sewn along the jib lines on the top panel between the head rope and the 162.6-cm mesh to reduce loss of small fish. Two 50-kg chain-link weights were added to the corners of the foot rope as the trawl was deployed to maximize fishing depth. To keep the trawl head rope fishing at the surface, two clusters of three A-4 Polyform buoys (inflated to 0.75 m diameter and encased in knotted mesh bags) were clipped on the opposing corner wingtips of the head rope and one A-3 Polyform float (inflated to 0.5 m diameter) was clipped into a mesh kite pocket in the center of the head rope with a third-wire unit to monitor the net spread. Two AQUAmark 300 pingers (10 kHz, 132 dB) were attached to the corners of the head rope to deter porpoise interactions. The trawl was fished with approximately 150 m of 1.6-cm wire main warp attached to each door, a 9.1 m length of 1.6-cm TS-II Dyneema line trailing off the top and bottom of each trawl door (back strap). Each back strap was connected with a “G” hook and flat link to an 80-m parallel rigging system constructed of 1.6-cm TS-II Dyneema bridles.

For each haul, the trawl was fished across a station for 20 min at approximately 1.5 m/sec (3 knots) to cover 1.9 km (1.0 nautical mile). Station coordinates were targeted as the midpoint of the trawl haul, and current, swell, and wind conditions usually dictated the direction in which the trawl was set. Twenty-eight hauls were scheduled in the strait habitat to meet sampling requirements for the forecasting model and to ensure that sufficient samples of marked juvenile salmon were obtained for interannual comparisons.

After each trawl haul, the fish were separated from the jellyfish, identified, enumerated, measured, labeled, bagged, and frozen. Jellyfish were identified to species when possible, counted, and total volume (including fragments) was estimated to the nearest 0.1 liter (L). After the catch was sorted, all fish and squid were typically measured to the nearest mm fork length (FL) or mantle length. In instances of very large fish catches, all fish were counted, but only a subsample of each species (≤ 100) was processed. Excess fish were enumerated and discarded. During times of extended processing, fish were chilled with ice packs to minimize tissue decomposition and gastric activity. All Chinook and coho salmon were examined for missing adipose fins that could indicate the presence of implanted CWTs. In the laboratory, those Chinook and coho with adipose fins intact were screened with a magnetic detector and CWTs were excised from the snouts of tagged fish. All tags were decoded and verified to determine fish origin.

Potential predators of juvenile salmon from each haul were identified, measured (FL, mm), weighed (g), and stomach contents were examined onboard the vessel. Stomachs were excised, weighed (0.1 g), and visually classified by percent fullness (0, 10, 25, 50, 75, and 100%). Stomach content weight was determined by subtracting the empty stomach weight from the full stomach weight. General prey composition was determined by estimating the contribution of major taxa to the nearest 10% of total volume. The wet-weight contribution of each prey taxon to the diets was then calculated by multiplying its percent total volume by the total content weight. Whenever possible, fish prey were identified to species and FLs were measured. Overall diets were summarized by percent weight of major prey taxa and the frequency of feeding fish.

Juvenile salmon catch data were adjusted using calibration coefficients from previous vessels to allow comparisons with the longterm data collected using the NOAA ship *John N. Cobb* (1997-2007). Unfortunately, a direct calibration of the *NWE* with a previously-used vessel was not possible; therefore, the *NWE* was assumed to be comparable to the similarly-sized and -powered chartered vessel FV *Chellissa* used in 2009. The catches from the FV *Chellissa* were directly compared to those from the RV *Medeia*, which had been previously calibrated to the NOAA ship *John N. Cobb* (Wertheimer et al. 2008, 2010). These paired comparisons permitted the computation of species-specific calibration factors to adjust the FV *Chellissa* catches. The calibration factors for the FV *Chellissa* were applied to the Ln(CPUE+1) for each trawl haul of the *NWE* to convert the data into "Cobb units", which were directly comparable to the first 13 years of the SECM time series (Wertheimer et al. 2010).

After each survey, frozen individual juvenile salmon were weighed (0.1 g) in the laboratory. Mean lengths, weights, Fulton condition factor ($g/mm^3 \cdot 10^5$; Cone 1989), and residuals from a length-weight linear regression (condition residuals, CR) were computed for each species by habitat and sampling month. To determine stock of origin, sagittal otoliths were extracted from the crania and preserved in 95% ethyl alcohol, then later mounted on slides, ground down to the primordia, and examined for potential thermal marks (Secor et al. 1992). Stock composition and growth trajectories of thermally marked fish were then determined for each month and habitat. An index of seasonal condition was obtained via calorimetry, using a 1425 Parr micro-bomb calorimeter. Whole body energy content (cal/g WW) was determined from ten fish of each species captured in July (Fergusson 2010).

In order to compare biophysical conditions observed in 2010 to the prior 13-yr time series, a set of key parameters was examined. These parameters included: average 20-m integrated temperature and salinity, MLD, zooplankton density and composition, the catch-per-unit-effort (average catch per haul, CPUE), size-at-time (length on July 24), CRs for the principal juvenile salmon species (pink, chum, sockeye, and coho), and the July energy density of juvenile pink, chum, and sockeye salmon. Graphical plots were used to compare annual means of these values from the core SECM sampling area in Icy Strait and to portray anomalies as deviations from the longterm grand means.

RESULTS AND DISCUSSION

Eight stations at Icy and Upper Chatham Straits and the ABM station were sampled monthly from May to August, while the four stations at Icy Point were sampled only in July and August (Figure 1). In total, data were collected from 67 rope trawl hauls, 78 CTD casts, 28 bongo net samples, 79 Norpac net samples, 44 surface water samples, 75 Secchi readings, and 75 ambient light measures during the four monthly surveys totaling 21 days at-sea (Table 2, Appendix 1). The sampling periods occurred near the ends of each month.

Oceanography

Overall, SST ranged from 9.4 to 14.2ºC from May to August, and averaged 11.7 ºC (Table 3; Appendix 1). Seasonal SST patterns differed among habitats (Figure 2a), with peaks occurring in June in inshore habitat and in August in strait and coastal habitats. Monthly mean SST differed by as much as ~2ºC among habitats. The monthly means for 20-m integrated temperatures followed a similar seasonal pattern as SSTs, but were colder.

Surface salinities ranged from 17.2 to 32.3 PSU from May to August, and averaged 27.2 PSU (Table 3; Appendix 1). Surface salinities followed similar patterns of seasonal decline in strait and inshore habitats (Figure 2b); salinities were lowest in inshore habitat and highest in coastal habitat. Mean salinities for the 20-m integrated water column were higher than the 3-m values, particularly in July and August.

Water clarity depths ranged from 2 to 8 m and MLD ranged from 6 to 23 m (Appendix 1). Water clarity extended deeper in strait and coastal habitats than in inshore habitat (Figure 3a). Seasonally, water clarity was deepest in August in all habitats. Seasonal MLD was similar in inshore and strait habitats and peaked in June, while MLD was deeper in coastal habitat and peaked in August (Figure 3b). Thus, trawl sampling depths (~20 m) spanned a range of habitat conditions that varied with depth, including the active surface layer and the stable waters below the MLD.

Other physical data also showed seasonal and spatial differences. Ambient light measurements ranged from 12 to 883 W/m^2, with a mean of 310 W/m^2 (Appendix 1). Light intensity was greatest in May, in conjunction with unusually warm SST for the month. Chlorophyll concentration ranged from 0.2 to 2.3 µg/L, with a mean of 0.7 µg/L, and phaeopigment concentrations ranged from <0.1 to 0.8 µg/L, with a mean of 0.2 µg/L (Table 4). Chlorophyll in surface water samples was highest in strait habitat, and lowest in coastal habitat. Seasonal chlorophyll peaked in inshore, strait, and coastal habitats in May, June, and July, respectively (Figure 4a). The May UCA and July IPA chlorophyll samples were destroyed during laboratory processing. Nutrient concentrations (range and mean) were 0.0–17.4 and 1.2 µM for PO_4, 1.7–24.3 and 5.2 µM for $Si(OH)_4$, 0.0–10.3 and 0.9 µM for NO_3, 0.0–1.2 and 0.04 µM for NO_2, and 0.1–11.32 and 2.5 µM for NH_4 (Table 4).

Zooplankton SVs ranged from 0.5 to 50 ml and averaged 9.8 ml in June through August (Table 5). A strong phytoplankton bloom in May prevented determination of ZSV, thus excluding May samples from the dataset. Seasonal patterns for ZSV were similar in inshore and forstrait habitats and highest in June (Figure 4b), which coincided with peak chlorophyll in strait habitat but followed peak chlorophyll in inshore habitat (Figure 4a). For coastal habitat, ZSV values were similar in July and August. Qualitative, visual examination of samples indicated a wide diversity of mesozooplankton taxa and phytoplankton present.

Zooplankton standing stock was greater for the 333- than for the 505-µm bongo samples. Standing stock ranged from 0.1 to 11.8 ml/m^3 with a mean of 1.5 ml/m^3 for 333-µm mesh, and ranged from 0.0 to 1.6 ml/m^3 with a mean of 0.5 ml/m^3 for the 505-µm mesh samples (Table 6). Patterns differed among habitats and months (Figure 5). Standing stock was highest in inshore habitat and lowest in coastal habitat. Mean peak values for both mesh sizes occurred in May or June in inshore habitat and in May in strait habitat, coinciding with seasonal warming and increased chlorophyll (Figures 2a, 4a). For coastal habitat, values were similar in July and August.

Seasonal abundance of zooplankton (333-µm) prey fields in Icy Strait ranged approximately 10-fold, from 396 to 3,602 organisms/m^3 (Table 6). Mean zooplankton density peaked in May (2000 organisms/m^3) and declined over the season to approximately 800 organisms/m^3 in August (Figure 6a). Zooplankton taxa were increasingly dominated by small calanoid copepods (33-74%) over the season. In May, seasonal peaks in the percentage composition of larvaceans (29%) and large calanoids (13%) were observed, whereas early life stages of euphausiids comprised approximately 20-24% of organisms in May and June (Figure 6b). Along with calanoids, these taxa are seasonally prominent in diets of juvenile salmon and other planktivores (Coyle and Paul 1992; Landingham et al. 1998; Sturdevant et al. 2004, 2011).

Seasonal patterns in species composition of the dominant taxa (calanoids) were observed. *Metridia* spp. comprised ≥ 70% of large calanoids throughout the four-month season. Other large calanoids mainly included *Neocalanus plumchrus/flemingeri* in May and *Calanus marshallae* in June through August. Small calanoids were dominated by *Pseudocalanus* spp. (46-90%); the principal other small copepods included unknown nauplii and *Oithona similis* (a cyclopoid) in May, *Centropages abdominalis* in June through August, and *Acartia* spp. in June and August.

Catch composition

The trawls sampled a total of five large jellyfish species: *Aequorea* sp., *Aurelia labiata*, *Chrysaora melanaster*, *Cyanea capillata*, and *Staurophora mertensii* (Table 7). The monthly mean total volume of jellyfish ranged from 2.4 to 20.3 L per haul. Overall, jellyfish monthly biomass increased 10-fold from June to August, but species composition varied by habitat (Figure 7). In particular, *Aurelia* biomass showed opposite trends from *Chrysaora* biomass in strait and coastal habitats.

In total, more than 39,000 fish, representing 26 taxa, were captured in 68 rope trawl hauls in strait and coastal habitats (Table 8). Juvenile salmon comprised approximately 97% of the total fish catch (Figure 8). Non-salmonids comprised a high proportion of the fish in coastal habitat, and were primarily represented by squid and rockfish (*Sebastes* spp.) larvae. Juvenile pink, chum, sockeye, and coho salmon occurred in 71-87% of the trawls, while juvenile Chinook salmon occurred in only 9% of the hauls (Table 9). All juvenile salmon species occurred more frequently in strait than in coastal habitat each month. In both habitats, CPUE declined seasonally for all juvenile salmon species except sockeye. Unusually high numbers of juvenile salmon were captured in strait habitat in both June and July, although CPUE was greatest in June for all species except sockeye salmon (Figure 9). In particular, CPUE for pink salmon was nearly

1,100 fish per trawl in June. For strait habitat, when the *NWE* catches were calibrated to "Cobb units", the Ln(CPUE+1) was reduced proportionally, resulting in large changes in nominal CPUE at high catch levels (Table 10).

Size and condition of juvenile salmon differed among the species and months (Tables 11–15, Figures 10–13). Most species increased monthly in both length and weight, indicating growth despite the influx of additional stocks with varied times of saltwater entry. From June to August, mean FLs of juvenile salmon increased from approximately 96 to 167 mm for pink; 104 to 151 mm for chum; 116 to 156 mm for sockeye; 181 to 252 mm for coho; and 192 to 209 mm (June-July only) for Chinook salmon (Tables 11–15, Figure 10). Mean weights of juvenile salmon increased monthly from 8 to 49 g for pink; 11 to 37 g for chum; 17 to 43 g for sockeye; 70 to 195 g for coho; and 88-117 g (June-July only) for Chinook salmon (Tables 11–15, Figure 11). Juvenile coho and Chinook salmon were consistently larger than pink, chum, and sockeye salmon in each month, and fish captured in coastal habitat were larger than those captured in strait habitat. Mean Fulton's condition for juvenile salmon increased monthly for all species in strait habitat. Samples from coastal habitat were limited, and few differences in Fulton's condition were apparent between July and August (Figure 12). Condition residuals from L-W regression were positive for pink, chum, and sockeye salmon in both strait and coastal habitats in July and August, suggesting that marine conditions were favorable for growth (Figure 13). Condition residuals for coho salmon were positive only at coastal habitat.

Stock-specific information was obtained from 16 CWT recoveries from 19 adipose fin-clipped juvenile coho and Chinook salmon, primarily caught in the strait habitat. Fifteen of the CWT recoveries were from coho salmon and one was from a Chinook salmon (Table 16). All but one of these fish originated from hatchery and wild stocks in northern SEAK; the one non-Alaska CWT fish was a coho salmon from Washington. All unmarked, adipose-clipped fish were caught in the coastal habitat, and probably originated from Pacific Northwest hatcheries. These facilities are mandated to adipose-clip but not necessarily CWT all fish released, a practice not used in Alaska. Migration rates of the CWT juvenile salmon ranged from 1.2 to 15.4 km/day and averaged 4.2 km/day.

Stock-specific information was also obtained from recoveries of otolith-marked hatchery chum, sockeye, and coho salmon, using the same individuals that were sampled for weight and condition. Releases of these species from SEAK enhancement facilities are commonly mass-marked and not CWTed. A total of 703 otolith-marked juvenile salmon that originated in SEAK were recovered (Tables 17-19; Figures 14-17).

For juvenile chum salmon, stock-specific information was derived from a subsample of 899 otolith-marked fish, representing 20% of those caught (Tables 8 and 17; Figure 14). Of all chum salmon otoliths examined, 601 (67%) were marked by hatcheries in SEAK: 410 (46%) were from DIPAC, 180 (20%) were from NSRAA, 9 (1%) were from AKI, and only 2 (< 1%) were from SSRAA. The remaining 298 (33%) chum salmon otoliths examined were unmarked and presumed to be wild. Hatchery composition declined from 32% in June to 4% in July and 1% in August for chum salmon. This decline is consistent with the pattern of seasonal decline observed in previous years. Catches of SSRAA hatchery chum salmon indicated a pattern of northward movement by these stocks (Table 17).

For juvenile sockeye salmon, stock-specific information was derived from the otoliths of a subsample of 515 fish, representing 64% of those caught (Tables 8 and 18; Figure 15). Of all the sockeye salmon otoliths examined, 80 (16%) were marked and originated from three stock groups: 67 (13%) were from Speel Arm, Alaska, 9 (2%) were from Tatsamenie Lake/Taku River, British Columbia (this includes both normal release and extended rearing releases), and 4 (1%) were from Sweetheart Lake, Alaska. The remaining 435 (84%) sockeye salmon otoliths examined were unmarked and presumably from wild stocks. Contrary to prior years, no evidence of stocks from southern SEAK was observed in the catch.

For juvenile coho salmon, stock-specific information was derived from the otoliths of a subsample of 488 fish (with adipose fins intact), representing 88% of those caught (Tables 8 and 19; Figure 16). Of all the coho salmon otoliths examined, 22 (5%) were marked and originated from DIPAC. The remaining 466 (95%) coho salmon otoliths examined were unmarked. DIPAC temporarily stopped otolith-marking coho salmon in 2003 (2005 recoveries), then reinstated marking of coho salmon in 2008.

Stock-specific sizes of otolith-marked juvenile chum and sockeye salmon increased monthly for all stock groups. Average weights of these fish were used to plot monthly growth trajectories (Figure 17). Both of these salmon species were released or migrated to sea in 2010 at the following approximate dates and size ranges: chum salmon in April–May (1–4 g) and sockeye salmon in April–June (5–10 g). Weights approximately doubled for both species from June to July and, for some stock groups, approximately tripled from July to August. The limited recovery of marked coho salmon prevented further stock-specific size analysis.

Stomachs of 58 immature and adult salmon representing all five species, and a single walleye pollock, were examined onboard as potential predators of juvenile salmon (Table 20). In June, we observed predation by pink salmon adults (2 of 9 adults examined) for the first time in the 14 years of SECM monitoring (Table 21; Figure 18). We also observed a high percentage of adult coho salmon (3 of 8) predating on juvenile salmon in August; longterm data indicate that coho salmon are common predators of juvenile salmon in strait habitat in late summer, with an overall 15% incidence of predation (SECM unpublished data). Most of the potential predators had been feeding; however, pink salmon had a high percentage (~34%) of empty guts, mainly during July (Table 21). Diet composition varied considerably among the species, and pink salmon diet was the most diverse. In addition to juvenile salmon prey, pink salmon diet included lanternfish (Myctophidae), larval sandlance (*Ammodytes hexapterus*), rockfish (Scorpaenidae), unidentifiable fish remains, crab larvae, euphausiids, and pteropods. Chum salmon diet consisted primarily of gelatinous invertebrate taxa, including remains of ctenophores and oikopleurans. Coho and Chinook salmon were both highly piscivorous. However, identifiable fish prey of coho salmon included juvenile salmon and lanternfish, while those of immature Chinook salmon included sandlance and fish larvae (walleye pollock and Osmeridae). Sockeye salmon diet consisted exclusively of hyperiid amphipods, which were present as minor prey among the other species.

Longterm trends

Our research in SEAK over the past 14 years indicates annual trends in biophysical factors, as well as seasonal patterns of habitat use and species- and stock-dependent migration for juvenile salmon. Biophysical measures from 2010 in Icy Strait were compared to the longterm time series to examine trends and identify anomalies (Figures 19-31).

Among the 2010 physical factors, anomalies were positive for average 20-m integrated temperatures and negative for salinity in all months except July, when they were reversed (Figures 19, 20, and 22a, b). Anomalies for MLD were also negative (deeper than average MLD) for all months except June (Figures 21 and 22c). May temperature is one significant biophysical factor that consistently enters the adult pink salmon harvest forecast using CPUE data (Wertheimer et al. 2008, 2009, 2010, 2011). The high mean temperature in May of 2010 was associated with a high forecast, and was similar to the high mean temperature for 2005 (Table 3, Figure 19), the year associated with an overestimated forecast for the 2006 adult pink salmon harvest (Wertheimer et al. 2011). A major difference between these years is that, in 2010, the warm temperatures did not persist through August as they did in 2005 (Figure 22). Moreover, unusual faunal observations were not reported from the GOA adjacent to SEAK in 2010 (Orsi et al. 2006a; Orsi et al. 2010). These contrasts in the effects of marine conditions point to the importance of contrasting annual data to the longterm means of biophysical parameters in order to detect changes in trends.

Among the 2010 biological factors, monthly total zooplankton densities were near average values except in May, when they showed a positive anomaly (Figures 23 and 24), consistent with anomalously warm temperatures (Figure 19). This zooplankton trend for 2010 contrasts with the previous four years from 2006-2009, when positive density anomalies persisted, and with the nine prior years from 1997-2005, when negative density anomalies persisted (Figure 23). Moreover, zooplankton composition anomalies were unusual in 2010 (Figure 25). In contrast to all prior years, both large and small calanoids showed synchronous, negative anomalies for percent composition, whereas euphausiid larvae and larvaceans showed strongly positive anomalies, particularly in May and June (Figure 25). These changes indicate differences in the 2010 abundance, composition, and timing of zooplankton prey fields, including taxa that are seasonally prominent in diets of juvenile salmon and other planktivores (Coyle and Paul 1992; Sturdevant et al. 2004, 2011).

Catches of juvenile salmon in 2010 were among the largest in the history of SECM sampling, and were the result of both high abundance and the fishing power of the chartered commercial trawl vessel. When juvenile salmon catches were calibrated to “Cobb units” (for consistency with the longterm data series from the NOAA ship *John N. Cobb*), the adjusted CPUEs were above average for all species except chum salmon (Figure 26 and 27). The adjusted pink salmon CPUE was the fourth highest in the 14-year time series.

Longterm trends indicated poor size and condition of juvenile salmon in 2010. Low CRs in June were followed by small size and low energy density in July (Figures 28-31). The large numbers of small-sized juvenile pink salmon could have influenced the unusual observations of cannibalism by adult pink salmon and the high incidence of predation by adult coho salmon, reflecting opportunistic trophic interactions. Poor condition of juvenile salmon in 2010 may also have been influenced by biophysical anomalies, such as abrupt changes in temperature, salinity, and MLD from May to June, low monthly zooplankton abundance, and unusual zooplankton prey composition.

These SECM time series data are used in conjunction with basin-scale biophysical parameters to develop forecast models for pink salmon harvest in SEAK (e.g., Wertheimer et al. 2011). Longterm monitoring of key stocks of juvenile salmon, on seasonal and interannual time scales, will enable researchers to understand how growth, abundance, and ecological interactions affect year-class strength of salmon in this region and to better understand their role in North Pacific marine ecosystems.

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Table 1.—Localities and coordinates of stations sampled in the marine waters of the northern region of southeastern Alaska, May–August 2010. Transect and station positions are shown in Figure 1.

Station	Latitude north	Longitude west	Distance: Offshore (km)	Distance: Between adjacent station (km)	Bottom depth (m)
Auke Bay Monitor					
ABM	58°22.00'	134°40.00'	1.5	—	60
Upper Chatham Strait transect					
UCA	58°04.57'	135°00.08'	3.2	3.2	400
UCB	58°06.22'	135°00.91'	6.4	3.2	100
UCC	58°07.95'	135°01.69'	6.4	3.2	100
UCD	58°09.64'	135°02.52'	3.2	3.2	200
Icy Strait transect					
ISA	58°13.25'	135°31.76'	3.2	3.2	128
ISB	58°14.22'	135°29.26'	6.4	3.2	200
ISC	58°15.28'	135°26.65'	6.4	3.2	200
ISD	58°16.38'	135°23.98'	3.2	3.2	234
Icy Point transect					
IPA	58°20.12'	137°07.16'	6.9	16.8	160
IPB	58°12.71'	137°16.96'	23.4	16.8	130
IPC	58°05.28'	137°26.75'	40.2	16.8	150
IPD	57°53.50'	137°42.60'	65.0	24.8	1,300

Table 2.—Numbers and types of data collected using a laboratory and charter vessel in different habitats sampled monthly in the marine waters of the northern region of southeastern Alaska, May–August 2010.

			Data collection type[1]				
Dates (days)	Vessel	Habitat	Rope trawl	CTD cast	Oblique bongo	20-m NORPAC	Chlorophyll & nutrients
26-27 May (2 days)	R/V *Quest*	Inshore	0	1	1	1	1
		Strait	0	8	4	8	8
		Coastal	0	0	0	0	0
24-29 June (6 days)	F/V *Northwest Explorer*	Inshore	0	1	1	1	1
		Strait	20	19	4	19	8
		Coastal	0	0	0	0	0
25-31 July (7 days)	F/V *Northwest Explorer*	Inshore	0	1	1	1	1
		Strait	20	19	4	20	8
		Coastal	4	4	4	4	4
24-29 August (6 days)	F/V *Northwest Explorer*	Inshore	0	1	1	1	1
		Strait	20	20	4	20	8
		Coastal	4	4	4	4	4
Total			**68**	**78**	**28**	**79**	**44**

[1]Rope trawl = 10- or 20-min hauls with Nordic 264 surface trawl 18 m wide by 24 m deep; CTD casts = to 200 m or within 10 m of the bottom; oblique bongo = 60-cm diameter frame, 505- and 333-µm meshes, towed double obliquely down to and up from a depth of 200 m or within 20 m of the bottom; 20-m NORPAC = 50-cm diameter frame, 243-µm conical net towed vertically from 20 m; chlorophyll and nutrients are from surface seawater samples.

Table 3.—Surface (3-m, mean) temperature (°C) and salinity (PSU) data collected monthly at stations in the marine waters of the northern region of southeastern Alaska, May–August 2010. Station code acronyms are listed in Table 1.

Month	*n*	Temp (°C)	Salinity (PSU)	*n*	Temp (°C)	Salinity (PSU)	*n*	Temp (°C)	Salinity (PSU)	*n*	Temp (°C)	Salinity (PSU)
Auke Bay Monitor												
	ABM											
May	1	12.6	26.0									
June	1	13.4	21.8									
July	1	11.4	21.4									
August	1	12.5	17.2									
Upper Chatham Strait transect												
	UCA			UCB			UCC			UCD		
May	1	10.3	29.8	1	11.2	29.9	1	10.5	28.4	1	10.6	27.0
June	2	10.8	28.9	2	10.4	29.1	2	10.9	28.9	1	11.9	25.8
July	2	11.6	25.2	2	12.2	24.9	2	11.8	24.8	1	11.7	25.8
August	2	12.9	23.6	2	12.9	25.1	2	12.5	23.3	2	12.4	24.6
Icy Strait transect												
	ISA			ISB			ISC			ISD		
May	1	9.7	30.4	1	9.4	30.4	1	9.9	30.1	1	9.4	30.4
June	3	10.8	28.8	3	11.5	27.3	3	11.9	26.2	3	11.6	26.4
July	3	11.2	27.7	3	11.3	27.6	3	11.4	26.4	3	11.4	26.9
August	3	11.1	27.8	3	12.2	24.3	3	12.8	22.7	3	12.8	21.9
Icy Point transect												
	IPA			IPB			IPC			IPD		
July	1	10.9	31.5	1	12.1	31.8	1	12.6	31.6	1	12.5	32.3
August	1	10.7	31.6	1	14.2	32.1	1	13.6	32.1	1	13.8	32.1

Table 4.—Nutrient (µM) and chlorophyll (µg/L) concentrations from 200-ml surface water samples collected monthly at stations in the marine waters of the northern and southern regions of southeastern Alaska, May–August 2010. Station code acronyms are listed in Table 1.

		Nutrients [µM]						
Station	Date	$[PO_4]$	$[Si(OH)_4]$	$[NO_3]$	$[NO_2]$	$[NH_4]$	Chlorophyll (µg/L)	Phaeopigment (µg/L)
ABM	26 May	0.01	10.99	0.08	0.10	0.58	0.92	0.42
	24 June	0.00	5.59	0.35	0.04	0.25	0.66	0.30
	25 July	2.32	1.97	0.03	0.03	2.27	0.64	0.00
	24 August	0.28	5.79	0.08	0.00	6.14	0.58	0.00
UCA	27 May	0.05	2.84	0.03	0.04	0.55		
	28 June	1.20	1.87	0.09	0.04	0.44	1.40	1.06
	30 July	0.27	1.81	0.03	0.05	1.46	0.68	0.26
	28 August	0.34	8.69	0.29	0.00	6.03	0.40	0.00
UCB	27 May	0.07	3.18	0.06	0.03	1.12	0.77	0.29
	28 June	0.96	2.10	0.06	0.02	11.32	1.05	0.72
	30 July	0.38	1.69	0.03	0.02	2.05	0.61	0.14
	28 August	0.09	8.11	0.00	0.00	0.85	0.60	0.00
UCC	27 May	0.00	3.64	0.07	0.00	0.36	0.87	0.40
	28 June	0.80	2.67	0.05	0.02	0.16	1.11	0.32
	30 July	0.52	1.80	0.06	0.01	2.38	0.61	0.00
	28 August	0.02	2.99	0.00	0.00	1.34	0.66	0.46
UCD	27 May	0.00	4.44	0.38	0.01	2.81	0.84	0.37
	28 June	2.85	1.74	0.00	0.09	2.89	1.04	0.49
	30 July	0.39	2.26	0.08	0.02	3.46	0.87	0.30
	28 August	0.15	6.97	0.66	0.01	1.01	0.81	0.43
ISA	27 May	0.11	4.02	0.05	0.06	0.50	0.62	0.15
	26 June	1.09	1.77	0.00	0.04	0.50	2.29	0.66
	26 July	0.51	2.42	0.08	0.03	3.61	0.55	0.00
	25 August	0.76	11.04	4.58	0.07	3.66	0.55	0.26
ISB	27 May	0.05	2.39	0.00	0.03	0.07	0.48	0.00
	26 June	0.60	1.65	0.11	0.04	0.25	1.44	0.67
	26 July	0.27	2.53	0.03	0.03	1.13	1.11	0.42
	25 August	0.82	5.55	0.88	0.03	6.24	0.28	0.02
ISC	27 May	0.05	2.39	0.00	0.03	0.85	0.60	0.41
	26 June	0.39	1.88	0.06	0.07	0.39	0.54	0.19
	26 July	0.24	3.22	0.07	0.03	1.34	1.37	0.42
	25 August	17.4	5.66	0.45	0.02	7.49	0.23	0.07

Table 4.—cont.

Station	Date	Nutrients [μM] [PO_4]	[$Si(OH)_4$]	[NO_3]	[NO_2]	[NH_4]	Chlorophyll (μg/L)	Phaeopigment (μg/L)
ISD	27 May	0.02	2.84	0.00	0.03	0.11	1.65	0.00
	26 June	1.50	2.11	0.05	0.08	3.14	0.58	0.37
	26 July	0.72	5.17	0.19	0.07	5.08	1.74	0.76
	25 August	2.36	4.40	0.43	0.02	7.70	0.22	0.08
IPA	28 July	1.04	20.30	2.86	0.05	2.28		
	27 August	1.70	24.33	10.31	0.10	3.20	0.51	0.00
IPB	28 July	1.10	14.90	2.40	0.08	1.57	0.97	0.47
	27 August	1.43	4.16	0.30	0.04	1.35	0.16	0.05
IPC	28 July	0.56	5.38	1.13	0.04	0.81	0.21	0.06
	27 August	0.94	3.81	0.91	0.03	3.47	0.25	0.05
IPD	28 July	0.91	10.07	5.49	0.12	3.34	0.19	0.05
	27 August	0.85	3.24	1.01	0.05	2.14	0.18	0.03

Table 5.—Mean zooplankton settled volumes (ZSV, ml) and total plankton settled volumes (TSV, ml) from vertical 20-m Norpac hauls (243-µm mesh) collected monthly at stations in the marine waters of the northern region of southeastern Alaska, May–August 2010. Station code acronyms are listed in Table 1. Volume differences between ZSV and TSV are caused by presence of phytoplankton or slub in the sample. Standing stock (ml/m^3) can be computed by dividing by the water volume filtered, a constant factor of 3.9 m^3 for these samples A phytoplankton bloom in May prevented determination of ZSV.

Month	*n*	ZSV	TSV	*n*	ZSV	TSV	*n*	ZSV	TSV	*n*	ZSV	TSV
Auke Bay Monitor												
	ABM											
May	1		340									
June	1	20.0	44.0									
July	1	3.8	12.0									
August	1	11.0	11.0									
Upper Chatham Strait transect												
	UCA			UCB			UCC			UCD		
May	1			1			1			1		
June	2	7.0	19.5	2	19.8	52.5	2	6.3	12.5	1	17.5	47.0
July	2	6.8	13.5	2	6.8	13.5	2	14.0	28.0	2	12.5	25.0
August	2	3.0	4.5	2	2.2	2.5	2	0.8	1.5	2	1.5	2.8
Icy Strait transect												
	ISA			ISB			ISC			ISD		
May	1			1			1			1		
June	3	25.3	63.3	3	29.7	53.3	3	24.7	53.3	3	17.5	41.7
July	3	16.0	34.7	3	8.8	17.7	3	3.9	9.0	3	3.3	7.5
August	3	5.3	6.0	3	3.8	3.8	3	3.3	3.3	3	6.3	6.3
Icy Point transect												
	IPA			IPB			IPC			IPD		
July	1	1.0	2.0	1	1.5	1.5	1	5.0	5.0	1	8.5	12.0
August	1	4.0	4.0	1	3.0	3.0	1	5.0	5.0	1	3.0	3.0

Table 6.—Zooplankton displacement volumes (DV, ml), standing stock (DV/m^3), and total density (number/m^3, 333-µm mesh only) from double oblique bongo (333- and 505-µm mesh) hauls collected monthly (n = 1) at the Icy Strait stations in the marine waters of the northern region of southeastern Alaska, May–August 2010. Standing stock (ml/m^3) is computed using flow meter readings to determine water volume filtered. Station code acronyms are listed in Table 1.

Month	Depth (m)	DV	DV/m^3	Total density	Depth (m)	DV	DV/m^3	Total density	Depth (m)	DV	DV/m^3	Total density	Depth (m)	DV	DV/m^3	Total density
333-µm mesh																
	ISA				ISB				ISC				ISD			
May	83	150	2.6	3,601.8	196	160	1.2	1,168.9	206	150	1.4	1,987.0	179	210	2.1	1,442.2
June	68	110	1.1	3,395.6	148	390	1.6	1,239.7	181	120	0.5	997.8	156	110	0.4	836.8
July	71	80	0.5	1,501.8	192	150	0.5	1,227.8	220	140	0.5	970.5	204	110	0.4	966.2
August	59	15	0.1	396.2	134	105	0.4	1,338.3	183	105	0.3	606.5	222	105	0.4	815.8
505-µm mesh																
	ISA				ISB				ISC				ISD			
May	83	115	1.1	—	196	110	0.5	—	206	150	0.8	—	179	125	0.8	—
June	68	70	0.7	—	148	415	1.6	—	181	95	0.4	—	156	75	0.3	—
July	71	60	0.4	—	192	120	0.4	—	220	90	0.3	—	204	95	0.3	—
August	59	5	0.0	—	134	75	0.3	—	183	90	0.3	—	222	95	0.3	—

Table 7.—Mean volume (L) of jellyfish captured in rope trawl hauls in the marine waters of the northern region of southeastern Alaska, June-August 2010.

	Volume (L)		
Genus	June	July	August
Aequorea sp.	0.2	4.1	10.9
Cyanea capillata	1.5	2.9	7.5
Chrysaora melanaster	0.5	1.6	0.8
Aurelia labiata	0.2	1.1	1.0
Staurophora mertensi	—	0.1	0.1
Total	2.4	9.8	20.3

Table 8.—Numbers of fish captured in rope trawl hauls in the strait (n = 60) and coastal (n = 8) marine habitats of the northern region of southeastern Alaska, June–August 2010. No trawling was conducted in coastal habitat in June.

		Strait			Coastal		
Common Name	Scientific name	June	July	August	June	July	August
		Salmonids					
Pink salmon[1]	*Oncorhynchus gorbuscha*	22,095	9,728	470		190	9
Chum salmon[1]	*O. keta*	3,293	1,188	38		19	—
Sockeye salmon[1]	*O. nerka*	270	399	10		26	—
Coho salmon[1]	*O. kisutch*	289	165	82		19	1
Pink salmon[3]	*O. gorbuscha*	9	16	1		6	—
Coho salmon[3]	*O. kisutch*	—	3	12		—	—
Chinook salmon[2]	*O. tshawytscha*	8	—	4		—	—
Chinook salmon[1]	*O. tshawytscha*	5	2	—		—	—
Chum salmon[3]	*O. keta*	1	1	1		—	—
Chum salmon[2]	*O. keta*	2	—	—		—	—
Sockeye salmon[3]	*O. nerka*	—	—	1		—	—
Salmonid subtotals		25,972	11,502	619		260	10
		Non-salmonids					
Squid	Gonatidae	—	—	—		128	411
Rockfish	*Sebastes spp.*	—	—	—		—	229
Pacific herring	*Clupea pallasi*	174	5	1		—	—
Crested sculpin	*Blepsias bilobus*	13	10	6		—	—
Soft sculpin	*Psychrolutes sigalutes*	7	3	—		—	—
Smooth lumpsucker	*Aptocyclus ventricosus*	6	2	2		—	—
Spiny lumpsucker	*Eumicrotremus orbis*	4	2	1		—	—
Pacific sandlance	*Ammodytes hexapterus*	6	—	—		—	—
Unknown larvae		—	—	—		—	6
Prowfish	*Zaprora silenus*	—	1	3		—	—

Table 8.—cont.

Common Name	Scientific name	Strait			Coastal		
		June	July	August	June	July	August
Wolf-eel	*Anarrhichthys ocellatus*	—	1	2		1	—
Flatfish larvae	Pleuronectidae	—	—	—		—	4
Walleye pollock[4]	*Theragra chalcogramma*	—	—	2		1	—
Silver-spine sculpin	*Blepsias cirrhosus*	1	—	—		—	—
Walleye pollock[3]	*T. chalcogramma*	—	1	—		—	—
Salmon shark	*Lamna ditropis*	—	—	1		—	—
Non-salmonid subtotals		211	25	18		130	650

[1]Juvenile
[2]Immature
[3]Adult
[4]Larvae

Table 9.—Frequency of occurrence of fish species captured in rope trawl hauls in the strait (n = 60) and coastal (n = 8) marine habitats of the northern region of southeastern Alaska by rope trawl, June–August 2010. The percent frequency of occurrence is shown in parentheses. No trawling was conducted in coastal habitat in June.

		Strait				Coastal			
Common name	Scientific name	June	July	August	(%)	June	July	August	(%)
Pink salmon[1]	*Oncorhynchus gorbuscha*	19	19	16	(90)		3	2	(63)
Chum salmon[1]	*O. keta*	18	19	10	(78)		3	—	(38)
Sockeye salmon[1]	*O. nerka*	20	17	8	(75)		3	—	(38)
Coho salmon[1]	*O. kisutch*	18	20	17	(92)		3	1	(50)
Pink salmon[3]	*O. gorbuscha*	7	5	1	(22)		3	—	(38)
Coho salmon[3]	*O. kisutch*	—	2	5	(12)		—	—	(0)
Chinook salmon[2]	*O. tshawytscha*	8	—	3	(18)		—	—	(0)
Chinook salmon[1]	*O. tshawytscha*	5	1	—	(10)		—	—	(0)
Chum salmon[3]	*O. keta*	1	1	1	(5)		—	—	(0)
Chum salmon[2]	*O. keta*	2	—	—	(3)		—	—	(0)
Sockeye salmon[3]	*O. nerka*	—	—	1	(2)		—	—	(0)
Squid	Gonatidae	—	—	—	(0)		3	4	(88)
Rockfish	*Sebastes spp.*	—	—	—	(0)		—	3	(38)
Pacific herring	*Clupea pallasi*	7	4	1	(20)		—	—	(0)
Crested sculpin	*Blepsias bilobus*	10	5	5	(33)		—	—	(0)
Soft sculpin	*Psychrolutes sigalutes*	4	2		(10)		—	—	(0)
Smooth lumpsucker	*Aptocyclus ventricosus*	3	2	2	(12)		—	—	(0)
Spiny lumpsucker	*Eumicrotremus orbis*	4	2	1	(12)		—	—	(0)
Pacific sandlance	*Ammodytes hexapterus*	3	—	—	(5)		—	—	(0)
Unknown larvae		—	—	—	(0)		—	2	(25)
Prowfish	*Zaprora silenus*	—	1	3	(7)		—	—	(0)
Wolf-eel	*Anarrhichthys ocellatus*	—	1	2	(5)		1	—	(13)
Flatfish larvae	Pleuronectidae	—	—	—	(0)		—	2	(25)

Table 9.—cont.

Common name	Scientific name	Strait				Coastal			
		June	July	August	(%)	June	July	August	(%)
Walleye pollock[4]	*Theragra chalcogramma*	—	—	2	(3)		1	—	(13)
Silver-spine sculpin	*Blepsias cirrhosus*	1	—	—	(2)		—	—	(0)
Walleye pollock[3]	*Theragra chalcogramma*	—	1	—	(2)		—	—	(0)
Salmon shark	*Lamna ditropis*	—	—	1	(2)		—	—	(0)

[1]Juvenile
[2]Immature
[3]Adult
[4]Larvae

Table 10.—Mean catch-per-unit-effort (CPUE) and mean Ln(CPUE+1) by species for the FV *Northwest Explorer* (*NWE*) in 2010; calibration factors for adjusting the Ln(CPUE+1) by a commercial fishing trawler to the fishing power of the NOAA ship *John N. Cobb*; and the mean calibrated Ln(CPUE+1) and back-calculated mean nominal CPUE in "Cobb units." Calibration factors were developed from paired comparisons of research and commercial fishing vessels (Wertheimer et al. 2010).

		NWE		Calibration	"Cobb units"	
Species	Month	CPUE	Ln(CPUE+1)	Factor	Ln(CPUE+1)	CPUE
Pink	June	1889.5	5.62	0.659	3.70	108.0
	July	104.1	5.57		3.67	69.8
	August	23.5	2.08		1.37	5.5
Chum	June	233.3	3.88	0.705	2.74	36.2
	July	40.2	4.00		2.82	23.3
	August	1.9	0.71		0.50	1.0
Sockeye	June	30.8	2.83	0.848	2.40	16.2
	July	40.2	2.78		2.36	20.7
	August	1.1	0.55		0.46	0.8
Coho	June	31.7	3.09	0.803	2.48	14.5
	July	16.2	2.66		2.14	8.6
	August	8.2	1.75		1.40	4.6

Table 11.—Length (mm, fork), weight (g), Fulton's condition [$(g/mm^3)\cdot(10^5)$], and condition residuals (CR) from length-weight regression analysis of juvenile pink salmon captured in the marine waters of the northern region of southeastern Alaska by rope trawl, June–August 2010. No trawling was conducted at Icy Point in June.

		June				July				August			
Locality	Factor	*n*	range	mean	se	*n*	Range	mean	se	*n*	range	mean	se
Upper	Length	285	75-137	101.2	0.6	226	90-182	132.2	1.2	248	123-203	164.5	0.9
Chatham	Weight	157	3.7-23.5	9.5	0.3	151	7.4-60.4	23.3	0.8	90	14.5-80.1	46.5	1.4
Strait	Condition	157	0.7-1.9	0.9	0.0	151	0.8-1.5	0.9	0.0	90	0.7-1.2	1.0	0.0
	CR	157	-0.19-0.82	0.00	0.01	151	-0.19-0.47	-0.02	0.01	90	-0.35-0.14	0.02	0.01
Icy	Length	425	70-134	92.2	0.5	816	84-175	124.0	0.4	156	129-211	172.6	1.2
Strait	Weight	300	3.3-22.0	6.7	0.1	400	7.7-55.5	19.4	0.4	103	19.0-92.7	51.4	1.5
	Condition	300	0.7-1.3	0.8	0.0	400	0.7-1.3	0.9	0.0	103	0.8-1.5	1.0	0.0
	CR	300	-0.26-0.37	-0.02	0.00	400	-0.36-0.29	0.01	0.00	103	-0.16-0.39	0.01	0.01
Icy	Length					115	105-248	158.7	2.4	9	131-178	154.6	5.2
Point	Weight					75	15.5-179.3	46.3	3.2	9	19.9-54.8	36.1	3.9
	Condition					75	0.9-1.2	1.0	0.0	9	0.8-1.3	0.9	0.0
	CR					75	-0.12-0.25	0.02	0.01	9	-0.22-0.25	-0.01	0.04
Total	Length	710	70-137	95.8	0.4	1157	84-248	129.1	0.6	413	123-211	167.3	0.7
	Weight	457	3.3-23.5	7.7	0.1	626	7.4-179.3	23.6	0.6	202	14.5-92.7	48.5	1.0
	Condition	457	0.7-1.9	0.8	0.0	626	0.7-1.5	0.9	0.0	202	0.7-1.5	1.0	0.0
	CR	457	-0.26-0.82	-0.01	0.00	626	-0.36-0.47	0.00	0.00	202	-0.35-0.39	0.02	0.01

Table 12.—Length (mm, fork), weight (g), Fulton's condition [(g/mm^3)·(10^5)], and condition residuals (CR) from length-weight regression analysis of juvenile chum salmon captured in the marine waters of the northern region of southeastern Alaska by rope trawl, June–August 2010. No trawling was conducted at Icy Point in June.

		June				July				August			
Locality	Factor	*n*	range	mean	se	*n*	Range	mean	se	*n*	range	mean	se
Upper	Length	218	82-140	107.5	0.7	93	87-171	132.7	2.0	22	109-190	149.7	4.8
Chatham	Weight	134	5.6-24.0	12.2	0.3	89	8.9-47.6	23.7	1.0	22	16.2-74.8	36.7	3.7
Strait	Condition	134	0.8-1.6	0.9	0.0	89	0.8-1.0	0.9	0.0	22	0.9-1.3	1.0	0.0
	CR	134	-0.24-0.51	-0.05	0.01	89	-0.23-0.08	-0.04	0.01	22	-0.12-0.28	0.05	0.02
Icy	Length	335	75-144	101.5	0.6	716	84-198	124.8	0.6	16	105-204	151.6	6.1
Strait	Weight	245	4.3-31.6	10.4	0.2	398	5.9-49.5	20.8	0.4	16	11.0-88.1	38.3	5.3
	Condition	245	0.5-1.2	0.9	0.0	398	0.5-2.1	1.0	0.0	16	0.9-1.2	1.0	0.0
	CR	245	-0.75-0.15	-0.03	0.01	398	-0.74-0.74	0.03	0.00	16	-0.13-0.13	0.02	0.02
Icy	Length					19	110-208	145.1	5.6	—	—	—	—
Point	Weight					19	11.6-90.0	33.1	4.6	—	—	—	—
	Condition					19	0.9-1.2	1.0	0.0	—	—	—	—
	CR					19	-0.12-0.15	0.00	0.02	—	—	—	—
Total	Length	553	75-144	103.9	0.5	828	84-208	126.1	0.6	38	105-204	150.5	3.8
	Weight	379	1.3-31.6	11.0	0.2	506	5.9-90.0	21.8	0.4	38	11.0-88.1	37.3	3.1
	Condition	379	0.5-1.6	0.9	0.0	506	0.5-2.0	1.0	0.0	38	0.9-1.3	1.0	0.0
	CR	379	-0.75-0.51	-0.04	0.00	506	-0.74-0.74	0.02	0.00	38	-0.13-0.28	0.03	0.01

Table 13.—Length (mm, fork), weight (g), Fulton's condition [$(g/mm^3)\cdot(10^5)$], and condition residuals (CR) from length-weight regression analysis of juvenile sockeye salmon captured in the marine habitat of the northern region of southeastern Alaska by rope trawl, June–August 2010. No trawling was conducted in June at Icy Point.

		June				July				August			
Locality	Factor	*n*	range	mean	se	*n*	Range	mean	se	*n*	range	mean	se
Upper	Length	49	78-170	121.2	2.9	14	85-199	140.7	9.4	2	140-152	146.0	6.0
Chatham	Weight	49	3.6-49.9	18.4	1.4	14	4.7-79.8	32.7	6.3	2	32.4-37.3	34.9	2.5
Strait	Condition	49	0.8-1.2	0.9	0.0	14	0.8-1.2	1.0	0.0	2	1.1-1.2	1.1	0.1
	CR	49	-0.22-0.12	-0.05	0.01	14	-0.22-0.13	-0.03	0.03	2	0.05-0.17	0.11	0.06
Icy	Length	137	77-253	114.2	1.9	384	80-197	119.2	0.8	8	120-194	158.5	9.0
Strait	Weight	112	4.3-178.2	16.3	1.6	305	5.2-85.6	18.9	0.5	8	16.3-77.5	44.5	7.1
	Condition	112	0.6-1.3	0.9	0.0	305	0.3-1.3	1.0	0.0	8	1-1.2	1.0	0.0
	CR	112	-0.53-0.22	-0.05	0.01	305	-1.53-0.23	0.04	0.01	8	-0.09-0.16	0.03	0.03
Icy	Length					26	120-203	182.1	3.7	—	—	—	—
Point	Weight					26	16.1-89.2	66.9	3.5	—	—	—	—
	Condition					26	0.9-1.2	1.1	0.0	—	—	—	—
	CR					26	-0.06-0.15	0.04	0.01	—	—	—	—
Total	Length	186	77-253	116.0	1.6	424	80-203	123.8	1.1	10	120-194	156.0	7.3
	Weight	161	3.6-178.2	16.9	1.2	345	4.7-89.2	23.1	0.9	10	16.3-77.5	42.6	5.8
	Condition	161	0.6-1.3	0.9	0.0	345	0.3-1.3	1.0	0.0	10	1-1.2	1.1	0.0
	CR	161	-0.53-0.22	-0.05	0.01	345	-1.53-0.23	0.04	0.01	10	-0.09-0.17	0.04	0.02

Table 14.—Length (mm, fork), weight (g), Fulton's condition [(g/mm^3)·(10^5)], and condition residuals (CR) from length-weight regression analysis of juvenile coho salmon captured in the marine habitat of the northern region of southeastern Alaska by rope trawl, June–August 2010. No trawling was conducted in June at Icy Point.

		June				July				August			
Locality	Factor	*n*	range	mean	se	*n*	range	mean	se	*n*	range	mean	se
Upper Chatham Strait	Length	108	95-225	174.9	2.7	66	170-270	210.1	2.5	15	214-320	250.1	6.7
	Weight	76	8.4-128.5	65.1	3.3	66	49.7-210.8	107.7	3.7	15	127.3-416.2	196.1	18.1
	Condition	76	0.7-1.4	1.1	0.0	66	0.9-1.4	1.1	0.0	15	1.1-1.4	1.2	0.0
	CR	76	-0.52-0.14	-0.07	0.01	66	-0.36-0.19	-0.02	0.01	15	-0.09-0.16	0.02	0.02
Icy Strait	Length	164	109-313	184.5	2.2	100	132-292	211.2	3.0	67	198-335	252.7	3.1
	Weight	163	11.6-358.4	72.3	2.8	100	22.3-327.7	116.7	4.9	67	87.4-438.0	195.6	7.6
	Condition	163	0.9-1.8	1.1	0.0	100	0.9-1.4	1.2	0.0	67	1.1-1.4	1.2	0.0
	CR	163	-0.24-0.49	-0.07	0.01	100	-0.29-0.19	0.00	0.01	67	-0.15-0.11	-0.02	0.01
Icy Point	Length					23	192-279	249.5	4.8	1	214	214.0	—
	Weight					23	94.9-274.2	207.1	11.9	1	123.9	123.9	—
	Condition					23	1.1-1.5	1.3	0.0	1	1.3	1.3	—
	CR					23	-0.13-0.21	0.08	0.02	1	0.09	0.08	—
Total	Length	272	95-313	180.7	1.7	189	130-292	215.0	2.1	83	198-335	251.8	2.8
	Weight	239	8.4-358.4	70.0	2.2	189	22.3-327.7	124.5	3.9	83	87.4-438.0	194.8	7.0
	Condition	239	0.7-1.8	1.1	0.0	189	0.9-1.5	1.2	0.0	83	1.1-1.4	1.2	0.0
	CR	239	-0.52-0.49	-0.07	0.01	189	-0.36-0.21	0.00	0.01	83	-0.15-0.16	-0.01	0.01

Table 15.—Length (mm, fork), weight (g), Fulton's condition [$(g/mm^3)\cdot(10^5)$], and condition residuals (CR) from length-weight regression analysis of juvenile Chinook salmon captured in the marine habitat of the northern region of southeastern Alaska by rope trawl, June–August 2010. No trawling was conducted in June at Icy Point.

		June				July				August			
Locality	Factor	*n*	range	mean	se	*n*	Range	mean	se	*n*	range	mean	se
Upper Chatham Strait	Length	2	183-185	184.0	1.0	—	—	—	—	—	—	—	—
	Weight	2	69.8-79.4	74.6	4.8	—	—	—	—	—	—	—	—
	Condition	2	1.2-1.3	1.2	0.1	—	—	—	—	—	—	—	—
	CR	2	-0.07-0.03	-0.02	0.05	—	—	—	—	—	—	—	—
Icy Strait	Length	2	175-225	200.0	25.0	2	201-217	209.0	8.0	—	—	—	—
	Weight	2	57.3-146.7	102.0	44.7	2	99.5-134.4	117.0	17.5	—	—	—	—
	Condition	2	1.1-1.3	1.2	0.1	2	1.3-1.4	1.3	0.0	—	—	—	—
	CR	2	-0.12--0.01	-0.06	0.05	2	-0.03-0.03	0.00	0.02	—	—	—	—
Icy Point	Length					—	—	—	—	—	—	—	—
	Weight					—	—	—	—	—	—	—	—
	Condition					—	—	—	—	—	—	—	—
	CR					—	—	—	—	—	—	—	—
Total	Length	4	175-225	192.0	11.2	2	201-217	209.0	8.0	—	—	—	—
	Weight	4	57.3-146.7	88.3	20.0	2	99.5-134.4	117.0	17.5	—	—	—	—
	Condition	4	1.1-1.3	1.2	0.1	2	1.3-1.4	1.3	0.0	—	—	—	—
	CR	4	-0.12-0.03	-0.04	0.03	2	-0.03-0.03	0.00	0.02	—	—	—	—

Table 16.—Release and recovery information decoded from coded-wire tags (CWT) recovered from coho and Chinook salmon lacking an adipose fin. Fish were captured in the marine waters of the northern region of southeastern Alaska by rope trawl, June–August 2010. Station code acronyms and coordinates are shown in Table 1.

		Release information						Recovery information							
Species	CWT code	Brood year	Agency[1]	Locality	2010 date	FL (mm)	W (g)	Locality	Station code	2010 date	FL (mm)	W (g)	Age	Days[2] since release	Distance traveled (km)
June															
Coho	040996	2008	ADFG	Chilkat R., AK (Wild)	5 /12			Icy Strait	ISB	6/25	141	26.8	1.0	44	145
Coho	040997	2008	ADFG	Chilkat R., AK (Wild)	5 /24			Chatham Str.	UCC	6/28	171	55.9	1.0	35	120
Coho	040997	2008	ADFG	Chilkat R., AK (Wild)	5 /24			Chatham Str.	UCD	6/28	152	35.6	1.0	35	120
Coho	041512	2008	ADFG	Berners R., AK (Wild)	6 /11	90		Icy Strait	ISA	6/25	182	66.1	1.0	14	95
Coho	041544	2008	ADFG	Taku River, AK (Wild)	5 /20			Icy Strait	ISB	6/26	165	47.6	1.0	38	120
Coho	041765	2008	NSRAA	Kasnyku Bay, AK	5 /11		20.5	Icy Strait	ISA	6/25	198	91.6	1.0	45	135
Coho	041766	2008	NSRAA	Kasnyku Bay, AK	5 /11		20.5	Icy Strait	ISD	6/25	215	112.1	1.0	45	130
Coho	042286	2008	DIPAC	Gastineau Channel, AK	6 /3		24.6	Icy Strait	ISD	6/26	151	33.2	1.0	24	87
July															
Chinook	042064	2008	NSRAA	Kasnyku Bay, AK	6 /1		69.8	Icy Strait	ISD	7/29	217	134.4	1.0	58	130
Coho	040996	2008	ADFG	Chilkat R., AK (Wild)	5 /12			Chatham Str.	UCA	7/30	220	123.1	1.0	79	130
Coho	040997	2008	SSRAA	Chilkat R., AK (Wild)	5 /24			Icy Strait	ISC	7/27	210	112.6	1.0	64	145
Coho	041544	2008	ADFG	Taku River, AK (Wild)	5 /20			Chatham Str.	UCC	7/31	221	124.7	1.0	72	115
Coho	041766	2008	NSRAA	Kasnyku Bay, AK	5 /11		20.5	Icy Strait	ISB	7/27	245	168.5	1.0	77	135
Coho	042269	2008	SSRAA	Nakat Inlet, AK	5 /21	139	26.6	Icy Point	IPC	7/28	261	226.7	1.0	68	670
Coho	634971	2008	WDFW	Fork Creek, WA	4 /15	137	30.2	Icy Point	IPC	7/28	268	263.9	1.0	104	1600
Coho	No tag							Icy Point	IPD	7/28	279	265.0			
Coho	No tag							Icy Point	IPC	7/28	273	264.0			
Coho	No tag							Icy Point	IPC	7/28	265	274.2			

Table 16.—cont.

		Release information						Recovery information							
Species	CWT code	Brood year	Agency[1]	Locality	2010 date	FL (mm)	W (g)	Locality	Station code	2010 date	FL (mm)	W (g)	Age	Days[2] since release	Distance traveled (km)
							August								
Coho	041543	2008	ADFG	Taku River, AK (Wild)	5 /18			Icy Strait	ISC	8/26	229	153.1	1.0	100	120

[1] ADFG = Alaska Department of Fish and Game; DIPAC = Douglas Island Pink and Chum Inc.; NSRAA = Northern Southeast Regional Aquaculture Association; SSRAA = Southern Southeast Regional Aquaculture Association; WDFW = Washington Department of Fish and Wildlife.

[2] Days since release may potentially include freshwater residence periods, such as for salmon fry marked and released in fall that over-wintered in freshwater and smolted the subsequent year.

Table 17.—Stock-specific information on juvenile chum salmon released from regional enhancement facilities and captured in the marine waters of the northern region of southeastern Alaska by rope trawl, June-August 2010. Length (mm, fork), weight (g), Fulton's condition [$(g/mm^3) \cdot (10^5)$], and condition residuals (CR) from length-weight regression analysis are reported for each stock group. See Table 15 for agency acronyms. No trawling was conducted in June at Icy Point.

		June				July				August			
Locality	Factor	n	range	mean	se	n	range	mean	se	n	range	mean	se
							DIPAC						
Upper Chatham Strait	Length	65	93-140	112.4	1.2	21	103-171	144.6	4.2	1	186	186.0	—
	Weight	65	7.6-23.9	13.5	0.4	21	9.8-47.6	30.8	2.4	1	68.0	68.0	—
	Condition	65	0.7-1.2	0.9	0.0	21	0.9-1	1.0	0.0	1	1.1	1.1	—
	CR	65	-0.24-0.21	-0.02	0.01	21	-0.09-0.06	0.00	0.01	1	0.07	0.07	—
Icy Strait	Length	185	84-126	105.0	0.7	132	95-161	131.3	1.3	2	180-204	192.0	12.0
	Weight	185	4.5-18.7	10.9	0.2	132	7.7-45.4	23.8	0.7	2	65.5-88.1	76.8	11.3
	Condition	185	0.4-1.1	0.9	0.0	132	0.5-2	1.0	0.0	2	1.0-1.1	1.1	0.0
	CR	185	-0.74-0.14	-0.03	0.01	132	-0.73-0.74	0.04	0.01	2	0.04-0.13	0.09	0.04
Icy Point	Length					4	122-160	140.8	9.3	—	—	—	—
	Weight					4	16.5-40.3	28.2	5.6	—	—	—	—
	Condition					4	0.9-1	1.0	0.0	—	—	—	—
	CR					4	-0.05-0.05	0.0	0.0	—	—	—	—
Total	Length	250	84-140	106.9	0.6	157	95-171	133.3	1.3	3	180-204	190.0	7.2
	Weight	250	4.5-23.9	11.6	0.2	157	7.7-47.6	24.8	0.7	3	65.5-88.1	73.9	7.2
	Condition	250	0.4-1.2	0.9	0.0	157	0.5-2	1.0	0.0	3	1-1.1	1.1	0.0
	CR	250	-0.74-0.21	-0.03	0.01	157	-0.73-0.74	0.04	0.01	3	0.04-0.13	0.08	0.03
							Port Armstrong						
Upper Chatham Strait	Length	2	103-111	107.0	4.0	1	145	145.0	—	—	—	—	—
	Weight	2	9.2-12.7	11.0	1.8	1	26.3	26.3	—	—	—	—	—
	Condition	2	0.8-0.9	0.9	0.0	1	0.9	0.9	—	—	—	—	—

Table 17.—cont.

Locality	Factor	June n	June range	June mean	June se	July n	July range	July mean	July se	August n	August range	August mean	August se
	CR	2	-0.11--0.02	-0.07	0.05	1	-0.11	-0.11	—	—	—	—	—
Icy Strait	Length	—	—	—	—	5	128-157	144.0	5.1	—	—	—	—
	Weight	—	—	—	—	5	19.1-40.1	30.0	3.7	—	—	—	—
	Condition	—	—	—	—	5	0.9-1	1.00	0.00	—	—	—	—
	CR	—	—	—	—	5	-0.05-0.06	0.01	0.02	—	—	—	—
Icy Point	Length					1	157	157.0	—	—	—	—	—
	Weight					1	34.9	34.9	—	—	—	—	—
	Condition					1	0.9	0.9	—	—	—	—	—
	CR					1	-0.08	-0.08	—	—	—	—	—
Total	Length	2	103-111	107.0	4.0	7	128-157	146.0	4.0	—	—	—	—
	Weight	2	9.2-12.7	11.0	1.8	7	19.1-40.1	30.2	2.7	—	—	—	—
	Condition	2	0.8-0.9	0.9	0.0	7	0.9-1	1.0	0.0	—	—	—	—
	CR	2	-0.11--0.02	-0.07	0.05	7	-0.11-0.06	-0.02	0.02	—	—	—	—
NSRAA													
Kasnyku Bay													
Upper Chatham Strait	Length	33	90-132	108.4	1.7	20	101-151	135.3	3.4	1	175	175.0	—
	Weight	33	5.6-24.0	11.6	0.7	20	8.9-34.1	23.5	1.8	1	54.3	54.3	—
	Condition	33	0.8-1.6	0.9	0.0	20	0.8-1.0	0.9	0.0	1	1.0	1.0	—
	CR	33	-0.19-0.51	-0.07	0.02	20	-0.22-0.06	-0.06	0.02	1	0.03	0.03	—
Icy Strait	Length	—	—	—	—	46	100-159	130.9	2.0	3	150-158	154.7	2.4
	Weight	—	—	—	—	46	9.6-38.7	22.1	1.0	3	34.9-39.3	37.6	1.4
	Condition	—	—	—	—	46	0.5-1.1	1.0	0.0	3	1.0-1.0	1.0	0.0
	CR	—	—	—	—	46	-0.64-0.17	-0.01	0.02	3	0.02-0.06	0.04	0.01

Table 17.—cont.

Locality	Factor	June				July				August			
		n	range	mean	se	n	range	mean	se	n	range	mean	se
Icy Point	Length					3	130-142	134.7	3.7	—	—	—	—
	Weight					3	19.3-32.2	23.8	4.2	—	—	—	—
	Condition					3	0.9-1.1	1.0	0.1	—	—	—	—
	CR					3	0.86-1.12	0.95	0.09	—	—	—	—
Total	Length	33	90-132	108.4	1.7	69	100-159	132.3	1.7	4	150-175	159.8	5.4
	Weight	33	5.6-24.0	11.6	0.7	69	8.9-38.7	22.6	0.9	4	34.9-54.3	41.8	4.3
	Condition	33	0.8-1.6	0.9	0.0	69	0.5-1.1	0.9	0.0	4	1.0-1.0	1.0	0.0
	CR	33	-0.19-0.51	-0.07	0.02	69	-0.64-0.17	-0.02	0.01	4	0.02-0.06	0.04	0.01
						Deep Inlet							
Icy Strait (Total)	Length	—	—	—	—	1	120	120.0	—	—	—	—	—
	Weight	—	—	—	—	1	15.9	15.9	—	—	—	—	—
	Condition	—	—	—	—	1	0.9	0.9	—	—	—	—	—
	CR	—	—	—	—	1	-0.03	-0.03	—	—	—	—	—
						Takatz Bay							
Upper Chatham Strait	Length	9	95-104	99.1	0.9	15	105-150	126.1	4.1	2	135-138	136.5	1.5
	Weight	9	6.8-9.4	8.2	0.3	15	10.2-29.6	18.6	1.8	2	23.4-25.4	24.4	1.0
	Condition	9	0.8-0.9	0.8	0.0	15	0.8-1.0	0.9	0.0	2	1.0-1.0	1.0	0.0
	CR	9	-0.19--0.06	-0.11	0.01	15	-0.15-0.03	-0.08	0.01	2	-0.01-0.00	0.00	0.01
Icy Strait	Length	—	—	—	—	41	96-148	125.5	1.7	5	128-149	136.8	3.9
	Weight	—	—	—	—	41	8.0-30.2	19.7	0.8	5	18.2-36.5	24.8	3.3
	Condition	—	—	—	—	41	0.8-1.2	1.0	0.0	5	0.8-1.1	0.9	0.0
	CR	—	—	—	—	41	-0.15-0.21	0.02	0.01	5	-0.12-0.13	-0.02	0.04

Table 17.—cont.

Locality	Factor	June n	June range	June mean	June se	July n	July range	July mean	July se	August n	August range	August mean	August se
Icy Point	Length					1	123	123.0		—	—	—	—
	Weight					1	16.0	16.0		—	—	—	—
	Condition					1	0.9	0.9		—	—	—	—
	CR					1	-0.10	-0.10		—	—	—	—
Total	Length	9	95-104	99.1	0.9	57	96-150	125.6	1.6	7	128-149	136.7	2.7
	Weight	9	6.8-9.4	8.2	0.3	57	8.0-30.2	19.4	0.7	7	18.2-36.5	24.7	2.3
	Condition	9	0.8-0.9	0.8	0.0	57	0.8-1.2	1.0	0.0	7	0.8-1.1	0.9	0.0
	CR	9	-0.19--0.06	-0.11	0.01	57	-0.15-0.21	-0.01	0.01	7	-0.12-0.13	-0.02	0.03
SSRAA Anita Bay													
Upper Chatham Strait	Length	—	—	—	—	—	—	—	—	1	185	185.0	—
	Weight	—	—	—	—	—	—	—	—	1	71.7	71.7	—
	Condition	—	—	—	—	—	—	—	—	1	1.1	1.1	—
	CR	—	—	—	—	—	—	—	—	1	0.14	0.14	—
Icy Strait	Length	—	—	—	—	—	—	—	—	—	—	—	—
	Weight	—	—	—	—	—	—	—	—	—	—	—	—
	Condition	—	—	—	—	—	—	—	—	—	—	—	—
	CR	—	—	—	—	—	—	—	—	—	—	—	—
Icy Point	Length					1	158	158.0	—	—	—	—	—
	Weight					1	40.4	40.4	—	—	—	—	—
	Condition					1	1.0	1.0	—	—	—	—	—
	CR					1	0.05	0.05	—	—	—	—	—
Total	Length	—	—	—	—	1	158	158.0	—	1	185	185.0	—

Table 17.—cont.

Locality	Factor	June				July				August			
		n	range	mean	se	n	range	mean	se	n	range	mean	se
	Weight	—	—	—	—	1	40.4	40.4	—	1	71.7	71.7	—
	Condition	—	—	—	—	1	1.0	1.0	—	1	1.1	1.1	—
	CR	—	—	—	—	1	0.05	0.05	—	1	0.14	0.14	—
						Unmarked stocks							
Upper	Length	22	89-121	105.5	1.9	29	100-165	127.8	3.4	13	109-190	141.8	6.2
Chatham	Weight	22	5.8-17	10.9	0.7	29	9.8-42.2	21.1	1.7	13	16.2-74.8	31.4	4.5
Strait	Condition	22	0.8-1.0	0.9	0.0	29	0.8-1.1	1.0	0.0	13	0.9-1.3	1.0	0.0
	CR	22	-0.15-0.06	-0.05	0.01	29	-0.11-0.08	-0.01	0.01	13	-0.10-0.28	0.07	0.03
Icy	Length	57	80-144	97.4	1.6	163	84-170	120.2	1.2	6	105-186	149.0	11.4
Strait	Weight	57	4.3-31.6	8.8	0.6	163	5.9-49.5	18.2	0.6	6	11.0-72.1	36.9	8.7
	Condition	57	0.7-1.1	0.9	0.0	163	0.8-1.4	1.0	0.0	6	1.0-1.1	1.0	0.0
	CR	57	-0.28-0.15	-0.03	0.01	163	-0.22-0.4	0.05	0.01	6	0.00-0.13	0.03	0.02
Icy	Length					8	110-208	153.9	11.3	—	—	—	—
Point	Weight					8	11.6-90.0	42.2	9.5	—	—	—	—
	Condition					8	0.9-1.1	1.0	0.0	—	—	—	—
	CR					8	-0.08-0.15	0.04	0.03	—	—	—	—
Total	Length	79	80-144	99.7	1.3	200	84-208	122.7	1.3	19	105-190	144.1	5.4
	Weight	79	4.3-31.6	9.4	0.5	200	5.9-90.0	19.6	0.7	19	11.0-74.8	33.1	4.0
	Condition	79	0.7-1.1	0.9	0.0	200	0.8-1.4	1.0	0.0	19	0.9-1.3	1.0	0.0
	CR	79	-0.28-0.15	-0.04	0.01	200	-0.22-0.40	0.04	0.01	19	-0.10-0.28	0.06	0.02

Table 18.—Stock-specific information on juvenile sockeye salmon released from regional enhancement facilities and captured in the marine waters of the northern region of southeastern Alaska by rope trawl, June-August 2010. Length (mm, fork), weight (g), Fulton's condition [$(g/mm^3) \cdot (10^5)$], and condition residuals (CR) from length-weight regression analysis are reported for each stock group. See Table 15 for agency acronyms. No trawling was conducted in June at Icy Point.

		June				July				August			
Locality	Factor	n	range	mean	se	n	range	mean	se	n	range	mean	se
						DIPAC							
						Speel Arm							
Upper	Length	12	110-140	125.6	3.0	3	130-147	135.7	5.7	1	140	140.0	—
Chatham	Weight	12	13.6-26.5	19.3	1.3	3	21.8-33.3	26.1	3.6	1	32.4	32.4	—
Strait	Condition	12	0.9-1.0	1.0	0.0	3	1.0-1.1	1.0	0.0	1	1.2	1.2	—
	CR	12	-0.10-0.06	-0.03	0.01	3	0.00-0.06	0.03	0.02	1	0.16	0.16	—
Icy	Length	19	113-138	121.5	1.6	32	106-160	132.4	1.8	—	—	—	—
Strait	Weight	19	13.2-26.3	17.9	0.9	32	12.2-42.1	24.9	1.1	—	—	—	—
	Condition	19	0.9-1.1	1.0	0.0	32	0.9-1.2	1.0	0.0	—	—	—	—
	CR	19	-0.15-0.14	-0.01	0.02	32	-0.06-0.20	0.05	0.01	—	—	—	—
Icy	Length					—	—	—	—	—	—	—	—
Point	Weight					—	—	—	—	—	—	—	—
	Condition					—	—	—	—	—	—	—	—
	CR					—	—	—	—	—	—	—	—
Total	Length	31	110-140	123.1	1.5	35	106-160	132.7	1.7	1	140	140.0	—
	Weight	31	13.2-26.5	18.4	0.7	35	12.2-42.1	25.0	1.0	1	32.4	32.4	—
	Condition	31	0.9-1.1	1.0	0.0	35	0.9-1.2	1.0	0.0	1	1.2	1.2	—
	CR	31	-0.15-0.14	-0.02	0.01	35	-0.06-0.20	0.05	0.01	1	0.16	0.16	—

Table 18.—cont.

Locality	Factor	June n	June range	June mean	June se	July n	July range	July mean	July se	August n	August range	August mean	August se
Sweetheart Lake													
Upper	Length	1	100	100.0	—	—	—	—	—	—	—	—	—
Chatham	Weight	1	9.5	9.5	—	—	—	—	—	—	—	—	—
Strait	Condition	1	1.0	1.0	—	—	—	—	—	—	—	—	—
	CR	1	-0.02	-0.02	—	—	—	—	—	—	—	—	—
Icy	Length	1	111	111.0	—	2	145-152	148.5	3.5	—	—	—	—
Strait	Weight	1	12.9	12.9	—	2	33.8-36.6	35.2	1.4	—	—	—	—
	Condition	1	0.9	0.9	—	2	1.0-1.1	1.1	0.0	—	—	—	—
	CR	1	-0.04	-0.04	—	2	0.03-0.10	0.06	0.03	—	—	—	—
Icy	Length					—	—	—	—	—	—	—	—
Point	Weight					—	—	—	—	—	—	—	—
	Condition					—	—	—	—	—	—	—	—
	CR					—	—	—	—	—	—	—	—
Total	Length	2	100-111	105.5	5.5	2	145-152	148.5	3.5	—	—	—	—
	Weight	2	9.5-12.9	11.2	1.7	2	33.8-36.6	35.2	1.4	—	—	—	—
	Condition	2	0.9-1.0	0.9	0.0	2	1.0-1.1	1.1	0.0	—	—	—	—
	CR	2	-0.04--0.02	-0.03	0.01	2	0.03-0.10	0.06	0.03	—	—	—	—
Tatsamenie Lake													
Upper	Length	—	—	—	—	1	199	199.0	—	—	—	—	—
Chatham	Weight	—	—	—	—	1	79.8	79.8	—	—	—	—	—
Strait	Condition	—	—	—	—	1	1.0	1.0	—	—	—	—	—
	CR	—	—	—	—	1	-0.03	-0.03	—	—	—	—	—

Table 18.—cont.

Locality	Factor	June n	June range	June mean	June se	July n	July range	July mean	July se	August n	August range	August mean	August se
Icy Strait	Length	6	96-121	110.7	3.7	2	123.0-143.0	133.0	10.0	—	—	—	—
	Weight	6	6.9-15.8	11.5	1.3	2	18.5-29.3	23.9	5.4	—	—	—	—
	Condition	6	0.8-0.9	0.8	0.0	2	1.0-1.0	1.0	0.0	—	—	—	—
	CR	6	-0.23--0.10	-0.17	0.05	2	0.00-0.01	0.00	0.01	—	—	—	—
Icy Point	Length					—	—	—	—	—	—	—	—
	Weight					—	—	—	—	—	—	—	—
	Condition					—	—	—	—	—	—	—	—
	CR					—	—	—	—	—	—	—	—
Total	Length	6	96-121	110.7	3.7	3	123.0-199.0	155.0	22.7	—	—	—	—
	Weight	6	6.9-15.8	11.5	1.3	3	18.5-79.8	42.5	18.9	—	—	—	—
	Condition	6	0.8-0.9	0.8	0.0	3	1.0-1.0	1.0	0.0	—	—	—	—
	CR	6	-0.23--0.10	-0.17	0.05	3	-0.03-0.01	-0.01	0.02	—	—	—	—
Unmarked stocks													
Upper Chatham Strait	Length	35	78-170	120.7	3.9	10	85-185	136.4	11.7	1	152	152.0	—
	Weight	35	3.6-49.9	18.5	2.0	10	4.7-63.2	30.0	7.3	1	37.3	37.3	—
	Condition	35	0.8-1.1	0.9	0.0	10	0.8-1.2	1.0	0.0	1	1.1	1.1	—
	CR	35	-0.22-0.12	-0.06	0.01	10	-0.22-0.12	-0.05	0.03	1	0.05	0.05	—
Icy Strait	Length	85	80-253	113.3	2.8	269	80-197	118.5	1.0	9	120-194	161.0	8.3
	Weight	85	4.3-178.2	16.3	2.2	269	5.2-85.6	18.1	0.6	9	16.3-77.5	46.7	6.6
	Condition	85	0.6-1.2	0.9	0.0	269	0.2-1.2	1.0	0.0	9	0.9-1.2	1.1	0.0
	CR	85	-0.52-0.22	-0.06	0.01	269	-1.53-0.23	0.04	0.01	9	-0.08-0.16	0.03	0.02
Icy Point	Length					26	120-203	182.1	3.7	—	—	—	—
	Weight					26	16.1-89.2	66.9	3.5	—	—	—	—
	Condition					26	0.9-1.2	1.1	0.0	—	—	—	—
	CR					26	-0.06-0.14	0.04	0.01	—	—	—	—

Table 18.—cont.

Locality	Factor	June				July				August			
		n	range	mean	se	n	range	mean	se	n	range	mean	se
Total	Length	120	78-253	115.5	2.3	305	80-203	124.5	1.4	10	120-194	160.1	7.5
	Weight	120	3.6-178.2	17.0	1.6	305	4.7-89.2	22.6	1.0	10	16.3-77.5	45.7	6.0
	Condition	120	0.6-1.2	0.9	0.0	305	0.2-1.2	1.0	0.0	10	0.9-1.2	1.1	0.0
	CR	120	-0.52-0.22	-0.06	0.01	305	-1.53-0.23	0.04	0.01	10	-0.08-0.16	0.03	0.02

Table 19.—Stock-specific information on juvenile coho salmon released from regional enhancement facilities and captured in the marine waters of the northern region of southeastern Alaska by rope trawl, June-August 2010. Length (mm, fork), weight (g), Fulton's condition [(g/mm^3) · (10^5)], and condition residuals (CR) from length-weight regression analysis are reported for each stock group. See Table 15 for agency acronyms. No trawling was conducted in June at Icy Point.

		June				July				August			
Locality	Factor	n	range	mean	se	n	range	mean	se	n	range	mean	se
						DIPAC							
						Gastineau Channel							
Upper	Length	4	147-158	153.5	2.4	7	210-235	221.7	3.1	2	242-253	247.5	5.5
Chatham	Weight	4	32.6-38.7	36.2	1.3	7	107.2-121.8	115.6	2.0	2	168.5-195.5	182.0	13.5
Strait	Condition	4	1.0-1.0	1.0	0.0	7	0.8-1.2	1.1	0.0	2	1.2-1.2	1.2	0.0
	CR	4	-0.13--0.07	-0.10	0.01	7	-0.35-0.02	-0.09	0.05	2	0.01-0.02	0.01	0.00
Icy	Length	1	154	154.0	—	3	200-218	210.0	5.3	5	228-266	249.8	6.8
Strait	Weight	1	38.1	38.1	—	3	87.6-119.7	102.8	9.3	5	135.5-221.2	176.2	14.9
	Condition	1	1.0	1.0	—	3	1.1-1.2	1.1	0.0	5	1.0-1.2	1.1	0.0
	CR	1	-0.06	-0.06	—	3	-0.09--0.01	-0.05	0.02	5	-0.14--0.02	-0.06	0.02
Icy	Length					—	—	—	—	—	—	—	—
Point	Weight					—	—	—	—	—	—	—	—
	Condition					—	—	—	—	—	—	—	—
	CR					—	—	—	—	—	—	—	—
Total	Length	5	147-158	153.6	1.9	10	200-235	218.2	3.1	7	228-266	249.1	4.9
	Weight	5	32.6-38.7	36.5	1.1	10	87.6-121.8	111.8	3.4	7	135.5-221.2	177.9	10.7
	Condition	5	1.0-1.0	1.0	0.0	10	0.8-1.2	1.1	0.0	7	1.0-1.2	1.1	0.0
	CR	5	-0.13--0.06	-0.10	0.01	10	-0.35-0.02	-0.08	0.03	7	-0.14-0.02	-0.04	0.02

Table 19.—cont.

Locality	Factor	June				July				August			
		n	range	mean	se	n	range	mean	se	n	range	mean	se
Unmarked stocks													
Upper	Length	69	95-225	181.3	3.4	57	170-270	208.3	2.7	13	214-320	250.5	7.7
Chatham	Weight	69	8.4-128.5	67.9	3.5	57	49.7-210.8	106.1	4.3	13	127.3-416.2	198.3	20.9
Strait	Condition	69	0.7-1.3	1.1	0.0	57	0.9-1.4	1.1	0.0	13	1.1-1.4	1.2	0.0
	CR	69	-0.51-0.13	-0.07	0.01	57	-0.27-0.19	-0.01	0.01	13	-0.08-0.16	0.03	0.02
Icy	Length	152	109-313	185.5	2.3	95	132-292	210.9	3.1	59	198-335	253.6	3.4
Strait	Weight	152	11.6-358.4	72.8	2.9	95	22.3-327.7	116.6	5.1	59	87.4-438.0	198.3	8.5
	Condition	152	0.9-1.7	1.1	0.0	95	0.9-1.3	1.2	0.0	59	1.0-1.3	1.2	0.0
	CR	152	-0.23-0.48	-0.07	0.01	95	-0.29-0.19	0.01	0.01	59	-0.14-0.11	-0.01	0.01
Icy	Length					20	192-279	247.3	5.4	1	214	214.0	—
Point	Weight					20	94.9-274.2	201.4	13.1	1	123.9	123.9	—
	Condition					20	1.0-1.5	1.3	0.0	1	1.3	1.3	—
	CR					20	-0.12-0.21	0.08	0.02	1	0.1	0.1	—
Total	Length	221	95-313	184.2	1.9	172	132-292	214.2	2.2	73	198-335	252.5	3.1
	Weight	221	8.4-358.4	71.3	2.3	172	22.3-327.7	123.0	4.1	73	87.4-438.0	197.3	7.8
	Condition	221	0.7-1.7	1.1	0.0	172	0.9-1.5	1.2	0.0	73	1.0-1.4	1.2	0.0
	CR	221	-0.51-0.48	-0.07	0.01	172	-0.29-0.21	0.01	0.01	73	-0.14-0.16	0.00	0.01

Table 20.—Number examined, length (mm, fork), wet weight (g), stomach content as percent body weight (%BW), and feeding intensity (0-100% volume fullness) of 59 potential predators of juvenile salmon captured in marine waters of the northern region of southeastern Alaska by rope trawl, June–August 2011. For scientific names, see Tables 8 and 9. For additional feeding data, see Table 20 and Figure 17. No trawling was conducted in coastal habitat in June.

		June				July				August			
Species	Factor	*n*	range	mean	sd	*n*	range	mean	sd	*n*	range	mean	sd
Pink salmon[1]	Length	9	445-535	494. 8	31.9	22	425-582	519.5	39.7	1	459	459	—
	Weight		1550-2350	1961.1	331.5		860-2600	1774.5	412.1		1100	1100	—
	%BW		0-1.3	0.4	0.4		0-1.7	0.3	0.4		0.1	0.1	—
	Fullness		0-100	50	33.1		0-75	27	31.6		25	25	—
Chum salmon[1]	Length	3	590-638	611.0	24.6	1	700	700.0	—	1	713	713.0	—
	Weight		3300-4900	4133.3	802.1		4190	4190.0	—		4270	4270.0	—
	%BW		0.4-0.6	0.5	0.1		0.5	0.5	—		0.1	0.1	—
	Fullness		1-75	50.3	42.7		25	25	—		10	10	—
Coho salmon[2]	Length	—	—	—	—	—	—	—	—	8	545-768	661.8	73.8
	Weight	—	—	—	—	—	—	—	—		3070-6650	4378.8	1340.2
	%BW	—	—	—	—	—	—	—	—		0.0-3.9	1.2	1.4
	Fullness	—	—	—	—	—	—	—	—		10-110	76.9	42.7
Chinook salmon[2]	Length	8	275-417	335.4	52.1		—	—	—	4	400-505	451.3	59.2
	Weight		300-1500	762.5	402.4		—	—	—		820-3000	1777.5	904.2
	%BW		0.0-1.8	0.7	0.6		—	—	—		0-0.5	0.2	0.2
	Fullness		25-100	68.8	29.1		—	—	—		0-50	27.5	26.3
Sockeye salmon [2]	Length	—	—	—	—		—	—	—	1	600	600.0	—
	Weight	—	—	—	—		—	—	—		2600	2600.0	—
	%BW	—	—	—	—		—	—	—		0.1	0.1	—
	Fullness	—	—	—	—		—	—	—		75	75	—

Table 20.—cont.

Species	Factor	June				July				August			
		n	range	mean	sd	*n*	range	mean	sd	*n*	range	mean	sd
Walleye pollock[2]	Length	—	—	—	—	1	320	320	—	—	—	—	—
	Weight	—	—	—	—		2400	2400	—	—	—	—	—
	%BW	—	—	—	—		0.1	0.1	—	—	—	—	—
	Fullness	—	—	—	—		75	75	—	—	—	—	—

[1] Adult
[2] Immature

Table 21.—Feeding intensity of potential predators of juvenile salmon examined from rope trawl hauls in the marine waters of the northern region of southeastern Alaska, June–August 2010. No trawling was conducted in coastal habitat in June.

Predator species	Life history stage	Number examined	Number empty	Percent feeding	Number with salmon	Percent feeders with salmon
Pink salmon	Adult	32	11	66	2	9.5
Chum salmon	Adult	5	0	100	0	0
Coho salmon	Adult	8	0	100	3	37.5
Chinook salmon	Immature	12	1	92	0	0
Sockeye salmon	Adult	1	0	100	0	0
Walleye pollock	Immature	1	0	100	0	0

Appendix 1.— Temperature (°C), salinity (PSU), ambient light (W/m^3), Secchi depth (m), mixed layer depth (MLD, m; see text for definition), zooplankton settled volume (ZSV, ml), and total plankton settled volumes (TSV, ml) by haul number at each station sampled in the marine waters of the northern region of southeastern Alaska, May–August 2010. Station code acronyms are listed in Table 1.

Date	Haul #	Station	Temperature (°C)	Salinity (PSU)	Light level (W/m^3)	Secchi (m)	MLD (m)	ZSV (ml)	TSV (ml)
26 May	14001	ABM	12.6	26.0	859	2.5	6		340.0
27 May	14002	ISD	9.4	30.4	607	5.0	7		500.0
27 May	14003	ISC	9.9	30.1	637	5.5	6		500.0
27 May	14004	ISB	9.4	30.4	883	4.0	6		500.0
27 May	14005	ISA	9.7	30.4	465	5.5	7		500.0
27 May	14006	UCA	10.3	29.8	511	5.5	6		500.0
27 May	14007	UCB	11.2	29.9	431	7.0	7		500.0
27 May	14008	UCC	10.5	28.4	187	3.5	7		500.0
27 May	14009	UCD	10.6	27.0	438	4.0	7		500.0
24 June	14010	ABM	13.4	21.8	140	2.5	8	20.0	44.0
25 June	14011	ISA	10.7	28.9	118	3.5	6	35.8	100.0
25 June	14012	ISB	11.9	26.3	550	6.0	6	50.0	60.0
25 June	14013	ISC	12.1	25.7	325	5.0	7	32.5	75.0
25 June	14014	ISD	12.2	25.8	136	4.5	9	25.0	50.0
26 June	14015	ISA	10.3	29.1	51	3.5	7	20.0	50.0
26 June	14016	ISB	11.0	27.8	71	4.0	9	29.0	58.0
26 June	14017	ISC	12.0	26.2	87	5.5	7	17.5	35.0
26 June	14018	ISD	11.8	26.2	257	5.5	9	15.0	30.0
27 June	14019	ISD	10.9	27.7	254	4.5	6	12.5	45.0
27 June	14020	ISC	11.5	26.7	393	6.0	6	24.0	50.0
27 June	14021	ISB	11.5	26.8	278	6.0	7	10.0	42.0
27 June	14022	ISA	11.4	27.6	681	6.0	7	20.0	40.0
28 June	14023	UCA	10.2	29.7	395	3.5	6	8.5	15.0
28 June	14024	UCB	9.3	30.1	413	3.5	6	14.5	50.0

Appendix 1.—cont.

Date	Haul #	Station	Temperature (°C)	Salinity (PSU)	Light level (W/m^3)	Secchi (m)	MLD (m)	ZSV (ml)	TSV (ml)
28 June	14025	UCC	10.4	29.7	705	5.0	17	7.8	12.0
29 June	14028	UCA	11.5	28.0	293	4.5	9	5.5	24.0
29 June	14029	UCB	11.5	28.1	299	5.0	10	25.0	55.0
29 June	14030	UCC	11.4	28.0	423	4.5	7	4.8	13.0
25 July	14031	ABM	11.4	21.4	236	2.0	8	3.8	12.0
26 July	14032	ISA	11.3	27.8	81	4.0	6	10.5	25.0
26 July	14033	ISB	11.2	27.6	446	5.0	8	9.0	18.0
26 July	14034	ISC	11.3	27.0	810	4.0	6	4.5	15.0
26 July	14035	ISD	11.2	27.7	751	5.0	6	2.5	7.5
27 July	14036	ISA	10.6	28.7	123		7	7.5	19.0
27 July	14037	ISB	11.0	28.4	264	4.0	7	3.8	8.0
27 July	14038	ISC	11.2	28.1	314	4.0	7	2.3	5.0
27 July	14039	ISD	11.6	28.1	476	5.0	6	2.3	5.0
28 July	14040	IPD	12.5	32.3	42	7.0	9	8.5	12.0
28 July	14041	IPC	12.6	31.6	495	7.0	16	5.0	5.0
28 July	14042	IPB	12.1	31.8	526	3.0	9	1.5	1.5
28 July	14043	IPA	10.9	31.5	293	3.0	7	1.0	2.0
29 July	14044	ISD	11.3	23.2	24	5.0	6	5.0	10.0
29 July	14045	ISC	11.6	22.7	31	6.0	7	4.8	7.0
29 July	14046	ISB	11.7	26.7	118	5.0	6	13.5	27.0
29 July	14047	ISA	11.8	26.3	297	6.0	6	30.0	60.0
30 July	14048	UCA	12.0	23.7	95	5.0	6	7.5	15.0
30 July	14049	UCB	11.8	25.5	222	6.0	8	6.0	12.0
30 July	14050	UCC	11.5	26.9	470	6.0	8	8.0	16.0
30 July	14051	UCD	11.7	25.8	743	4.0	7	9.5	19.0
30 July	14052	UCB	12.5	24.3	325	6.0	6	7.5	15.0
30 July	14053	UCA	11.2	26.6	298	5.0	6	6.0	12.0
24 August	14056	ABM	12.5	17.2	375	4.0	8	11.0	11.0

Appendix 1.—cont.

Date	Haul #	Station	Temperature (°C)	Salinity (PSU)	Light level (W/m^3)	Secchi (m)	MLD (m)	ZSV (ml)	TSV (ml)
25 August	14057	ISA	10.8	28.2	32	4.0	6	4.0	6.0
25 August	14058	ISB	12.3	24.3	123	6.0	7	5.0	5.0
25 August	14059	ISC	12.5	24.1	148	6.0	7	4.5	4.5
25 August	14060	ISD	12.7	21.9	195	6.0	6	10.0	10.0
25 August	14061	ISB	11.9	26.2	191	4.0	6	3.5	3.5
25 August	14062	ISA	10.9	28.1	179	5.0	7	6.0	6.0
26 August	14063	ISA	11.5	26.3	31	5.0	6	6.0	6.0
26 August	14064	ISB	12.4	22.3	49	6.0	6	3.0	3.0
26 August	14065	ISC	12.8	21.1	117	7.0	7	2.0	2.0
26 August	14066	ISD	12.8	21.7	124	6.0	7	5.0	5.0
26 August	14067	ISC	13.0	20.1	490	6.0	6	3.5	3.5
26 August	14068	ISD	12.9	22.0	683	8.0	6	4.0	4.0
27 August	14069	IPD	13.8	32.1	12	6.0	14	3.0	3.0
27 August	14070	IPC	13.6	32.1	163	7.0	23	5.0	5.0
27 August	14071	IPB	14.2	32.1	178	6.0	15	3.0	3.0
27 August	14072	IPA	10.7	31.6	259	7.0	12	4.0	4.0
28 August	14073	UCA	13.0	23.3	21	6.0	6	1.5	3.0
28 August	14074	UCB	13.1	24.4	49	6.0	6	2.3	3.0
28 August	14075	UCC	12.7	22.6	152	5.0	8	0.5	1.0
28 August	14076	UCD	12.3	24.4	228	4.0	7	1.5	2.5
28 August	14077	UCB	12.6	25.7	125	5.5	8	2.0	2.0
28 August	14078	UCA	12.9	24.0	105	5.0	6	4.5	6.0
29 August	14079	UCC	12.4	24.0	29	5.0	6	1.0	2.0
29 August	14080	UCD	12.5	24.8	82	5.0	6	1.5	3.0

Appendix 2.—Catch and life history stage of salmonids captured in the marine waters of the northern region of southeastern Alaska, June–August 2010. Length of trawl (minutes) is indicated for each haul. No trawling was conducted in June at Icy Point. Station code acronyms are listed in Table 1.

			Trawl	Juvenile salmon					Immature and adult salmon				
Date	Haul #	Station	time	Pink	Chum	Sockeye	Coho	Chinook	Pink	Chum	Sockeye	Coho	Chinook
25 June	14011	ISA	20	308	30	14	20	2	1	1	0	0	0
25 June	14012	ISB	20	31	3	3	29	0	1	0	0	0	0
25 June	14013	ISC	20	1,206	128	7	1	0	2	1	0	0	1
25 June	14014	ISD	20	5,919	431	25	31	0	0	0	0	0	0
26 June	14015	ISA	20	0	0	5	12	0	0	0	0	0	0
26 June	14016	ISB	20	4,520	1,810	118	27	0	1	0	0	0	0
26 June	14017	ISC	2	698	62	7	7	0	0	0	0	0	0
26 June	14018	ISD	10	3	0	2	13	1	0	0	0	0	0
27 June	14019	ISD	10	6,240	316	25	12	0	1	0	0	0	0
27 June	14020	ISC	10	1,462	53	7	10	0	0	0	0	0	1
27 June	14021	ISB	10	238	5	5	0	0	0	0	0	0	0
27 June	14022	ISA	10	532	38	3	9	0	2	0	0	0	0
28 June	14023	UCA	10	260	142	10	3	0	0	0	0	0	1
28 June	14024	UCB	10	260	144	9	5	1	1	0	0	0	0
28 June	14025	UCC	10	3	2	4	22	0	0	0	0	0	0
28 June	14026	UCD	10	107	34	6	57	1	0	1	0	0	1
28 June	14027	UCD	10	13	3	3	19	0	0	0	0	0	1
29 June	14028	UCA	10	218	66	7	7	0	0	0	0	0	1
29 June	14029	UCB	10	60	21	9	5	0	0	0	0	0	1
29 June	14030	UCC	10	17	5	1	0	0	0	0	0	0	1
26 July	14032	ISA	20	3,132	287	63	10	0	1	0	0	0	0
26 July	14033	ISB	10	901	101	34	6	0	0	1	0	0	0
26 July	14034	ISC	10	255	44	43	2	0	0	0	0	0	0
26 July	14035	ISD	10	966	120	44	6	0	0	0	0	0	0
27 July	14036	ISA	10	672	114	10	4	0	0	0	0	0	0
27 July	14037	ISB	10	644	53	16	17	0	0	0	0	0	0

Appendix 2.—cont.

Date	Haul #	Station	Trawl time	Juvenile salmon					Immature and adult salmon				
				Pink	Chum	Sockeye	Coho	Chinook	Pink	Chum	Sockeye	Coho	Chinook
27 July	14038	ISC	10	888	56	36	9	0	0	0	0	0	0
27 July	14039	ISD	10	958	69	58	19	0	0	0	0	0	0
28 July	14040	IPD	20	0	0	0	3	0	1	0	0	0	0
28 July	14041	IPC	20	35	4	13	12	0	1	0	0	0	0
28 July	14042	IPB	20	125	5	12	4	0	0	0	0	0	0
28 July	14043	IPA	20	30	10	1	0	0	4	0	0	0	0
29 July	14044	ISD	10	129	30	15	13	2	0	0	0	0	0
29 July	14045	ISC	10	473	137	46	1	0	0	0	0	0	0
29 July	14046	ISB	10	340	57	18	8	0	6	0	0	0	0
29 July	14047	ISA	10	128	27	2	4	0	0	0	0	0	0
30 July	14048	UCA	10	20	4	2	10	0	0	0	0	0	0
30 July	14049	UCB	10	67	20	3	7	0	0	0	0	2	0
30 July	14050	UCC	10	32	15	0	11	0	4	0	0	0	0
30 July	14051	UCD	10	7	1	3	6	0	3	0	0	0	0
30 July	14052	UCB	10	67	30	5	15	0	0	0	0	0	0
30 July	14053	UCA	10	26	12	0	8	0	2	0	0	1	0
31 July	14054	UCC	10	23	11	1	4	0	0	0	0	0	0
31 July	14055	UCD	10	0	0	0	5	0	0	0	0	0	0
25 August	14057	ISA	20	0	0	0	16	0	0	0	0	1	0
25 August	14058	ISB	20	6	0	1	2	0	0	0	0	0	0
25 August	14059	ISC	20	4	0	0	2	0	0	0	0	0	0
25 August	14060	ISD	20	14	3	2	3	0	0	0	0	0	0
25 August	14061	ISB	20	78	5	2	11	0	0	0	0	0	0
25 August	14062	ISA	20	12	2	0	13	0	0	0	0	0	0
26 August	14063	ISA	20	5	2	1	0	0	0	0	0	0	0
26 August	14064	ISB	20	8	2	0	3	0	0	0	0	0	0
26 August	14065	ISC	20	0	0	1	2	0	0	0	0	0	0
26 August	14066	ISD	20	8	2	1	4	0	0	1	0	5	0
26 August	14067	ISC	20	21	0	0	11	0	0	0	0	1	0

Appendix 2.—cont.

Date	Haul #	Station	Trawl time	Juvenile salmon					Immature and adult salmon				
				Pink	Chum	Sockeye	Coho	Chinook	Pink	Chum	Sockeye	Coho	Chinook
26 August	14068	ISD	20	1	0	0	0	0	0	0	0	0	0
27 August	14071	IPB	20	2	0	0	1	0	0	0	0	0	0
27 August	14072	IPA	20	7	0	0	0	0	0	0	0	0	0
28 August	14073	UCA	20	0	0	0	3	0	0	0	0	2	1
28 August	14074	UCB	20	8	2	0	1	0	0	0	0	0	0
28 August	14075	UCC	20	2	0	1	2	0	0	0	0	3	0
28 August	14076	UCD	20	156	10	0	1	0	0	0	0	0	0
28 August	14077	UCB	20	5	0	0	3	0	0	0	0	0	0
28 August	14078	UCA	20	0	0	0	1	0	0	0	0	0	2
29 August	14079	UCC	20	109	8	0	4	0	0	0	0	0	0
29 August	14080	UCD	20	33	2	1	0	0	1	0	1	0	1

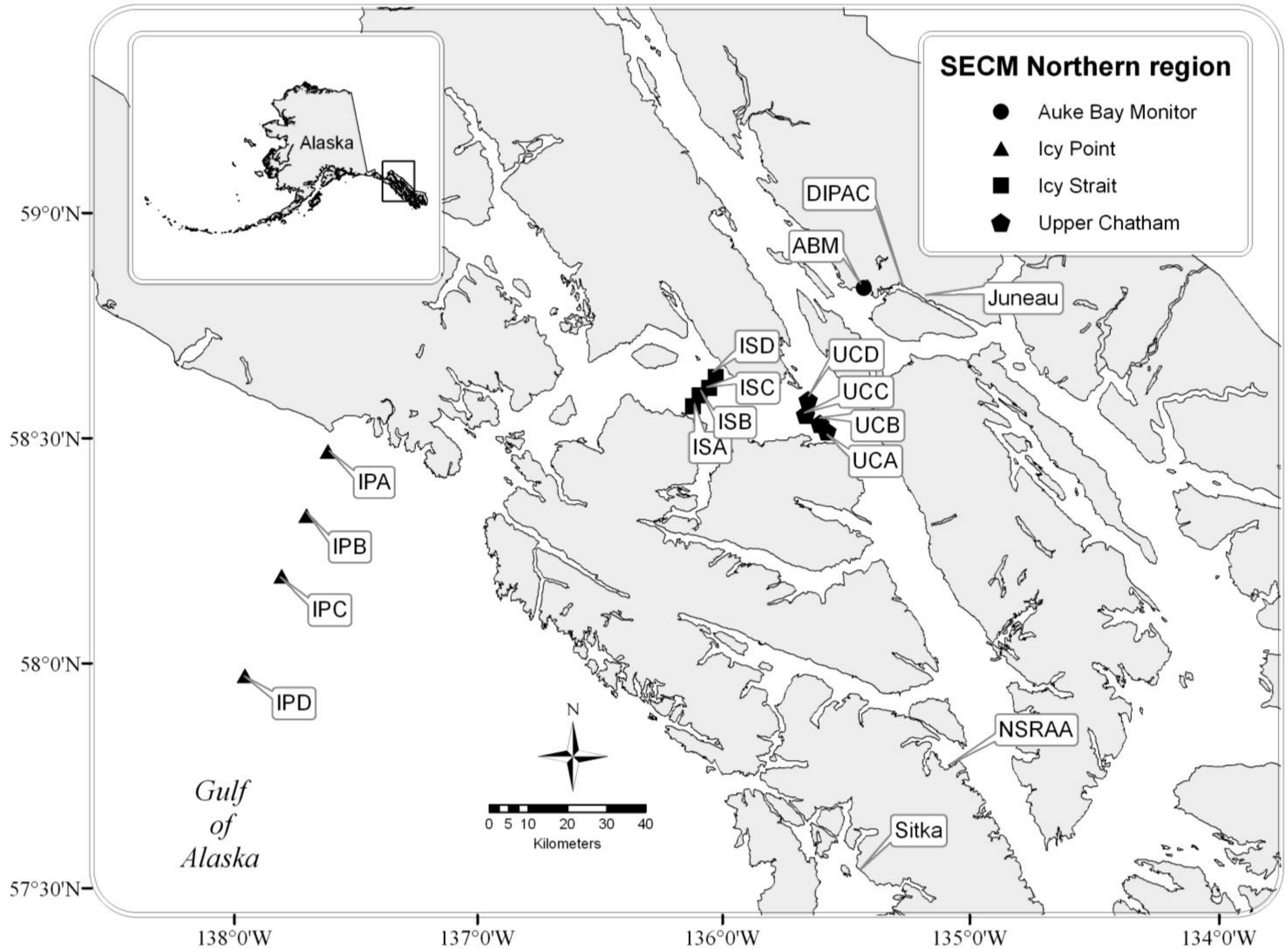

Figure 1.—Stations sampled in the marine waters of the northern region of southeastern Alaska, May–August 2011. Transect and station coordinates and station code acronyms are shown in Table 1.

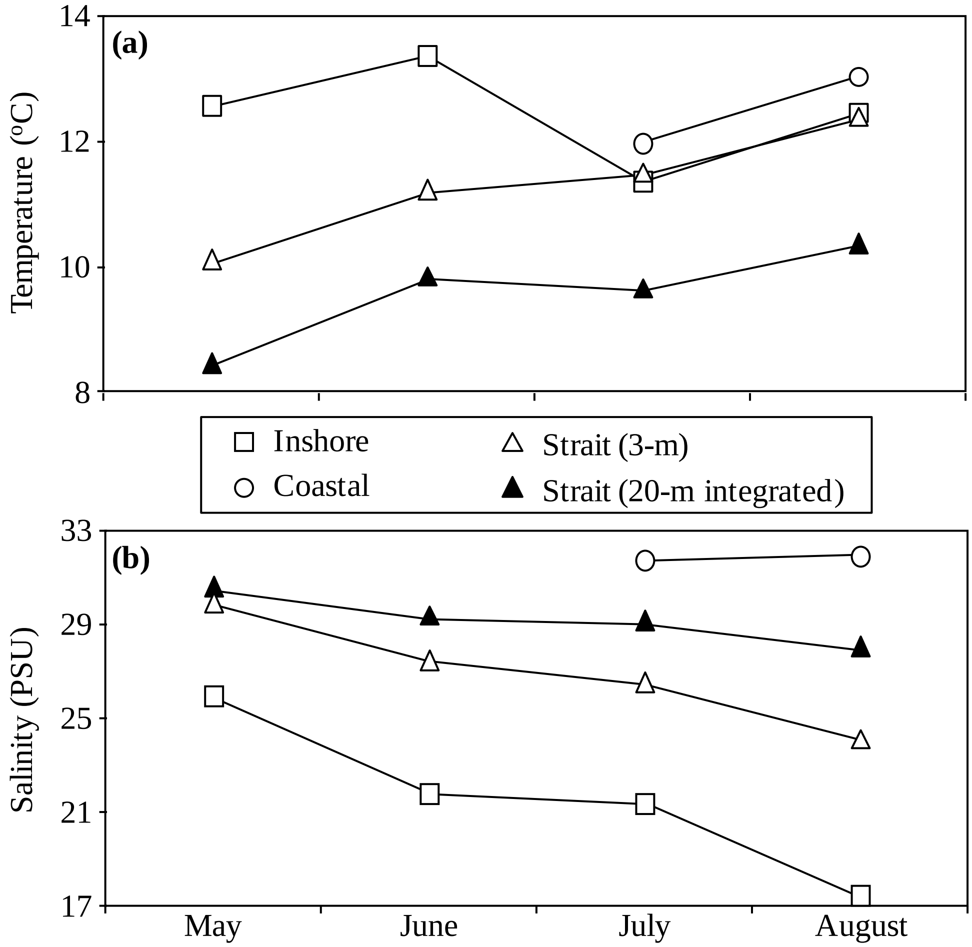

Figure 2.—Mean surface (3-m) and 20-m integrated temperature (a, ˚C) and salinity (b, PSU) measures in the marine waters of the northern region of southeastern Alaska, May–August 2010. The 3-m measures represent the most active segment of the water column, while the 20-m integrated measures represent more stable waters also sampled by the trawl (see also Figure 3). See Table 2 for monthly sample sizes and Appendix 1 for data values.

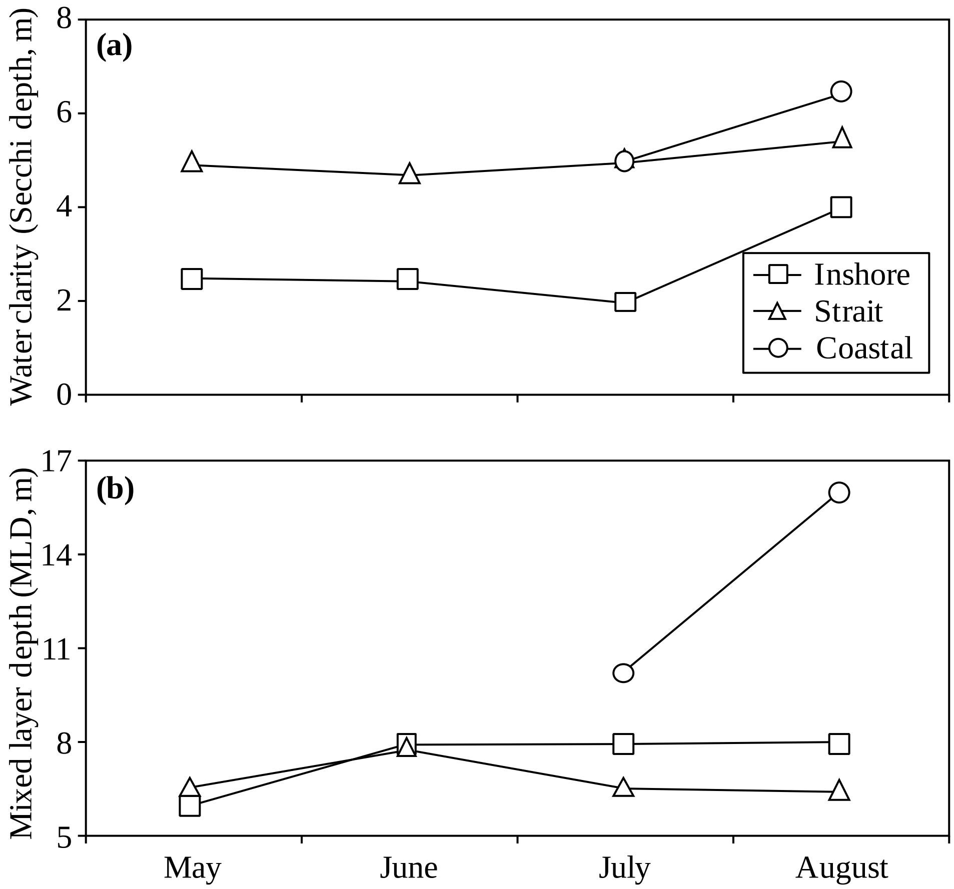

Figure 3.—Water clarity as mean depth (a, m) of Secchi disappearance and mixed layer depth (b, MLD, m) calculated from CTD profiles of the marine water column in the northern region of southeastern Alaska, May–August 2010. See Table 2 for monthly sample sizes and Appendix 1 for data values.

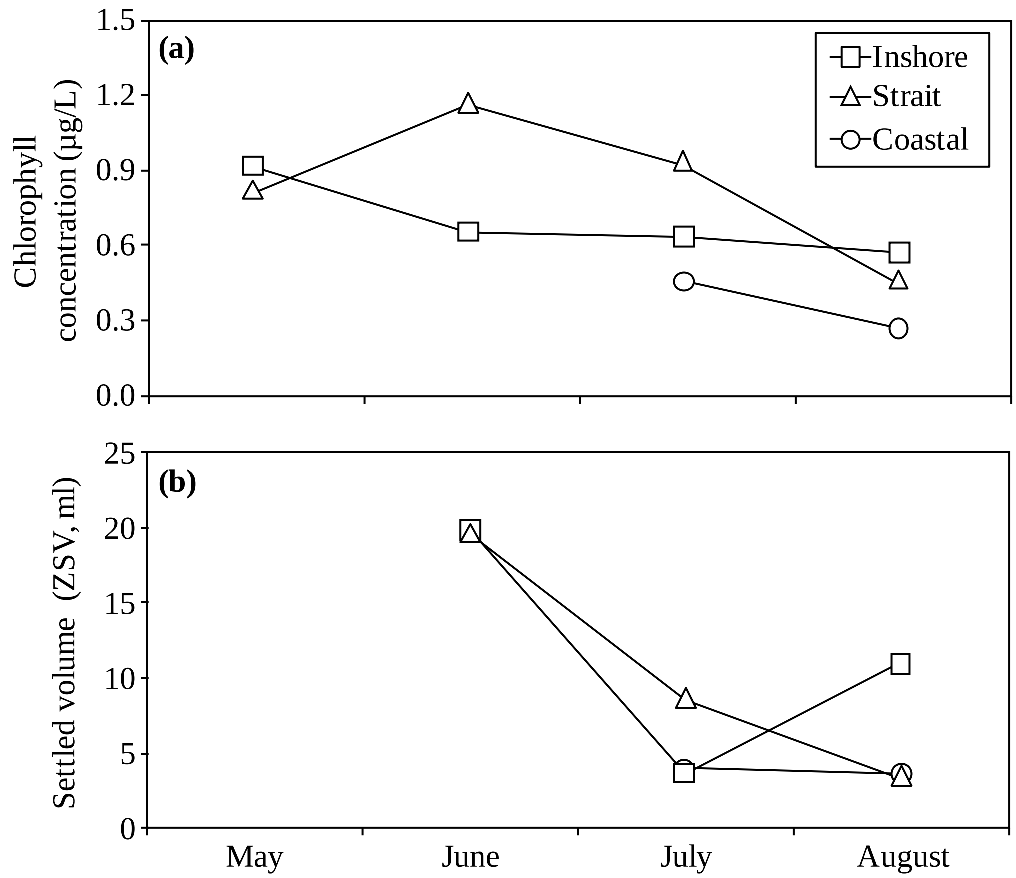

Figure 4.—Mean chlorophyll-a concentration (a, µg/L) from surface water samples and zooplankton settled volumes (b, ZSV, ml) from 20-m Norpac hauls in the marine waters of the northern region of southeastern Alaska, May–August 2010. Chlorophyll was estimated from single monthly samples per station, while ZSV was measured during all hauls at each station. A phytoplankton bloom in May prevented determination of ZSV. See Table 2 for monthly sample sizes and Appendix 1 for data values. Zooplankton standing stock (ml/m^3) can be computed by dividing by the water volume filtered, a constant factor of 3.9 m^3 for these samples.

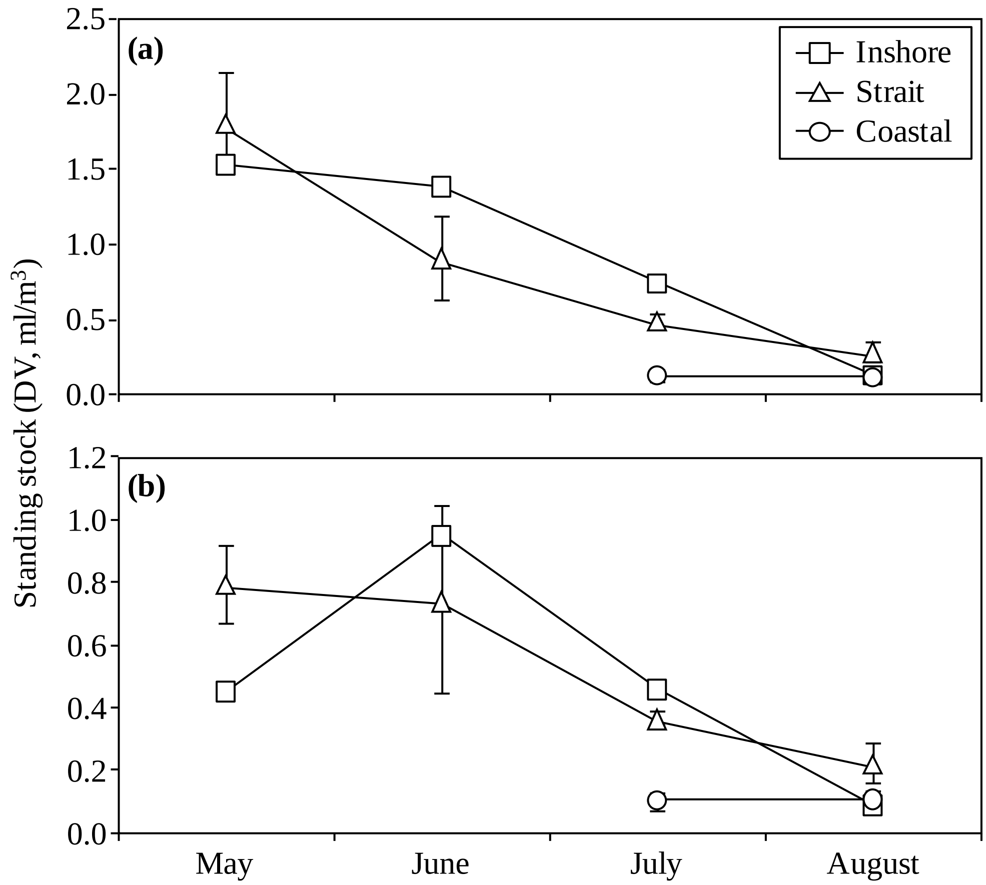

Figure 5.—Monthly zooplankton standing stock (mean ml/m^3, ± 1 standard error) from (a) 333-µm and (b) 505-µm mesh double oblique bongo net samples hauled from ≤ 200 m depths during daylight in the marine waters of the northern region of southeastern Alaska, May–August 2010.

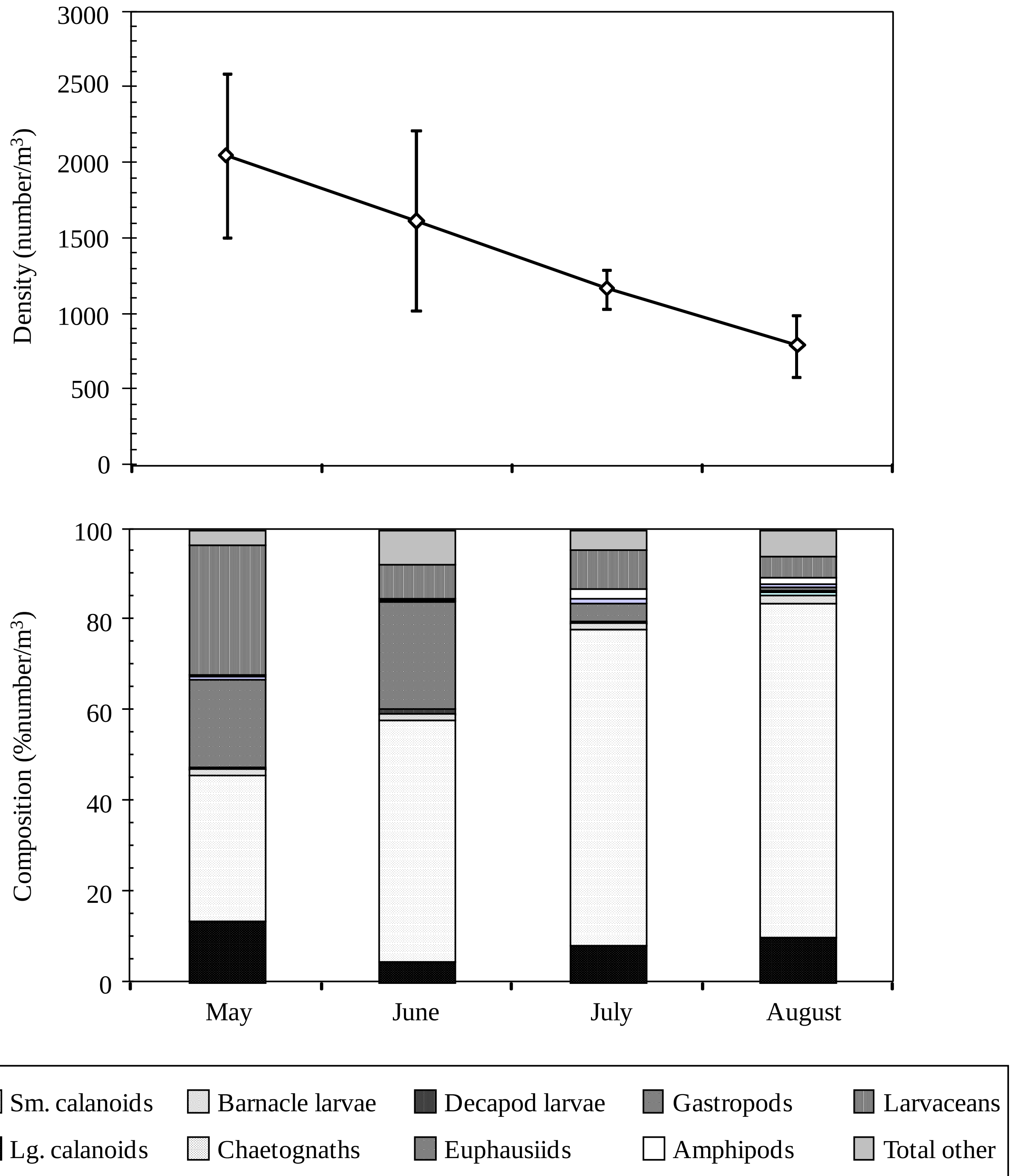

Figure 6.—Monthly "deep" (≤ 200 m depth) zooplankton collected in marine waters of the northern region of southeastern Alaska, May–August 2010. Data include (a) mean total density of organisms (thousands/m^3) ± 1 standard error, and (c) taxonomic composition (mean percent/m^3). Samples were collected in daylight using a 333-μm mesh bongo net (double oblique tow) at 4 stations in Icy Strait each month.

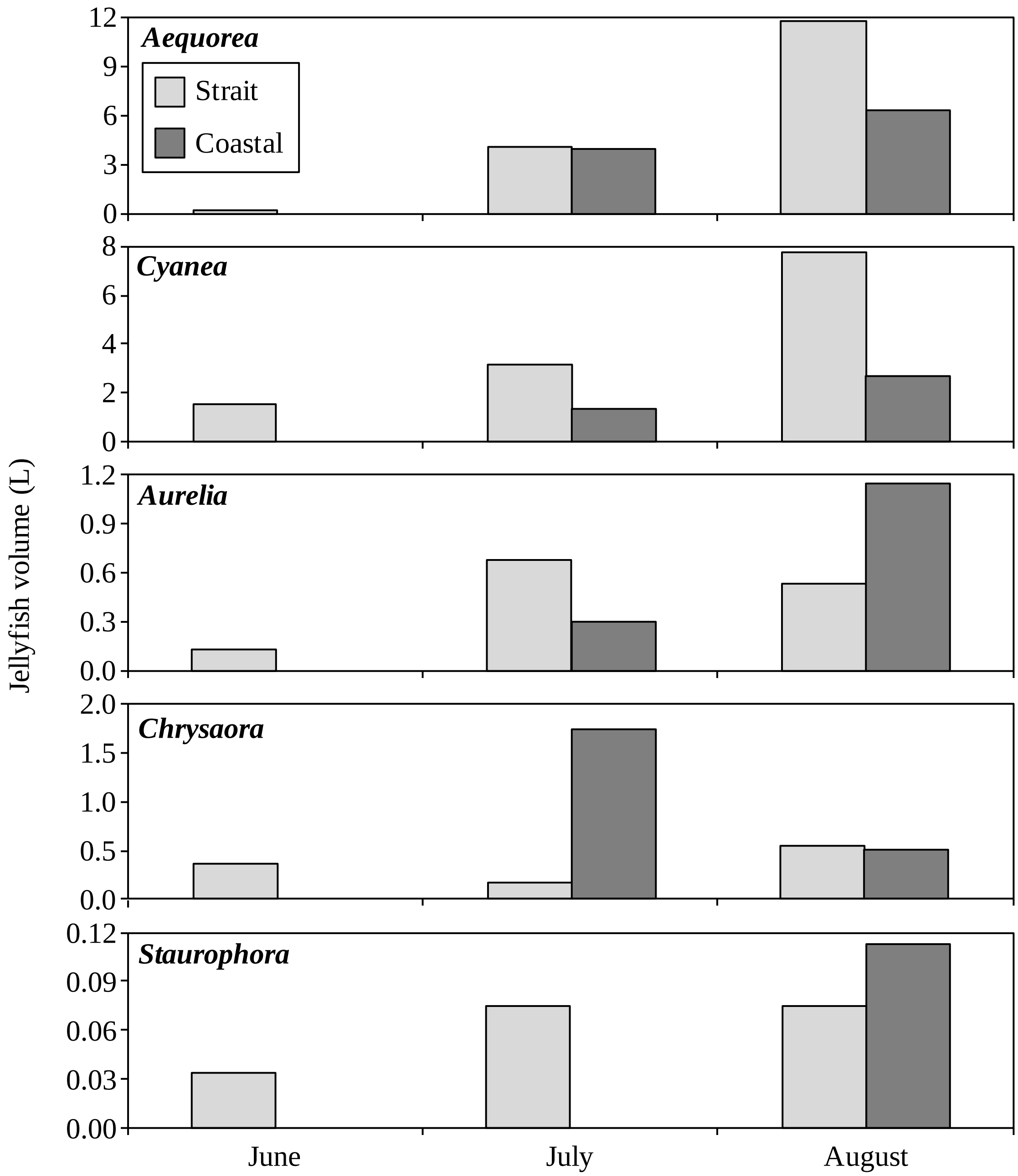

Figure 7.—Mean volume (L) of jellyfish captured in the strait and coastal marine habitats of the northern region of southeastern Alaska by rope trawl, June–August 2010. See Table 2 for monthly sample sizes. No trawling was conducted in the coastal habitat in June. Note difference in y-axis scales.

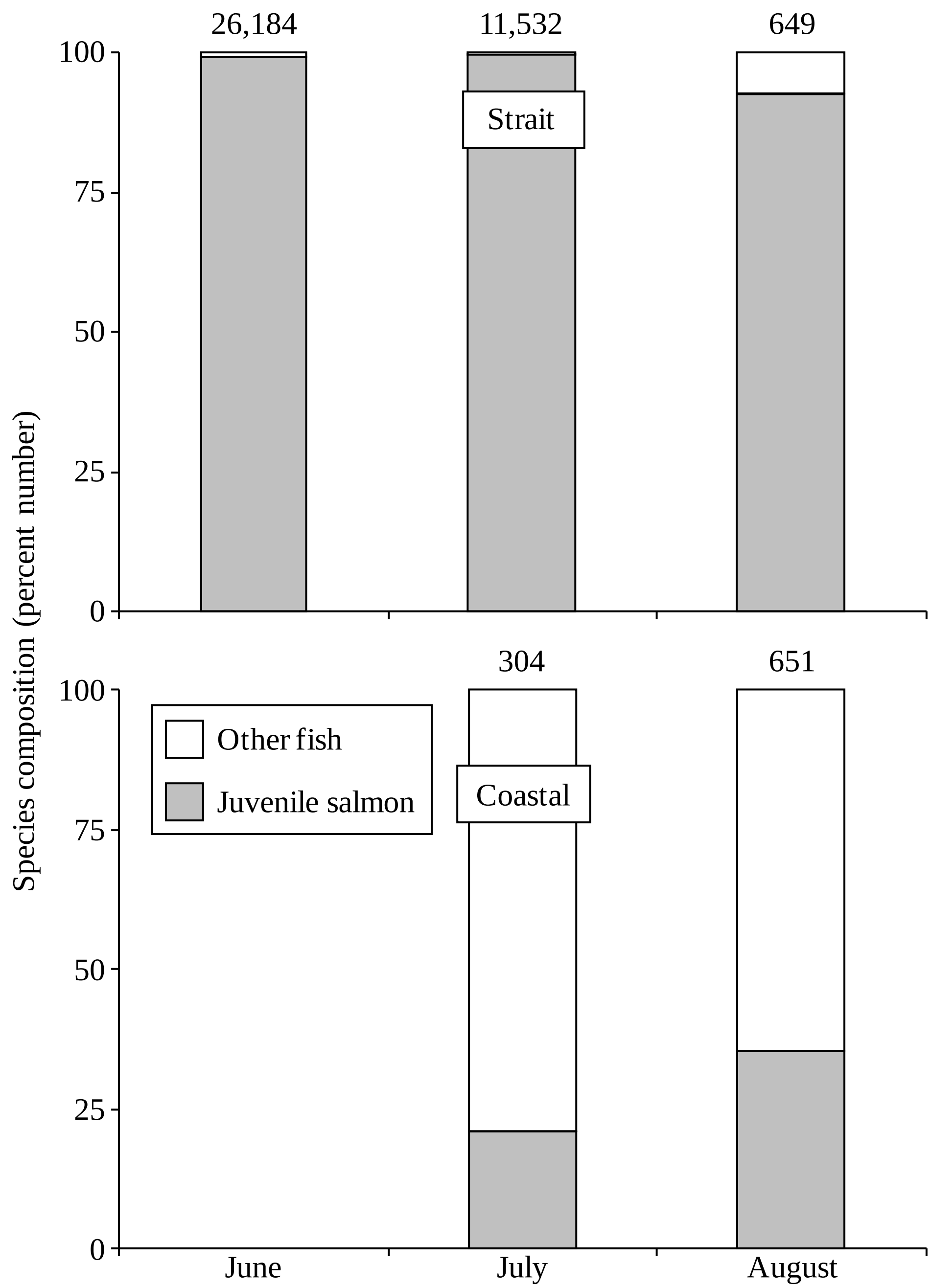

Figure 8.—Fish composition from rope trawl catches in the strait and coastal marine habitats of the northern region of southeastern Alaska, June–August 2010. Total number of fish is indicated above each bar. See Tables 2 and 8 for monthly sample sizes by species. No trawling was conducted in coastal habitat in June. Other fish in coastal habitat were primarily squid and rockfish larvae.

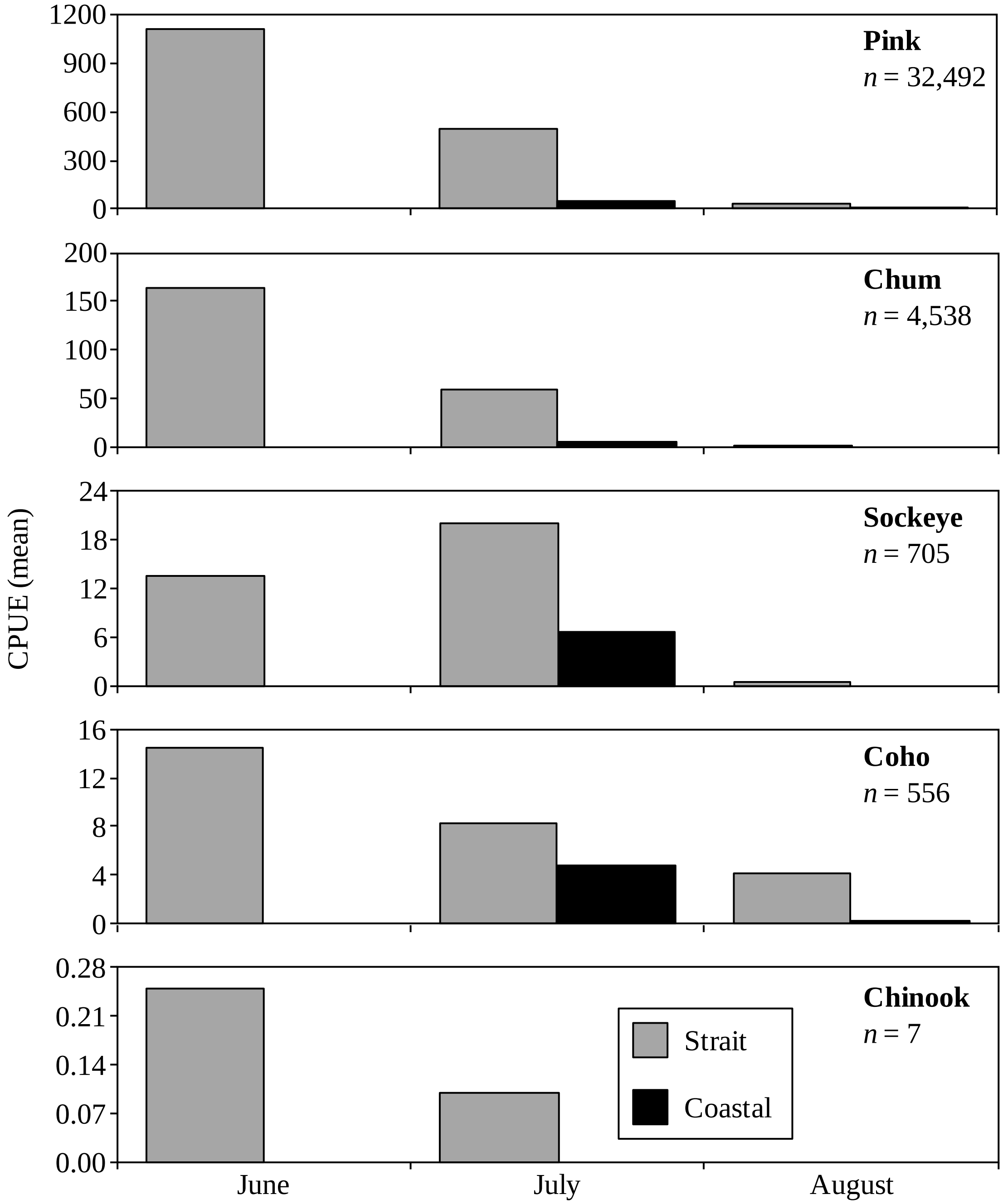

Figure 9.—Catch-per-unit-effort (CPUE, mean catch per trawl haul) of juvenile salmon captured in the strait and coastal marine habitats of the northern region of southeastern Alaska, June–August 2010. Total seasonal catch is indicated for each species. See Table 2 for the number of trawl samples per month. No trawling was conducted in the coastal habitat in June. Note difference in y-axis scales.

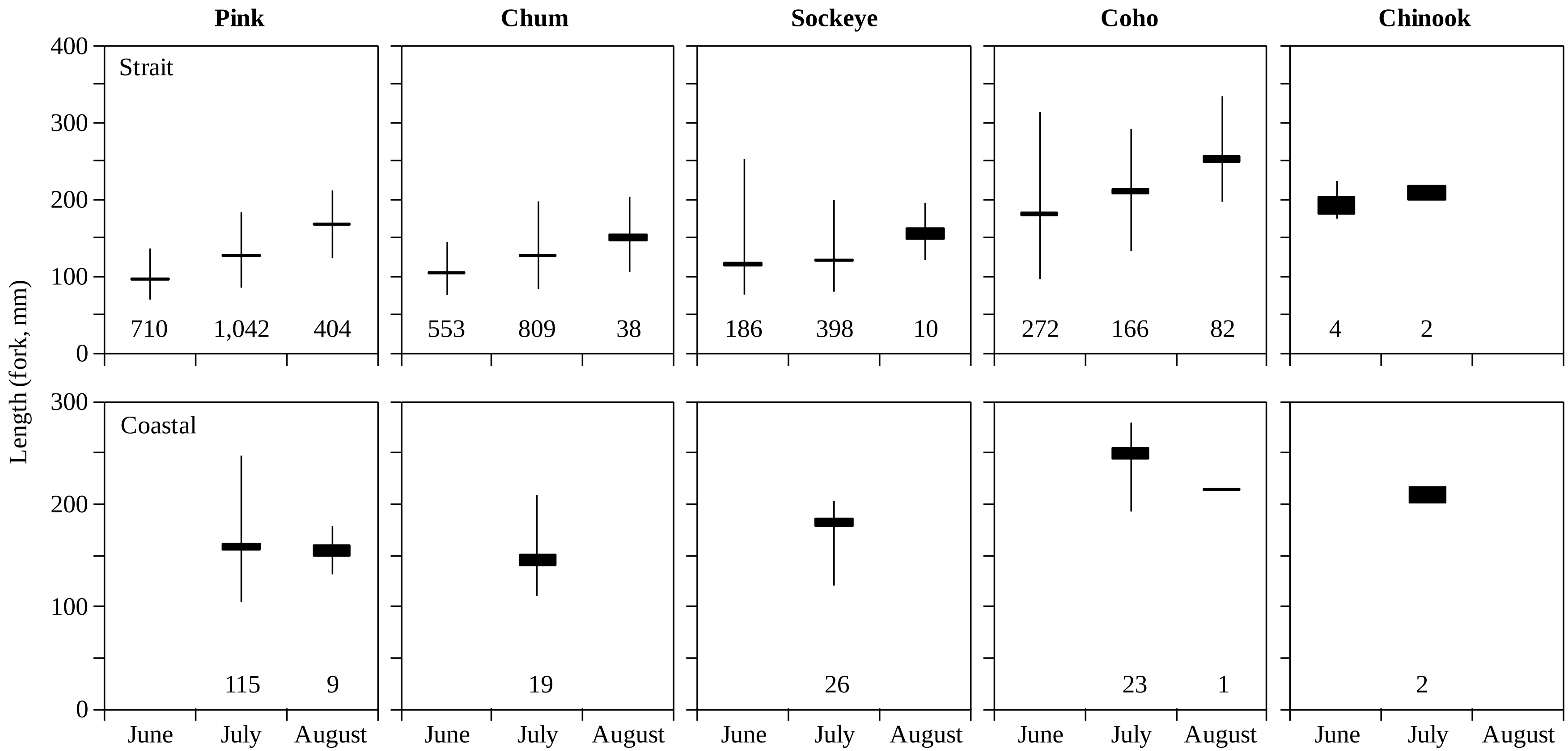

Figure 10.—Length (mm, fork) of juvenile salmon captured by rope trawl in the marine waters of the northern region of southeastern Alaska, June–August 2010. Length of vertical bars is the length range for each sample, and the boxes within the range are one standard error on either side of the mean. Sample sizes are indicated for each month. No trawling was conducted in the coastal habitat in June. Note difference in y-axis scales.

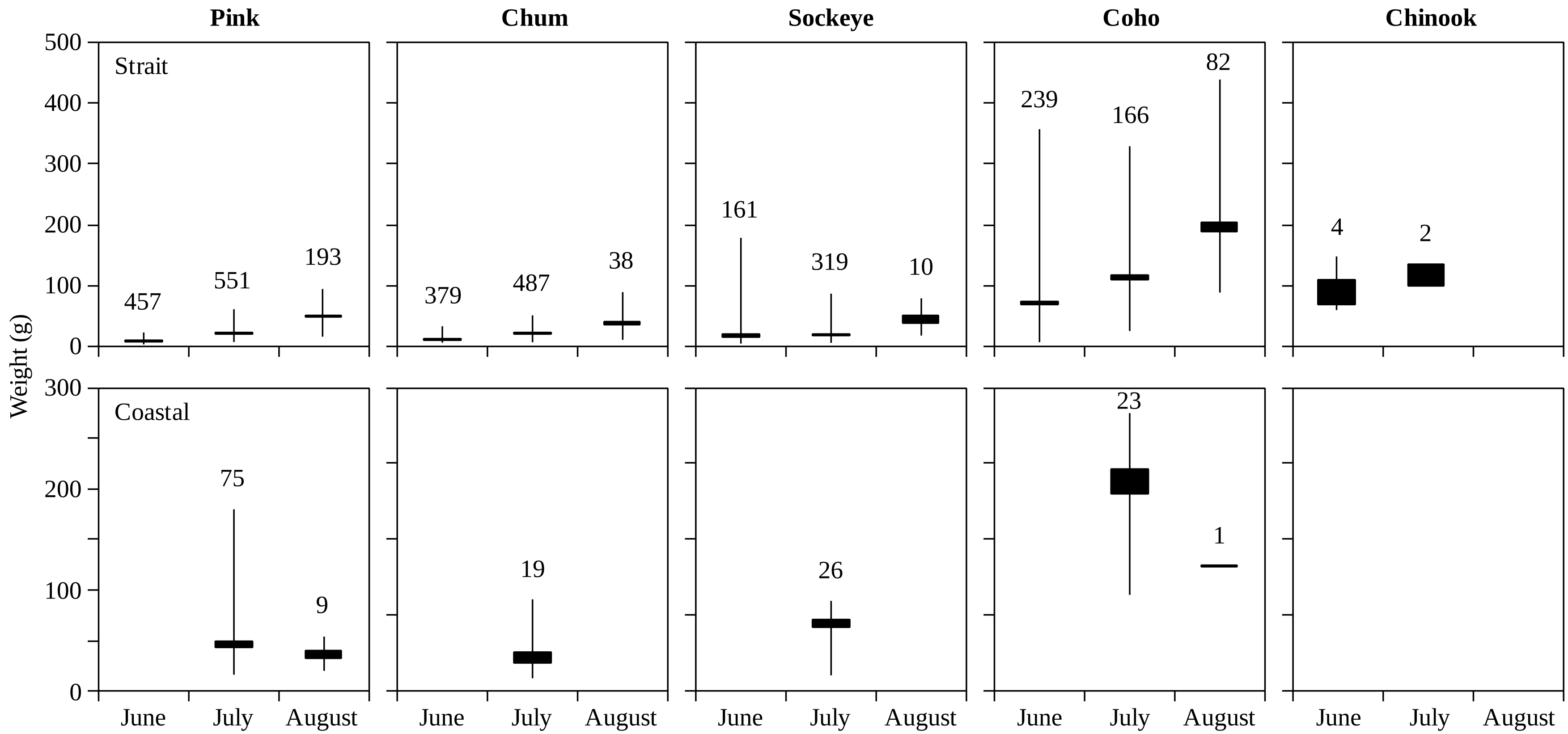

Figure 11.—Weight (g) of juvenile salmon captured by rope trawl in the strait and coastal marine habitats of the northern region of southeastern Alaska, June–August 2010. Length of vertical bars is the weight range for each sample, and the bars within the range are one standard error on either side of the mean. Sample sizes are indicated for each month. No trawling was conducted in the coastal habitat in June. Note difference in y-axis scales.

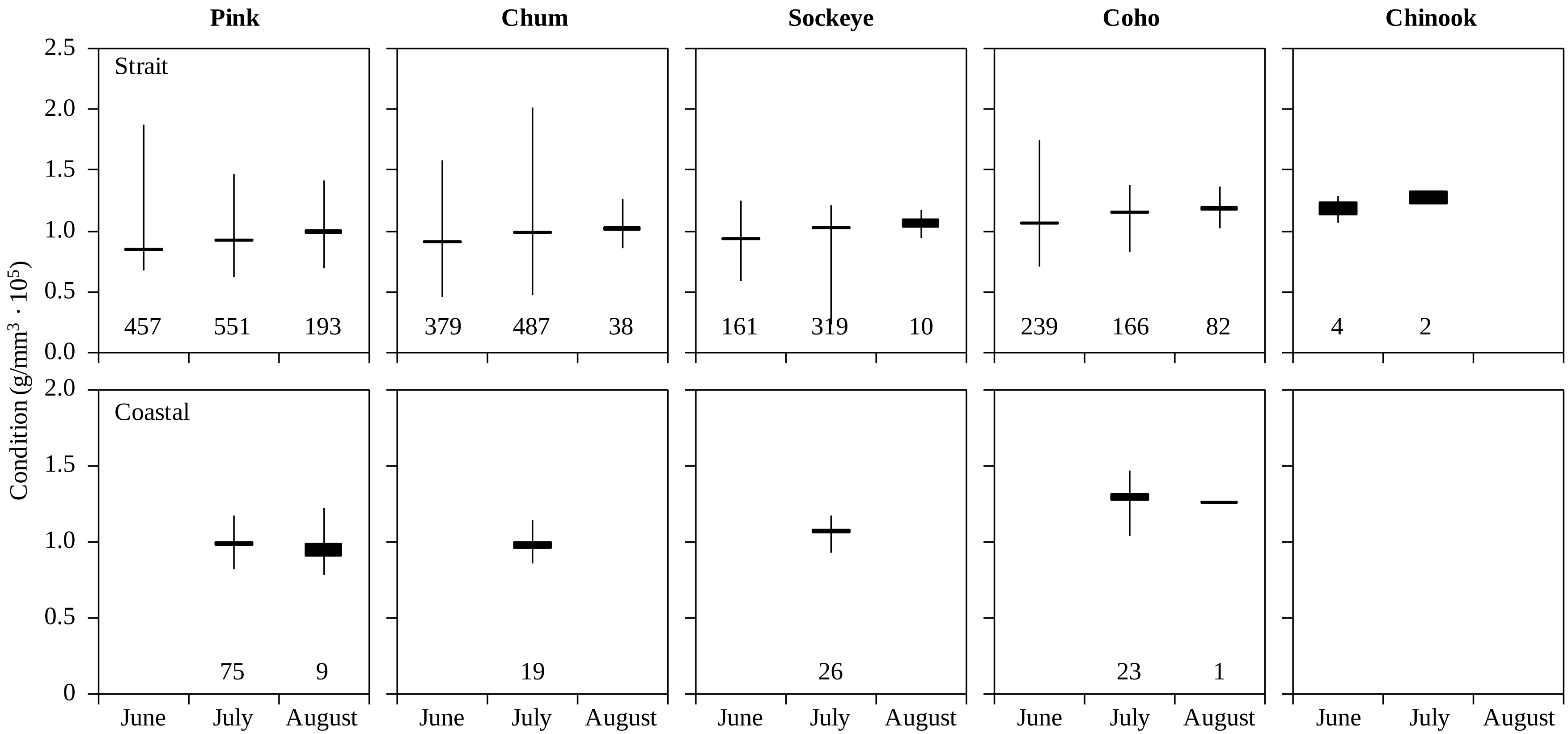

Figure 12.—Fulton's condition (g/mm^3 · 10^5) of juvenile salmon captured by rope trawl in the strait and coastal marine habitats of the northern region of southeastern Alaska, June–August 2010. Length of vertical bars is the range of condition for each sample, and the bars within the range are one standard error on either side of the mean. Sample sizes are indicated for each month. No trawling was conducted in the coastal habitat in June. Note difference in y-axis scales.

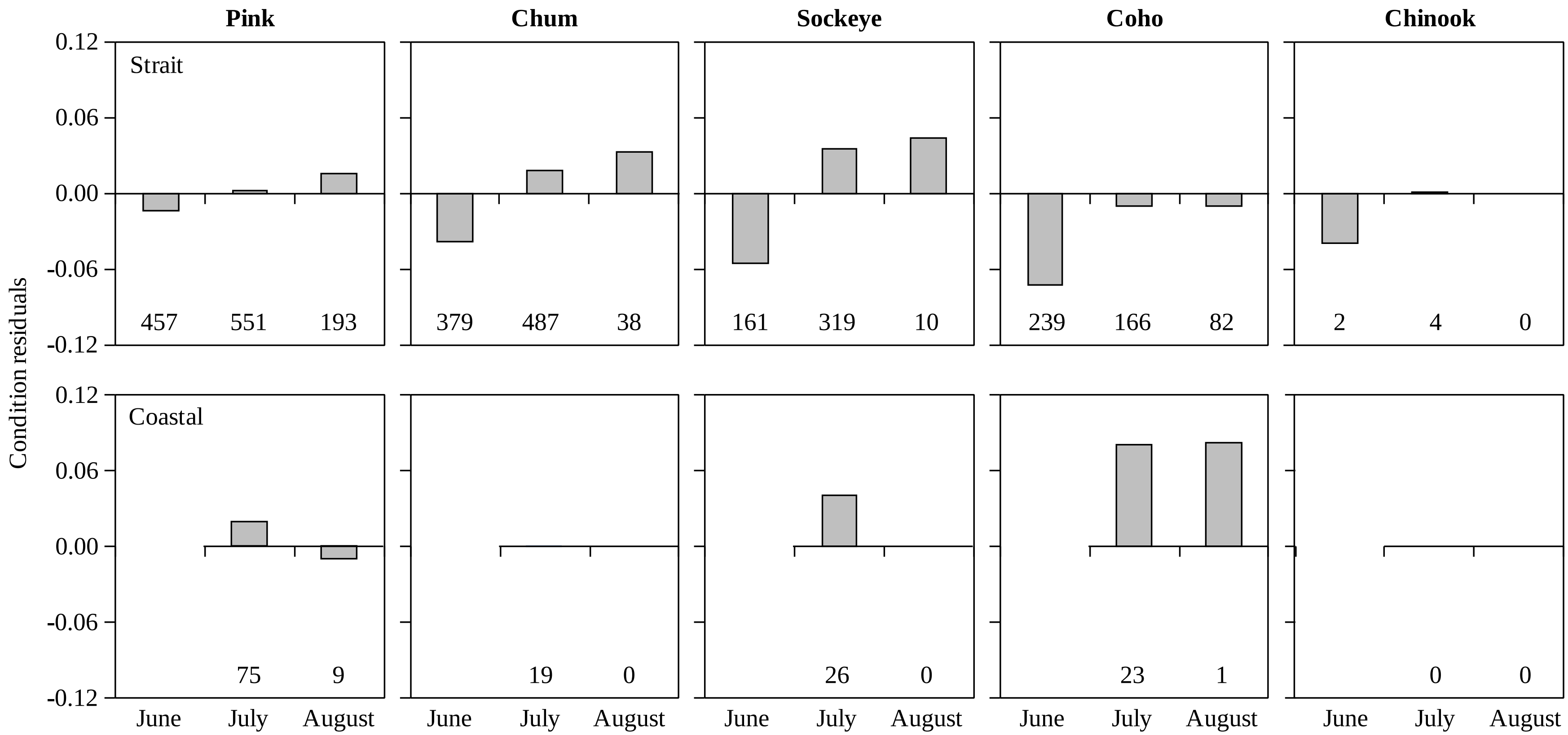

Figure 13.—Condition residuals from length-weight regression analysis of juvenile salmon captured by rope trawl in the strait and coastal marine habitats of the northern region of southeastern Alaska, June–August 2010. Sample sizes are indicated for each month. No trawling was conducted in the coastal habitat in June.

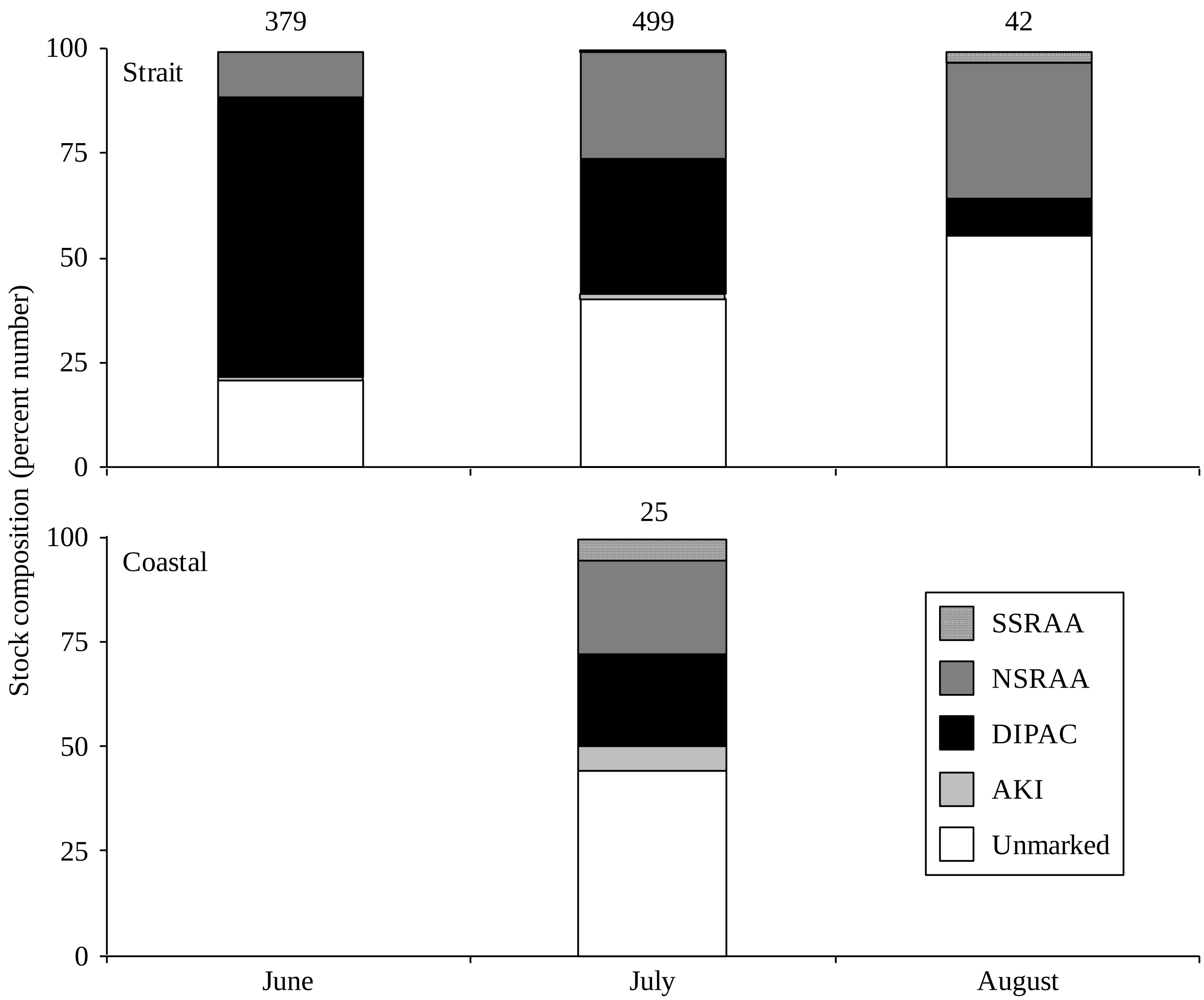

Figure 14.—Monthly stock composition (based on otolith thermal marks) of juvenile chum salmon captured by rope trawl in the strait and coastal marine habitats of the northern region of southeastern Alaska, June–August 2010. Number of salmon sampled per month is indicated above each bar. No trawling was conducted in June in the coastal habitat. No chum salmon were caught in August in the coastal habitat.

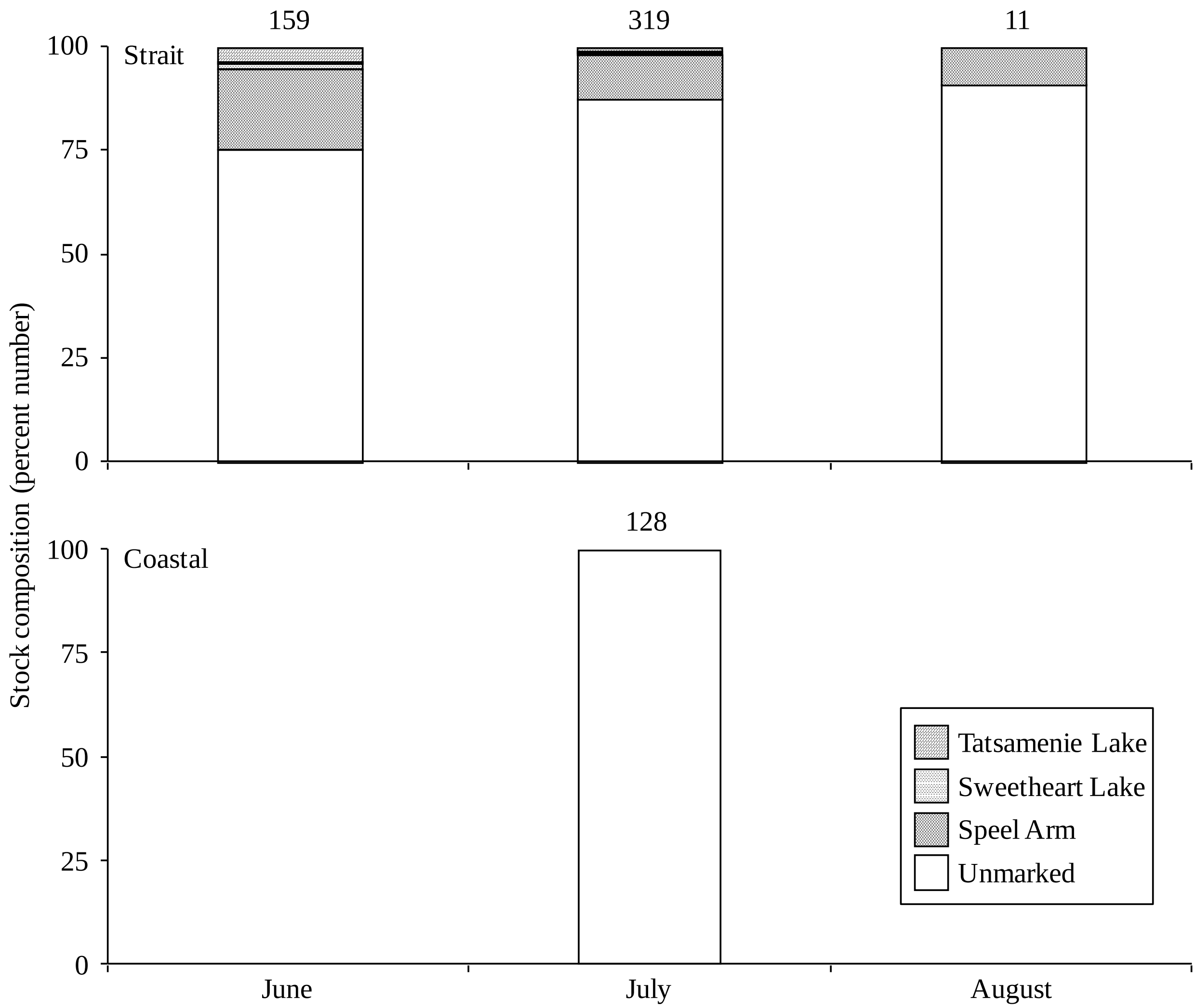

Figure 15.—Monthly stock composition (based on otolith thermal marks) of juvenile sockeye salmon captured by rope trawl in the strait and coastal marine habitats of the northern region of southeastern Alaska, June–August 2010. Number of salmon sampled per month is indicated above each bar. No trawling was conducted in June in the coastal habitat. No sockeye salmon were caught in August in the coastal habitat.

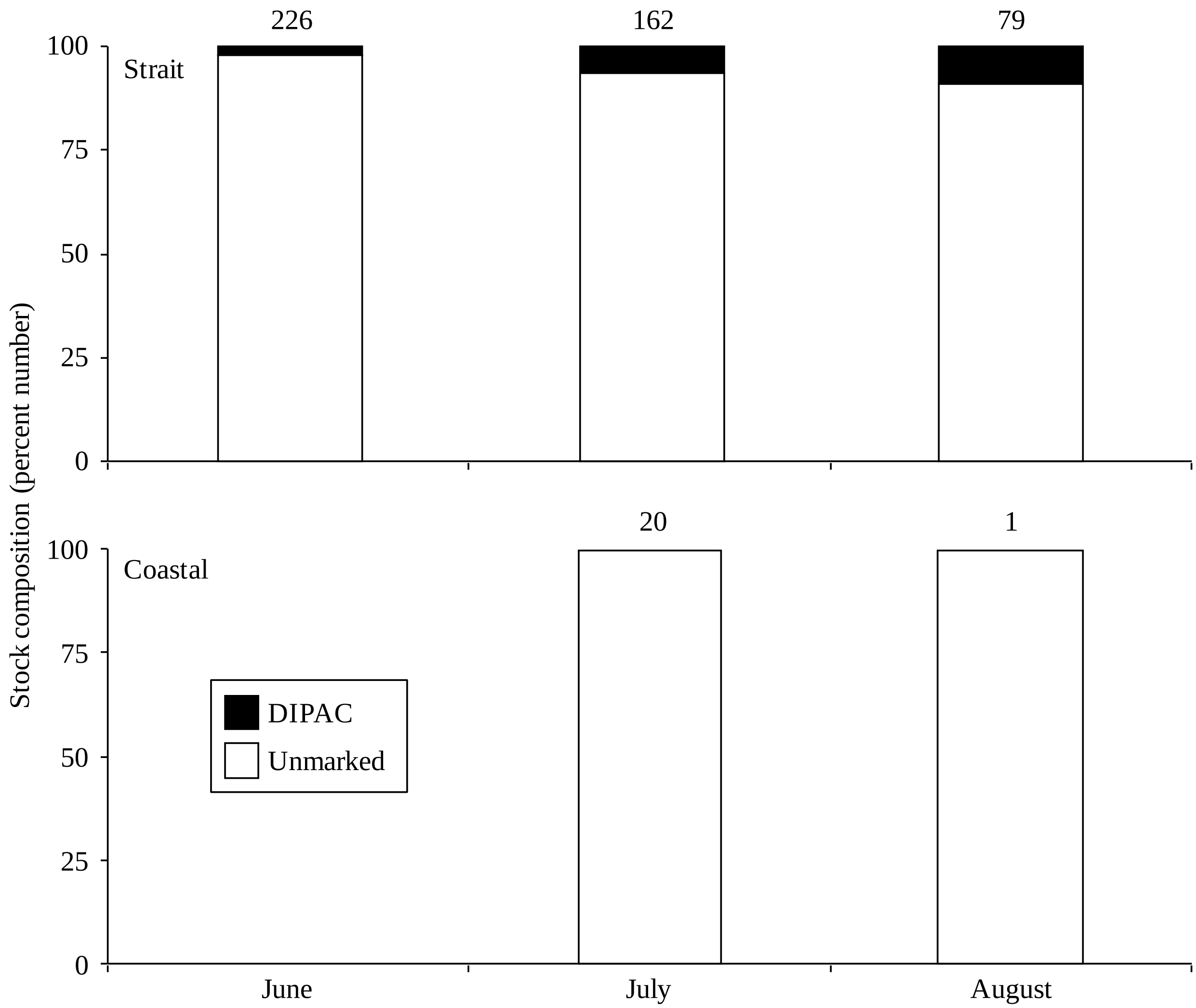

Figure 16.—Monthly stock composition (based on otolith thermal marks) of juvenile coho salmon captured by rope trawl in the strait and coastal marine habitats of the northern region of southeastern Alaska, June–August 2010. Number of salmon sampled per month is indicated above each bar. No trawling was conducted in June in the coastal habitat.

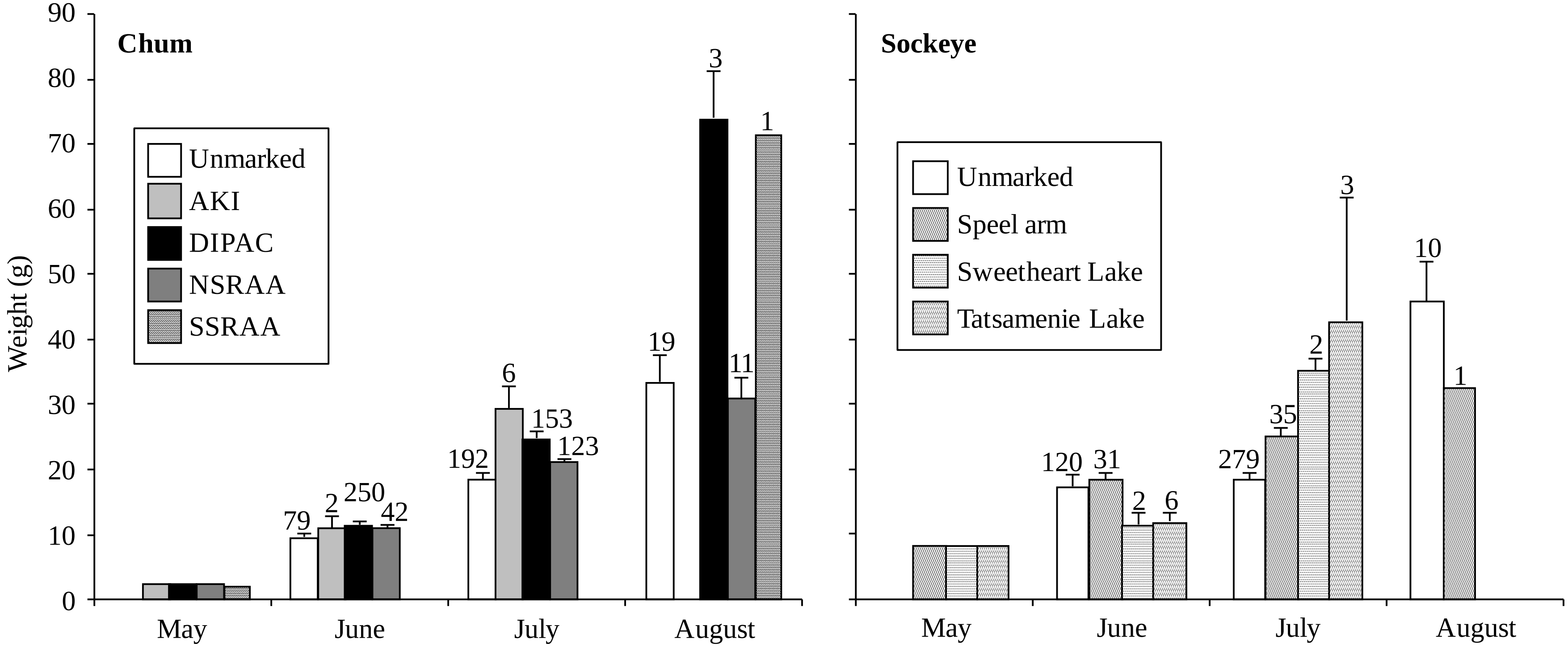

Figure 17.—Stock-specific growth trajectories of juvenile chum and sockeye salmon captured by rope trawl in the strait marine habitat of the northern region of southeastern Alaska, June–August 2010. Weights of May fish are mean values at time of hatchery release. No trawling was conducted in June in the coastal habitat. The sample sizes and the standard error of the mean are indicated above each bar.

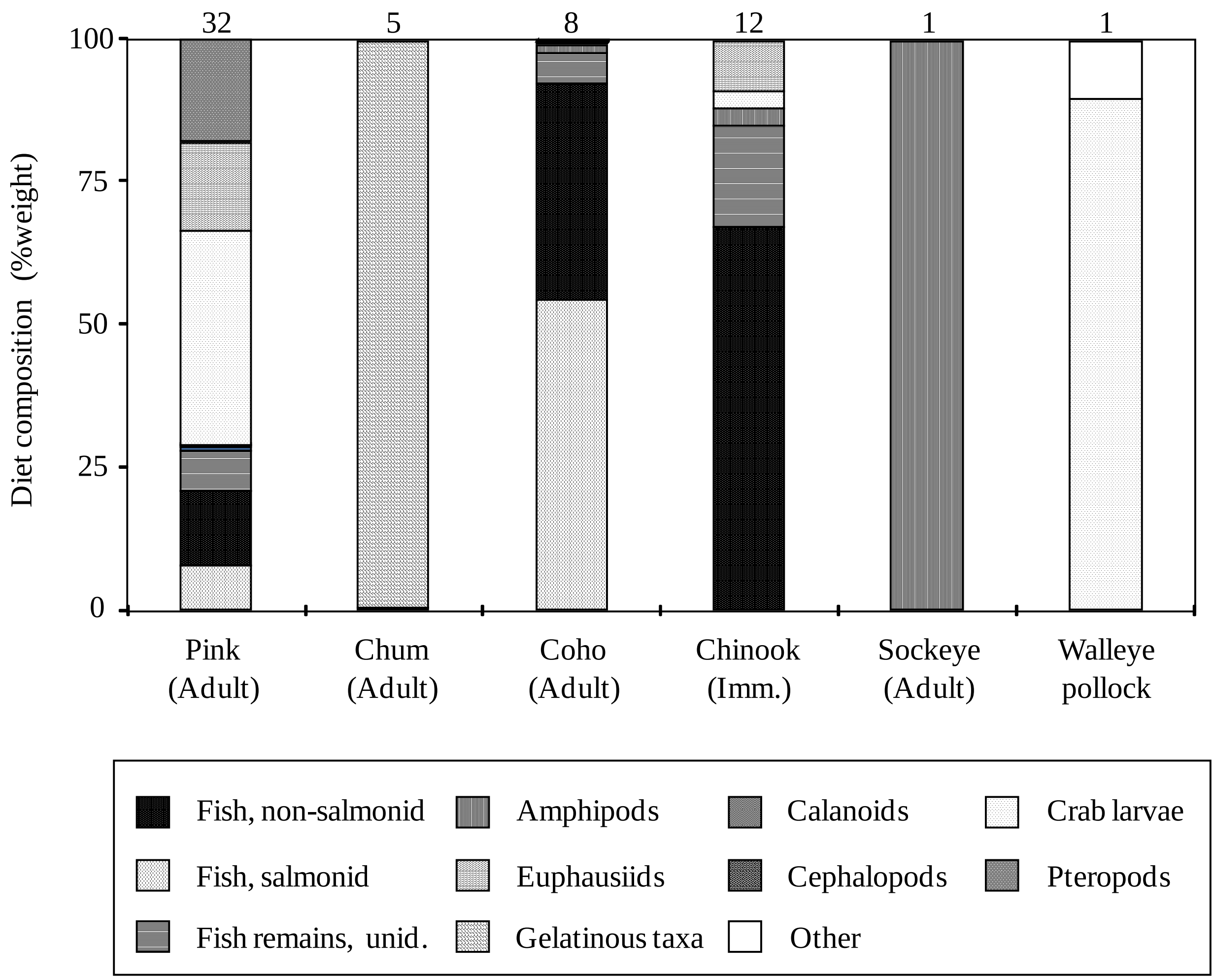

Figure 18.—Prey composition of 59 potential predators of juvenile salmon captured in 67 rope trawl hauls in the marine waters of the northern region of Southeast Alaska, June–August 2010. The numbers of fish examined per species are shown above the bars. See Tables 18-19 for additional feeding attributes.

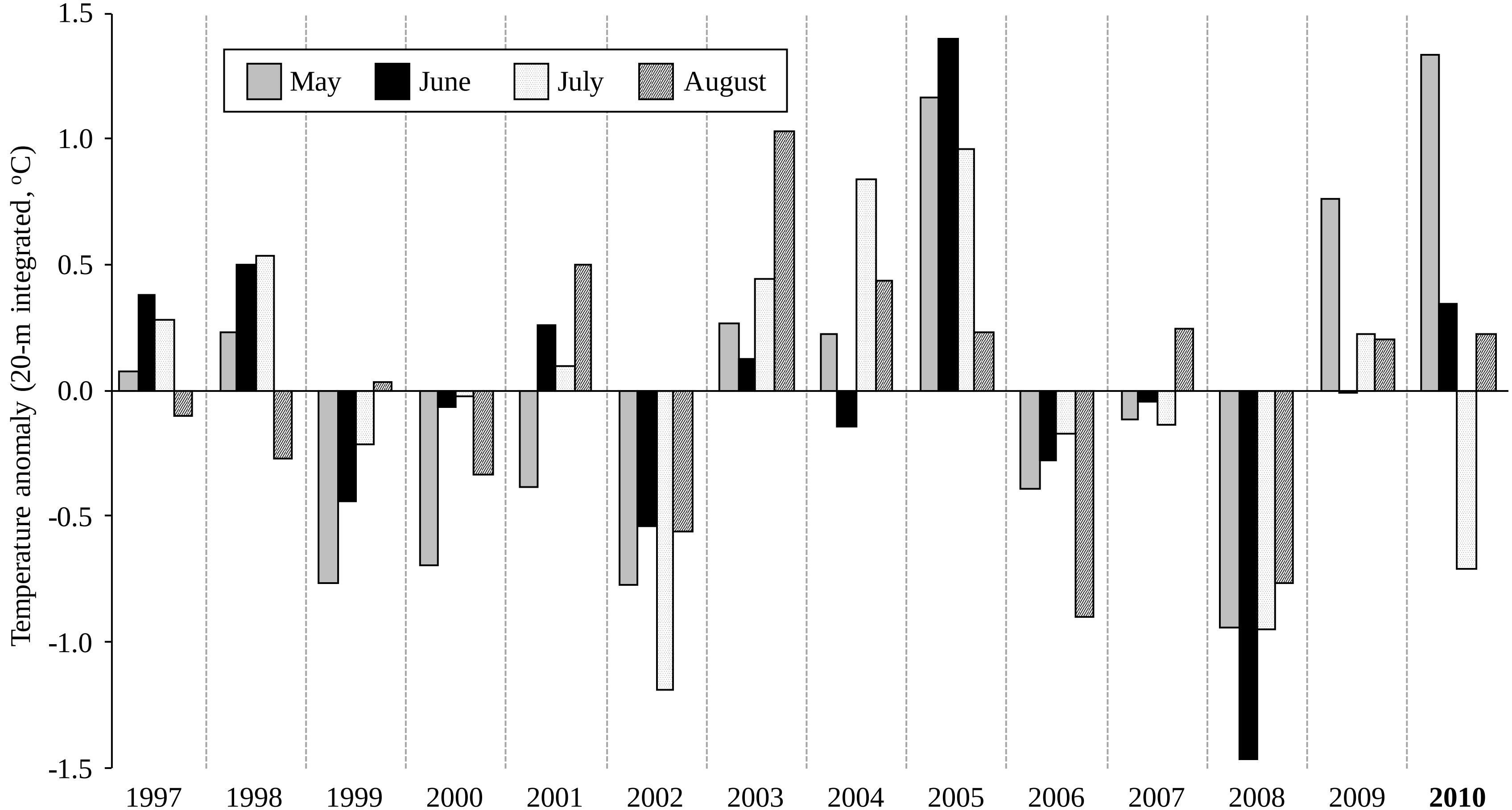

Figure 19.—Monthly anomalies for temperature (20-m integrated, °C) across the 14-yr time series from the strait habitat in the northern region of southeastern Alaska, 1997-2010. Data (shaded bars) are deviations from monthly mean values (0-lines) by year. See also Figures 2 and 3.

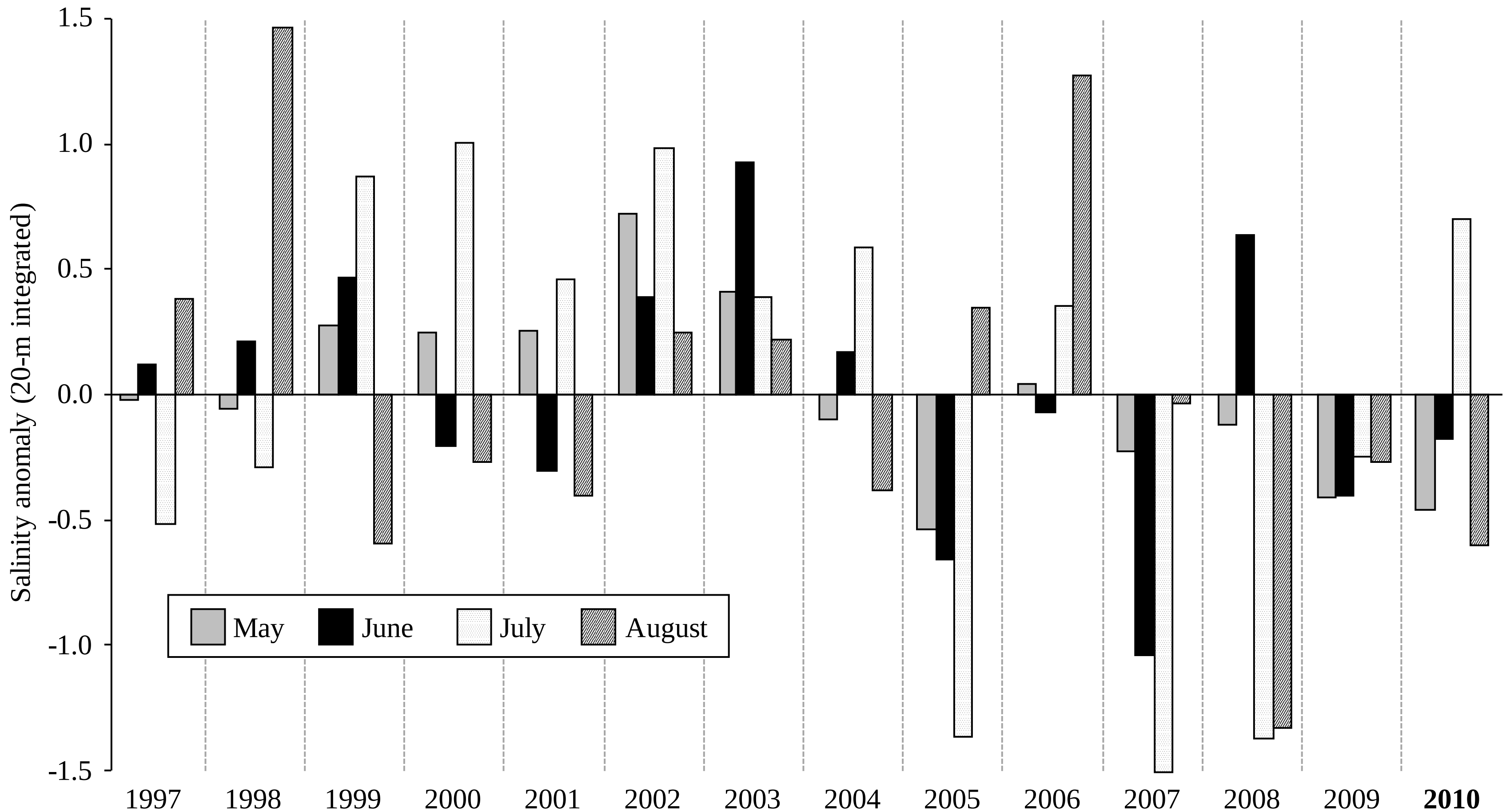

Figure 20.—Monthly anomalies for salinity (20-m integrated, PSU) across the 14-yr time series from the strait habitat in the northern region of southeastern Alaska, 1997-20010. Data (shaded bars) are deviations from monthly mean values (0-lines) by year. See also Figures 2 and 3.

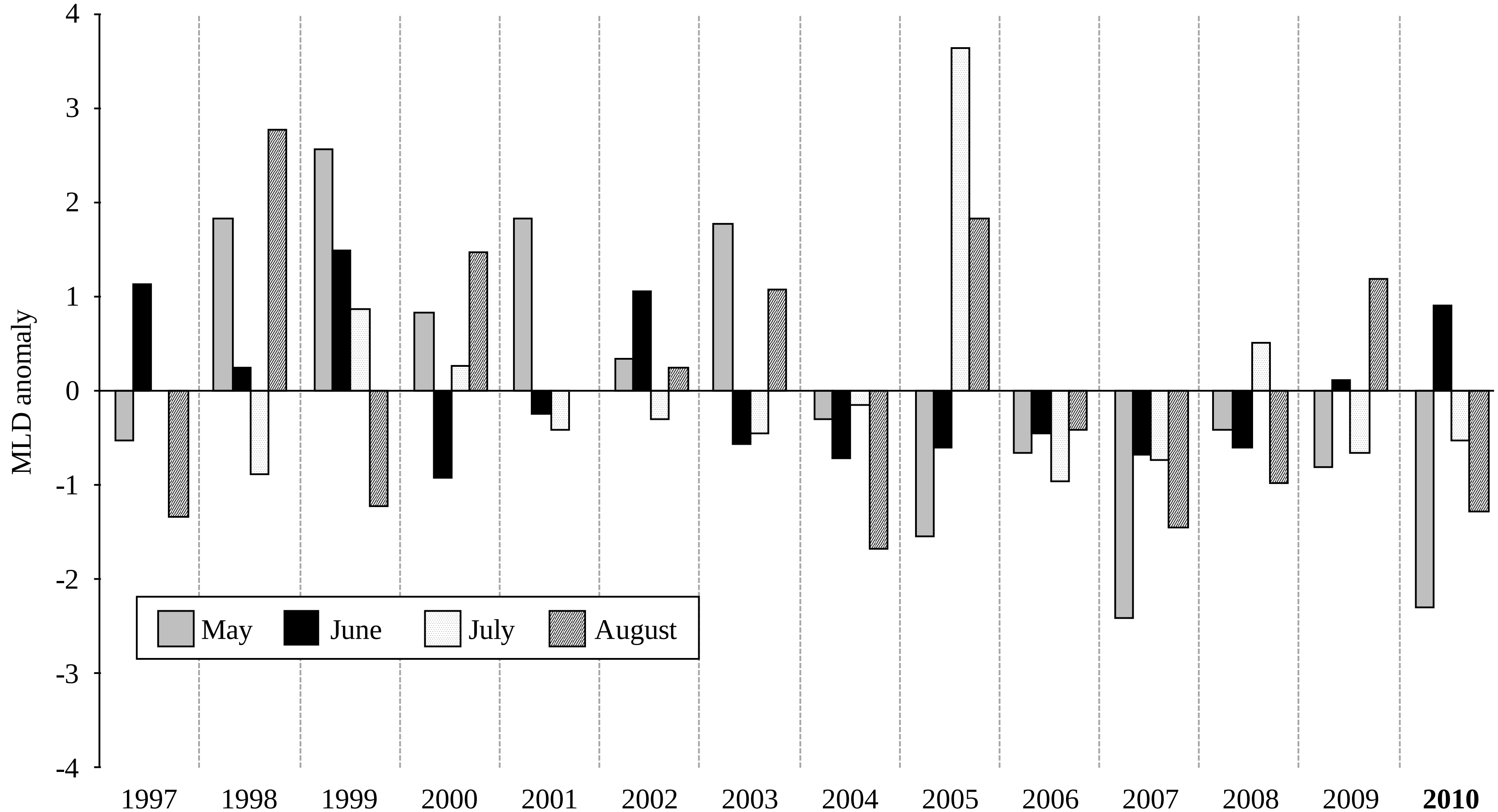

Figure 21.—Monthly anomalies for mixed layer depth (MLD, m) across the 14-yr time series from the strait habitat in the northern region of southeastern Alaska, 1997-2010. Data (shaded bars) are deviations from monthly mean values (0-lines) by year. See also Figures 2 and 3.

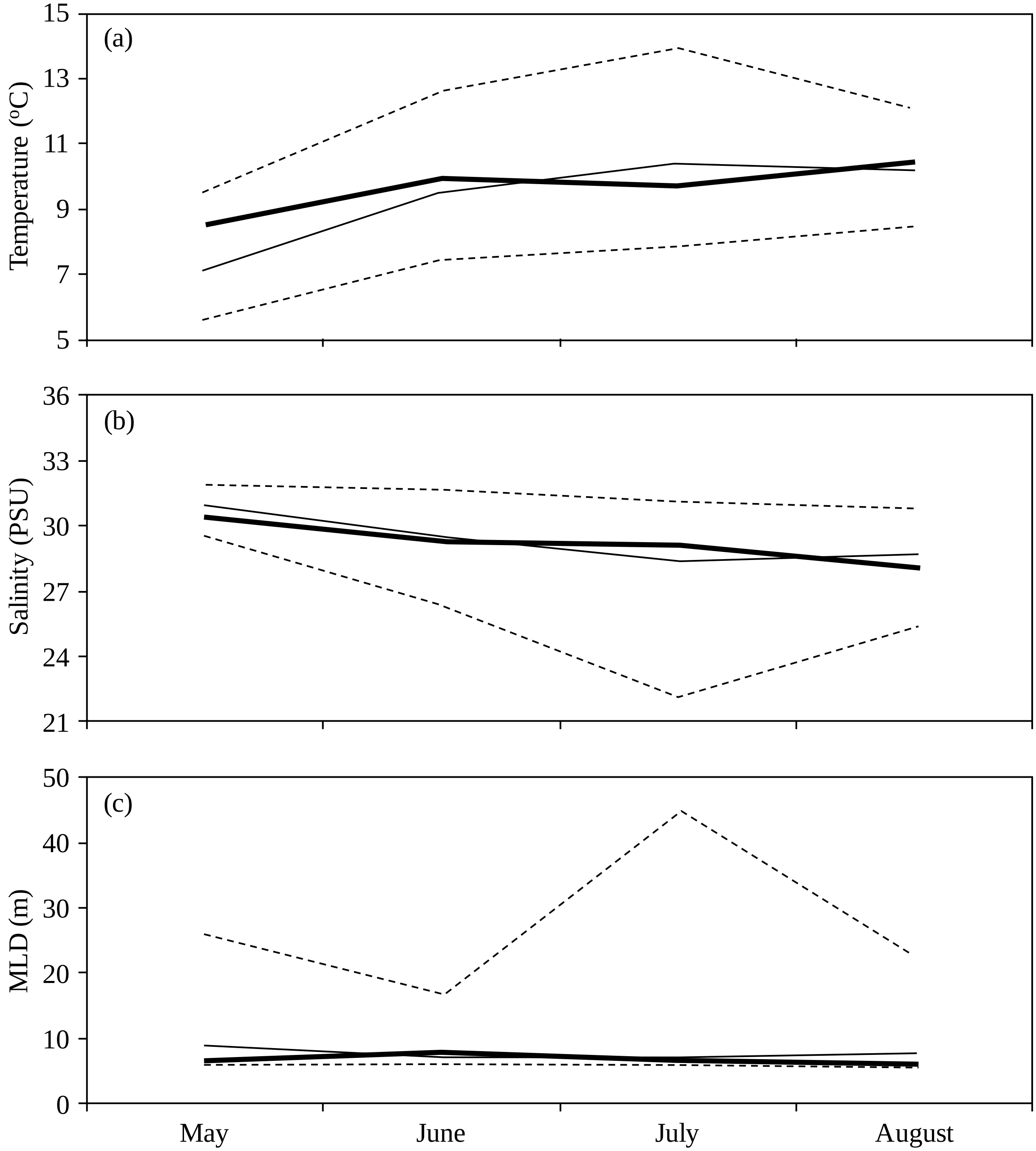

Figure 22.—Temperature (20-m integrated; ºC), salinity (20-m integrated, PSU), and mixed layer depth (MLD, m) across a 14-yr time series from the strait habitat in the northern region of southeastern Alaska, 1997-2010. Data compare the 2010 means for (a) temperature, (b) salinity, and (c) MLD (thick solid lines) to the grand mean values (thin solid lines) within observed ranges (minimum and maximum, dashed lines), by month. See also Figures 2 and 3.

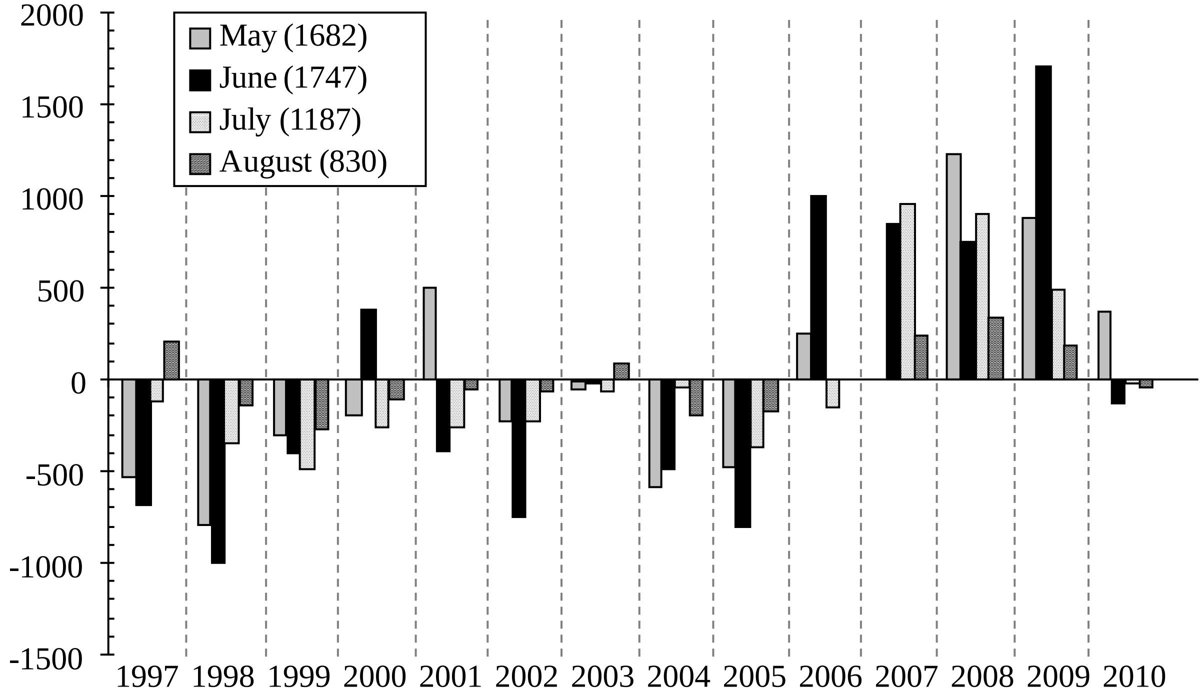

Figure 23.—Montly anomalies for zooplankton total density across the 14-yr time series from strait habitat in the northern region of southeastern Alaska, 1997-2010. Data (shaded bars) are deviations from longterm monthly mean density (numbers/m^3) indicated by the 0-line; longterm mean monthly values are indicated in the key. Monthly samples (n = 4) were collected using a 333-µm mesh bongo net deployed to a maximum depth of 200 m and retrieved using a double oblique trajectory. No samples were collected in August 2006, and the May 2007 nighttime values were omitted because high densities did not represent standard daytime sampling protocol. See also Figures 6, 24, and 25.

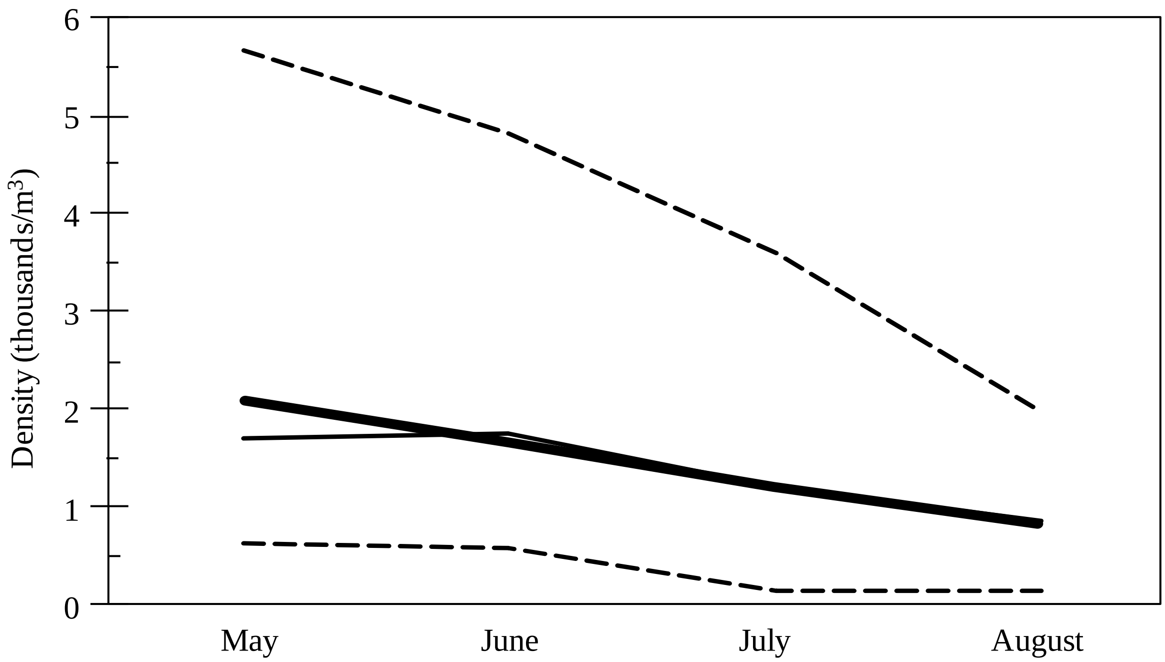

Figure 24.—Monthly zooplankton total density (thousands/m^3) for 2010 compared to the 14-yr time series from strait habitat in the northern region of southeastern Alaska, 1997-2010. Data are mean densities for 2010 (thick solid line) compared to grand mean densities (thin solid line) within the observed density range (minimum and maximum, dashed lines) by month, from 333-µm mesh bongo net samples as described in Figure 23. No samples were collected in August 2006 and the May 2007 nighttime values were omitted. See also Figures 6, 23, and 25.

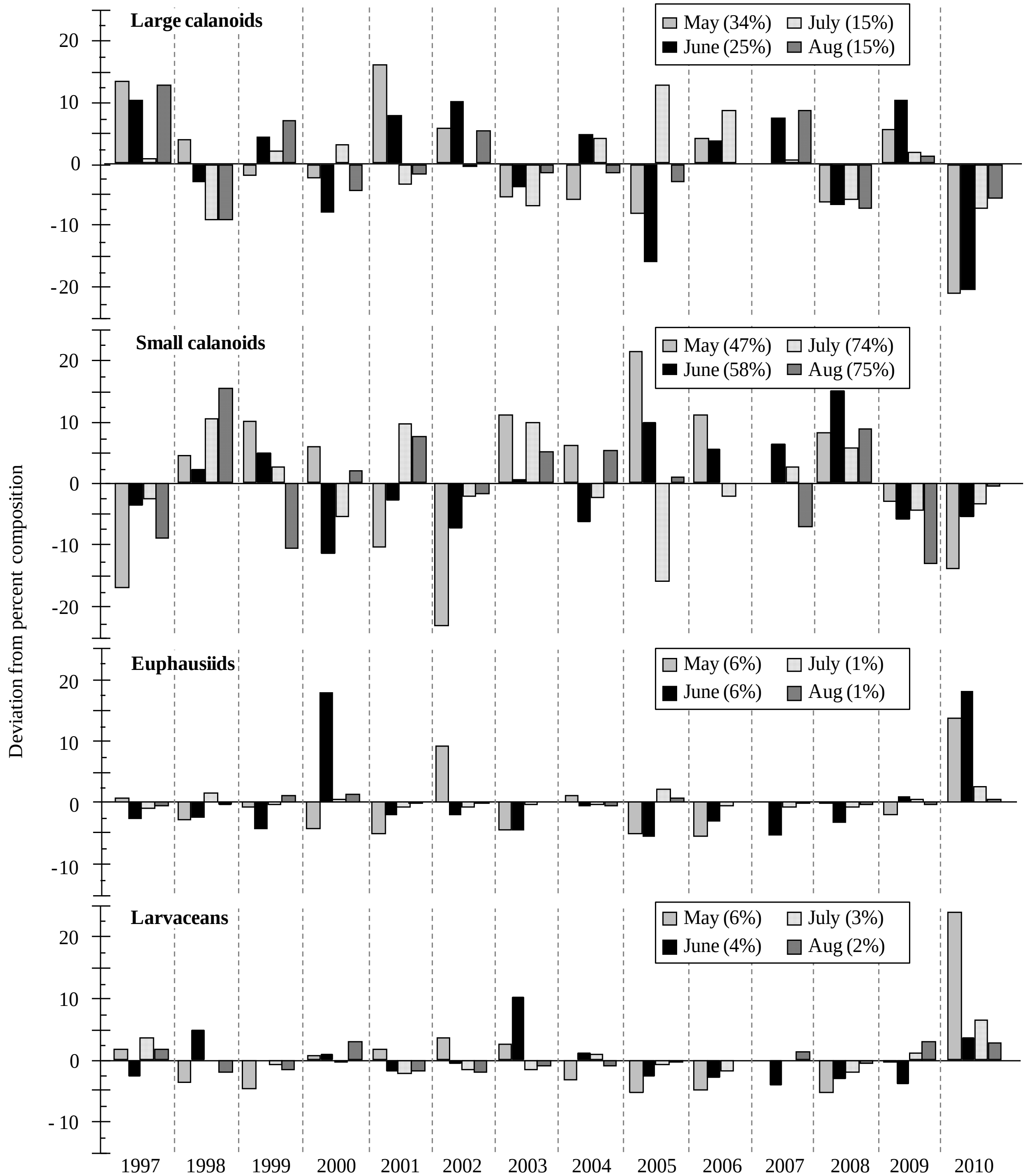

Figure 25.—Monthly anomalies for zooplankton composition across the 14-yr time series from strait habitat in the northern region of southeastern Alaska, 1997-2010. Data (shaded bars) are deviations from longterm mean percent of total density (percent number/m^3), indicated by the 0-line; longterm mean monthly percentages are indicated in the key. Samples were from 333-µm mesh bongo nets as described in Figure 23. See also Figures 6 and 24.

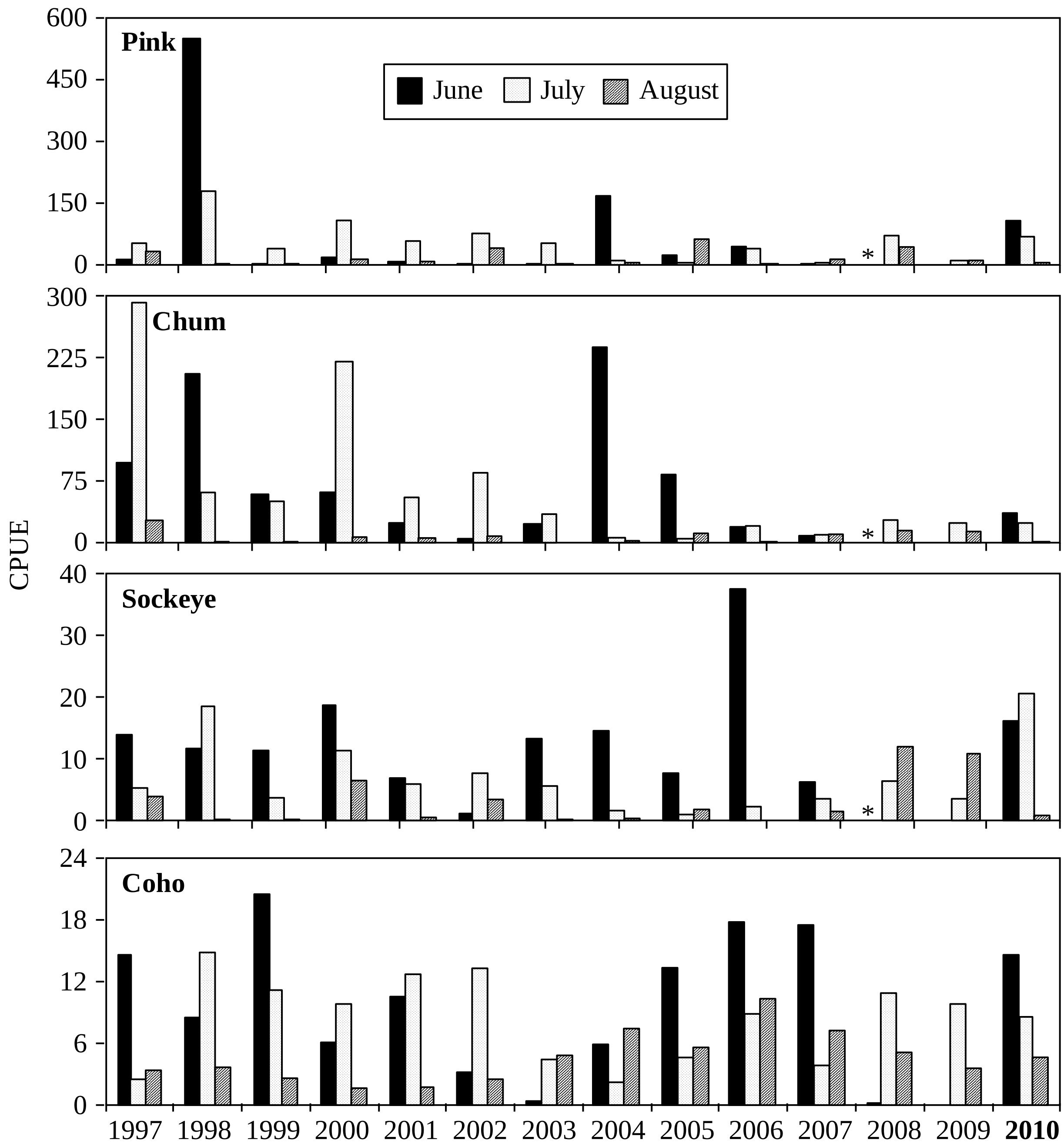

Figure 26.—Monthly catch-per-unit-effort (CPUE, mean catch per trawl haul) for juvenile pink, chum, sockeye, and coho salmon across the 14-yr time series from strait habitat in the northern region of southeastern Alaska, 1997-2010. Asterisks indicate a zero catch. Note differences in scale of y-axes by species. No trawling was conducted in June, 2009. See also Figure 9. These values are in "Cobb units" see Table 10 for conversion factors.

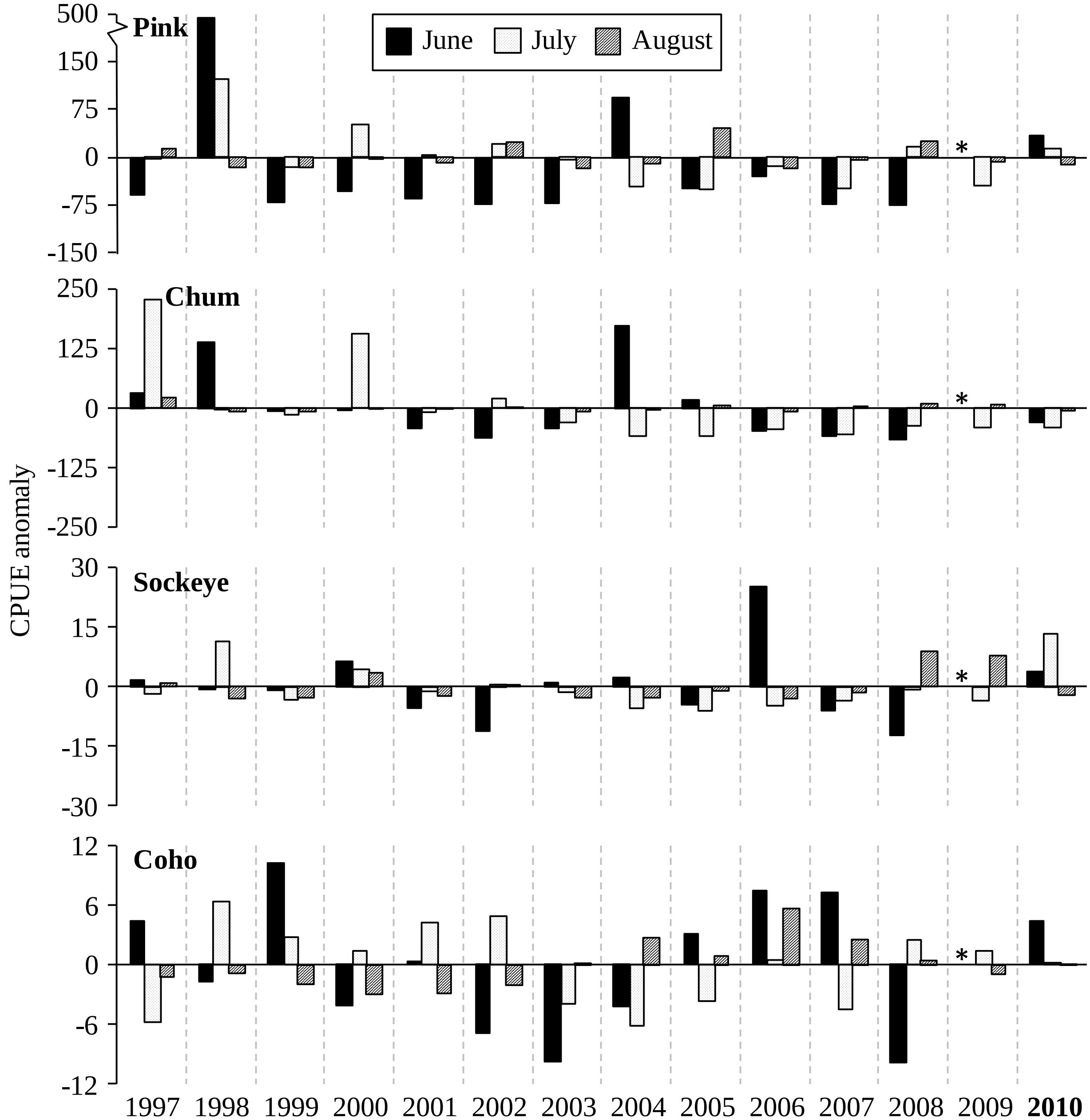

Figure 27.—Monthly anomalies for catch-per-unit-effort (CPUE, mean catch per trawl haul) for juvenile pink, chum, sockeye, and coho salmon across the 14-yr time series from strait habitat in the northern region of southeastern Alaska, 1997-2010. Data (shaded bars) are deviations from the longterm monthly mean CPUE (0-lines). No trawling was conducted in June 2009 (asterisks). Note differences in scale of y-axes by species. See also Figure 9. Values are in “Cobb units” (Table 10).

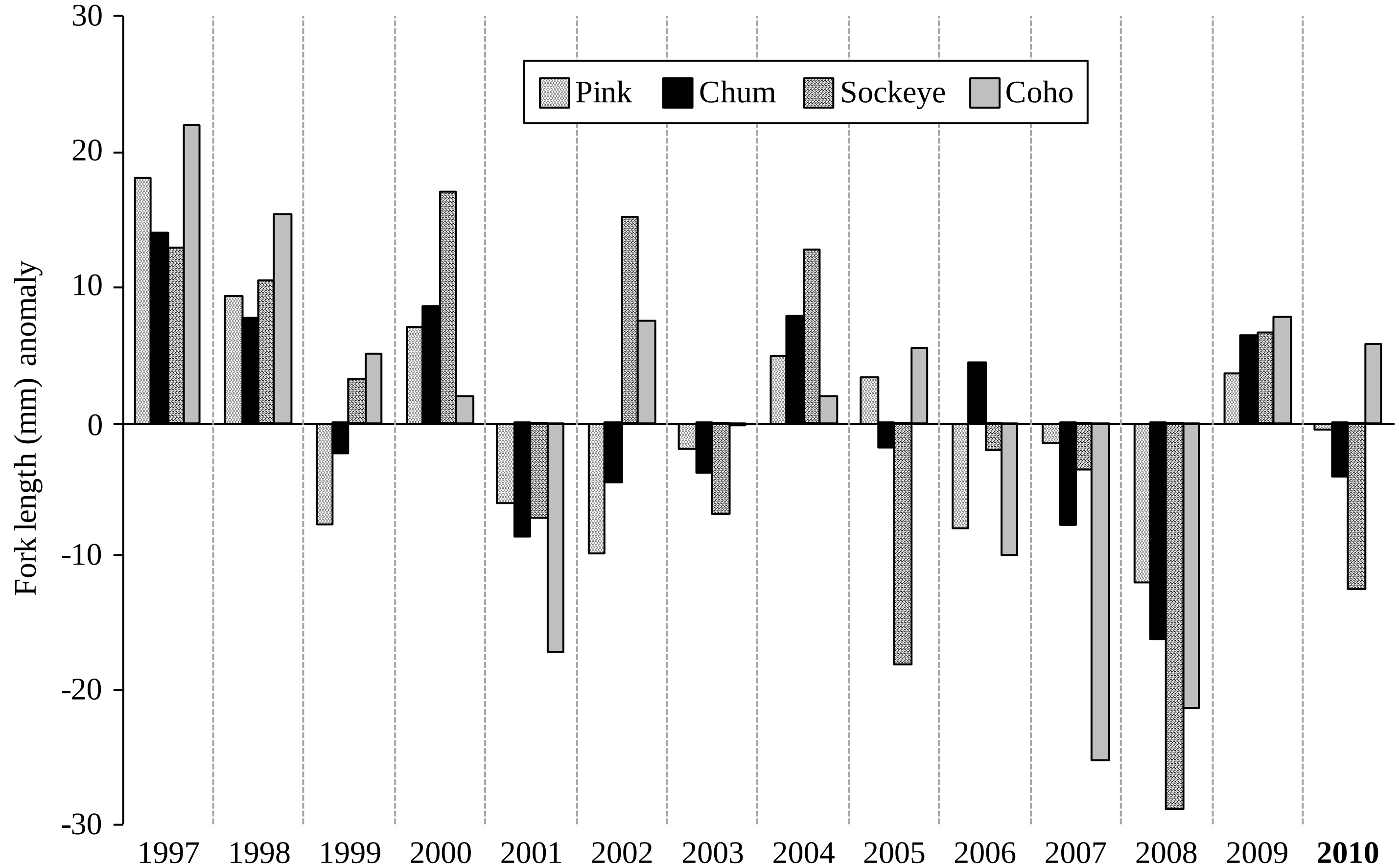

Figure 28.—Anomalies for annual size-at-time (fork length, mm, on July 24) for juvenile pink, chum, sockeye, and coho salmon across the 14-yr time series from strait habitat in the northern region of southeastern Alaska, 1997-2010. Data (shaded bars) are deviations from the longterm monthly mean size-at-time (0-line). See also Figure 10.

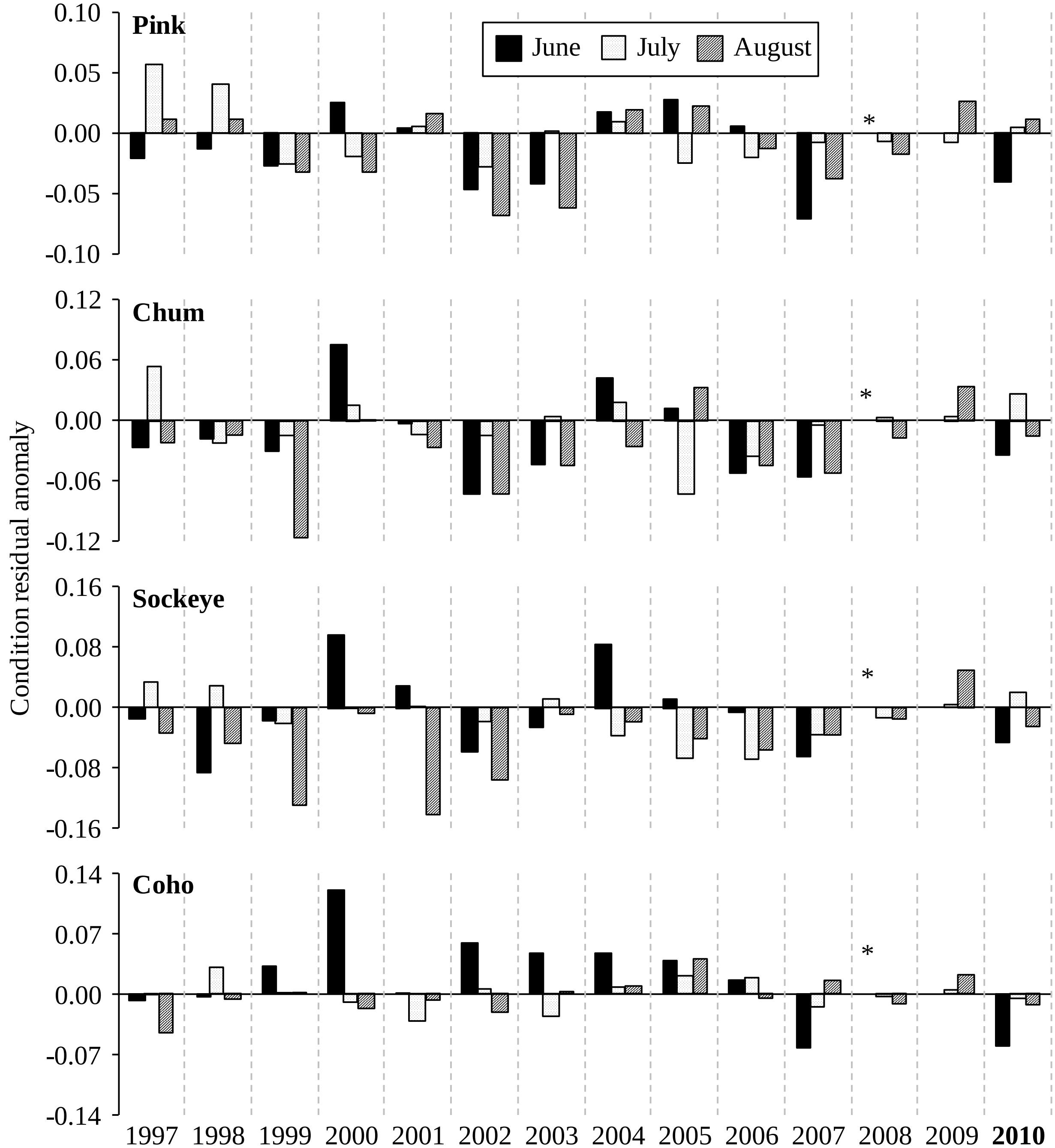

Figure 29.—Monthly anomalies for condition residuals (CR) from length-weight linear regressions for juvenile pink, chum, sockeye, and coho salmon across the 14-yr time series from strait habitat in the northern region of southeastern Alaska, 1997-2010. Data (shaded bars) are deviations from the longterm monthly mean CR (0-lines). No trawling was conducted in June of 2009. Asterisks indicate insufficient samples available for processing in June 2008. Note difference in y-axis scales. See also Tables 10-13 and Figure 13.

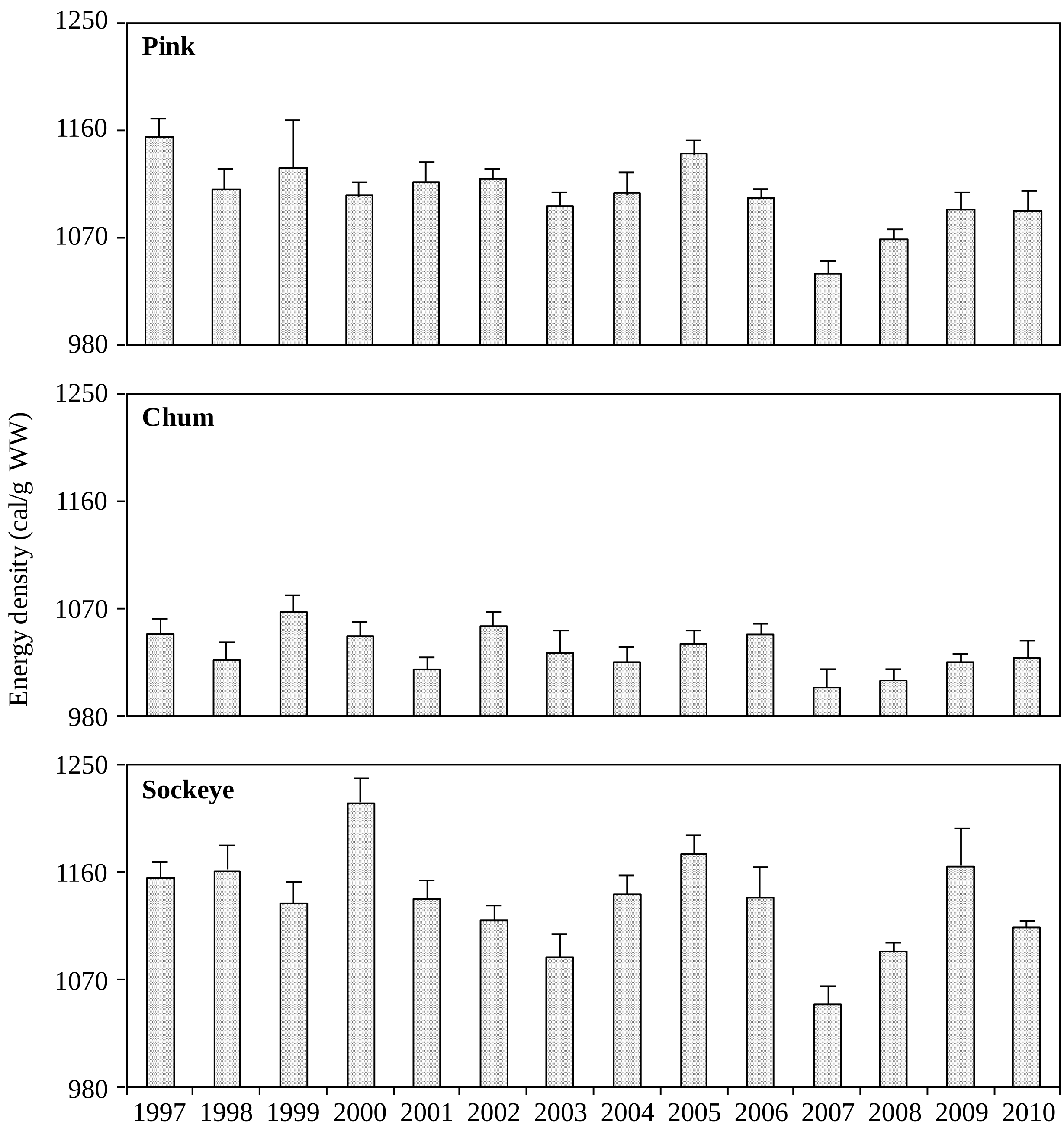

Figure 30.—Annual July energy density (cal/g WW) for juvenile pink, chum, and sockeye salmon across the 14-yr time series from strait habitat in the northern region of southeastern Alaska, 1997-2010.

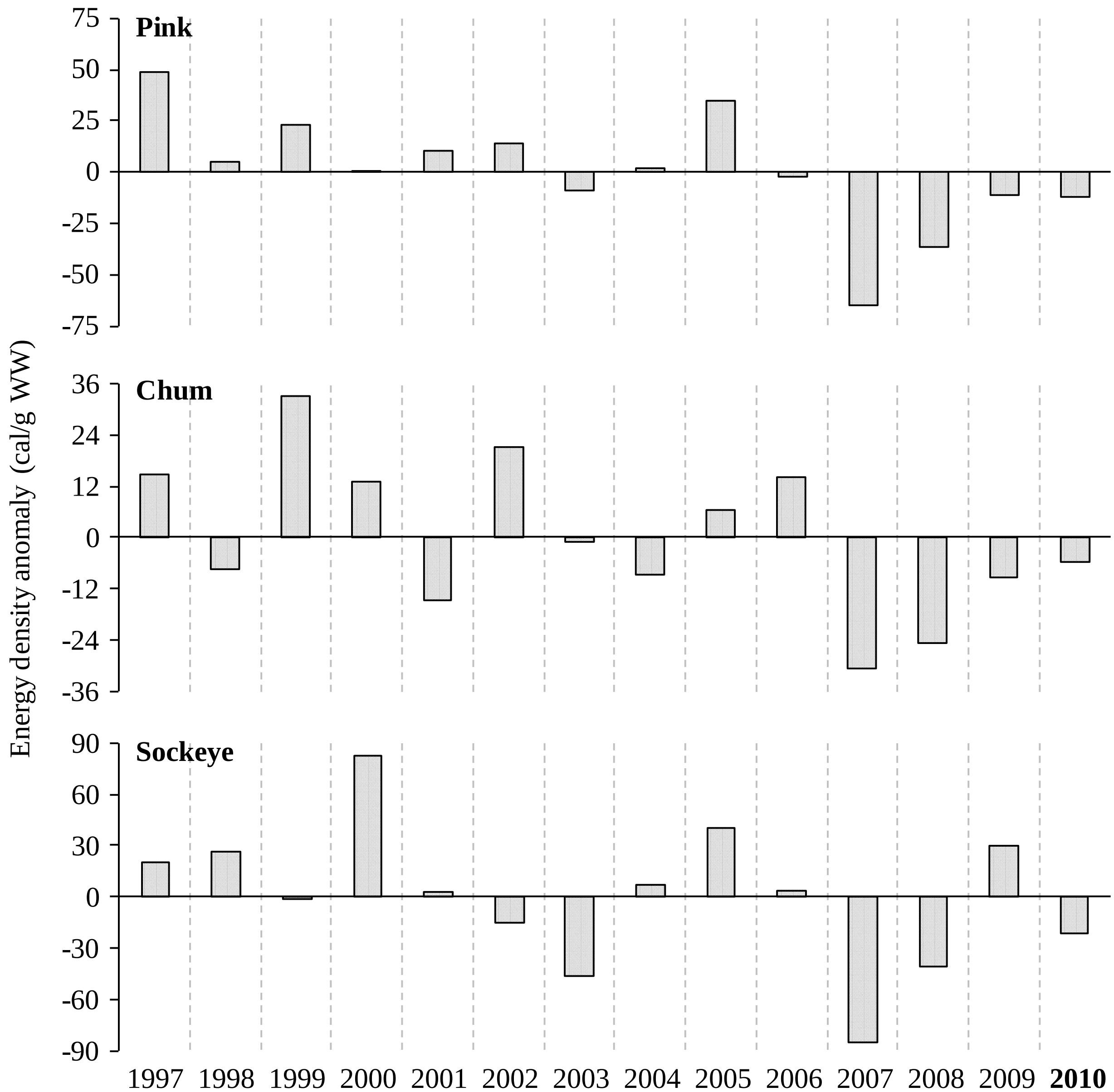

Figure 31.—Annual July anomalies for energy density (cal/g WW) of juvenile pink, chum, and sockeye salmon across the 14-yr time series from strait habitat in the northern region of southeastern Alaska, 1997-2010. Data (shaded bars) are deviations from the longterm July mean energy density (0-line). See also Figure 30.