

Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2016

by

Joseph A. Orsi, Andrew K. Gray, Wesley W. Strasburger, and Emily A. Fergusson

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Alaska Fisheries Science Center, Auke Bay Laboratories
Ted Stevens Marine Research Institute
17109 Point Lena Loop Road
Juneau, AK 99801 USA

Submitted to the

NORTH PACIFIC ANADROMOUS FISH COMMISSION

by

United States of America

April 2016

THIS PAPER MAY BE CITED IN THE FOLLOWING MANNER:

Orsi, J.A., A.K. Gray, W.W. Strasburger, and E.A. Fergusson. 2016. Southeast Alaska Coastal Monitoring (SECM) survey plan for 2016. NPAFC Doc. 1641. 17 pp. National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Alaska Fisheries Science Center, Auke Bay Laboratories, Ted Stevens Marine Research Institute (Available at <http://www.npafc.org>).

Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2016

Keywords: juvenile salmon, ocean monitoring, ecology, ecosystem, Southeast Alaska

ABSTRACT

This survey plan details the proposed sampling for the Southeast Coastal Monitoring (SECM) project in May, June, July, and August of 2016. A primary objective of this SECM research is to study the habitat use and early marine ecology of juvenile (age-0) Pacific salmon (*Oncorhynchus* spp.) and associated epipelagic ichthyofauna in Southeast Alaska (SEAK) and in the Gulf of Alaska ecosystem. The SECM surveys have been continuous since 1997, and have provided long-term biological and oceanographic data sets associated with all five species of wild and hatchery salmon during a period of climate change. Ecosystem metrics from this SECM time series are currently used to develop pre-season forecast models for pink salmon (*O. gorbuscha*) harvest in SEAK and additionally contribute annual NOAA ecosystem consideration reports for Chinook salmon (*O. tshawytscha*), Sablefish (*Anoplopoma fimbria*), and zooplankton. The SECM project is currently supported by the Alaska Fisheries Science Center, Auke Bay Laboratories, along with supplemental funding from the Northern Fund of the Pacific Salmon Commission.

SECM sampling planned for 2016

A primary objective of this SECM research is to study the habitat use and early marine ecology of juvenile (age-0) Pacific salmon (*Oncorhynchus* spp.) and associated epipelagic ichthyofauna in Southeast Alaska (SEAK) and in the Gulf of Alaska (GOA) ecosystem. In 2016,

SECM research surveys are scheduled to continue at 13 core stations during four monthly intervals from late May to late August (Tables 1 and 2). These surveys will be conducted off government and chartered research vessels in the vicinities of Icy Strait and Icy Point (58° N, 135°W; 57° N, 134° W) to sample fish, zooplankton, nutrients, chlorophyll, and physical water properties using a surface trawl, plankton nets, and an oceanographic profiler (Figure 1). Continued monitoring in 2016 will extend the long-term biological and oceanographic SECM time series to 20 continuous years, covering recent periods of climate change, for all five species of both wild and hatchery Pacific salmon.

SECM researchers have collaborated with many agencies, institutions, and individuals over the project lifespan and have contributed numerous reports and publications to the scientific community (http://www.afsc.noaa.gov/ABL/EMA/EMA_SECM.htm; see selected publications section). Annual presentations on pre-season pink salmon forecasting have been given to the Purse Seine Task Force (http://www.afsc.noaa.gov/ABL/EMA/EMA_PSF.htm) since 2005, and both oral and poster presentations on topics on relevant salmon ecology topics have been delivered at professional meetings and seminars, such as both Alaska Chapter and National American Fisheries Society meetings, the Alaska Hatchery Managers Meeting, the Alaska Marine Science Symposium, the Pink and Chum Salmon Workshop, the North Pacific Anadromous Fish Commission (NPAFC) Meetings, the Salmon Ocean Ecology Meetings, the State of the Salmon international conference, and at the University of Alaska.

SECM data are reported annually in the NPAFC document series. These contributions are an important service to the fisheries research community and continue to provide data that will improve the understanding of salmon production and interactions in regional and basin-scale ecosystems. The increasing value of these time series has most recently become apparent in

stock assessments for pink salmon and Chinook salmon reported in NOAA Ecosystems Consideration Reports. For example, information on juvenile Chinook salmon ecology has been reported and applied to improve understanding of stocks in western Alaska, where the causes for disastrous run failures are unknown. Additionally, annual pink salmon harvest forecasts have been provided to the stakeholders of SEAK commercial fishery for over a decade, which has a tremendous economic benefit to the region that can reach \$125 M annually.

Historical SECM sampling 1997–2015

Historically, some aspects of the SECM project have varied to accommodate new research objectives or process studies designed to examine specific questions. From 1997 to 2000, SECM research was directed at sampling juvenile salmon and their associated biophysical parameters in inshore, strait, and coastal habitats along a primary seaward migration corridor in the northern region of SEAK. Up to 24 stations spanning 250 km were sampled five times annually, from May to early October. These habitats extended geographically from inshore localities near large glacial rivers to 65 km offshore in the GOA. Fish were sampled during the daytime with a NORDIC 264 surface rope trawl from the National Oceanic and Atmospheric Administration (NOAA) Ship *John N. Cobb*. The biophysical data collected included vertical profile data on water temperature and salinity, surface nutrients and chlorophyll, zooplankton from vertical 20-m hauls and double oblique hauls deployed to 200 m depth, and onboard stomach analysis of potential predators of juvenile salmon. A laboratory process study of juvenile sablefish predation impact on juvenile salmon was initiated in response to unusual field observations in 1999. After four years of sampling, the inshore sampling stations and the Cross

Sound transect were eliminated because juvenile salmon trawl catches were consistently low in these habitats during the sampling months.

In 2001–2004, SECM researchers continued biophysical sampling at 13 core stations and directed more research effort into process studies. Two such studies initiated in 2001 included diel feeding periodicity and prey fields of juvenile pink, chum, and coho salmon, and onboard gastric evacuation rate experiments for juvenile pink and chum salmon. These process studies were designed to increase our understanding of trophic linkages and provide more specific input parameters for use in bioenergetics models to evaluate coastal marine carrying capacity and salmon habitat quality (growth potential). Beginning in 2002, the late September sampling was eliminated because juvenile salmon abundances had been consistently low for this monthly interval, and consequently, sampling time intervals were extended in earlier months to maximize the opportunities for obtaining data at offshore stations and to replicate trawling at the core stations. In 2003, sampling frequency at the 13 core stations was increased from four to six time intervals between mid-May and late August, to gain better temporal resolution of biophysical factors related to salmon growth and abundance. Two process studies were conducted in this year, one on sea lice infestation of juvenile salmon at sea and another on energetics of starved juvenile chum salmon brought into the laboratory from trawl catches during field surveys. Additionally, in 2003 and 2004, concurrent sampling with a second, smaller mesh, trawl was conducted in two time intervals to examine spatial distribution and to compare size-selectivity of two trawl types for juvenile salmon. Also in 2004, the SECM trawl sampling effort returned to one of the inshore habitats to collaborate with a Taku Inlet study on hatchery- and wild-stock interactions of juvenile chum salmon.

From 2005 to 2009, SECM research expanded to include a second sampling region in southern Southeast Alaska. The established sampling scheme of 13 core stations was maintained in the northern region from late May to late August, and eight stations in Clarence Strait were also sampled in late June and late July. The 2008 scheduled sampling in Clarence Strait was not accomplished because of a fatal vessel breakdown of the *John N. Cobb*. In 2009, sampling was resumed in the southern region; however, vessel charter contract logistics only allowed sampling to occur in July in this region. Future efforts are not planned for the southern region, but the four years of comparative sampling of juvenile salmon and associated biophysical parameters will be used to broaden basic understanding of the trophic relationships and ecological interactions of wild and hatchery juvenile salmon and associated fishes in different marine environments. In 2007, inter-vessel calibrations were conducted to compare catch-per-unit-effort (CPUE) for juvenile salmon between the *John N. Cobb* and the RV *Medeia*. Calibrations were also done between the *Medeia* and a charter vessel (FV *Steller*) in 2008 and between the *Medeia* and another charter vessel (FV *Chellissa*) in 2009.

From 2010 to 2015, the northern region of Southeast Alaska was sampled monthly from late May to late August with an ABL vessel (May only) and the charter vessel FV *Northwest Explorer*. These surveys included sampling at the Icy Point stations in June, July, and August to complement the Gulf of Alaska Integrated Ecosystem Research Program (GOA-IERP).

Support and rationale for SECM research

In addition to internal NOAA support, the SECM project has been partially supported over the years with funding through the Global Ocean Ecosystem Dynamics (GLOBEC) program, a Pacific Salmon Commission endowment (the Northern Fund, NF), and NOAA's

Pacific Coastal Salmon Recovery Fund (Alaska Sustainable Salmon Fund, AKSSF). The SECM research project addresses several goals and objectives identified by the NOAA Science Plan of the AFSC, the NPAFC, and the North Pacific Research Board (NPRB) (GOA-IERP).

The mission of NOAA's current next generation [Strategic Plan](#) involves three objectives: to understand and predict changes in climate, weather, oceans, and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems and resources. NOAA's current vision is to have healthy ecosystems, communities, and economies that are resilient in the face of this change that is expected to impact fisheries production. SECM research emphasizes long-term monitoring of coastal marine habitats used by juvenile salmon and associated epipelagic fishes, to understand how environmental variation affects the sustainability of these marine resources in an ecological context. SECM research provides valuable time series data specific to salmon and other marine species to monitor long-term ecosystem changes and also provides salmon forecasting data to ensure that regional fisheries are sustained through an ecosystem approach to management. One of the focus areas for planning in [NOAA's Annual Guidance Memorandum \(FY 2012-2020\)](#) is to "Enhance research and modeling to advance NOAA's mission" and includes to "continually improve our environmental modeling capabilities, focusing on regional climate, high impact weather, and ecological forecasting". SECM research project has provided pre-season salmon forecasting information to regional stakeholders of Southeast Alaska fishing communities for the past eleven years, thus helping to sustain regional fisheries with science-based ecological forecasts.

The [AFSC Science Plan](#) addresses three main research themes: (1) Monitor and assess fish, crab, and marine mammal populations, fisheries, marine ecosystems, and associated communities that rely on these resources; (2) Understand and forecast effects of climate change

on marine resources; and (3) Describe and evaluate the role of habitats in supporting healthy marine ecosystems and populations of fish, crab, and marine mammals. The SECM long-term time series dataset is ideally suited to provide information addressing each of these themes.

The NPAFC 2011–2015 [Science Plan](#) identifies the study of juvenile anadromous salmon stocks in ocean ecosystems as an important component. This Science Plan has a primary goal to explain and forecast the annual variation in Pacific salmon production, an overarching theme of “Forecast of Pacific salmon production in the ocean ecosystems under changing climate”, and five primary research topics: 1) Migration and survival mechanisms of juvenile salmon in the ocean ecosystems; 2) Climate impacts on Pacific salmon production in the Bering Sea (BASIS) and adjacent waters; 3) Winter survival of Pacific salmon in the North Pacific ocean ecosystems; 4) Biological monitoring of key salmon populations; and 5) Development and applications of stock identification methods and models for management of Pacific salmon. SECM research is aligned with both the goal and themes of the NPAFC Science Plan, and specifically addresses research topics 1 and 4 related to the understanding of migration and survival mechanisms of salmon juveniles and biological monitoring of key salmon populations.

Table 1.—Localities and coordinates of stations scheduled for monthly sampling by the Southeast Alaska Coastal Monitoring (SECM) project in marine waters of the northern region of Southeast Alaska in May, June, July, and August of 2016. No sampling is scheduled at the Icy Point stations in May.

Locality	Station	Latitude	Longitude	Offshore distance (km)	Bottom depth (m)
Auke Bay Monitor	ABM	58°22.00'N	134°40.00'W	1.5	60
Upper Chatham Strait	UCA	58°04.57'N	135°00.08'W	3.2	400
Upper Chatham Strait	UCB	58°06.22'N	135°00.91'W	6.4	100
Upper Chatham Strait	UCC	58°07.95'N	135°04.00'W	6.4	100
Upper Chatham Strait	UCD	58°09.64'N	135°02.52'W	3.2	200
Icy Strait	ISA	58°13.25'N	135°31.76'W	3.2	128
Icy Strait	ISB	58°14.22'N	135°29.26'W	6.4	200
Icy Strait	ISC	58°15.28'N	135°26.65'W	6.4	200
Icy Strait	ISD	58°16.38'N	135°23.98'W	3.2	234
Icy Point	IPA	58°20.12'N	137°07.16'W	6.9	160
Icy Point	IPB	58°12.71'N	137°16.96'W	23.4	130
Icy Point	IPC	58°05.28'N	137°26.75'W	40.2	150
Icy Point	IPD	57°53.50'N	137°42.60'W	65.0	1,300

Table 2.—Monthly Southeast Alaska Coastal Monitoring (SECM) project research surveys and vessels (laboratory and chartered) scheduled in marine waters of the northern region of Southeast Alaska in May, June, July, and August of 2016.

Vessel, survey #	On or about (days)	Research focus	Sampling conducted
<i>RV Sashin</i> SA-16-01	20-22 May (3 days)	Oceanography	CTD, chlorophyll and nutrients, zooplankton 9 core stations in Icy/Chatham Straits and Auke Bay
<i>FV Northwest Explorer</i> NW-16-02	24 June–01 July (8 days)	Oceanography Fish survey (trawl)	CTD, chlorophyll and nutrients, zooplankton, fish 9 core stations and 4 stations in Icy Point
<i>FV Northwest Explorer</i> NW-16-03	26 July–02 August (8 days)	Oceanography Fish survey (trawl)	CTD, chlorophyll and nutrients, zooplankton, fish 9 core stations and 4 stations in Icy Point
<i>FV Northwest Explorer</i> NW-16-04	22-29 August (8 days)	Oceanography Fish survey (trawl)	CTD, chlorophyll and nutrients, zooplankton, fish 9 core stations and 4 stations in Icy Point

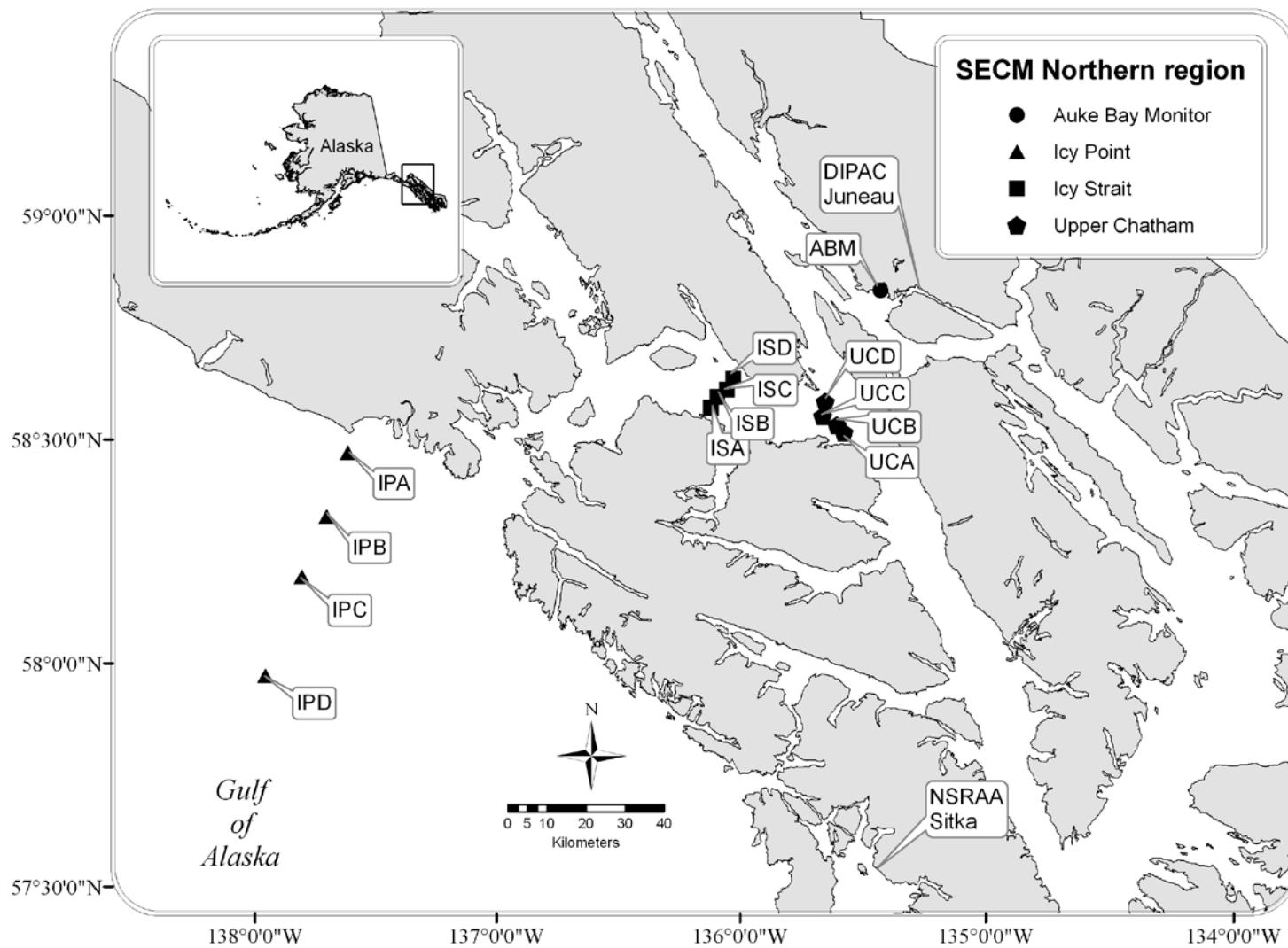


Figure 1.—Stations scheduled for monthly sampling by the Southeast Alaska Coastal Monitoring (SECM) project in marine waters of the northern region of Southeast Alaska in May (no Icy Point stations [IPA, IPB, IPC, IPD]), June, July, and August of 2016.

Selected publications

- Briscoe, R. J., M. D. Adkison, A.C. Wertheimer, and S. G. Taylor. 2005. Biophysical factors associated with the marine survival of Auke Creek, Alaska, coho salmon. *Trans. Am. Fish. Soc.* 134: 817-828.
- Brodeur, R., E. A. Daly, M. V. Sturdevant, T. W. Miller, J. H. Moss, M. E. Thiess, M. Trudel, L. A. Weitkamp, J. Armstrong, and E. Norton. 2007. Regional comparisons of juvenile salmon feeding ecology in coastal marine waters off the west coast of North America. *Amer. Fish. Soc. Symp.* 57:183-203.
- Celewycz, A. G., E. A. Fergusson, J. H. Moss, and J. A. Orsi. 2014. High seas salmonid coded-wire tag recovery data, 2013. NPAFC Doc. 1528. 37 p. NOAA, NMFS, Alaska Fish. Sci. Cent., Auke Bay Laboratories, Ted Stevens Marine Res. Institute.
[http://www.npafc.org/new/publications/Documents/PDF%202014/1528\(USA\).pdf](http://www.npafc.org/new/publications/Documents/PDF%202014/1528(USA).pdf)
- Fergusson, E. A., M. V. Sturdevant, and J. A. Orsi. 2010. Effects of starvation on energy density of juvenile chum salmon captured in the marine waters of southeastern Alaska. *Fish. Bull.* 108(2): 218–225.
- Fergusson, E. A., M. V. Sturdevant, and J. A. Orsi. 2013. Trophic relationships among juvenile salmon during a 16-year time series of climate variability in Southeast Alaska NPAFC Tech. Rep. 9:112-117. (Available at www.npafc.org).
- Fisher, J. , M. Trudel, A. Ammann, J. A. Orsi, J. Piccolo, C. Bucher, E. Casillas, J. A. Harding, B. MacFarlane, R. D. Brodeur, J. F. T. Morris, and D. W. Welch. 2007. Comparisons of the coastal distributions and abundances of juvenile Pacific Salmon from Central California to the Northern Gulf of Alaska. *Amer. Fish. Soc. Symp.* 57:31–80.
- Fisher, J. P., L. A. Weitkamp , D. J. Teel , S. A. Hinton, J. A. Orsi, E. V. Farley Jr. , J. F. T. Morris , M. E. Thiess , R. M. Sweeting & M. Trudel. 2014. Early Ocean Dispersal Patterns of Columbia River Chinook and Coho Salmon, *Transactions of the American Fisheries Society*, 143:1, 252-272, DOI: 10.1080/00028487.2013.847862
<http://www.tandfonline.com/doi/pdf/10.1080/00028487.2013.847862>
- Heard, W. R., J. A. Orsi, A. C. Wertheimer, M. V. Sturdevant, J. M. Murphy, D. G. Mortensen, B. L. Wing, and A. G. Celewycz. 2001. A synthesis of research on early marine ecology of juvenile Pacific Salmon in Southeast Alaska. Page 52 in NPAFC Technical Report 2: Workshop on Factors Affecting Production of Juvenile Salmon. North Pacific Anadromous Fish Commission Tokyo, Japan.
- LaCroix J. J., A. C. Wertheimer, J. A. Orsi, M. V. Sturdevant, E. A. Fergusson, and N. A. Bond. 2009. A top-down survival mechanism during early marine residency explains coho salmon year-class strength in southeast Alaska. *Deep-Sea Research II* 56:2560-2569.
- Mundy, P.R., D.M. Allen, J.L. Boldt, N.A. Bond, S. Dressel, E.V. Farley, Jr., D.H. Hanselman, J. Heifetz, R.R. Hopcroft, M.A. Janout, C. Ladd, R.C. Lam, P.A. Livingston, C.R.

- Lunsford, J.T. Mathis, F.J. Mueter, C.N. Rooper, N. Sarkar, S.A. K. Shotwell, M. V. Sturdevant, A. C. Thomas, T. J. Weingartner, and D. Woodby. 2010. Status and trends of the Alaska Current Region, 2003-2008, pp. 142-195 In: S.M. McKinnell and M.J. Dagg [Eds.]. Marine Ecosystems of the North Pacific Ocean, 2003-2008. PICES Special Publication 4, 393 pp.
- Murphy, J. M., A. L. J. Brase, and J. A. Orsi. 1999. An ocean survey of juvenile salmon in the northern region of southeastern Alaska, May–October 1997. NOAA Tech. Memo NMFS-AFSC-105. Auke Bay Lab., Alaska Fish. Sci. Cen., Nat. Mar. Fish. Serv., NOAA, U.S. Dept. Commerce, 11305 Glacier Highway, Juneau, AK 99801-8626, USA, 40 pp.
- Murphy, J. M., and J. A. Orsi. 1999. Physical oceanographic observations collected aboard the NOAA Ship *John N. Cobb* in the northern region of southeastern Alaska, 1997 and 1998. NOAA Proc. Rep. AFSC 99-02. Auke Bay Lab., Alaska Fish. Sci. Cen., Nat. Mar. Fish. Serv., NOAA, U.S. Dept. Commerce, 11305 Glacier Highway, Juneau, AK 99801-8626, USA, 239 pp.
- Nishimura, G., and M. Sturdevant. 2011. Portable winch technology for use on smaller vessels. *Sea Technology* 52 (July), 3 pp.
- NOAA Strategic Plan 2006-2011. New Priorities for the 21st Century (accessed 11 Jan 2011 at: http://www.nssl.noaa.gov/aboutnssl/Strategic_Plan_2006_FINAL_04282005.pdf).
- NOAA 2012. Implementing the NOAA Next Generation Strategic Plan: Annual Guidance Memorandum FY 2016-2020. (accessed 06 Jan 2015 at: http://www.ppi.noaa.gov/wp-content/uploads/FY14-20_AGM_Final_Signed_130816.pdf)
- NOAA 2014. Ecosystem Considerations 2014. Edited by: S. Zador Resource Ecology and Fisheries Management Division, Alaska Fisheries Science Center, National Marine Fisheries Service, NOAA. 1) Forecasting Pink Salmon Harvest in Southeast Alaska, Contributed by J. Orsi, E. Fergusson, and A. Wertheimer 2) Using Ecosystem Indicators to develop a Chinook Salmon Abundance Index for Southeast Alaska, Contributed by J. Orsi, E. Fergusson, and A. Wertheimer, 3) Long-term Zooplankton and Temperature Trends in Icy Strait, Southeast Alaska, Contributed by E. Fergusson, J. Orsi and M. Sturdevant, and 4) Southeast Coastal Monitoring Survey Indices and the Recruitment of Gulf of Alaska Sablefish, Contributed by E. Yasumiishi, K. Shotwell, D. Hanselman, J. Orsi, and E. Fergusson. 263 p. <http://www.afsc.noaa.gov/REFM/Docs/2014/ecosystem.pdf>
- NOAA 2015. NOAA's Next Generation Strategic Plan (accessed 06 Jan 2015 at: <http://www.ppi.noaa.gov/ngsp/>).
- NPAFC Anonymous. 2010. North Pacific Anadromous Fish Commission Science Plan 2011-2015. NPAFC Doc. 1255. 34 pp. Committee on Scientific Research and Statistics (CSRS), North Pacific Anadromous Fish Commission, Suite 502, 889 West Pender Street, Vancouver, B.C., V6C 3B2 Canada. (Available at www.npafc.org). (accessed 06 Jan 2015 at: http://www.npafc.org/new/science_plan.html).

- Orsi, J. A., D. G. Mortensen, and J. M. Murphy. 1999. Early marine ecology of pink and chum salmon in southeastern Alaska. pp 64–72 *In*: Proceedings of the 19th Northeast Pacific Pink and Chum Salmon Workshop, March 3–5 1999, Juneau, AK. Auke Bay Lab., Alaska Fish. Sci. Cen., Nat. Mar. Fish. Serv., NOAA, U.S. Dept. Commerce, 11305 Glacier Highway, Juneau, AK 99801-8626, USA.
- Orsi, J. A., M. V. Sturdevant, J. M. Murphy, D. G. Mortensen, and B. L. Wing. 2000. Seasonal habitat use and early marine ecology of juvenile Pacific salmon in southeastern Alaska. *N. Pac. Anadr. Fish Comm. Bull. No. 2*:111–122.
- Orsi, J. A., M. V. Sturdevant, J. M. Murphy, D. G. Mortensen, B. L. Wing, A. C. Wertheimer, and W. R. Heard. 2001. Southeast Alaska coastal monitoring for habitat use and early marine ecology of juvenile Pacific salmon. Pp. 38 *In*: R. Beamish, Y. Ishida, V. Karpenko, P. Livingston, and K. Myers (eds.). NPAFC Workshop on Factors Affecting Production of Juvenile Salmon: Comparative Studies on Juvenile Salmon Ecology Between the East and West North Pacific Ocean, October 29, 2000, Tokyo, Japan. North Pacific Anadromous Fish Commission Technical Report 2. Vancouver, Canada.
- Orsi, J. A., A. C. Wertheimer, and S. Nutting. 2004. Comparisons of the size of juvenile pink and chum salmon caught during surface rope and pair trawling in the marine waters of southeastern Alaska, June 2004. (NPAFC Doc. 799) Auke Bay Lab., Alaska Fish. Sci. Cen., Nat. Mar. Fish. Serv., NOAA, 11305 Glacier Highway, Juneau, AK 99801-8626, USA, 10 pp.
- Orsi, J. A., A. C. Wertheimer, M. V. Sturdevant, E. A. Fergusson, D. G. Mortensen, and B. L. Wing. 2004. Juvenile chum salmon consumption of zooplankton in marine waters of southeastern Alaska: A bioenergetics approach to implications of hatchery stock interactions. *Rev. Fish Biol. Fish.* 14:335-359.
- Orsi, J. A., J. A. Harding, S. S. Pool, R. D. Brodeur, L. J. Haldorson, J. M. Murphy, J. H. Moss, E. V. Farley Jr., R. M. Sweeting, J. F. T. Morris, M. Trudel, R. J. Beamish, R. L. Emmett, and E. A. Fergusson. 2007. Epipelagic fish assemblages associated with juvenile Pacific salmon in neritic waters of the California Current and the Alaska Current. *Amer. Fish. Soc. Symp.* 57:105-155.
- Orsi, J. A., A. C. Wertheimer, E. A. Fergusson, and M. V. Sturdevant. 2008. Interactions of hatchery chum salmon with juvenile chum and pink salmon in the marine waters of southeastern Alaska. Pp. 20-24 *In*: Proceedings of the 23rd Northeast Pacific Pink and Chum Salmon Workshop. K. Neely, O. Johnson, J. Hard, L. Weitkamp, and K. Adicks (Rapporteurs). February 19-21, 2008, Bellingham, Washington, 95 pp.
- Orsi, J. A., E. A. Fergusson, M. V. Sturdevant, B. L. Wing, A. C. Wertheimer, and W. R. Heard. 2009. Annual Survey of Juvenile Salmon, Ecologically-Related Species, and Environmental Factors in the Marine Waters of Southeastern Alaska, May–August 2008. NPAFC Doc. 1181. 72 pp. (Available at <http://www.npafc.org>).

- Orsi, J., A. Wertheimer, M. Sturdevant, E. Fergusson, and B. Wing. 2009. Insights From a 12-year biophysical time series of juvenile Pacific salmon in Southeast Alaska: the Southeast Alaska Coastal Monitoring Project (SECM). AFSC, Quarterly July-Aug-Sept. Feature article (Available at <http://www.afsc.noaa.gov/quarterly/jas2009/jas09.htm>).
- Orsi, J. A., M. V. Sturdevant, E. A. Fergusson, B. L. Wing, and W. R. Heard. 2010. Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2010. NPAFC Doc. 1224. 14 pp. (Available at <http://www.npafc.org>).
- Orsi, J. A., E. A. Fergusson, M. V. Sturdevant, W. R. Heard, and E. V. Farley, Jr. 2011. Annual Survey of Juvenile Salmon, Ecologically-Related Species, and Environmental Factors in the Marine Waters of Southeastern Alaska, May–August 2010*. NPAFC Doc. 1342, 87 pp. (Available at <http://www.npafc.org>). *(The SECM annual survey reports for the years 1997-2009 are also listed in the NPAFC web link as Docs: 277, 346, 497, 498, 536, 630, 702, 798, 871, 955, 1057, 1110, 1181, and 1280)
- Orsi, J. A. 2012. Oral presentations. Chinook salmon insights from marine ecosystem monitoring in Southeast Alaska: Chinook Salmon [Symposium](#), Anchorage, AK in October 2012 and at a [Seminar](#) at the University of Alaska in Juneau, AK in November 2012.
- Orsi, J. A., E. A. Fergusson, and M. V. Sturdevant. 2012. Recent harvest trends of pink and chum salmon in Southeast Alaska: Can marine ecosystem indicators be used as predictive tools for management? NPAFC Tech. Rep. 8:130-134. (Available at www.npafc.org).
- Orsi, J. A., M. V. Sturdevant, E. A. Fergusson, W. R. Heard, and E. V. Farley, Jr. 2013. Chinook salmon marine migration and production mechanisms in Alaska. NPAFC Tech. Rep. 9:240-243. (Available at <http://www.npafc.org>).
- Orsi, J. A., M. V. Sturdevant, E. A. Fergusson, S. C. Heinl, S. C. Vulstek, J. M. Maselko, and J. E. Joyce. 2013. Connecting the “dots” among coastal ocean metrics and Pacific salmon production in Southeast Alaska, 1997-2012. NPAFC Tech. Rep. 9:260-266. (Available at <http://www.npafc.org>).
- Orsi, J. A., Piston, E. Fergusson, and J. Joyce. 2014. Biological Monitoring of Key Salmon Populations: Southeast Alaska Pink Salmon. July NPAFC Newsletter p 13-19. [http://www.npafc.org/new/publications/Newsletter/NL36/Newsletter36%20\(13-19\).pdf](http://www.npafc.org/new/publications/Newsletter/NL36/Newsletter36%20(13-19).pdf)
- Orsi, J. A., E. A. Fergusson, E. V. Farley, Jr., and R. A. Heintz. 2014. Southeast Alaska Coastal Monitoring (SECM) Survey Plan for 2014. NPAFC Doc. 1508. 17 pp. (Available at <http://www.npafc.org>).
- Orsi, J. A., and P. R. Mundy. 2014. Challenges in communicating outlooks and forecasts of production and timing and associated uncertainty to salmon fishery managers and the public. Presentation made at 2014 FUTURE Science Meeting. <https://www.pices.int/publications/presentations/2014-FUTURE-OSM/S3/1550-Orsi.pdf>

- Orsi, J. A. and E. A. Fergusson. 2014. Annual survey of juvenile salmon, ecologically-related species, and biophysical factors in the marine waters of southeastern Alaska, May–August 2013. NPAFC Doc. 1554. 86 pp. Auke Bay Lab., Alaska Fisheries Science Center, NOAA, NMFS. (Available at <http://www.npafc.org>).
- Orsi, J. A. and E. A. Fergusson. 2015. Annual survey of juvenile salmon, ecologically-related species, and biophysical factors in the marine waters of southeastern Alaska, May–August 2014. NPAFC Doc. 1617. 64 pp. (Available at <http://www.npafc.org>).
- Park, W., M. Sturdevant, J. Orsi, A. Wertheimer, E. Fergusson, W. Heard, and T. Shirley. 2004. Interannual abundance patterns of copepods during an ENSO event in Icy Strait, southeastern Alaska. *ICES J. Mar. Sci.* 61(4):464-477.
- Park, W., and T.C. Shirley. 2008. Variations of abundance and hatch timing of dungeness crab larvae in southeastern Alaska: implications for climate effect. *Animal Cells and Systems* 12:287-295.
- Reese C, N. Hillgruber, M. Sturdevant, A. Wertheimer, W. Smoker, and R. Focht. 2009. Spatial and temporal distribution and the potential for estuarine interactions between wild and hatchery chum salmon (*Oncorhynchus keta*) in Taku Inlet, Alaska. *Fish. Bull.* 107:433–450.
- Robbins, J. B. 2006. Biophysical factors associated with the marine growth and survival of Auke Creek, Alaska, coho salmon (*Oncorhynchus kisutch*). Unpub. M.S. Thesis, University of Alaska, Juneau, Alaska. 93 pp.
- Sturdevant, M. V., E. A. Fergusson, J. A. Orsi, and A. C. Wertheimer. 2002. Diel feeding of juvenile pink, chum, and coho salmon in Icy Strait, southeastern Alaska, May–September 2001 (NPAFC Doc. 631) Auke Bay Lab., Alaska Fish. Sci. Cen., Nat. Mar. Fish. Serv., NOAA, U.S. Dept. Commerce, 11305 Glacier Highway, Juneau, AK 99801-8626, USA, 42 pp.
- Sturdevant, M. V., E. A. Fergusson, J. A. Orsi, and A. C. Wertheimer. 2004. Diel feeding and gastric evacuation of juvenile pink and chum salmon in Icy Strait, Southeastern Alaska, May–September 2001. NPAFC Tech. Rep. No. 5: 107-109. Auke Bay Lab., Alaska Fish. Sci. Cen., Nat. Mar. Fish. Serv., NOAA, U.S. Dept. Commerce, 11305 Glacier Highway, Juneau, AK 99801-8626.
- Sturdevant M. V., E. A. Fergusson, J. A. Orsi, and A. C. Wertheimer. 2008. Seasonal patterns in diel feeding, gastric evacuation, and energy density of juvenile chum salmon in Icy Strait, Southeast Alaska, 2001. *In: Proceedings of the 23rd Northeast Pacific Pink and Chum Salmon Workshop*. K. Neely, O. Johnson, J. Hard, L. Weitkamp, and K. Adicks (Rapporteurs). February 19-21, 2008, Bellingham, Washington, 95 pp.
- Sturdevant, M. V., M. F. Sigler, and J. A. Orsi. 2009. Sablefish predation on juvenile salmon in the coastal marine waters of Southeast Alaska in 1999. *Trans. Am. Fish. Soc.* 138:675–691.

- Sturdevant, M., G. Nishimura, and J. Orsi. 2011. Sidewinder: description of a new block winch for deploying instruments at sea. *Mar. Coastal Fish.* 3(1): 317-323.
- Sturdevant, M., E. Fergusson, N. Hillgruber, C. Reese, J. Orsi, R. Focht, A. Wertheimer, and B. Smoker. 2012. Lack of trophic competition among wild and hatchery juvenile chum salmon during early marine residence in Taku Inlet, Southeast Alaska. *Environmental Biology of Fishes* 94:101-116. Available at <http://dx.doi.org/10.1007/s10641-011-9899-7>.
- Sturdevant, M. V., J. A. Orsi, and E. A. Fergusson. 2012. Diets and trophic linkages of epipelagic fish predators in coastal Southeast Alaska during a period of warm and cold climate years, 1997–2011. *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science* 4(1):526-545, Available at: <http://www.tandfonline.com/doi/abs/10.1080/19425120.2012.694838>
- Sturdevant, M. V., R. E. Brenner, E. A. Fergusson, J. A. Orsi, and W. R. Heard. 2013. Does predation by returning adult pink salmon regulate pink salmon or herring abundance? *NPAFC Tech. Rep.* 9: 153-164. (Available at <http://www.npafc.org>).
- Trudel, M., J. Fisher, J. A. Orsi, J. F. T. Morris, M. E. Thiess, R. M. Sweeting, S. Hinton, E. A. Fergusson, and D. W. Welch. 2009. Distribution and Migration of Juvenile Chinook salmon derived from coded wire tag recoveries along the continental shelf of western North America. *Trans. Amer. Fish. Soc.* 138:1369–1391.
- Turner, E., and D. B. Haidvogel. 2009. [Taking ocean research results to applications: examples and lessons from US GLOBEC](#). *Oceanography* 22(4):232-241.
- Weitkamp, L. A. and M. V. Sturdevant. 2008. Food habits and marine survival of juvenile Chinook and coho salmon from marine waters of Southeast Alaska. *Fish. Oceanog.* 17(5):380–395.
- Weitkamp, L. A., J. A. Orsi, K. W. Myers, and R. C. Francis. 2011. Contrasting early marine ecology of Chinook and coho salmon in Southeast Alaska: insight in to factors affecting marine survival. *Mar. Coastal Fish.* 3(1):233-249.
- Wertheimer, A. C., E. A. Fergusson, R. L. Focht, W. R. Heard, J. A. Orsi, M. V. Sturdevant, and B. L. Wing. 2003. Sea lice infestation of juvenile salmon in the marine waters of the northern region of southeastern Alaska, May–August, 2003. (NPAFC Doc. 706) Auke Bay Lab., Alaska Fish. Sci. Cen., Nat. Mar. Fish. Serv., NOAA, U.S. Dept. Commerce, 11305 Glacier Highway, Juneau, AK 99801-8626, USA, 13 pp.
- Wertheimer, A. C., J. A. Orsi, M. V. Sturdevant, and E. A. Fergusson. 2008. Forecasting pink salmon abundance in Southeast Alaska from juvenile salmon abundance and associated environmental parameters. Final Report, Pacific Salmon Commission Northern Fund. 41 pp.
- Wertheimer, A. C., J. A. Orsi, E. A. Fergusson, and M. V. Sturdevant. 2009. Calibration of Juvenile Salmon Catches using Paired Comparisons between Two Research Vessels

Fishing Nordic 264 Surface Trawls in Southeastern Alaska, July 2008. NPAFC Doc. 1180. 18 pp. (Available at <http://www.npafc.org>).

Wertheimer, A. C., J. A. Orsi, E. A. Fergusson, and M. V. Sturdevant. 2009. Forecasting Pink Salmon Harvest in Southeast Alaska from Juvenile Salmon Abundance and Associated Environmental Parameters: 2008 Returns and 2009 Forecast. NPAFC Doc. 1201. 20 pp. (Available at <http://www.npafc.org>).

Wertheimer, A. C., J. A. Orsi, E. A. Fergusson, and M. V. Sturdevant. 2010. Calibration of Juvenile Salmon Catches using Paired Comparisons between Two Research Vessels Fishing Nordic 264 Surface Trawls in Southeast Alaska, July 2009. NPAFC Doc. 1277, 20 pp. (Available at <http://www.npafc.org>).

Wertheimer, A. C., J. A. Orsi, E. A. Fergusson, and M. V. Sturdevant. 2010. Forecasting Pink Salmon Harvest in Southeast Alaska from Juvenile Salmon Abundance and Associated Environmental Parameters: 2009 Harvest and 2010 Forecast. NPAFC Doc. 1278, 20 pp. (Available at <http://www.npafc.org>).

Wertheimer, A. C., J. A. Orsi, E. A. Fergusson, and M. V. Sturdevant. 2011. Forecasting Pink Salmon Harvest in Southeast Alaska from Juvenile Salmon Abundance and Associated Environmental Parameters: 2010 Returns and 2011 Forecast. NPAFC Doc. 1343, 20 pp. (Available at <http://www.npafc.org>).

Wertheimer, A. C., J. A. Orsi, E. A. Fergusson, and M. V. Sturdevant. 2013. Forecasting Pink Salmon Harvest in Southeast Alaska from Juvenile Salmon Abundance and Associated Biophysical Parameters: 2012 Returns and 2013 Forecast. NPAFC Doc. 1486, 23 pp. (Available at <http://www.npafc.org>).

Wertheimer, A. C., J. A. Orsi, E. A. Fergusson, and M. V. Sturdevant. 2014. Forecasting pink salmon harvest in southeast Alaska from juvenile salmon abundance and associated biophysical parameters: 2013 returns and 2014 forecast. NPAFC Doc. 1555. 24 pp. Auke Bay Lab., Alaska Fisheries Science Center, NOAA, NMFS. (Available at <http://www.npafc.org>).