

SOP 14: Annual Data Report (OC_K Creation) version 2

The Annual Data Report summarizes the field efforts of the previous sampling year, provides graphical and tabular summaries of collected data, and places these data within historical and regional contexts so that unusual observations can be identified. The sampling year ends with the October cruise, so the final certified data does not become available until after the instrument returns from the Sea-Bird calibration facility, typically in early January. The Annual Data Report is normally generated in February.

Because water column samples of phytoplankton, suspended sediment, and dissolved oxygen are not collected and analyzed, the ancillary data sensors cannot be quantitatively compared on an intercruise or interannual basis, and certainly not within the same cruise (it is acceptable to compare measurements within the same cast, however). For example, different phytoplankton species have different responses as measured by the fluorometer. Consequently, even within a single cruise, data are not directly comparable because phytoplankton communities within a fjord near a glacier may well have different species compositions from communities more closely connected to the Gulf of Alaska. Similarly, field personnel have no way to calibrate the OBS sensor in situ to particle size distribution, shape, color, reflectivity, etc., so turbidity measurements among casts and cruises must be interpreted with considerable caution. Nonetheless, it is important to examine these data (on a relative scale) in order to note possible significant changes in the character of these parameters over time.

1 Annual Report Format and Content

The Annual Data Report follows the NPS Natural Resource Technical Report format (<http://www.nature.nps.gov/publications/nrpm/nrrntr.cfm>) and contains the following sections and content:

1. **Introduction:** Overview of the monitoring program and its history, personnel involved
2. **Methods:** Summary of the sampling methodology, timing of fieldwork
3. **Coverage:** Chart showing what stations were occupied in which months
4. **Synopsis of operations:** Overview of the year, what went well, what problems cropped up, what needs particular attention in the coming year. Summary of observation comments and notes recorded on the field log sheets. Formal protocol revisions that went into effect.
5. **Results:**
 1. *Tables summarizing basic measurement and statistics.* Provide the mean, maximum, minimum, and standard deviation (as appropriate) of designated parameters in the upper 50 m of the water column from all cruises (for each core station). Parameters will include temperature, salinity, density, vertical density gradient, fluorescence, oxygen, OBS, and PAR. (See example in Section 2, following.) A second table will depict water column conditions from near the bottom at each station.
 2. *Analysis of Station 04 with respect to historical data.* Vertical profile plots or tables of the temperature and salinity measurements from Station 04 in all cruises along with historical mean and $\pm$ one standard deviation.

3. *Horizontal cross-sections*. Horizontal cross-sections of temperature, salinity, density, fluorescence, oxygen, and OBS from the midsummer (July) and midwinter (December–early February) cruises. For each of the cruises with cross-section plots, one set of cross-sections should show the data extending from Icy Strait to the head of the West Arm, and a second set should show the data from Icy Strait to the head of the East Arm.
6. **Discussion:** Summary of observations based on tables and figures presented in the Results section. Note in particular any anomalous conditions that persist through multiple sampling periods, multiple years, and/or across domains, as well as discussing regional geographic context.

2 Content of Results Section (i):

Tables Summarizing Basic Measurements and Associated Statistics

In order to assess the measurements made within each cruise, standard statistical summary tables (Figure SOP 14.1), and plots are created by the Project Leader with help from the Data Manager and Data Steward accessing the certified database.

These tables are useful to other researchers conducting marine-related studies in the park. Such data tables can be incorporated directly into their analyses, and the Annual Data Report provides sufficient context for interpretation of these measurements.

Rows of each table describe each field effort conducted through the year and at each core station. Columns of the data tables contain the 0–50 m depth level mean, maximum, minimum, and standard deviation for all of the following parameters: temperature, salinity, density (σ_t), vertical density gradient, fluorescence, dissolved oxygen concentration, OBS, and PAR. Exceptions to the reported statistics are for (1) the density gradient parameter, which requires reporting of the mean, maximum, and depth of maximum only; and (2) the PAR measurement, which requires the mean, minimum, and maximum values only. For purposes of this report, vertical density gradient is calculated as (density at next lower bin – density at next higher bin) $\times$ 0.5. The top and bottom depth bins of each cast have no vertical density gradient. Figure SOP 14.1 shows example table setups for reporting these statistics.

The 0–50 m depth level captures the portion of the water column where the majority of primary production, macronutrient utilization, phytoplankton standing stock, thermal stratification, and low-salinity lenses all occur. Thus, summarizing this portion of the water column provides a broad perspective on the physical, chemical, and primary productivity components of the system.

The near-bottom summary table provides information about (1) bottom water renewal rates and timing within the fjord, (2) nutrient budget cycle dynamics, and (3) connectivity of the fjord with the outside waters.

GLBA Oceanography Core Stations 0-50m Annual Data Summary																	
Station	Year	Month	Temperature				Salinity				Density				Density Gradient		
			mean	min	max	std	mean	min	max	std	mean	min	max	std	mean	max	depth of max
01		Dec/Jan															
		Mar															
		Apr															
		May															
		Jun															
		Jul															
		Aug															
		Sep															
		Oct															
		Dec/Jan															
04		Mar															
		Apr															
		May															
		Jun															
		Jul															
		Aug															
		Sep															
		Oct															
		Dec/Jan															
		Mar															
07		Apr															
		May															
		Jun															
		Jul															
		Aug															
		Sep															
		Oct															
		Dec/Jan															
		Mar															
		Apr															

GLBA Oceanography Core Stations 0-50m Annual Data Summary																	
Station	Year	Month	Fluorescence				Oxygen				OBS				PAR		
			mean	min	max	std	mean	min	max	std	mean	min	max	std	mean	min	max
01		Dec/Jan															
		Mar															
		Apr															
		May															
		Jun															
		Jul															
		Aug															
		Sep															
		Oct															
		Dec/Jan															
04		Mar															
		Apr															
		May															
		Jun															
		Jul															
		Aug															
		Sep															
		Oct															
		Dec/Jan															
		Mar															
07		Apr															
		May															
		Jun															
		Jul															

Figure SOP 14.1. Example data summary tables for reporting the basic measurement and statistics collected at the core station set.

3 Content of Results Section (ii):

Analysis of Station 04 with Respect to Historical Data

Using data from Station 04 only, vertical profiles (temperature vs. depth, and salinity vs. depth) are plotted along with the climatologic mean profile in order to assess the relation of the current data to the long-term mean (Figure SOP 14.2). The data are also tabulated so that the values shown in the plots are easily accessible to managers and other researchers (Table SOP 14.1). Station 04 is selected for this analysis because it represents a deep station inside the main sill of the fjord and with close connection (proximity) to the West Arm, East Arm, and Lower Bay domains.

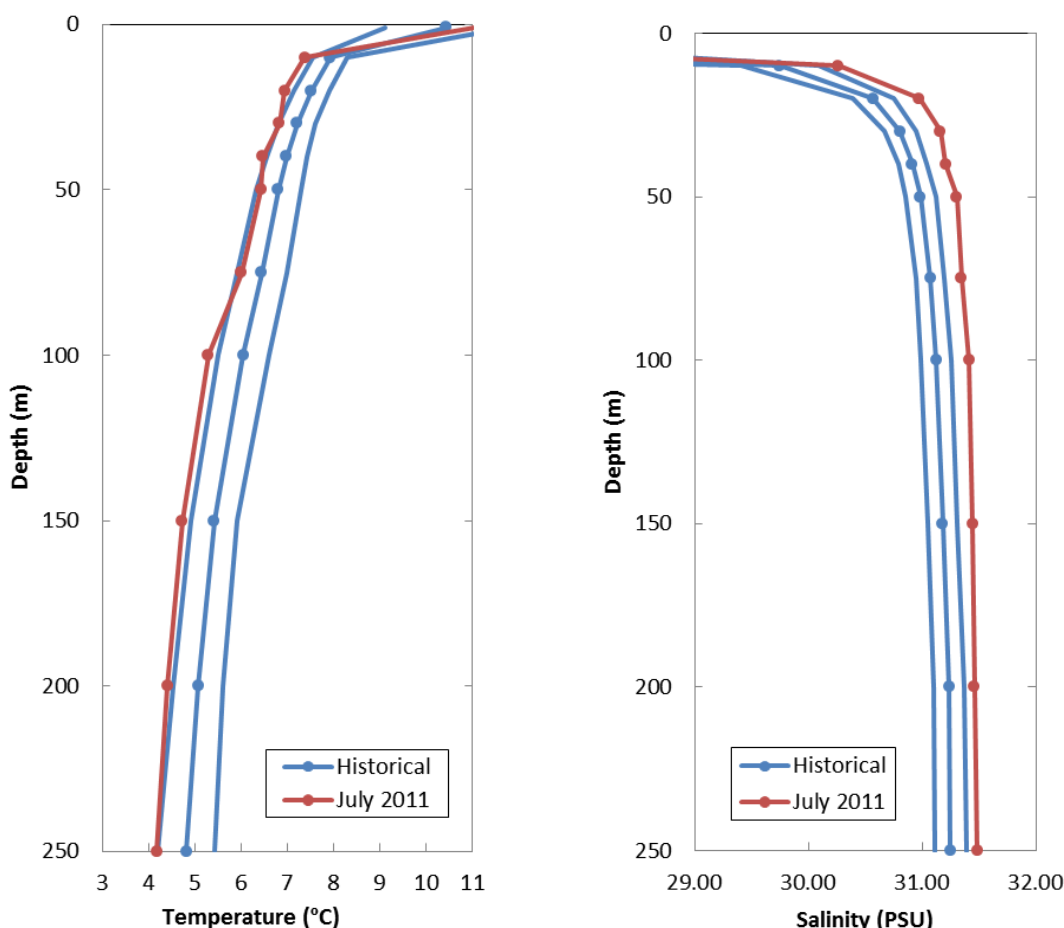


Figure SOP 14.2. Example vertical profiles of water temperature (left) and salinity (right) shown along with historical. Data are taken from oceanographic Station 04 in Glacier Bay. Plotted are the current data (July 2011, red with dots) and July 1993 through July 2010 mean values (blue with dots) along with $\pm$ bounds of one standard deviation to either side of the historical mean (blue without dots). Only a subset of the full vertical profile has been displayed here: the 0, 10, 20, 30, 50, 75, 100, 150, 200, and 250 m depth levels. From this plot, we see that waters in July 2011 are anomalously cold below 75 m depth, whereas the waters are anomalously salty throughout the water column.

Error bounds of one standard deviation plotted to either side of the monthly climatology will allow the profile of interest to be assessed as to whether the monthly values' deviations (from the monthly climatology) are considered "normal" or "anomalous." An anomalous value is defined as one with observations that fall beyond one standard deviation of the mean of that month's historical measurements. Therefore, by definition of one standard deviation and the assumption of a normal distribution, 68% of all years will be considered "normal" and 32% will be considered "anomalous." Anomalous measurements are noted in the discussion section of the report. Observations that fall outside of two standard deviations ($\sim$ 95% of normally distributed observations) represent very unusual occurrences and deserve particular attention within the annual report.

Table SOP 14.1. Example data table: tabular display of the same data presented in Figure SOP 14.2. To help draw attention to anomalous measurements, observations made in July 2011 that lie outside one standard deviation of the long-term mean are emphasized in ***bold italic*** type.

Depth (m)	Station 04 Temperature (°C)					Station 04 Salinity (PSU)				
	July 2011	Historic c July mean	Historic mean -1 SD	Historic mean +1 SD	<i>n</i>	July 2011	Historic July mean	Historic mean -1 SD	Historic c mean +1 SD	<i>n</i>
0	11.04	10.44	9.11	11.76	15	24.62	22.59	19.30	25.88	15
10	<i>7.38</i>	7.93	7.56	8.30	15	<i>30.26</i>	29.75	29.41	30.09	15
20	<i>6.95</i>	7.53	7.15	7.91	15	<i>30.97</i>	30.57	30.39	30.75	15
30	6.83	7.21	6.82	7.61	15	<i>31.16</i>	30.80	30.66	30.94	15
40	<i>6.47</i>	6.98	6.54	7.42	15	<i>31.20</i>	30.91	30.79	31.03	15
50	6.43	6.81	6.32	7.30	15	<i>31.30</i>	30.99	30.85	31.12	15
75	6.02	6.45	5.91	7.00	15	<i>31.35</i>	31.07	30.94	31.20	15
100	<i>5.29</i>	6.06	5.51	6.60	14	<i>31.41</i>	31.12	30.99	31.25	14
150	<i>4.73</i>	5.42	4.92	5.93	14	<i>31.44</i>	31.18	31.05	31.31	14
200	<i>4.41</i>	5.08	4.54	5.61	13	<i>31.46</i>	31.24	31.10	31.37	13
250	<i>4.19</i>	4.82	4.21	5.44	7	<i>31.48</i>	31.25	31.11	31.39	7

These tables and vertical profile plots are generated for a select subset, the “standard oceanographic” depths: 0, 10, 20, 30, 40, 50, 75, 100, 150, 200, 250, 300, 400, and 500 m depth levels.

4 Content of Results Section (iii): Horizontal Cross-sections

Horizontal cross-sectional plots are generated by the Ocean Data View (ODV) (<http://odv.awi.de/>) or other scientific graphics software. An ASCII data table provided by the Data Manager that contains the full “flattened” dataset can be imported directly into ODV. Parameters to plot include temperature, salinity, fluorescence, oxygen, and OBS, and the transect includes stations from Icy Strait to the head of West Arm. Figure SOP 14.3 shows an example horizontal cross-section figure along the Glacier Bay transect.

These figures provide a visual depiction of the data collected with the highest spatial resolution. Features within the figures lend themselves to interpretation and discussion of biophysical processes that are important to understanding the dynamics of the Glacier Bay marine ecosystem.

5 Validation and Submission of the Deliverable

The final version of OC_K is generated as a DOCX file by the Project Leader. It is passed to the Data Manager for processing as an NRTR by the NPS publications staff. Once the publications group approves the final product, the data manager creates a PDF file and performs the protocol-defined validation checks. Eventually the report is confirmed certified through the standard workflow described in Chapter 4. The Data Manager installs the final PDF in the auxiliary repository, creates a web link for it, updates the Deliverable Product Tracking grid, and forwards the final OC_K to NPS’s IRMA Data Store.

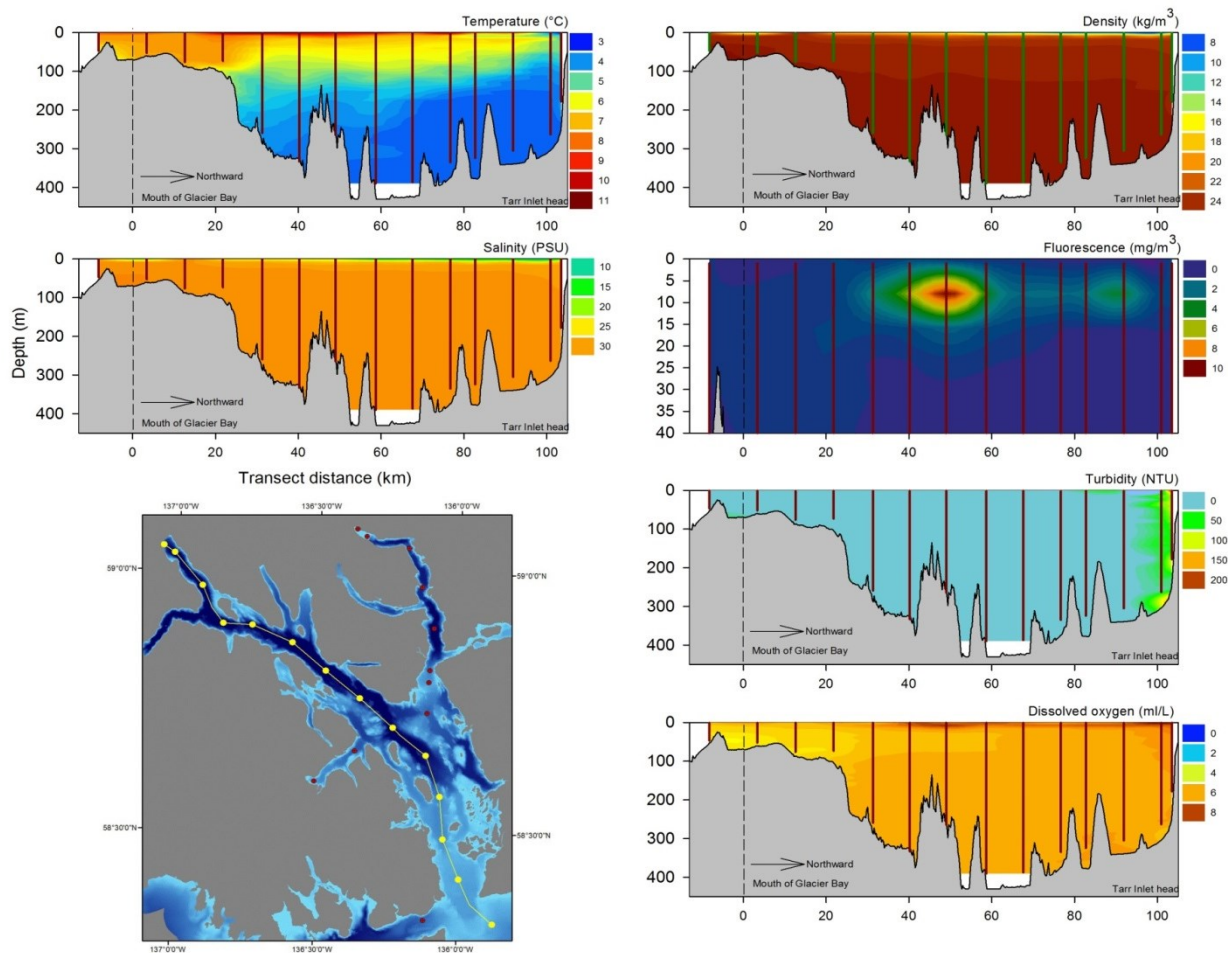


Figure SOP 14.3. Example ODV-generated cross-sectional contour plots using Glacier Bay CTD data collected in July 2011. The map in the lower left-hand corner depicts station locations as yellow dots, along with a line transect. On the contour plots, the mouth of Glacier Bay (Station 00) is located at 0 km on the horizontal axis.