Database of Physical-Chemical Water Properties in Alberni Inlet, Vancouver Island, 1939-2018

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CANADIAN DATA REPORT

FISHERIES AND AQUATIC SCIENCES 1290

2019

DATABASE OF PHYSICAL-CHEMICAL WATER PROPERTIES IN ALBERNI INLET, VANCOUVER ISLAND, 1939-2018

by

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ABSTRACT

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The ALBERNI PHYSICAL-CHEMICAL WATER PROPERTIES DATABASE is a repository of marine conductivity-temperature-depth (CTD) profile data collected via research and monitoring programs operating in Alberni Inlet, on the west coast of Vancouver Island, British Columbia, Canada. The surveys occurred from 1939 to 2018 at various locations from Alberni Harbour out to Barkley Sound. This meta-data report describes the resulting database of water property measurements, and summarizes the raw physical-chemical data on a seasonal and annual basis. Supplementary effluent water quality data generated by the paper mill in Port Alberni (e.g. monthly mean biochemical oxygen demand, total suspended solids, and effluent volume) are included for the years 1997-2018. These data provide background material for understanding conditions in the estuary and upper inlet affecting multiple marine life stages of salmon utilizing the Somass watershed.

RÉSUMÉ

Stiff, H. W., K. D. Hyatt, and L. Cross. 2019. Database of physical-chemical water properties in Alberni Inlet, Vancouver Island, 1939-2018. Can. Data Rep. Fish. Aquat. Sci. 1290: iv + 147 p.

La BASE DE DONNÉES SUR LES PROPRIÉTÉS PHYSICO-CHIMIQUES DE L'EAU D'ALBERNI est un répertoire de données sur des profils de conductivité, température et profondeur (CTP) marins recueillies dans le cadre de programmes de recherche et de surveillance à Alberni Inlet, sur la côte ouest de l'île de Vancouver, Colombie-Britannique, Canada. Les levés ont eu lieu de 1939 à 2018 à divers endroits, du havre Alberni jusqu'à Barkley Sound. Ce rapport de métadonnées décrit la base de données ainsi obtenue des mesures des propriétés de l'eau et résume les données physico-chimiques brutes par saison et par année. Les données supplémentaires sur la qualité de l'eau des effluents produits par l'usine de papier de Port Alberni (p. ex. la demande biochimique en oxygène mensuelle moyenne, le total des solides en suspension et le volume des effluents) sont présentées pour les années 1997 à 2018. Ces données fournissent le contexte pour connaître les conditions dans l'estuaire et la partie supérieure de la bouche qui influencent les multiples stades de vie marine des saumons qui utilisent le bassin hydrographique de la Somass.

INTRODUCTION

This report documents a database of CTD[1] water property surveys assembled in the ALBERNI INLET PHYSICAL-CHEMICAL WATER PROPERTIES DATABASE. This relational database consolidates known CTD data obtained through various programs in the marine and estuarine environment from Alberni Harbour out to Barkley Sound.

Alberni Inlet is a 2-3 km-wide fjord that stretches 40 km inland from Barkley Sound on the west coast of Vancouver Island in the traditional territories of the Nuu-chah-nulth peoples (Figure 1). The fjord comprises two main basins, separated by a shallow sill, approximately 40-50 m deep, at Sproat Narrows (Figure 2). The inner basin is 15 km long with a maximum depth of 130 m. The deeper outer basin (maximum depth 350 m) extends 45 km to Barkley Sound, and is connected to the Pacific Ocean via Trevor Channel (max depth ~200 m, with a 30 m sill at the seaward end), and via Junction Passage and Imperial Eagle Channel (mean depth ~80 m) (Lee and Stucchi 1983).

The upper inlet is an estuarine environment characterized by density/salinity gradients, generated by varying levels of marine and freshwater inputs, and subject to physical mixing mechanisms such as tides, winds, and river discharge. Density stratification of the water column develops in relation to temperature and salinity gradients in the absence of strong physical mixing effects (Hatfield Cons. 2017).

The Somass River at the head end of the fjord provides the bulk of freshwater inputs[2] to Alberni Inlet, contributing to a two-layer density stratification comprised of a brackish buoyant surface layer (2-5 m thick, salinity <15 ppt) floating on a denser, highly saline (> 30 ppt) sub-halocline layer (Parker and Sibert 1972). Net flow of the surface layer is seaward, as a positive function of river discharge. Entrainment of sub-halocline waters into the outflowing surface layer results in replenishment (renewal) of the lower layers from seaward toward the head of the inlet (*ibid*).

The Somass watershed sustains various salmon populations which enable valuable commercial, indigenous, and recreational fisheries. These fish utilize Alberni Inlet for juvenile rearing habitat and as a migratory path to and from the headwater lakes (Great Central and Sproat lakes). Due in part to significant fish production enhancements[3] in the watershed, these systems currently support significant wild populations of Sockeye salmon (*Oncorhynchus nerka*) with average annual stock

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[1] A CTD survey unit is an oceanographic instrument used to measure the conductivity, temperature, and pressure (the D stands for "depth," which is closely related to pressure) of seawater. Conductivity is directly related to salinity, the concentration of salts and other inorganic compounds in seawater.

[2] The Somass River drains an area of about 1,426 km² into into the head of Alberni Inlet. Mean annual discharge 121 m^3/s.

[3] Historical salmon enhancement and infrastructure projects include fishway ladders (1927, 1954), lake enrichment (in Great Central Lake), and a hatchery for Chinook salmon (*O. gorbuscha*), Coho salmon (*O. keta*), and Steelhead trout (*Salmo gairdneri*).

returns since 1990 of ~700,000 fish (DFO 2018), providing millions of dollars in aggregate economic benefits to the region yearly (AgriService BC 2017).

However, total fish returns for Somass Sockeye stocks have been highly variable over recent decades, ranging from 130,000 to two million fish (DFO 2018). Large fluctuations in abundance are strongly linked to variations in marine conditions associated with climate variability (Hyatt et al. 2018), but Somass salmonids face additional challenges in upper Alberni Inlet – specifically, restricted use of the water column due to degraded water quality (high effluent toxicity and low oxygen concentrations) associated with urban development and industrial pollution from historical pulp and paper production in the town of Port Alberni (Iseki et al. 1984; Colodey et al. 1990; Spohn et al. 1996; Birtwell et al. 2014).

Situated at the head of the inlet where the Somass River flows into the estuary, CATALYST PAPER CORPORATION (CPC) (PORT ALBERNI DIVISION) currently operates a paper mill (Figure 3), which commenced operations in 1947 as a 250 t/d kraft sulphate pulp mill (Parker and Sibert 1972; Cross 1994). As part of the original environmental effluent assessment for the mill, it was determined that low Somass River discharge rates – especially in late summer/fall – were correlated with the persistence of low dissolved oxygen (DO) concentrations in the harbour (Tully 1949), which restrict fish habitat (Birtwell et al. 1983) and can be lethal to fish and other marine organisms (Davis 1975).[4]

Over subsequent decades, the physical, chemical, and biological properties of the water column in Alberni Harbour and the Inlet became the focus of various monitoring efforts by industry, government agencies and research boards (e.g. Tully et al. 1957; Waldichuk et al. 1968, 1969; Kask and Parker 1971; Parker et al. 1972, 1973, 1974; Ketchum 1976, 1977; Lee and Stucchi 1983; Colodey et al. 1990; Lim and Colodey 1992). These intermittent monitoring efforts between 1939 and 1988 involved vessel-based water sampling at various inlet locations to profile changes in Conductivity (related to salinity) and Temperature at Depth (CTD) in the water column; DO (and sometimes pH) readings were included.

Concerns about low DO levels in the harbour and upper inlet due to industrial effluents coincided with major expansions of mill operations throughout the mid-1950s and 1960s (Colodey et al. 1990; Seaconsult 1994a).[5] In 1970, primary and secondary mill effluent treatment processes were added (installation of a primary clarifier and aeration lagoon) for the paper production portion of the effluent. The kraft mill effluent remained untreated.

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[4] To accommodate a mill expansion to 500 t/d in the 1950s, water storage facilities - including the Great Central Lake Dam and associated saddle dams - were constructed to provide adequate freshwater discharge volumes in an effort to maintain acceptable DO levels in Alberni Harbour for aquatic life via mixing and entrainment (Parker and Sibert 1972).

[5] Mill history, operations, and effluent management up to 1994 are documented in Cross (1994), the EEM Pre-Design Study by Seaconsult Marine Research Ltd (Seaconsult 1994), and updated to present in Hatfield (2018).

Special federal and provincial regulations for the management of effluent pollution at pulp and paper mills were gradually implemented by the early 1990s (Colodey et al. 1999).[6,7] This resulted in the implementation of the federal PULP AND PAPER EFFLUENT REGULATIONS (PPER) under the *Fisheries Act* in 1992, requiring pulp and paper mills in Canada to conduct an ENVIRONMENTAL EFFECTS MONITORING (EEM) program. The objective of the nation-wide EEM program was to assess the adequacy of existing regulations for protection of fish, fish habitat, and the use of fisheries resources from industrial waste discharges, specifically from pulp and paper mills (Seaconsult 1994a).[8] This required daily sampling and monthly reporting of effluent outputs, including total effluent volume, total suspended solids (TSS), and biochemical-oxygen-demand (BOD).

In addition, a site-specific DISSOLVED OXYGEN MONITORING PROGRAM (DOMP) was implemented for the Port Alberni mill under Section VII[9] of the federal PPER, requiring routine sampling of the physical and chemical water properties at specific locations in the upper inlet (Figure 3). Currently, regulatory compliance requires weekly profiles of dissolved oxygen (DO), water temperature, and salinity during the summer and fall, and tri-monthly profiles during the winter and spring at four stations located from 0 to 5 km down-inlet from the mill (Hatfield 2018). Variations in sampling effort occurring over the history of the DOMP (1990-present) are documented below.

METHODS

Physical and chemical data from research vessel surveys were assembled for various Alberni Harbour, Alberni Inlet, and Barkley Sound locations (Figure 3, Figure 4). Conductivity-Temperature-Depth (CTD) profile data were obtained from existing electronic databases, published documents, and unpublished reports from a variety of sources including government research agencies (e.g., ENVIRONMENT CANADA and FISHERIES AND OCEANS CANADA), consultants[10] and industry (e.g. CATALYST PAPER CORPORATION), as well as non-governmental organizations (e.g. WEST COAST AQUATIC); see RESULTS section below for data sources.

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[6] Pulp and Paper Effluent Regulations (Part 2 s.36 (1) and Schedule VII) (http://laws-lois.justice.gc.ca/eng/regulations/SOR-92-269/?showtoc=&instrumentnumber=SOR-92-269)

[7] Regulations Prescribing Certain Deleterious Substances Related to the Effluent from Pulp and Paper Mills and Authorizing the Deposit of Limited Quantities of those Deleterious Substances in Certain Circumstances http://laws-lois.justice.gc.ca/eng/regulations/SOR-92-269/page-1.html#h-1

[8] The EEM program has been executed in cycles, each three years in duration. The results of the first cycle were reported by April 1, 1996 (Seaconsult 1996). The results of Cycle 8 will be reported in 2019.

[9] DO Monitoring Program: Section VII of PPER http://laws-lois.justice.gc.ca/eng/regulations/SOR-92-269/page-15.html#h-34

[10] Data reports associated with the DO monitoring program include: Seaconsult Marine Research (1991-2001); Hatfield Consultants (2002-2018).

The geospatial distribution and frequency of the assembled CTD surveys vary widely in association with the purpose of the original programs. However, the surveys may be logically collated in a relational database as they share a common oceanographic methodology and data structure consisting of one or more water property attributes (i.e. water temperature, dissolved oxygen, salinity and/or pH) measured at depth, for a given date, time and location.

STATISTICAL ANALYSIS SOFTWARE (SAS® Version 9.4) was used to assemble and analyze data from CSV file downloads and/or supplied MICROSOFT EXCEL® spreadsheets. The resulting datasets were uploaded for storage into the ALBERNI INLET PHYSICAL-CHEMICAL WATER PROPERTIES relational database.[11] Survey data were organized by project, station, date, time, depth and variable in three principle tables: PROJECTS, SAMPLES, and MEASUREMENTS, with associated lookup tables for station identification, variable type and units, agency name, etc (Figure 5).

CTD readings are stored in the MEASUREMENTS table, coded (*VMV_Code*) by variable type (Table 2).Meta-data were assigned a unique *ProjectID* associated with a project name in the PROJECTS table to distinguish between survey programs (Table 3). A unique *SampleID* in the SAMPLES table serves to distinguish between surveys performed on the same date at the same general location.

As the geospatial coordinates for CTD survey sites usually differed between projects (and often varied between dates for a given project), the latitude and longitude coordinates associated with a survey sample were retained in the STATIONS table along with the original *StudyStation* name, and uniquely identified by the *StationID* key. However, all study stations were also assigned – based on proximity – to one of a reduced set of common stations for grouping purposes, as designated in the assigned *Station* field (Table 4; Figure 4)[12].

DATA ANALYSIS

For the purposes of this report, CTD project data were exported from MS-Access® (2010) to SAS® 9.4 for statistical summary analyses and time-series plots. Depth values were rounded to the nearest integer. Where obtained from pressure readings, depth values were not adjusted[13] since sample depths rarely exceeded 300 m. Data gaps were detected programmatically. Single missing values in depth profiles were interpolated from non-missing vertically-adjacent observations by station, date and variable. Larger data gaps were not interpolated.

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[11] Available from DFO upon request. Contact Howard.Stiff@dfo-mpo.gc.ca or Kim.Hyatt@dfo-mpo.gc.ca for information on the MICROSOFT ACCESS® (2010) database.

[12] For example, all *Study Stations* within about ~1 km of Hohm Island in Alberni Harbour shared a designated *Station* = HOHM. In other cases, for example further down-inlet, study stations sharing a common basin may be assigned a common *Station* value, under the assumption that such stations share similar water property values (e.g. study stations centrally located between Stamp Narrows and Sproat Narrows would be assigned to *Station* 10KM).

[13] Conversion from *pressure* to *depth* is density dependent but depth is generally equivalent to 99% of pressure readings at 300 m and 98% at 3000 m (pers. comm. G. Gatien, Phys. Oceanographer, DFO/IOS, Sidney, B.C.).

Data anomalies were identified programmatically via univariate statistical analyses and visually through time-trend plots by station, depth, and parameter (i.e. water temperature, dissolved oxygen, salinity, and pH). Anomalous, out-of-range data detections were checked against survey spreadsheets where available. The OMIT field for the appropriate parameter in the observations table was set to TRUE to exclude aberrant data from database queries and analyses.

Data quality control (QC) consisted of examining descriptive statistics and graphic output to identify surveys with missing values, outliers, and/or anomalous values in conjunction with a review of field notes where available. Anomalous data were identified and corrected where appropriate, or retained in the database but flagged for omission from data analyses.

The DATA QUALITY FLAG field was used to denote records with data issues:

- Blank = "Clear", no evident data issues.
- 1 = "Adjusted", interpolated between adjacent values, or adjusted by a constant to rectify obvious data issues, or statistically estimated
- 2 = "Caution", Unadjusted – but dubious – observations; possible outliers, anomalies.
- 9 = "Error" - Uncorrectable erroneous observations that should be omitted from analyses.

Single missing or erroneous values were interpolated between valid observations at adjacent depths by variable, flagged (DATA QUALITY FLAG = 1), and noted in the DATA ADJUSTMENT comment field. In surveys with multiple missing values for a variable at sequential depths, the data were unadjusted (left blank) or flagged for omission.

Descriptive statistics (minimum, mean, maximum, standard deviation, and 10^{th} and 90^{th} percentiles) were tabulated for each parameter (water temperature, dissolved oxygen, salinity, and pH) by station and depth. Summary tables of these parameter values are not included in the current report given that they may be generated at will from raw observations included in the database.

Time-series of temperature, oxygen, and salinity parameters were plotted by decade, station and depth for comparative visual analysis. Annual chronographic contour plots comparing weekly salinity, DO, and temperature time-series were produced for Hohm Island in the inner harbour, and station 5KM.

RESULTS & DISCUSSION

DATA SOURCES

The ALBERNI INLET PHYSICAL-CHEMICAL WATER PROPERTIES database contains almost 10,000 CTD surveys collected since October 1939 containing one or more of water temperature, salinity, dissolved oxygen and pH variables.

The bulk of the data in the database consists of CTD surveys routinely collected by the mill as part of the DISSOLVED OXYGEN MONITORING PROGRAM (DOMP) for

Environment Canada, representing approximately 85% of surveys stored. DOMP data span the years 1990-2018 for 6-8 stations (depending on year) at standardized locations between Alberni Harbour and China Creek, approximately 10 km down inlet, and include surface observations at the mouth of the Somass River (Figure 3). DOMP methods and data are described in more detail below.

Secondary sources (in terms of volume) of CTD data include research cruises extracted from the IOS CTD database, representing 69% of non-DOMP surveys. CTD data were obtained via water samples ("bottle data", prior to the mid-1970s) or from automated electronic profiling systems (rosette or multi-variable CTD systems) for a variety of locations in Alberni Inlet and Barkley Sound, for intermittent years between 1954 and 2000 (Figure 4). Much of these data are currently available via the IOS Water Properties Data Portal[14]. Though certain meta-data for these surveys have been retained in the database (e.g. geographic and temporal data), comprehensive meta-data details (e.g. equipment, weather, personnel, etc) for these surveys should be retrieved by interested parties directly from the IOS data portal or published reports.

IOS CTD Portal data sources included:

- Fisheries Research Board of Canada, Pacific Oceanographic Group (POG, Nanaimo, B.C.):
  - Years: 1939, 1941 (Tully et al. 1957)
    - 199 surveys, 13% of non-DOMP surveys
- Institute of Ocean Sciences (IOS, Sidney, B.C.)
  - Years: 1979-1981, 1986, 1988, 1998, 2000
    - 281 surveys, 18% of non-DOMP surveys
- Pacific Biological Station (PBS, Nanaimo, B.C.)
  - Years: 1954, 1957, 1959, 1962, 1965-1967, 1973
    - 796 surveys, 51% of non-DOMP surveys
- University of British Columbia (UBC, Vancouver, B.C.)
  - Years: 1959, 1970, 1971, 1976, 1988
    - 26 surveys over 8 dates
- Consultants (Dobrocky Seatech Ltd, Victoria, B.C.)
  - Years: 1977
    - 61 surveys over 6 dates

Another twenty-nine percent of non-DOMP surveys were obtained from published reports (i.e. not available online):

- Environnent Canada (Vancouver, B.C.):
  - Years: 1978 - 1988 (Lim and Colodey 1988)

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[14] IOS Water Properties Data Portal: http://www.pac.dfo-mpo.gc.ca/science/oceans/data-donnees/search-recherche/profiles-eng.asp. The data in the IOS DATA_LIBRARY are stored in readable ASCII files in IOS HEADER format. This is a custom data format which includes metadata and supporting information in addition to the actual measurements. The files are stored in directories, by CRUISE and PROJECT. The DATA_LIBRARY is not accessible (directly) via the Internet. Users must contact the Senior Analyst to arrange for access to these data.

        - 220 surveys, 14%
- Environnent Canada - Environmental Protection Services (EPS):
    - Years: 1984, 1986, 1988, 1990
        - 39 surveys (2%) (EPS (1992) Regional Report DR92-11)

The remainder of database entries were obtained from unpublished data:

- Salmon In Regional Ecosystems (DFO/SIRE):
    - Years: 2015
    - 29 surveys across 5 dates

A key dataset used here for data calibration purposes (Appendix D) but not included in this database is available from the researcher (Pawlowicz 2017). The dataset contains 93 CTD profiles obtained monthly from 2004-2013 at two stations in Barkley Sound[15], as well as two multi-station sections along the length of Trevor Channel and Alberni Inlet on 21-Jun-2007 and 21-Feb-2009.

Dissolved Oxygen Monitoring Program

The DISSOLVED OXYGEN MONITORING PROGRAM (DOMP) commenced in 1990/1991 (Seaconsult 1991, 1994). The purpose of DOMP surveys is to monitor the potential impacts of mill effluent on Alberni Inlet water quality and biota. Mill staff are required to collect, record, and report physical-chemical data using CTD equipment during daylight (business) hours (Monday to Friday, 08:00 - 16:00) at weekly (June-October) or tri-monthly (November-May) intervals at established monitoring stations. Data are submitted to Environment Canada (ECCC) on a monthly basis as per Schedule VII of the PULP AND PAPER EFFLUENT REGULATIONS (SOR/92-269) under Canada's *Fisheries Act*.

Personnel associated with the Port Alberni paper mill[16] have conducted CTD surveys at the head of Alberni Inlet, with a focus on the Somass RIVER station and five upper inlet stations, from the effluent OUTFALL station (adjacent to the mill) in the estuary, to the 10KM point down-inlet (Figure 3). Water temperature, salinity, dissolved oxygen and acid/base concentration (pH; prior to 2016) were sampled from surface to the lesser of fjord bottom or maximum cable length (depth range varied from 25 - 60 m given instrument changes), usually on a weekly basis, weather-permitting.

Sampling stations have varied in number, location, and frequency over the years (*cf.* Seaconsult 1991b vs Hatfield 2018), but were standardized to include (Figure 3):

- SOMASS RIVER, located ~1 km upstream of the Somass River outlet (49°15.0′N x 124°48.6'W), maximum depth ~3 m;

[15] Station "SARITA" is at the deepest part of a small (209 m) sub-basin near the Sarita River outlet, in Trevor Channel. Station "SWALE" is located near Swale Rock in a relatively flat part of Imperial Eagle Channel, at a depth of 102 m (Pawlowicz 2017).

[16] Mill ownership has changed: Macmillan-Bloedel Ltd (1990-1997); Pacifica Papers (1998-2001); Norske Canada (2002-2004); Catalyst Paper Corporation (2005-present).

- OUTFALL station, located at the paper mill effluent outfall, at 49°14.35′N x 124°49.10′W, maximum depth ~10 m;
- HOHM (HI-2) station, located near Hohm Island at 49°13.92′N x 124°49.17′W, maximum depth ~15 m;
- POLLY (PP-2) station, located near Polly Point, at 49°12.98′N x 124°49.30′W, maximum depth ~30 m;
- 5KM station, located approximately 5 km down-inlet, between Polly Point and Stamp Narrows, at 49°11.80′N x 124°49.00′W, maximum depth ~40 m;
- 10KM station, located approximately 10 km down-inlet between Stamp Narrows and Sproat Narrows, at 49°09.33′N x 124°48.00′W, maximum depth ~120 m. Station 10KM was discontinued at the end of December 1999.[17]

Data currently collected include station, date, time, depth (metres), water temperature (°C), salinity in parts per thousand (ppt), and the quantity of dissolved oxygen (DO) in mg/L and percent saturation.[18] All parameters are measured at depths of 0 (surface), 1-10, 12, 15, 20, 25, 30, 35, 40, and 50 m (where these depths exist), and at bottom, for each monitoring station.

For temperature, salinity, and pH probes, standardized solutions and calibration methods were used as per instrument specifications (Hatfield 2018). Salinity was calibrated monthly, at a minimum, and typically twice per month. Calibration of the DO probe occurred prior to each survey using air calibration according to manufacturer's instructions. In addition, a grab sample was taken once per sampling day at the POLLY (PP-2) station at depths of 1, 10, and 20 m for laboratory analysis using the Winkler dissolved oxygen analysis method (Hatfield 2018). Due to occasional inclement weather, or equipment malfunction, this was not possible during every sampling event.

Additional data recorded by mill personnel included tide height (m) and Somass River discharge (m^3/s). As these data are available elsewhere, they were not incorporated into the DO database.[19,20]

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[17] In the summers of 2012 and 2015, Station 10KM was again surveyed (3 and 4 times, respectively) in association with EEMP tagged fish studies (Hatfield 2013b; 2016b).

[18] Though not required for the DO monitoring program, pH was sampled for most years until February 2016, when monitoring equipment was replaced, and pH sampling was eliminated.

[19] Tide heights, in metres, are set out in the *Canadian Tide and Current Tables*, published by the Department of Fisheries and Oceans.

[20] Somass River flow, in m^3/s, was available from Environment Canada's WATER SURVEY DATABASE (WSD) for hydrometric station 08HB017 (49.29°N x 124.87°W) from 1957 to December 2002. Estimates based on the Somass stage height to discharge formula were reported by CATALYST PAPER CORPORATION from 2003 to present, however, easily-accessible digital data were not available for years prior to 2007.

DO Monitoring Program Changes

Sample collection and analysis methods used in historical DO monitoring programs are described in detail in Seaconsult (1994a).[21]

In 1986, sampling station HI-2 was introduced as an additional DO monitoring station near the historical station HI-3 at Hohm Island. As readings at these stations were highly correlated and considered redundant, the federal government authorized the elimination of monitoring at HI-3 at the end of June 1999, with continued monitoring at HI-2 given its more direct positioning within the discharge stream of the Somass River and mill outfall (Hatfield 2018).

In 1990, summer sampling in the harbour increased in frequency and location at the request of EC following evident delays in Sockeye salmon migration (Seaconsult 1991). This involved 123 CTD profiles at six HOHM stations and three POLLY stations over the July-October period (*ibid*).

In 2000, a reduced DO program was authorized based on EC analyses of the DO monitoring data which indicated improved oxygen levels as a result of the installation of an activated sludge treatment process in 1993 and the shut-down of the kraft mill in the same year (pers. comm., Janice Boyd[22], Jan. 2017). Sampling at the 10KM station was dropped from DO monitoring program requirements, and routine sampling at other DOMP stations was reduced to the current rates from weekly winter sampling and variable rates of summer sampling which ranged from 3 per week (e.g. Seaconsult 1994a) to almost daily in some years (e.g. Seaconsult 1991).

No other changes to the sampling program were evident in the PPER amendments[23] in 2006, 2009, 2011 and 2012.

Equipment Changes

Measurements of dissolved oxygen, salinity, and temperature are currently sampled (since 2016) using a *Eureka Manta 2 Water Quality Sonde* unit with a 60 m cable. This unit replaced the *Hydrolab 4A Mini-Sonde* (equipped with a 50 m cable) employed since October 2003. Prior to that (1993 - 2002), a *Hydrolab Surveyor 3* system was used (or, in the event of equipment failure, a YSI 650 unit; Hatfield 2018). This replaced the *Hydrolab Surveyor 2* unit (implemented in 1985) in late 1992. The 50 m cable was purchased in 1991, and (likely) replaced a 25 m cable (pers. comm., Larry Cross, Environmental Manager, CATALYST PAPER CORPORATION, Aug 2018). Monitoring of pH occurred since 1991, but was discontinued at the end of 2015 as it was not required under federal regulations and the *Eureka Manta 2* CTD unit was not equipped to collect pH data.

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[21] Prior to implementation of the DOMP in the early 1990s, the mill sampled Somass River and Hohm Island locations weekly since 1958, though the whereabouts of these data are unknown.

[22] EEM Regional Coordinator (retired 2017), Environmental Protection Operations Directorate Pacific & Yukon Region / Environment and Climate Change Canada / Government of Canada.

[23] PPER amendments http://laws-lois.justice.gc.ca/eng/regulations/SOR-92-269/PITIndex.html

CTD Unit	Start Date	Cable	Notes
Hydrolab Surveyor 2	1985	25 m	Exact start-date unknown
	1991	50 m	50 m cable installed in 1991
Hydrolab Surveyor 3	1993	50 m	Purchased late 1992; exact start-date unknown
	16/10/2002	50 m	Last survey before malfunction
Hydrolab 4A Mini-Sonde	01/01/2003?	50 m	In service in January 2003
	28/10/2015	50 m	Last survey before malfunction
Eureka Manta 2 WQ Sonde	01/01/2016	60 m	Trial unit to replace 4A
	18/05/2016	60 m	Permanent replacement; No pH probe

Alberni Inlet DO Database Development

In 2010-2011, EC staff developed a Microsoft Access® database for DOMP data and populated it with historical mill data from spreadsheets (Janice Boyd, pers. comm.). The Access database was provided to the Science Branch, Pacific Region of DFO, and currently constitutes the data repository for the ALBERNI INLET PHYSICAL CHEMICAL WATER PROPERTIES DATABASE, with only minor changes to the database structure (Figure 5).

Environmental Effects Monitoring Program Data

Monthly mean estimates of effluents discharged by the mill were obtained from CPC (2002-2017) and ECCC (1997-2001). Effluent variables include: BOD (kg/d); TSS (kg/d); and Effluent flow or volume (m^3/d). Monthly data are included as a separate table within the database.

City of Port Alberni Liquid Waste Stream

Monthly estimates of municipal liquid wastes discharged via the city's Sewage Lagoon were not available at the time of publication, but may be available directly from the City of Port Alberni for the years 1990-2017 (pers. comm., Amar Giri, Utilities Superintendent, Port Alberni, April 2019).

Municipal effluent variables include: monthly mean BOD (kg/d); TSS (kg/d); mean daily and monthly total Flow or volume (m^3), and mean dissolved oxygen of the waste stream.

DATA ISSUES

IOS CTD Data

Quality Control and Assurance (QC/QA) are managed by IOS staff prior to data archival in the Water Properties

DO Monitoring Program Data

CTD depth values were not adjusted for semi-diurnal changes in daily tide height. Minimum and maximum tide heights in Alberni Inlet range from -0.2 to +3.8 m, depending on time of year. This may affect 'bottom depth' at upper inlet stations, especially at sites in Alberni Harbour. For example, pressure readings at 'bottom' at Hohm Island stations may correspond to 15-20 m during high tides, but 11-14 m during extreme low tides.

A common survey problem affecting the data involves vessel drift during CTD sampling. In such cases, strong currents and/or windy weather contribute to vessel drift during CTD depth profiles, especially at the more exposed, down-inlet locations. Situations where the cable angle significantly deviated from 90° relative to the water surface during depth profiles might lead to incomplete depth profiles or false readings. These situations were generally noted at the time in survey spreadsheets; unfortunately, the comments were not incorporated into the original ALBERNI INLET PHYSICAL-CHEMICAL WATER PROPERTIES database. Likely data anomalies due to equipment malfunction, vessel drift, or unreconciled transcription errors were filtered from data analyses via setting the OMIT field to TRUE for that parameter observation.

A significant source of uncertainty in the DOMP dataset pertains to salinity readings associated with CTD units *Hydrolab Surveyor 3*, which appear to be biased high (1993-2002), and *Hydrolab Surveyor 4A*, which appear to be biased low for some years (2009-2015). The salinity data were retained in the database, but adjusted using simple statistical techniques as described in Appendix D. Use with caution. The rationale for retaining the adjusted salinity time-series is that, despite significant uncertainty in the location of the mean that potentially renders inter-annual comparisons invalid, the intra-annual variation is likely representative and provides useful information for within-year analyses.

Unresolved anomalous data were annotated (in comments fields) and either corrected (and flagged with DATA QUALITY FLAG = 1), or retained in the database as is, but flagged for omission (i.e. OMIT field = YES; DATA QUALITY FLAG = 9), as described in Appendix A.

SUMMARY DATA[24]

Historical sampling effort (total profiles by year and station) in Alberni Inlet and Barkley Sound in the ALBERNI INLET PHYSICAL-CHEMICAL WATER PROPERTIES database is tabulated in Table 1. The frequency distribution of annual surveys by location – organized by approximate latitude from Barkley Sound to Alberni Harbour – is displayed in Figure 6, and grouped by general location (Barkley Sound, Alberni Inlet, and Alberni Harbour) in Figure 7.

Descriptive statistics for each water property variable are summarized and tabulated across all years for the DO MONITORING PROGRAM by station and depth (Table 5 - Table 9).

Time-series graphs of daily mean water temperature, salinity, and DO at sub-halocline depths (>=10 m) are plotted to give a visual impression of inter-annual water property variability at each DOMP station (OUTFALL: Figure 8; HOHM: Figure 9; POLLY: Figure 10; 5KM: Figure 11; 10KM: Figure 12).

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[24] For summary analyses, depth profile data for geographically-proximal stations (e.g. HI-2 and HI-3 near Hohm Island) were averaged by date, depth, and parameter. This condensed the number of observations in years where multiple surveys were taken within the same date and general location, such as in the early 1990s.

Where sufficient intra-annual data exist, the seasonal flux in salinity, temperature and DO concentration are portrayed in chronographic contour plots for HOHM (Figure 13 - Figure 62) and 5KM stations (Figure 63 - Figure 91) by year.

Environmental Effects Monitoring Program Data

Annual estimates of effluents discharged by the mill since 1997 are presented in Table 10 - Table 12, including monthly mean BOD (kg/d); TSS (kg/d); and Effluent volume (m^3/d). Annual estimates are presented in Figure 92.

Total mill effluent volume has generally declined since 1997, with a slight increase since 2012 due to the sale of the CPC aeration lagoon to the City of Port Alberni[25], thereby eliminating the routing of mill effluents through the lagoon following primary and secondary treatment systems (pers. comm., L. Cross, Environmental Manager, CPC, Port Alberni, July 2018). BOD outputs remain below 0.6 t/d, but mill TSS has risen from <0.5 t/d (2005-2011) to ~1.0 t/d since 2013 (Figure 92).

City of Port Alberni Liquid Waste Stream

Contact Utilities Superintendent[26], City of Port Alberni, for monthly estimates of municipal liquid wastes discharged via Sewage Lagoon for the City of Port Alberni, 1990-2017.

ACKNOWLEDGEMENTS

CATALYST PAPER CORPORATION (PORT ALBERNI DIVISION) provided weekly CTD data from the DOMP program. Ron Manners, Bob Nelson, Tina Graham, Kai Theus, Kate Tanner, and Ashley Popovich collected the data during field work over the past 25 years. Larry Cross managed the DOMP field program and data management, and assisted in the interpretation of water quality and effluent time-series data.

Bob More at ENVIRONMENT CANADA (ECCC) was responsible for DOMP database development and implementation. ECCC Janice Boyd (EEM Regional Coordinator (retired)) provided access to the database, and assisted with ongoing population of the database. Heather McDermott (ECCC Monitoring Scientist) assisted with provision of EEMP data.

CTD data from IOS databases were made available by Joe Liguanti (retired) and Peter Chandler. Di Wan, Andrew Lee, Germaine Gatien from IOS provided further technical support. Margot Stockwell (DFO) assisted with map figures.

Sarita “Hole” CTD data (2004-2013) and mid-inlet CTD surveys at various stations in June 2007 and February 2009 (Pawlowicz 2017) were provided courtesy of Rich Pawlowicz (Earth, Ocean and Atmospheric Sciences, UBC, Vancouver). These data

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[25] The City of Port Alberni is currently developing a Liquid Waste Management Plan in conjunction with the B.C. Ministry of Environment. This plan will identify a 40-year schedule for upgrading, replacement and expansion of the City sewerage and drainage system. The key component of this initiative is the acquisition, upgrading and operation of an additional wastewater treatment facility purchased from Catalyst Paper Corporation (http://www.portalberni.ca).

[26] Pers. comm., Amar Giri, Utilities Superintendent, City of Port Alberni, 250-720-2845 (April 2019).

assisted with clarifying anomalies in the DOMP salinity time-series. As these data are not currently included in the ALBERNI INLET PHYSICAL-CHEMICAL WATER PROPERTIES database, contact Rich Pawlowicz regarding data access.

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Table 1. Historical sampling effort (total profiles by year and station) in Alberni Inlet (AI) and Barkley Sound (BS), from ocean shelf to upper inlet.

-1959

		Year						Total
		1939	1941	1954	1957	1958	1959	
Barkley	Station							
	BS_IE_A1			1	1		1	3
	BS_TC_H	2	1					3
	BS_TC_A2		1	1	1		1	4
	BS_IE_6	2						2
	BS_IE_5	2						2
	BS_TC_A3		1	1	1		1	4
	BS_TC_E		2	1	1		1	5
	AI_Junc	2	17					19
Harbour	AI_Polly	2	7					9
	AI_Lumbr		36	3	3		3	45
	AI_Hohm	1	66	4	3	34	37	145
	AI_Outf		24	1	1		1	27
	AI_Somss					42	45	87
Inlet	AI_Uchck	2		1	1		1	5
	AI_Nahm	2	16	1	1		1	21
	AI_10km	2	16	1	1		1	21
	AI_5km		30					30
Total		17	217	15	14	76	93	432

Continued...

Table 1, continued...

1960s

		Year										Total
		1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	
Barkley	Station											
	BS_IE_A1		1	1				1		1		4
	BS_TC_A2		1	1				1		1		4
	BS_TC_A3		1	1				1		1		4
	BS_TC_E		1	1				1		1		4
Harbour	AI_Lumbr		3	3			17	35	9	6		73
	AI_Hohm	32	25	27	21	18	49	56	30	36	7	301
	AI_Outf		4	8			26	44	12	8		102
	AI_Somss	50	52	51	44	22	46	52	51	43	7	418
Inlet	AI_Uchck		1	1				1		1		4
	AI_Nahm		1	1				1		1		4
	AI_10km		1	1				1		1		4
	AI_8km						2	12	3	2		19
	AI_Stmp						4					4
Total		82	91	96	65	40	144	206	105	102	14	945

1970s

		Year					Total
		1971	1973	1977	1978	1979	
Barkley	Station						
	AI_Junc		3				3
Harbour	AI_Lumbr		5				5
	AI_Hohm	1	3		2	4	10
	AI_Outf		4				4
	AI_Somss				2	3	5
Inlet	AI_Uchck		5				5
	AI_Nahm		4				4
	AI_12km		4				4
	AI_10km		4	7			11
	AI_8km			39			39
	AI_Stmp			8			8
	AI_5km		4	7			11
Total		1	36	61	4	7	109

Table 1, continued...

1980s

		1980	1981	1982	1983	1984	1985	1986	1987	1988	Total
		Year									
Barkley	Station										
	BS_TC_A4							1			1
Harbour	AI_Polly							1			1
	AI_Lumbr					1				2	3
	AI_Hohm	16	25	10	17	15	21	9	11	14	138
	AI_Outf					1		1		2	4
	AI_Somss	11	16	9	13	5	12	5	3	1	75
Inlet	AI_Uchck							3		2	5
	AI_Nahm							1		2	3
	AI_SprO							1			1
	AI_SprN							1			1
	AI_10km					1		1		2	4
	AI_Stmp					1					1
	AI_5km					1		2		2	5
Total		27	41	19	30	25	33	26	14	27	242

1990s

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	Total
		Year										
Harbour	Station											
	AI_Polly	143	72	81	88	92	83	82	76	67	39	823
	AI_Lumbr	1										1
	AI_Hohm	152	143	162	184	178	162	171	144	134	54	1,484
	AI_Outf	92	70	71	88	85	79	81	74	68	38	746
	AI_Somss		67	79	88	85	72	82	71	65	39	648
Inlet	AI_Nahm	1										1
	AI_10km		59	65	86	77	73	68	64	50	13	555
	AI_8km	1										1
	AI_Stmp	1										1
	AI_5km	56	66	60	87	81	79	78	66	60	36	669
Total		447	477	518	621	598	548	562	495	444	219	4,929

Table 1, continued...

2000s

		Year										Total
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
Harbour	Station											
	Al_Polly	41	42	43	32	33	30	42	45	41	40	389
	Al_Hohm	32	36	36	33	37	30	42	42	42	42	372
	Al_Outf	30	35	35	33	38	28	43	42	42	42	368
	Al_Somss	29	37	37	33	38	29	41	43	41	42	370
Inlet	Al_5km	33	30	32	27	28	25	37	43	42	38	335
Total		165	180	183	158	174	142	205	215	208	204	1,834

2010s

		Year									Total
		2010	2011	2012	2013	2014	2015	2016	2017	2018	
Harbour	Station										
	Al_Polly	36	38	39	42	40	41	41	38	25	340
	Al_Hohm	36	41	40	42	43	45	41	39	26	353
	Al_Outf	35	37	41	41	41	41	42	36	26	340
	Al_Somss		35	41	43	43	40	39	38	25	304
Inlet	Al_Uchck						1				1
	Al_Nahm						5				5
	Al_SprO						4				4
	Al_12km						4				4
	Al_10km			3			5				8
	Al_Stmp						5				5
	Al_5km	35	35	34	25	34	36	40	39	24	302
Total		142	186	198	193	201	227	203	190	126	1,666

Table 2. Water property variables look-up table (VALVAR).

VarID Code	Variable Name	Units
1	*pH*	
20	*Salinity*	g/kg (or ppt)
21	*Temperature*	°C
22	*Oxygen, Dissolved*	mg/L
23	*Oxygen, Dissolved*	% Saturation

Table 3. CTD survey projects are identified in the database with a Project ID (numeric) and a Project Code Name (character).

CTD SURVEY PROJECTS				
Agency	**Years**	**Source**	**Project Code Name**	**Project ID**
Catalyst Paper Corporation (CPC) & Environment Canada	1990-2017	Env. Can. Dissolved Oxygen Monitoring Program (DOMP) Larry Cross (CPC)	PY5901	1
Ocean Science and Surveys (DFO/IOS)	1939	Tully et al. (1957)	TULL57	2
Ocean Science and Surveys (DFO/IOS)	1941	Tully et al. (1957)	TULL57	2
Ocean Science and Surveys (DFO/IOS)	1957	Waldichuk et al (1968, 1969)	1957-10	3
Ocean Science and Surveys (DFO/IOS)	1959	Waldichuk et al (1968, 1969)	1959-11	4
Ocean Science and Surveys (DFO/IOS)	1961	Waldichuk et al (1968, 1969)	1961-10	5
Ocean Science and Surveys (DFO/IOS)	1962	Waldichuk et al (1968, 1969)	1962-13	6
Ocean Science and Surveys (DFO/IOS)	1965	Waldichuk et al (1968, 1969)	1965-12	7
Ocean Science and Surveys (DFO/IOS)	1965	Waldichuk et al (1968, 1969)	1965-13	8
Ocean Science and Surveys (DFO/IOS)	1965	Waldichuk et al (1968, 1969)	1965-14	9
Ocean Science and Surveys (DFO/IOS)	1965	Waldichuk et al (1968, 1969)	1965-15	10
Ocean Science and Surveys (DFO/IOS)	1965	Waldichuk et al (1968, 1969)	1965-16	11
Ocean Science and Surveys (DFO/IOS)	1965	Waldichuk et al (1968, 1969)	1965-17	12
Ocean Science and Surveys (DFO/IOS)	1965	Waldichuk et al (1968, 1969)	1965-18	13
Ocean Science and Surveys (DFO/IOS)	1973	Parker R.R. (Caligus)	1973-11	14
Ocean Science and Surveys (DFO/IOS)	1973	Parker R.R. (Caligus)	1973-12	15
Ocean Science and Surveys (DFO/IOS)	1973	Parker R.R. (Caligus)	1973-13	16
Ocean Science and Surveys (DFO/IOS)	1973	Parker R.R. (Caligus)	1973-14	17
Ocean Science and Surveys (DFO/IOS)	1986	Johnson W.K. (Endeavour)	1986-91	18
Ocean Science and Surveys (DFO/IOS)	1954	Waldichuk et al (1968, 1969)	1954-10	19
Ocean Science and Surveys (DFO/IOS)	1966	Waldichuk et al (1968, 1969)	1966-11	20
Ocean Science and Surveys (DFO/IOS)	1966	Waldichuk et al (1968, 1969)	1966-12	21
Ocean Science and Surveys (DFO/IOS)	1966	Waldichuk et al (1968, 1969)	1966-13	22
Ocean Science and Surveys (DFO/IOS)	1966	Waldichuk et al (1968, 1969)	1966-14	23
Ocean Science and Surveys (DFO/IOS)	1966	Waldichuk et al (1968, 1969)	1966-15	24
Ocean Science and Surveys (DFO/IOS)	1966	Waldichuk et al (1968, 1969)	1966-16	25
Ocean Science and Surveys (DFO/IOS)	1966	Waldichuk et al (1968, 1969)	1966-17	26
Ocean Science and Surveys (DFO/IOS)	1966	Waldichuk et al (1968, 1969)	1966-18	27
Ocean Science and Surveys (DFO/IOS)	1966	Waldichuk et al (1968, 1969)	1966-19	28
Ocean Science and Surveys (DFO/IOS)	1966	Waldichuk et al (1968, 1969)	1966-20	29
Ocean Science and Surveys (DFO/IOS)	1966	Waldichuk et al (1968, 1969)	1966-21	30
Ocean Science and Surveys (DFO/IOS)	1966	Waldichuk et al (1968, 1969)	1966-22	31
Ocean Science and Surveys (DFO/IOS)	1967	Waldichuk et al (1968, 1969)	1967-11	32
Ocean Science and Surveys (DFO/IOS)	1967	Waldichuk et al (1968, 1969)	1967-12	33
Ocean Science and Surveys (DFO/IOS)	1967	Waldichuk et al (1968, 1969)	1967-13	34
Ocean Science and Surveys (DFO/IOS)	1968	Waldichuk et al (1968, 1969)	1968-88	35
Ocean Science and Surveys (DFO/IOS)	1968	Waldichuk et al (1968, 1969)	1968-99	36
Ocean Science and Surveys (DFO/IOS)	1977	Buckingham, W.R.	1977-85	37
Environment Canada	1984, 1986, 1988, 1990	EPS Regional Report DR92-11 (1992)	EC84868890	38
Ocean Science and Surveys (DFO/IOS)		Waldichuk et al (1968, 1969)	FRBC1028	39
Environnent Canada - Environmental Protection Services (EC/EPS)	1978-1988	Lim & Colodey (1988)	EPS-88-1	40
Ocean Science and Surveys (DFO/IOS)			1990-14	41
Ocean Science and Surveys (DFO/IOS)		FRBC Tech Rep 444 (1974) Parker et al.	FRBC444-71	43
Salmon in Regional Ecosystems (DFO/SIRE)	2015	Hyatt and Ferguson, DFO SAFE-SIRE Alberni Testboat CTD Surveys	SIRE2015	45

Table 4. CTD profile locations (and associated 'standard' Stations) associated with survey projects identified by Project ID and Project Code Name.

PROJECT STATIONS						DATABASE FIELDS		
Project Code Name	Project ID	Study Station	Latitude	Longitude	Station Description	Station	Code	Station ID
PY5901	1	Somass	49.25	-124.82	Somass River mouth	Somass	44	0
PY5901	1	Outfall	49.24	-124.82	Outfall of Port Alberni Mill at head of Alberni Inlet	Outfall	43	1
PY5901	1	Hohm I - 2 (HI-2)	49.23	-124.82	Directly down Alberni Inlet from Outfall Station and due north of HI-3	Hohm	42	2
PY5901	1	Hohm I - 3 (HI-3)	49.23	-124.83	Hohm Island - 100 m north	Hohm	42	3
PY5901	1	PP-2	49.22	-124.82	Polly Point mid-channel 2.5 km down Alberni Inlet	Polly	40	4
PY5901	1	5 km	49.20	-124.82	5 km down Alberni Inlet between Polly Point and Stamp Narrows	5km	38	5
PY5901	1	China Ck - 10 km	49.15	-124.80	10 km down Alberni Inlet at China Creek, mid-channel	10km	34	6
TULL57	2	1	49.21	-124.82	Alberni Inlet - Polly Point (see Table I, Figure 1)	Polly	40	9
TULL57	2	2	49.16	-124.80	Alberni Inlet - China Creek	10km	34	10
TULL57	2	3	49.07	-124.85	Alberni Inlet - Nahmint Creek (see Table I, Figure 1)	Nahmint	24	11
TULL57	2	4	48.98	-124.91	Alberni Inlet - Uchucklesit (see Table I, Figure 1)	Uchuck	17	12
TULL57	2	5	48.97	-125.11	Barkley Sound - Head of Imperial Eagle Channel (see Table I, Figure 1)	ImpEagleHd	6	13
TULL57	2	6	48.87	-125.23	Barkley Sound - Imperial Eagle Channel	ImpEagle	5	14
TULL57	2	7	48.83	-125.18	Trevor Channel - Deer Group	BarkTrevDeer	2	15
TULL57	2	8	48.95	-125.04	Barkley Sound - Junction Pass (see Table I, Figure 1)	Junction	14	16
TULL57	2	A	49.20	-124.82	Alberni Inlet - 5 KM (see Table I, Figure 1)	5km	38	17
TULL57	2	B	49.15	-124.80	Alberni Inlet - 10 KM	10km	34	18
TULL57	2	C	49.03	-124.85	Alberni Inlet - Nahmint Creek	Nahmint	24	20
TULL57	2	D	48.95	-125.02	Alberni Inlet - at Junction Pass	Junction	14	21
TULL57	2	E	48.92	-125.05	Trevor Channel - Nuchaquis	BarkTrevNuch	11	23
TULL57	2	F	48.88	-125.11	Trevor Channel - Deer Group	BarkTrevA3	8	25
TULL57	2	G	48.85	-125.15	Trevor Channel - Bamfield	BarkTrevA2	3	26
TULL57	2	H	48.82	-125.18	Trevor Channel - Keeshan	BarkTrevDeer	2	27
UBC	46	Sarita	48.88	-125.05	Trevor Channel – Sarita "Hole"	BarkTrevSarita	4	1010
UBC	46	Swale	48.92	-125.18	Barkley Sound – Imp Eagle Channel near Swale Rock	ImpEagleSwale	10	1008
TULL57	2	Hohm	49.23	-124.82	Alberni Harbour - 1941 (Tully 1957)	Outfall	43	102
TULL57	2	G21	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	103
TULL57	2	H21	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	104
TULL57	2	H23	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	105
TULL57	2	I18	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Outfall	43	106
TULL57	2	I20	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	107

PROJECT STATIONS						DATABASE FIELDS		
Project Code Name	Project ID	Study Station	Latitude	Longitude	Station Description	Station	Code	Station ID
TULL57	2	I22	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	108
TULL57	2	I23	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	109
TULL57	2	I24	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	110
TULL57	2	J16	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Outfall	43	111
TULL57	2	J18	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Outfall	43	112
TULL57	2	J23	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	113
TULL57	2	J27	49.21	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	114
TULL57	2	K17	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Outfall	43	115
TULL57	2	K27	49.21	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	116
TULL57	2	K29	49.21	-124.82	Alberni Harbour grid cell (see Fig. 2)	Polly	40	117
TULL57	2	K30	49.21	-124.82	Alberni Harbour grid cell (see Fig. 2)	Polly	40	118
TULL57	2	L17	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	119
TULL57	2	L20	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	120
TULL57	2	L23	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	121
TULL57	2	L24	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	122
TULL57	2	L27	49.21	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	123
TULL57	2	L28	49.21	-124.82	Alberni Harbour grid cell (see Fig. 2)	Polly	40	124
TULL57	2	L29	49.21	-124.82	Alberni Harbour grid cell (see Fig. 2)	Polly	40	125
TULL57	2	M16	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Outfall	43	126
TULL57	2	M17	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	127
TULL57	2	M26	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	128
TULL57	2	M27	49.21	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	129
TULL57	2	N13	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Outfall	43	130
TULL57	2	N14	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Outfall	43	131
TULL57	2	N15	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Outfall	43	132
TULL57	2	N16	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	133
TULL57	2	N17	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	134
TULL57	2	O15	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Outfall	43	135
TULL57	2	O26	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	136
TULL57	2	O27	49.21	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	137
TULL57	2	P13	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Outfall	43	138
TULL57	2	P15	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Outfall	43	139
TULL57	2	P16	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Hohm	42	140
TULL57	2	P20	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	141
TULL57	2	P21	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	142
TULL57	2	P25	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	143
TULL57	2	P26	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	144
TULL57	2	P27	49.21	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	145
TULL57	2	Q19	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	146

PROJECT STATIONS						DATABASE FIELDS		
Project Code Name	Project ID	Study Station	Latitude	Longitude	Station Description	Station	Code	Station ID
TULL57	2	Q20	49.23	-124.82	Alberni Harbour grid cell (see Fig. 2)	Lumber	41	147
1957-10	3	A-1	48.82		Lat 48.82 - Alberni Inlet - Barkley Sound (A-1)	BarkSoundA1	0	1001
1957-10	3	A-2	48.85		Lat 48.85 - Alberni Inlet - Trevor Channel (A-2)	BarkTrevA2	3	1004
1957-10	3	A-3	48.88		Lat 48.88 - Alberni Inlet - Trevor Channel (A-3)	BarkTrevA3	8	1007
1957-10	3	A-4	48.92		Lat 48.92 - Alberni Inlet - Nuchaquis (A-4)	BarkTrevNuch	11	1011
1957-10	3	IOS15	48.96		Lat 48.96 - Alberni Inlet - above Uchucklesit	Uchuck	17	1015
1957-10	3	Outside Nahmint	49.04		Lat 49.04 - Alberni Inlet - A-6	Nahmint	24	1023
1957-10	3	10 Km	49.14		Lat 49.14 - Alberni Inlet - 10 Km	10km	34	1033
1957-10	3	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1957-10	3	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1957-10	3	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1957-10	3	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1959-11	4	A-1	48.82		Lat 48.82 - Alberni Inlet - Barkley Sound (A-1)	BarkSoundA1	0	1001
1959-11	4	A-2	48.85		Lat 48.85 - Alberni Inlet - Trevor Channel (A-2)	BarkTrevA2	3	1004
1959-11	4	A-3	48.88		Lat 48.88 - Alberni Inlet - Trevor Channel (A-3)	BarkTrevA3	8	1007
1959-11	4	A-4	48.92		Lat 48.92 - Alberni Inlet - Nuchaquis (A-4)	BarkTrevNuch	11	1011
1959-11	4	IOS15	48.96		Lat 48.96 - Alberni Inlet - above Uchucklesit	Uchuck	17	1015
1959-11	4	Outside Nahmint	49.04		Lat 49.04 - Alberni Inlet - A-6	Nahmint	24	1023
1959-11	4	10 Km	49.14		Lat 49.14 - Alberni Inlet - 10 Km	10km	34	1033
1959-11	4	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1959-11	4	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1959-11	4	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1959-11	4	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1961-10	5	A-1	48.82		Lat 48.82 - Alberni Inlet - Barkley Sound (A-1)	BarkSoundA1	0	1001
1961-10	5	A-2	48.85		Lat 48.85 - Alberni Inlet - Trevor Channel (A-2)	BarkTrevA2	3	1004
1961-10	5	A-3	48.88		Lat 48.88 - Alberni Inlet - Trevor Channel (A-3)	BarkTrevA3	8	1007
1961-10	5	A-4	48.92		Lat 48.92 - Alberni Inlet - Nuchaquis (A-4)	BarkTrevNuch	11	1011
1961-10	5	IOS15	48.96		Lat 48.96 - Alberni Inlet - above Uchucklesit	Uchuck	17	1015
1961-10	5	Outside Nahmint	49.04		Lat 49.04 - Alberni Inlet - A-6	Nahmint	24	1023
1961-10	5	10 Km	49.14		Lat 49.14 - Alberni Inlet - 10 Km	10km	34	1033

PROJECT STATIONS						DATABASE FIELDS		
Project Code Name	Project ID	Study Station	Latitude	Longitude	Station Description	Station	Code	Station ID
1961-10	5	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1961-10	5	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1961-10	5	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1961-10	5	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1962-13	6	A-1	48.82		Lat 48.82 - Alberni Inlet - Barkley Sound (A-1)	BarkSoundA1	0	1001
1962-13	6	A-2	48.85		Lat 48.85 - Alberni Inlet - Trevor Channel (A-2)	BarkTrevA2	3	1004
1962-13	6	A-3	48.88		Lat 48.88 - Alberni Inlet - Trevor Channel (A-3)	BarkTrevA3	8	1007
1962-13	6	A-4	48.92		Lat 48.92 - Alberni Inlet - Nuchaquis (A-4)	BarkTrevNuch	11	1011
1962-13	6	IOS15	48.96		Lat 48.96 - Alberni Inlet - above Uchucklesit	Uchuck	17	1015
1962-13	6	Outside Nahmint	49.04		Lat 49.04 - Alberni Inlet - A-6	Nahmint	24	1023
1962-13	6	10 Km	49.14		Lat 49.14 - Alberni Inlet - 10 Km	10km	34	1033
1962-13	6	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1962-13	6	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1962-13	6	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1962-13	6	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1962-13	6	Somass	49.25	-124.82	Lat 49.25 - Somass River above lime-rock dock	Somass	44	1044
1965-12	7	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1965-12	7	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1965-12	7	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1965-12	7	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1965-13	8	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1965-13	8	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1965-13	8	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1965-13	8	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1965-13	8	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1965-14	9	Stamp	49.18		Lat 49.18 - Alberni Inlet - Stamp Narrows	StampNarr	36	1037
1965-14	9	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1965-14	9	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1965-14	9	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1965-15	10	Stamp	49.18		Lat 49.18 - Alberni Inlet - Stamp Narrows	StampNarr	36	1037

PROJECT STATIONS						DATABASE FIELDS		
Project Code Name	Project ID	Study Station	Latitude	Longitude	Station Description	Station	Code	Station ID
1965-15	10	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1965-15	10	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1965-15	10	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1965-15	10	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1965-16	11	Stamp	49.18		Lat 49.18 - Alberni Inlet - Stamp Narrows	StampNarr	36	1037
1965-16	11	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1965-16	11	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1965-16	11	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1965-16	11	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1965-17	12	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1965-17	12	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1965-17	12	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1965-17	12	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1965-17	12	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1965-18	13	Stamp	49.18		Lat 49.18 - Alberni Inlet - Stamp Narrows	StampNarr	36	1037
1965-18	13	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1965-18	13	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1965-18	13	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1965-18	13	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1973-11	14	IOS16	48.97		Lat 48.97 - Alberni Inlet - Uchucklesit	Uchuck	17	1016
1973-11	14	IOS19	49.00		Lat 49.00 - Alberni Inlet - 15 nm	Uchuck	17	1019
1973-11	14	Nahmint	49.07		Lat 49.07 - Alberni Inlet - Nahmint	Nahmint	24	1026
1973-11	14	Inside Sproat	49.13		Lat 49.13 - Alberni Inlet - above Sproat Narrows	12km	31	1032
1973-11	14	10 Km	49.15		Lat 49.15 - Alberni Inlet - 10 KM	10km	34	1034
1973-11	14	Inside Stamp	49.19		Lat 49.19 - Alberni Inlet - above Stamp Narrows	5km	38	1038
1973-11	14	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1973-11	14	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1973-11	14	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1973-12	15	IOS14	48.95		Lat 48.95 - Alberni Inlet - below Uchucklesit	Junction	14	1014
1973-12	15	IOS19	49.00		Lat 49.00 - Alberni Inlet - 15 nm	Uchuck	17	1019
1973-12	15	Nahmint	49.07		Lat 49.07 - Alberni Inlet - Nahmint	Nahmint	24	1026

PROJECT STATIONS						DATABASE FIELDS		
Project Code Name	Project ID	Study Station	Latitude	Longitude	Station Description	Station	Code	Station ID
1973-12	15	Inside Sproat	49.13		Lat 49.13 - Alberni Inlet - above Sproat Narrows	12km	31	1032
1973-12	15	10 Km	49.15		Lat 49.15 - Alberni Inlet - 10 KM	10km	34	1034
1973-12	15	Inside Stamp	49.19		Lat 49.19 - Alberni Inlet - above Stamp Narrows	5km	38	1038
1973-12	15	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1973-12	15	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1973-12	15	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1973-13	16	IOS14	48.95		Lat 48.95 - Alberni Inlet - below Uchucklesit	Junction	14	1014
1973-13	16	IOS19	49.00		Lat 49.00 - Alberni Inlet - 15 nm	Uchuck	17	1019
1973-13	16	Nahmint	49.07		Lat 49.07 - Alberni Inlet - Nahmint	Nahmint	24	1026
1973-13	16	Inside Sproat	49.13		Lat 49.13 - Alberni Inlet - above Sproat Narrows	12km	31	1032
1973-13	16	10 Km	49.15		Lat 49.15 - Alberni Inlet - 10 KM	10km	34	1034
1973-13	16	Inside Stamp	49.19		Lat 49.19 - Alberni Inlet - above Stamp Narrows	5km	38	1038
1973-13	16	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1973-13	16	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1973-14	17	IOS14	48.95		Lat 48.95 - Alberni Inlet - below Uchucklesit	Junction	14	1014
1973-14	17	IOS19	49.00		Lat 49.00 - Alberni Inlet - 15 nm	Uchuck	17	1019
1973-14	17	Nahmint	49.07		Lat 49.07 - Alberni Inlet - Nahmint	Nahmint	24	1026
1973-14	17	Inside Sproat	49.13		Lat 49.13 - Alberni Inlet - above Sproat Narrows	12km	31	1032
1973-14	17	10 Km	49.15		Lat 49.15 - Alberni Inlet - 10 KM	10km	34	1034
1973-14	17	Inside Stamp	49.19		Lat 49.19 - Alberni Inlet - above Stamp Narrows	5km	38	1038
1973-14	17	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1973-14	17	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1973-14	17	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1986-91	18	A-4	48.90		Lat 48.90 - Alberni Inlet - Trevor Channel (A-4)	BarkTrevA4	9	1009
1986-91	18	IOS15	48.96		Lat 48.96 - Alberni Inlet - above Uchucklesit	Uchuck	17	1015
1986-91	18	IOS19	49.00		Lat 49.00 - Alberni Inlet - 15 nm	Uchuck	17	1019
1986-91	18	IOS22	49.03		Lat 49.03 - Alberni Inlet	Nahmint	24	1022
1986-91	18	Outside Sproat	49.09		Lat 49.09 - Alberni Inlet - below Sproat Narrows	SproatOut	28	1028
1986-91	18	Sproat Narrows	49.12		Lat 49.12 - Alberni Inlet - Sproat Narrows	SproatNarr	30	1031
1986-91	18	Outside PP	49.20		Lat 49.20 - Alberni Harbour - 5 KM (A-8)	5km	38	1039
1954-10	19	A-1	48.82		Lat 48.82 - Alberni Inlet - Barkley Sound (A-1)	BarkSoundA1	0	1001

PROJECT STATIONS						DATABASE FIELDS		
Project Code Name	Project ID	Study Station	Latitude	Longitude	Station Description	Station	Code	Station ID
1954-10	19	A-2	48.85		Lat 48.85 - Alberni Inlet - Trevor Channel (A-2)	BarkTrevA2	3	1004
1954-10	19	A-3	48.88		Lat 48.88 - Alberni Inlet - Trevor Channel (A-3)	BarkTrevA3	8	1007
1954-10	19	A-4	48.92		Lat 48.92 - Alberni Inlet - Nuchaquis (A-4)	BarkTrevNuch	11	1011
1954-10	19	IOS16	48.97		Lat 48.97 - Alberni Inlet - Uchucklesit	Uchuck	17	1016
1954-10	19	Outside Nahmint	49.04		Lat 49.04 - Alberni Inlet - A-6	Nahmint	24	1023
1954-10	19	10 Km	49.14		Lat 49.14 - Alberni Inlet - 10 Km	10km	34	1033
1954-10	19	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1954-10	19	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1954-10	19	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1954-10	19	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1966-11	20	A-1	48.82		Lat 48.82 - Alberni Inlet - Barkley Sound (A-1)	BarkSoundA1	0	1001
1966-11	20	A-2	48.85		Lat 48.85 - Alberni Inlet - Trevor Channel (A-2)	BarkTrevA2	3	1004
1966-11	20	A-3	48.88		Lat 48.88 - Alberni Inlet - Trevor Channel (A-3)	BarkTrevA3	8	1007
1966-11	20	A-4	48.92		Lat 48.92 - Alberni Inlet - Nuchaquis (A-4)	BarkTrevNuch	11	1011
1966-11	20	IOS15	48.96		Lat 48.96 - Alberni Inlet - above Uchucklesit	Uchuck	17	1015
1966-11	20	Outside Nahmint	49.04		Lat 49.04 - Alberni Inlet - A-6	Nahmint	24	1023
1966-11	20	10 Km	49.14		Lat 49.14 - Alberni Inlet - 10 Km	10km	34	1033
1966-11	20	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1966-11	20	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1966-11	20	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1966-11	20	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1966-11	20	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1966-12	21	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1966-12	21	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1966-12	21	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1966-12	21	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1966-12	21	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1966-13	22	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1966-13	22	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1966-13	22	Inside PP	49.22	-124.82	Alberni Harbour - Inside Polly Point	Lumber	41	1041

PROJECT STATIONS						DATABASE FIELDS		
Project Code Name	Project ID	Study Station	Latitude	Longitude	Station Description	Station	Code	Station ID
1966-13	22	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1966-13	22	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1966-14	23	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1966-14	23	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1966-14	23	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1966-14	23	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1966-14	23	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1966-15	24	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1966-15	24	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1966-15	24	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1966-15	24	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1966-15	24	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1966-16	25	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1966-16	25	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1966-16	25	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1966-16	25	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1966-16	25	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1966-16	25	Somass	49.25	-124.82	Lat 49.25 - Somass River above lime-rock dock	Somass	44	1044
1966-17	26	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1966-17	26	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1966-17	26	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1966-17	26	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1966-17	26	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1966-17	26	Somass	49.25	-124.82	Lat 49.25 - Somass River above lime-rock dock	Somass	44	1044
1966-18	27	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1966-18	27	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1966-18	27	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1966-18	27	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1966-18	27	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1966-19	28	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036

PROJECT STATIONS						DATABASE FIELDS		
Project Code Name	Project ID	Study Station	Latitude	Longitude	Station Description	Station	Code	Station ID
1966-19	28	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1966-19	28	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1966-19	28	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1966-19	28	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1966-20	29	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1966-20	29	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1966-20	29	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1966-20	29	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1966-20	29	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1966-21	30	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1966-21	30	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1966-21	30	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1966-21	30	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1966-21	30	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1966-22	31	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1966-22	31	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1966-22	31	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1966-22	31	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1966-22	31	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1967-11	32	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1967-11	32	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1967-11	32	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1967-11	32	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1967-11	32	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1967-12	33	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1967-12	33	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1967-12	33	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1967-12	33	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1967-12	33	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043

PROJECT STATIONS						DATABASE FIELDS		
Project Code Name	Project ID	Study Station	Latitude	Longitude	Station Description	Station	Code	Station ID
1967-13	34	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1967-13	34	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1967-13	34	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1967-13	34	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1967-13	34	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1968-88	35	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1968-88	35	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1968-88	35	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1968-88	35	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1968-88	35	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1968-99	36	A-1	48.82		Lat 48.82 - Alberni Inlet - Barkley Sound (A-1)	BarkSoundA1	0	1001
1968-99	36	A-2	48.85		Lat 48.85 - Alberni Inlet - Trevor Channel (A-2)	BarkTrevA2	3	1004
1968-99	36	A-3	48.88		Lat 48.88 - Alberni Inlet - Trevor Channel (A-3)	BarkTrevA3	8	1007
1968-99	36	A-4	48.92		Lat 48.92 - Alberni Inlet - Nuchaquis (A-4)	BarkTrevNuch	11	1011
1968-99	36	IOS15	48.96		Lat 48.96 - Alberni Inlet - above Uchucklesit	Uchuck	17	1015
1968-99	36	Outside Nahmint	49.04		Lat 49.04 - Alberni Inlet - A-6	Nahmint	24	1023
1968-99	36	10 Km	49.14		Lat 49.14 - Alberni Inlet - 10 Km	10km	34	1033
1968-99	36	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1968-99	36	A-9	49.21	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point (A-9)	Lumber	41	1040
1968-99	36	Inside PP	49.22	-124.82	Lat 49.22 - Alberni Harbour - Inside Polly Point	Lumber	41	1041
1968-99	36	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	1042
1968-99	36	Outfall	49.24	-124.82	Lat 49.24 - Alberni Harbour - Outfall	Outfall	43	1043
1977-85	37	China Ck	49.16		Lat 49.16 - Alberni Inlet - China Creek	10km	34	1035
1977-85	37	Outside Stamp	49.17		Lat 49.17 - Alberni Inlet - below Stamp Narrows	8km	35	1036
1977-85	37	Stamp	49.18		Lat 49.18 - Alberni Inlet - Stamp Narrows	StampNarr	36	1037
1977-85	37	Outside PP	49.20		Lat 49.20 - Alberni Harbour - 5 KM (A-8)	5km	38	1039
EC 84868890	38	1	49.24	-124.82	Lim & Colodey (1992) 1990 data	Outfall	43	1991
EC84868890	38	3	49.23	-124.82	Lim & Colodey (1992) 1990 data	Hohm	42	1992
EC84868890	38	10	49.17	-124.82	Lim & Colodey (1992) 1990 data	StampNarr	36	1993
EC84868890	38	1	49.24	-124.82	Lim & Colodey (1992) 1980s data	Outfall	43	2000

PROJECT STATIONS						DATABASE FIELDS		
Project Code Name	Project ID	Study Station	Latitude	Longitude	Station Description	Station	Code	Station ID
EC84868890	38	2	49.23	-124.82	Lim & Colodey (1992) 1980s data	Hohm	42	2001
EC84868890	38	10	49.20	-124.81	Lim & Colodey (1992) 1980s data	5km	38	2002
EC84868890	38	3	49.23	-124.82	Lim & Colodey (1992) 1980s data	Hohm	42	2003
EC84868890	38	4	49.23	-124.82	Lim & Colodey (1992) 1980s data	Hohm	42	2004
EC84868890	38	5	49.22	-124.82	Lim & Colodey (1992) 1980s data	Lumber	41	2005
EC84868890	38	6	49.22	-124.82	Lim & Colodey (1992) 1980s data	Polly	40	2006
EC84868890	38	7	49.21		Lim & Colodey (1992) 1980s data	5km	38	2007
EC84868890	38	8	49.20		Lim & Colodey (1992) 1980s data	5km	38	2008
EC84868890	38	11	49.23	-124.82	Lim & Colodey (1992) 1980s data	Hohm	42	2009
EC84868890	38	14	49.24	-124.82	Lim & Colodey (1992) 1980s data	Outfall	43	2012
EC84868890	38	15	49.23	-124.82	Lim & Colodey (1992) 1980s data	Hohm	42	2013
EC84868890	38	18	49.18		Lim & Colodey (1992) 1980s data	StampNarr	36	2015
EC84868890	38	19	49.14		Lim & Colodey (1992) 1980s data	10km	34	2016
EC84868890	38	32	49.22	-124.82	Lim & Colodey (1992) 1980s data	Lumber	41	2017
EC84868890	38	A-4	49.05		Lim & Colodey (1992) 1980s data	Nahmint	24	2018
EC84868890	38	SB-1	49.02		Lim & Colodey (1992) 1980s data	Uchuck	17	2019
EC84868890	38	UT-1	49.02		Lim & Colodey (1992) 1980s data	Uchuck	17	2020
EC84868890	38	34	49.23	-124.82	Lim & Colodey (1992) 1980s data	Hohm	42	2021
FRBC1028	39	Somass	49.25	-124.82	Lat 49.25 - Somass River above lime-rock dock	Somass	44	10280
FRBC1028	39	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	10281
EPS-88-1	40	Somass	49.25	-124.82	Lat 49.25 - Somass River above lime-rock dock	Somass	44	10880
EPS-88-1	40	Hohm	49.23	-124.82	Lat 49.23 - Alberni Harbour - above Hohm Island	Hohm	42	10881
1990-14	41	Outside PP	49.20		Lat 49.20 - Alberni Harbour - 5 KM (Parizeau 1990)	5km	38	10101
1990-14	41	Stamp	49.18		Lat 49.17 - Stamp Narrows (Parizeau 1990)	8km	35	10102
1990-14	41	Outside Nahmint	49.04		Lat 49.04 - Alberni Inlet - (Parizeau 1990)	Nahmint	24	10103
1990-14	41	Harbour	49.04	-124.82	Alberni Inlet - (Parizeau 1990)	Lumber	41	10104
1990-14	41	Hohm	49.23	-124.82	Alberni Inlet - (Parizeau 1990)	Hohm	42	10105
1990-14	41	Hohm	49.23	-124.82	Alberni Inlet - (Parizeau 1990)	Hohm	42	10106
1990-14	41	Outfall	49.23	-124.82	Alberni Inlet - (Parizeau 1990)	Outfall	43	10107
FRBC 444-71	43	Hohm I - 2	49.23	-124.82	Directly down Alberni Inlet from Outfall Station and due north of HI-3	Hohm	42	2

PROJECT STATIONS						DATABASE FIELDS		
Project Code Name	Project ID	Study Station	Latitude	Longitude	Station Description	Station	Code	Station ID
SIRE2015	45	Uchuck	48.96		SIRE Barkley CTD Surveys 2015 - Alberni Inlet near Uchucklesit Inlet (Limestone Island)	Uchuck	17	5017
SIRE2015	45	Ten Mile	49.07		SIRE Barkley CTD Surveys 2015 - Ten Mile Point across from Nahmint	Nahmint	24	5026
SIRE2015	45	Outside Sproat	49.09		SIRE Barkley CTD Surveys 2015 - below Sproat Narrows	SproatOut	28	5029
SIRE2015	45	Inside Sproat	49.13		SIRE Barkley CTD Surveys 2015 - above Sproat Narrows	12km	31	5030
SIRE2015	45	China Ck	49.16		SIRE Barkley CTD Surveys 2015	10km	34	5034
SIRE2015	45	LoneTree	49.18		SIRE Barkley CTD Surveys 2015 - Lone Tree Point in Stamp Narrows	StampNarr	36	5038
SIRE2015	45	Hohm	49.23	-124.82	SIRE Barkley CTD Surveys 2015	Hohm	42	5042
		Alply	49.23	-124.82	Alply Boom - Alberni Plywood Mill	Polly	40	10990

Table 5. Upper Alberni Inlet physical-chemical water properties. Descriptive statistics by station and depth (m): OUTFALL 1990-2017.

Station: OUT-FALL

	Water Temp (C)						D.O. (mg/L)					Salinity (ppt)					pH				
	N	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max
Depth																					
0	1426	3.6	6.3	14.4	20.7	26.4	3.9	7.6	9.6	12.1	15.9	0.0	0.4	4.1	9.8	24.4	6.2	7.1	7.6	8.1	9.4
5	1406	4.5	8.6	11.3	14.5	22.2	0.4	2.0	4.9	8.1	14.0	0.0	20.6	26.8	31.2	33.2	6.3	7.1	7.4	7.8	8.7
10	1054	7.3	8.9	10.0	11.2	14.3	0.2	1.1	3.3	6.0	9.5	24.8	29.1	30.8	32.3	33.7	6.5	7.1	7.4	7.8	9.1
15	48	8.4	8.9	10.1	11.7	12.9	0.2	0.5	2.5	5.0	6.1	29.1	29.9	31.1	32.2	32.6	6.7	7.0	7.4	7.8	8.0

Table 6. Upper Alberni Inlet physical-chemical water properties. Descriptive statistics by station and depth (m): HOHM ISLAND (HI-2 and HI-3 combined) 1990-2017.

Station: HOHM HI-2 HI-3

	Water Temp (C)						D.O. (mg/L)					Salinity (ppt)					pH				
	N	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max
Depth																					
0	2168	2.7	5.9	14.4	20.6	26.4	2.5	7.7	9.6	12.2	16.0	0.0	0.7	4.9	10.9	27.8	6.2	7.3	7.7	8.2	9.0
5	2160	3.9	8.7	11.4	14.6	21.7	0.5	2.4	5.2	8.2	14.3	0.0	20.7	26.9	31.2	33.0	6.3	7.2	7.5	7.9	8.7
10	2145	7.3	8.9	10.1	11.2	14.5	0.2	1.1	3.4	6.2	9.6	23.2	29.5	31.1	32.4	33.8	6.5	7.1	7.5	7.8	9.9
15	1571	7.1	8.8	9.8	10.8	13.4	0.2	0.8	2.8	5.3	8.5	26.1	29.8	31.3	32.6	33.5	6.5	7.1	7.4	7.8	10.0
20	45	8.6	8.9	9.8	10.8	12.3	0.5	1.0	2.9	4.8	6.1	29.7	30.1	31.0	32.2	32.7	6.9	7.1	7.4	7.7	7.9
25	2	9.6	9.6	9.6	9.7	9.7	2.2	2.2	2.7	3.3	3.3	30.6	30.6	30.6	30.6	30.6	7.1	7.1	7.3	7.6	7.6
30	1	9.8	9.8	9.8	9.8	9.8	3.0	3.0	3.0	3.0	3.0						7.6	7.6	7.6	7.6	7.6

Table 7. Upper Alberni Inlet physical-chemical water properties. Descriptive statistics by station and depth (m): POLLY POINT (PP-2) 1990-2017.

Station: POLLY PP-2

	Water Temp (C)						D.O. (mg/L)					Salinity (ppt)					pH				
	N	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max
Depth																					
0	1525	3.1	5.8	14.1	20.4	25.1	1.3	7.7	9.7	12.2	14.5	0.0	0.8	5.4	11.7	27.8	6.3	7.2	7.7	8.2	11.3
5	1526	3.8	8.6	11.2	14.4	20.6	0.9	2.8	5.6	8.5	15.1	0.0	21.7	27.2	31.2	33.3	6.0	7.2	7.5	7.9	11.7
10	1518	7.4	8.8	10.0	11.2	15.2	0.3	1.6	3.9	6.7	9.8	21.8	29.3	31.0	32.4	33.3	6.4	7.2	7.5	7.9	8.9
15	1500	7.4	8.8	9.8	10.8	13.7	0.2	1.4	3.3	5.9	9.6	27.1	29.9	31.4	32.7	34.1	6.5	7.1	7.5	7.8	8.8
20	1473	7.4	8.8	9.7	10.6	13.1	0.1	1.2	2.8	4.9	9.2	27.4	30.1	31.6	32.8	34.3	6.4	7.1	7.4	7.8	8.7
25	1358	7.8	8.8	9.6	10.5	12.7	0.3	1.0	2.4	4.3	7.5	27.7	30.3	31.7	32.9	34.6	6.3	7.1	7.4	7.7	8.6
30	1056	7.9	8.8	9.5	10.4	12.1	0.1	0.9	2.1	3.5	6.9	27.9	30.5	31.9	32.9	34.4	6.5	7.1	7.4	7.7	8.5

Table 8. Upper Alberni Inlet physical-chemical water properties. Descriptive statistics by station and depth (m): 5KM 1990-2017.

Station: 5KM

	Water Temp (C)						D.O. (mg/L)					Salinity (ppt)					pH				
	N	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max
Depth																					
0	1286	1.9	6.0	14.0	20.2	26.4	5.2	8.0	9.8	12.1	17.4	0.0	1.0	6.1	13.1	25.9	5.8	7.2	7.7	8.2	9.1
5	1283	4.3	8.6	11.2	14.1	19.2	0.9	3.5	6.1	8.8	13.2	0.5	22.1	27.4	31.1	33.4	6.1	7.2	7.6	8.0	8.8
10	1277	7.3	8.8	10.1	11.3	17.0	1.0	2.6	4.7	7.3	10.8	24.1	29.2	31.0	32.4	34.0	6.5	7.2	7.6	8.0	9.2
15	1261	7.4	8.8	9.8	10.9	14.3	0.8	2.3	4.2	6.5	10.1	27.1	29.9	31.4	32.7	33.7	6.5	7.2	7.5	7.9	9.7
20	1246	7.3	8.8	9.7	10.7	13.7	0.8	2.0	3.7	5.8	9.0	27.3	30.2	31.6	32.8	34.1	6.5	7.2	7.5	7.8	9.8
25	1169	7.6	8.8	9.6	10.5	12.6	0.6	1.8	3.2	5.1	8.4	27.5	30.3	31.7	32.9	34.6	5.5	7.2	7.5	7.8	10.0
30	1108	7.8	8.8	9.5	10.4	12.3	0.4	1.5	2.9	4.4	7.3	27.8	30.4	31.8	32.9	34.5	6.4	7.1	7.4	7.8	10.1
40	1038	8.0	8.7	9.4	10.2	11.7	0.5	1.5	2.7	4.1	6.5	28.0	30.8	32.0	33.0	34.7	6.4	7.1	7.4	7.8	9.5
50	184	8.9	9.0	9.4	9.9	11.5	0.5	1.7	2.7	4.1	6.2	29.6	31.6	32.6	33.3	34.6	7.0	7.3	7.6	7.9	8.5

Table 9. Upper Alberni Inlet physical-chemical water properties. Descriptive statistics by station and depth (m): 10KM 1991-1999, 2012, 2015.

Station: 10KM

	Water Temp (C)						D.O. (mg/L)					Salinity (ppt)					pH				
	N	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max	Min	P10	Mean	P90	Max
Depth																					
0	570	3.7	6.6	14.3	19.5	22.7	6.1	7.9	9.5	11.8	14.2	0.0	2.2	9.8	18.2	29.3	6.3	7.4	7.8	8.2	10.3
5	570	5.4	8.8	11.7	15.0	18.7	2.6	4.3	6.5	8.5	13.0	0.2	22.0	27.3	31.4	32.9	6.3	7.4	7.7	8.2	9.0
10	566	7.2	8.9	10.3	11.5	14.7	2.0	3.5	5.4	7.9	10.0	24.9	30.0	31.4	32.5	33.4	6.7	7.4	7.7	8.1	9.2
15	554	7.4	9.0	10.1	11.2	14.6	2.3	3.3	5.0	7.3	9.0	28.6	30.6	31.8	32.7	33.5	6.7	7.4	7.7	8.1	9.2
20	545	7.5	9.0	9.9	10.8	14.4	2.1	3.2	4.6	6.6	8.7	28.8	31.0	32.0	32.8	33.6	6.7	7.3	7.7	8.0	9.2
25	528	7.9	9.0	9.7	10.6	13.3	1.0	3.0	4.2	5.9	8.1	29.1	31.2	32.2	32.9	33.7	6.7	7.3	7.7	8.0	9.3
30	514	8.4	9.0	9.7	10.5	12.7	1.4	2.8	3.9	5.3	7.5	29.3	31.4	32.3	33.0	34.1	6.7	7.3	7.6	7.9	9.5
40	491	7.6	8.9	9.5	10.4	12.1	1.7	2.6	3.5	4.7	6.1	30.1	31.6	32.5	33.1	34.3	6.6	7.3	7.6	7.9	9.6
50	107	8.8	9.0	9.3	9.5	10.2	1.6	2.1	3.0	4.1	4.7	30.8	32.2	32.9	33.5	34.4	7.2	7.4	7.7	8.0	8.4

Table 10. Monthly mean Effluent volume (m^3/d) discharged by the mill. Source: ENVIRONMENT CANADA (1997-2001) and CATALYST PAPER CORPORATION (2002-2017).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1997	83,968	95,429	97,323	92,600	93,032	94,900	98,258	99,871	96,300	91,419	91,900	88,258	93,605
1998	97,613	95,857	91,806	89,267	99,290	103,500	98,387	109,742	112,500	108,742	114,300	112,290	102,775
1999	105,000	113,679	107,581	102,100	95,226	91,767	88,355	92,355	87,967	102,226	102,033	103,452	99,312
2000	103,903	94,931	96,452	101,000	94,613	110,467	102,935	112,903	105,333	104,355	100,333	104,613	102,653
2001	108,645	108,250	100,065	95,533	52,419	78,067	87,226	100,194	81,900	94,839	75,033	61,387	86,963
2002	72,500	74,900	73,800	76,100	74,500	73,500	72,600	93,200	90,600	81,700	96,500	91,600	80,958
2003	94,500	98,100	97,100	99,500	94,200	85,800	88,900	89,400	85,400	88,200	86,800	85,300	91,100
2004	85,000	85,100	84,200	82,000	82,900	88,500	101,300	97,600	91,100	87,400	88,600	91,300	88,750
2005	92,600	82,700	73,400	70,600	71,300	72,100	72,900	75,000	78,200	76,500	74,700	75,600	76,300
2006	79,600	78,700	74,200	71,100	71,300	71,200	76,400	78,300	72,900	57,400	62,200	63,100	71,367
2007	65,700	63,900	66,000	64,500	63,000	66,600	72,600	67,200	54,900	52,000	50,400	48,200	61,250
2008	47,000	44,900	44,600	44,000	60,400	61,400	62,000	62,900	64,800	66,700	64,800	59,200	56,892
2009	64,200	63,400	56,900	64,900	64,800	66,000	66,400	66,800	66,600	66,200	66,500	62,600	64,608
2010	62,300	62,700	62,700	61,700	64,900	65,700	60,400	60,600	59,900	59,600	61,100	62,100	61,975
2011	60,200	62,300	61,800	57,100	57,500	58,200	58,200	58,300	58,400	58,800	59,500	60,300	59,217
2012	61,300	57,200	58,900	57,100	58,100	58,200	60,500	60,300	58,800	57,900	58,600	61,100	59,000
2013	60,000	61,400	49,200	52,000	56,700	54,100	71,500	82,500	77,100	71,900	72,900	77,200	65,542
2014	68,900	67,300	68,300	66,500	65,100	69,700	70,800	75,100	69,800	68,400	65,400	69,600	68,742
2015	69,400	72,600	73,000	70,700	63,800	73,600	79,400	86,000	81,800	81,100	74,000	76,700	75,175
2016	88,000	89,400	91,600	85,100	78,900	80,800	87,800	83,900	82,300	84,300	85,700	72,100	84,158
2017	67,800	79,300	86,300	85,500	82,500	68,700	73,000	78,900	76,800	74,800	76,100	79,300	77,417
Average	**78,006**	**78,669**	**76,916**	**75,662**	**73,547**	**75,848**	**78,565**	**82,432**	**78,733**	**77,832**	**77,495**	**76,443**	**77,512**

Table 11. Monthly mean volume of Total Suspended Solids (TSS, kg/d) discharged by the mill. Source: ENVIRONMENT CANADA (1997-2001) and CATALYST PAPER CORPORATION (2002-2017).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1997	672.0	505.6	653.7	770.6	828.7	848.3	951.1	803.1	403.8	798.1	874.7	695.3	733.8
1998	1,087.1	729.5	750.2	593.8	653.6	691.5	789.2	797.8	841.2	809.8	1,189.1	1,211.9	845.4
1999	846.7	759.7	767.1	641.1	680.3	809.3	559.9	800.7	847.2	843.7	683.6	917.4	763.1
2000	1,299.4	1,221.9	1,065.3	1,257.5	809.5	864.5	817.0	806.1	1,305.1	900.9	913.7	810.1	1,005.9
2001	887.6	782.0	581.1	557.9	303.4	669.2	532.5	598.8	666.8	750.2	632.6	628.4	632.5
2002	688.0	485.0	598.0	349.0	418.0	515.0	536.0	433.0	452.0	469.0	1,303.0	1,347.0	632.8
2003	1,140.0	878.0	748.0	537.0	670.0	750.0	1,119.0	821.0	700.0	783.0	647.0	720.0	792.8
2004	751.0	684.0	757.0	871.0	1,010.0	862.0	1,225.0	1,795.0	1,843.0	1,143.0	933.0	859.0	1,061.1
2005	800.0	516.0	515.0	440.0	464.0	838.0	552.0	286.0	195.0	221.0	414.0	784.0	502.1
2006	559.0	499.0	533.0	311.0	218.0	136.0	186.0	160.0	243.0	474.0	414.0	539.0	356.0
2007	632.0	537.0	302.0	213.0	159.0	199.0	209.0	535.0	714.0	347.0	388.0	421.0	388.0
2008	467.0	460.0	311.0	326.0	353.0	329.0	325.0	364.0	343.0	340.0	336.0	274.0	352.3
2009	338.0	476.0	262.0	348.0	363.0	383.0	451.0	379.0	397.0	388.0	378.0	381.0	378.7
2010	394.0	390.0	356.0	405.7	360.0	459.0	455.0	377.0	368.0	526.0	486.0	406.0	415.2
2011	364.0	505.0	405.0	413.0	360.0	402.0	482.0	365.0	375.0	437.0	370.0	473.0	412.6
2012	469.0	430.0	399.0	351.0	385.0	455.0	849.0	1,053.0	548.0	993.0	1,109.0	1,261.0	691.8
2013	934.0	881.0	748.0	811.0	608.0	475.9	853.0	1,153.0	1,182.7	806.0	1,145.9	1,240.0	903.2
2014	735.0	1,000.0	848.0	630.5	573.1	962.0	904.0	814.0	821.3	898.6	724.4	1,178.0	840.7
2015	945.0	2,461.0	1,885.0	785.0	1,039.0	872.0	815.0	1,122.0	1,651.0	1,406.0	1,561.0	1,426.0	1,330.7
2016	1,319.0	1,471.0	1,319.0	926.0	883.0	821.0	811.0	734.0	782.0	844.0	1,165.0	1,049.0	1,010.3
2017	963.0	1,072.0	1,267.0	1,096.0	798.0	708.0	970.0	1,238.0	888.0	770.0	804.0	1,094.0	972.3
Average	**775.8**	**797.3**	**717.6**	**601.6**	**568.4**	**621.4**	**685.3**	**735.0**	**741.3**	**711.8**	**784.4**	**843.6**	**715.3**

Table 12. Monthly mean volume of Biochemical Oxygen Demand (BOD, kg/d) discharged by the mill. Source: ENVIRONMENT CANADA (1997-2001) and CATALYST PAPER CORPORATION (2002-2017).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1997	203.9	328.0	382.3	415.7	358.2	393.2	436.4	391.9	291.3	357.7	293.5	275.6	344.0
1998	354.9	420.1	387.3	356.7	453.7	454.3	427.8	612.4	583.1	509.2	605.2	437.3	466.8
1999	497.6	539.9	510.3	495.6	466.1	477.6	438.9	364.0	443.5	461.1	493.7	754.4	495.2
2000	752.2	538.9	598.5	620.5	541.5	496.5	465.1	478.1	553.5	540.5	521.5	584.1	557.6
2001	626.1	587.6	638.0	502.5	273.4	418.4	426.2	486.8	440.1	509.9	383.6	197.6	457.5
2002	331.0	388.0	456.0	418.0	383.0	392.0	459.0	621.0	459.0	347.0	669.0	614.0	461.4
2003	522.0	540.0	461.0	584.0	573.0	545.0	593.0	638.0	507.0	619.0	485.0	502.0	547.4
2004	602.0	541.0	567.0	671.0	586.0	719.0	745.0	806.0	1,107.0	786.0	643.0	602.0	697.9
2005	537.0	373.0	470.0	503.0	464.0	375.0	526.0	309.0	443.0	453.0	483.0	482.0	451.5
2006	603.0	515.0	503.0	396.0	402.0	317.0	275.0	284.0	276.0	327.0	453.0	424.0	397.9
2007	360.0	297.0	374.0	323.0	235.0	307.0	279.0	329.0	311.0	269.0	243.0	283.0	300.8
2008	248.0	214.0	197.0	219.0	315.0	358.0	290.0	379.0	362.0	453.0	306.0	192.0	294.4
2009	216.0	236.0	185.0	193.0	172.0	181.0	212.0	170.0	146.0	151.0	186.0	184.0	186.0
2010	179.0	223.0	209.0	176.5	171.0	356.0	383.0	233.0	247.0	298.0	441.0	357.0	272.8
2011	328.0	353.0	264.0	272.0	223.0	259.0	257.0	214.0	345.0	338.0	248.0	261.0	280.2
2012	330.0	225.0	147.0	175.0	201.0	303.0	665.0	689.0	455.0	578.0	575.0	538.0	406.8
2013	539.0	427.0	256.0	392.0	312.0	283.0	509.0	681.5	504.9	317.8	316.8	337.0	406.3
2014	427.0	588.0	380.0	327.0	259.0	368.5	442.0	328.2	394.5	291.0	378.2	628.0	401.0
2015	394.0	784.0	921.0	520.0	438.0	209.0	281.0	408.0	539.0	483.0	434.0	490.0	491.8
2016	549.0	683.0	632.0	347.0	376.0	406.0	465.0	414.0	412.0	433.0	677.6	522.0	493.1
2017	721.0	763.0	636.0	516.5	405.0	334.0	771.0	538.0	444.0	506.0	381.0	435.0	537.5
Average	**443.8**	**455.5**	**436.9**	**401.1**	**362.3**	**378.7**	**445.1**	**446.4**	**441.1**	**429.9**	**438.9**	**433.3**	**426.1**

FIGURES

Figure 1. Alberni Inlet and Barkley Sound, west coast of Vancouver Island.

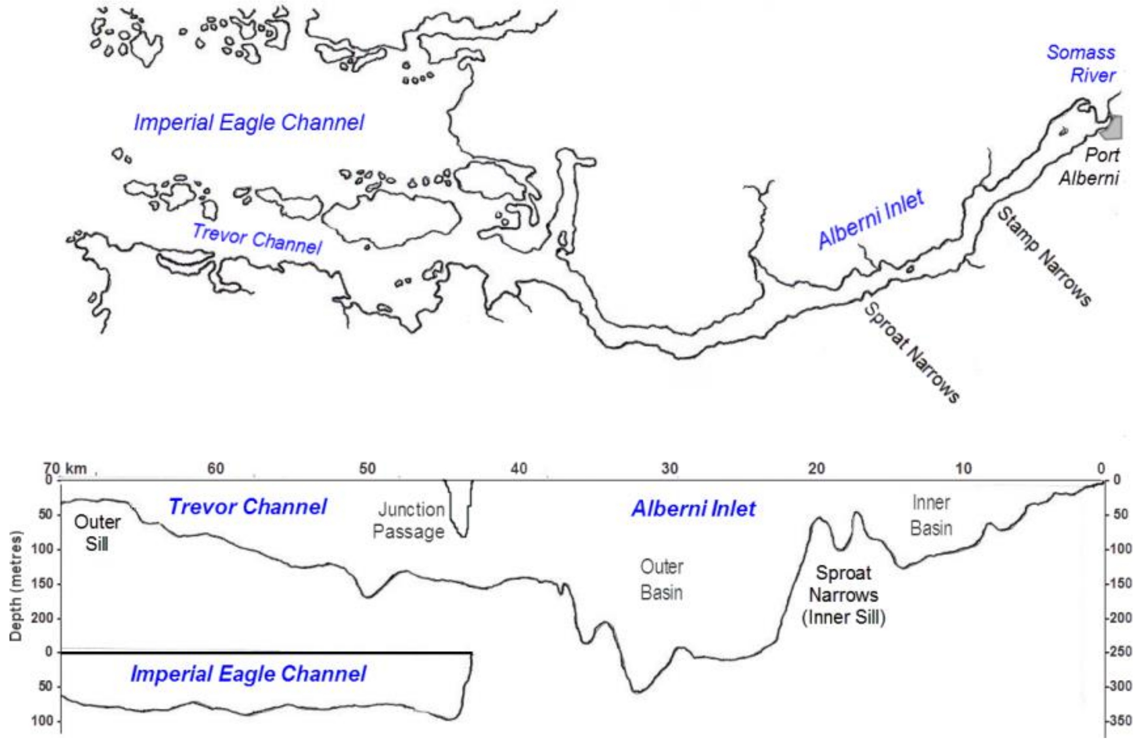


Figure 2. Elevation of Alberni Inlet and outlet channels (adapted from Tully (1949)).

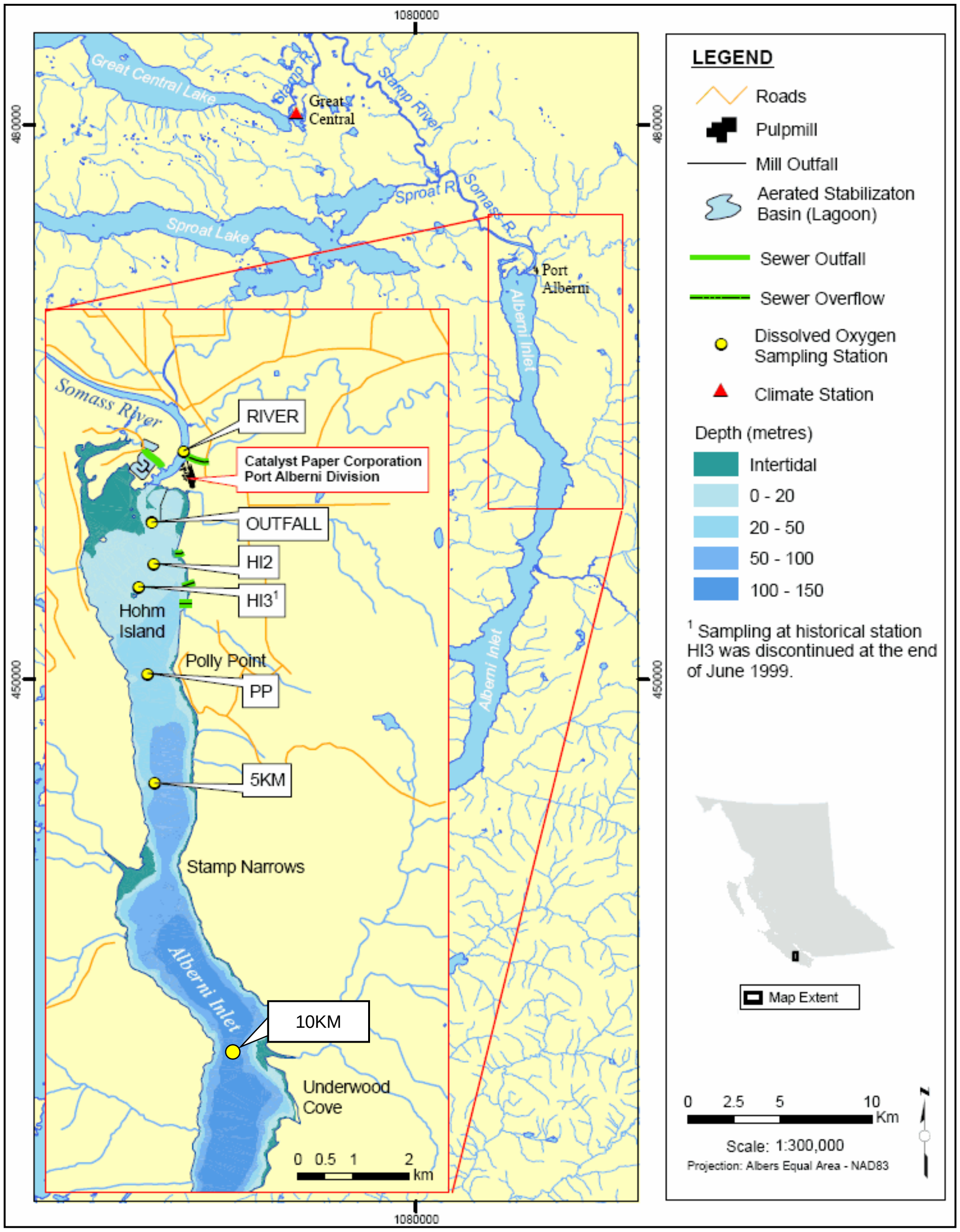


Figure 3. Upper Alberni Inlet CTD survey stations for the DISSOLVED OXYGEN MONITORING PROGRAM (adapted from Hatfield 2018, with permission).

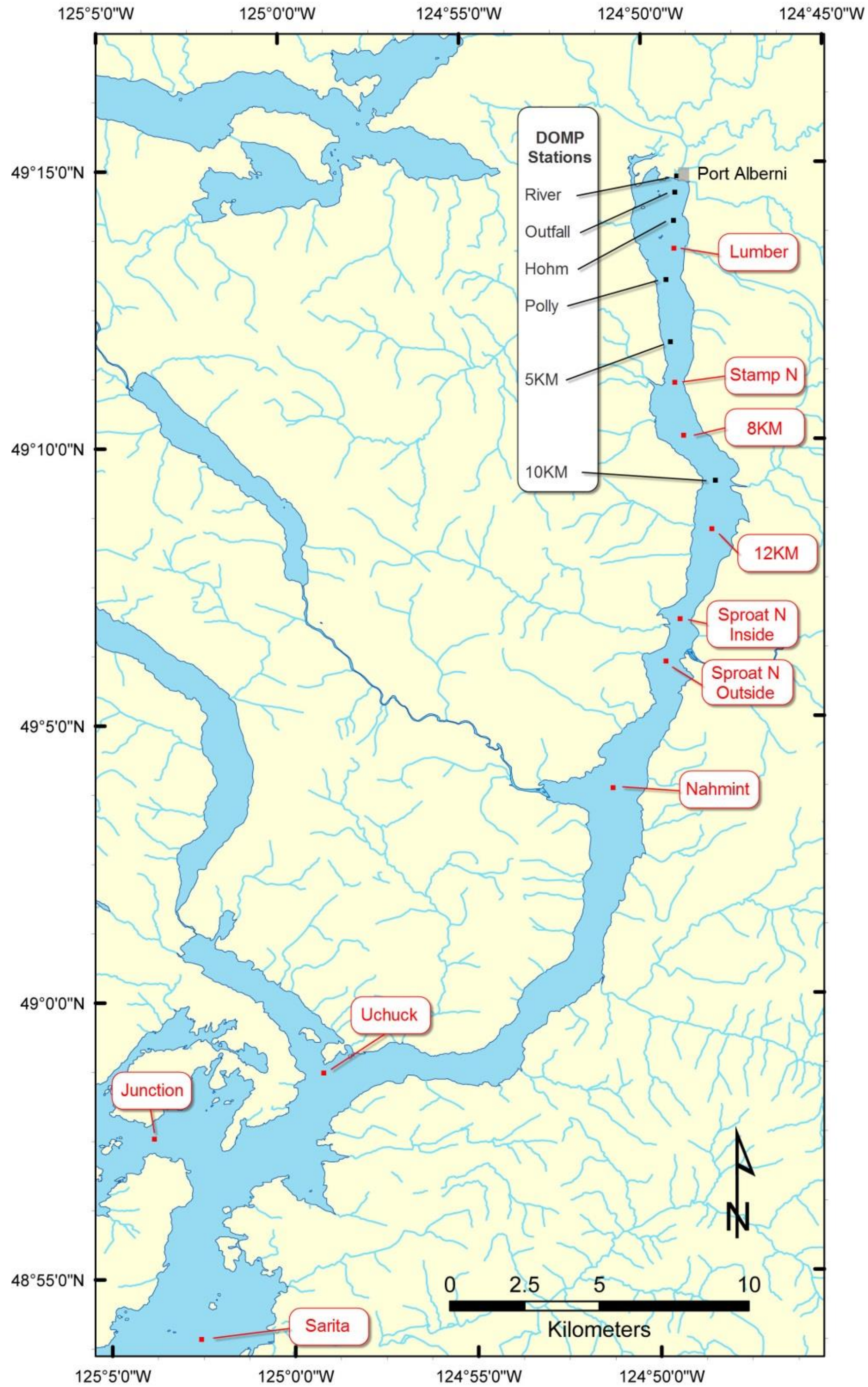


Figure 4. CTD survey locations, including standard stations for the paper mill's DISSOLVED OXYGEN MONITORING PROGRAM (DOMP 1990-2017; black dots), and approximate locations for CTD stations associated with miscellaneous project sites (1939-1990, red dots).

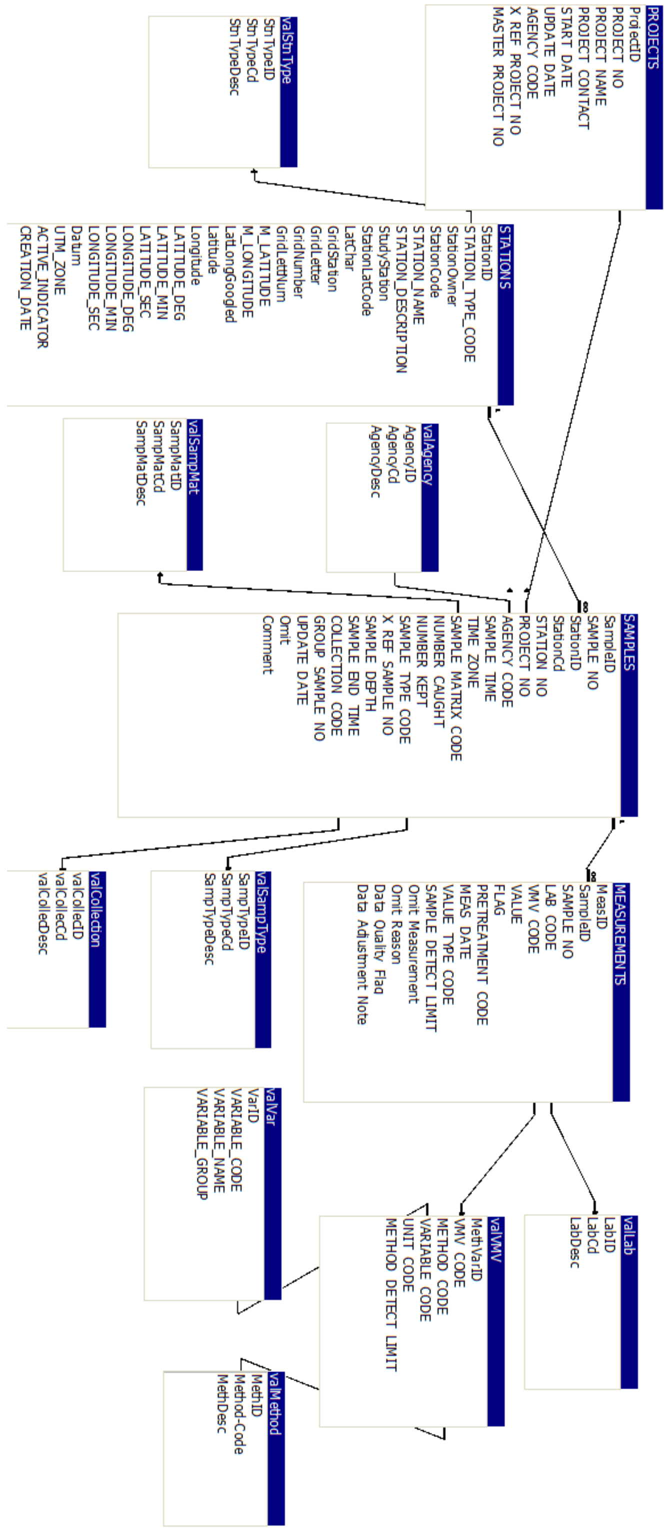


Figure 5. Relationship diagram for the ALBERNI INLET PHYSICAL-CHEMICAL WATER PROPERTIES database.

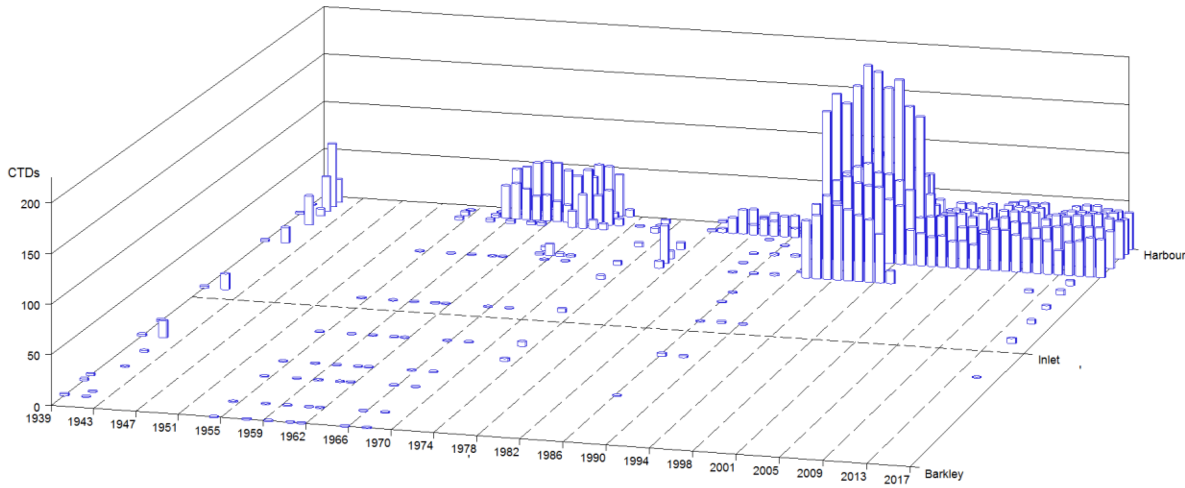


Figure 6. Frequency of CTD samples in the ALBERNI INLET PHYSICAL-CHEMICAL WATER PROPERTIES Database, by year and station, ordered from ocean shelf (Barkley) to upper inlet (Harbour). (See also Figure 7 for comparison.)

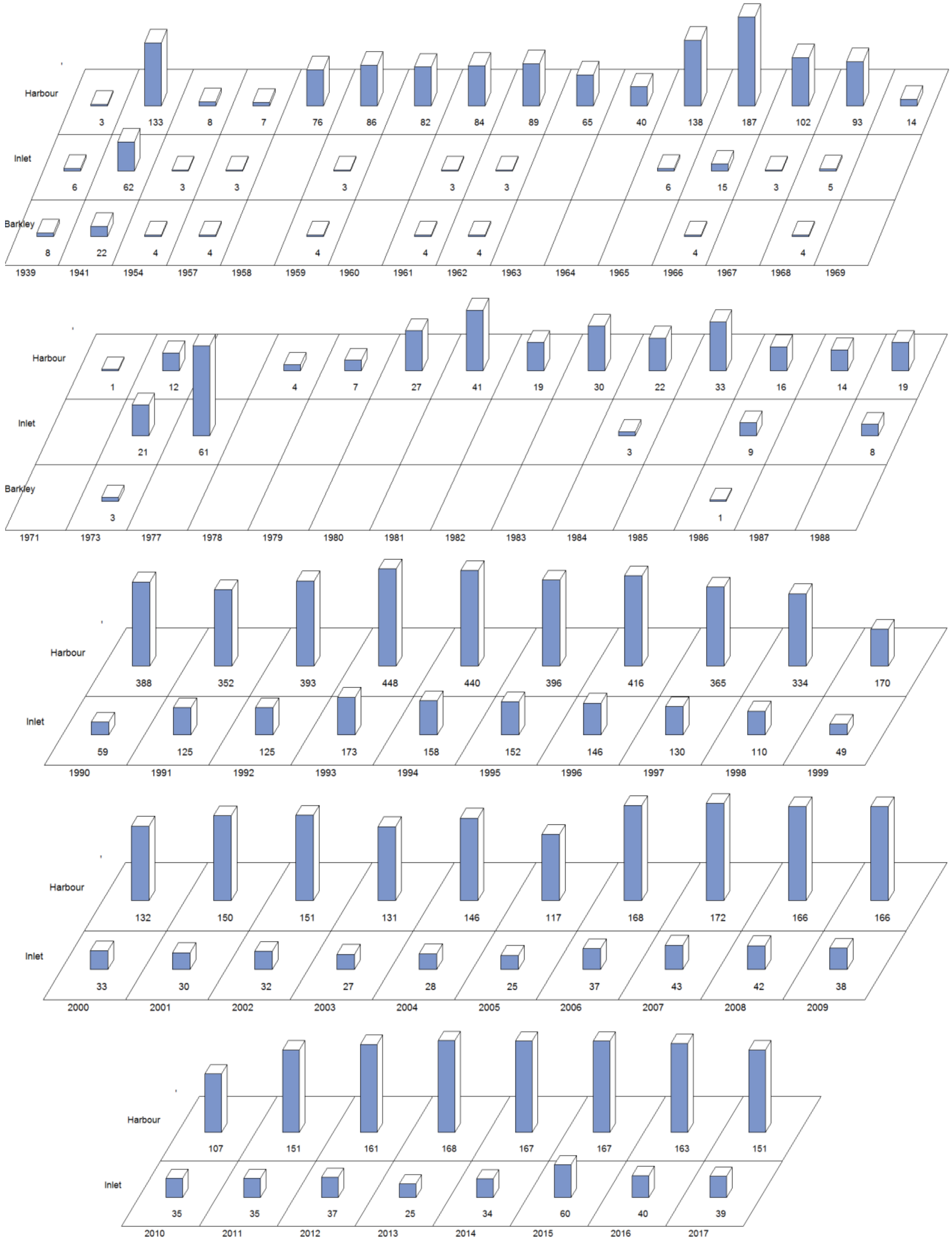


Figure 7. Frequency of CTD samples in the ALBERNI INLET PHYSICAL-CHEMICAL WATER PROPERTIES Database, by year and general location.

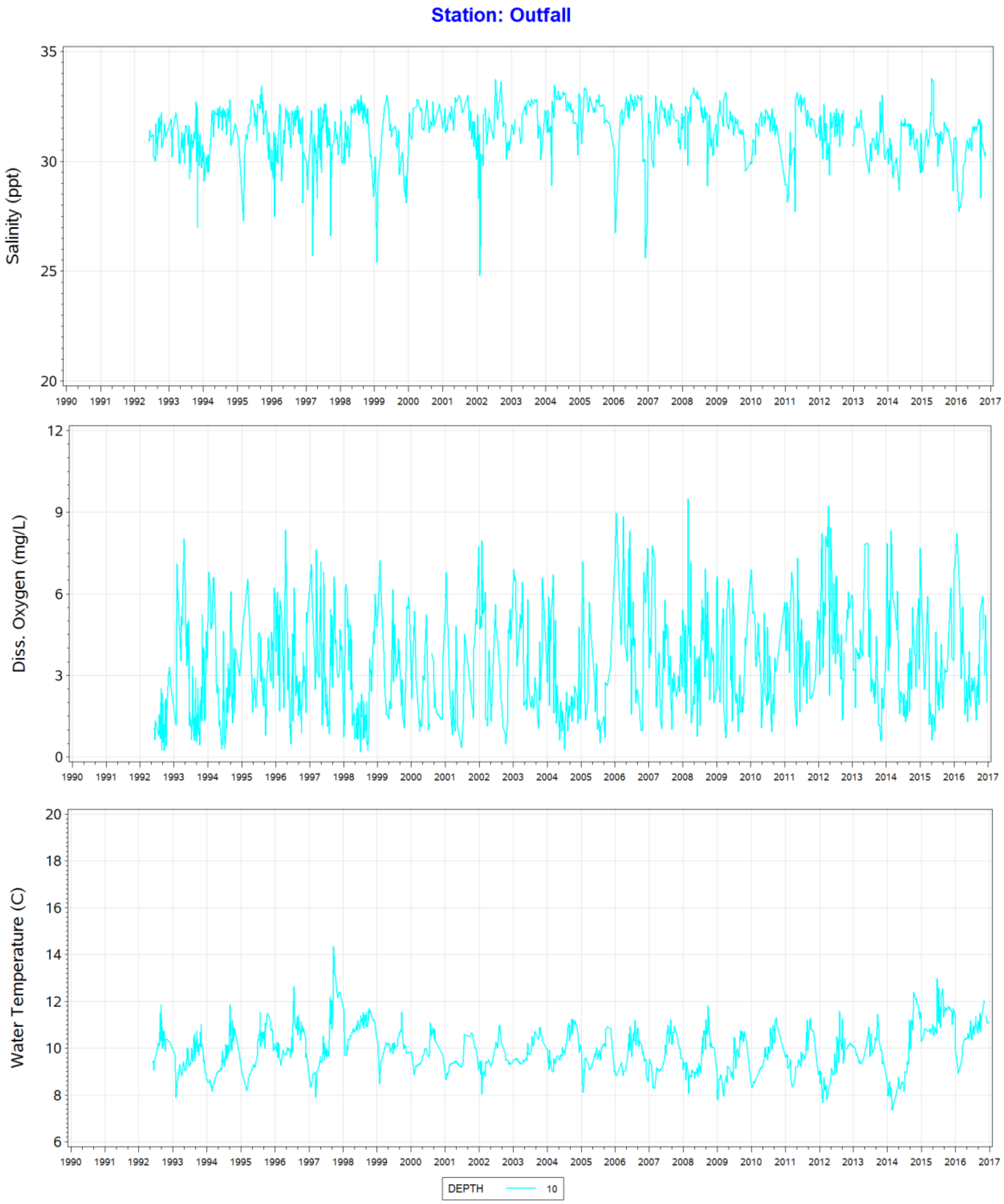


Figure 8. Salinity (top), DO (middle) and Temperature (bottom) at depth at Outfall Station, 1990-2017.

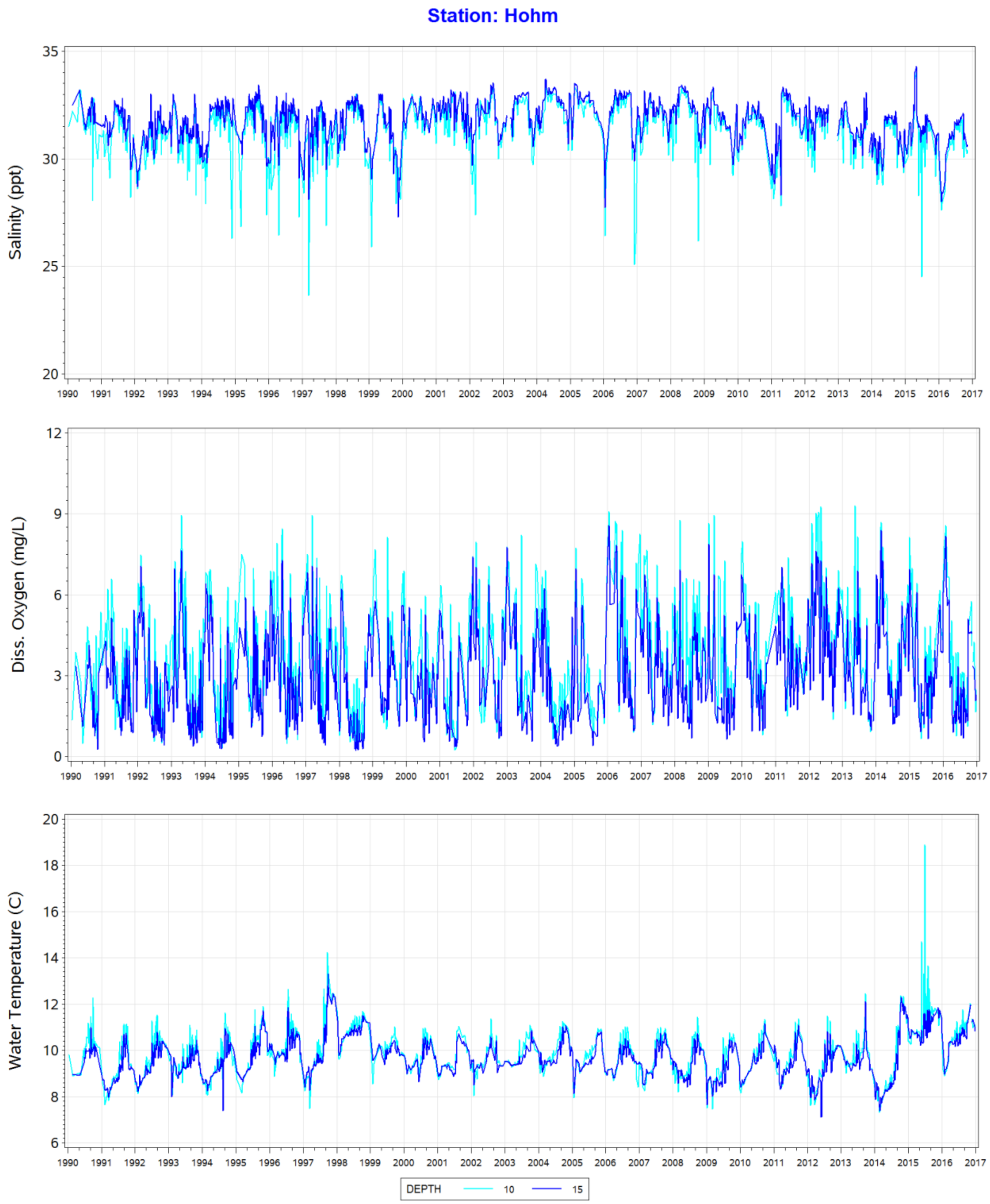


Figure 9. Salinity (top), DO (middle) and Temperature (bottom) at depth at Hohm Station (stations HI-2 and HI-3, combined), 1990-2017.

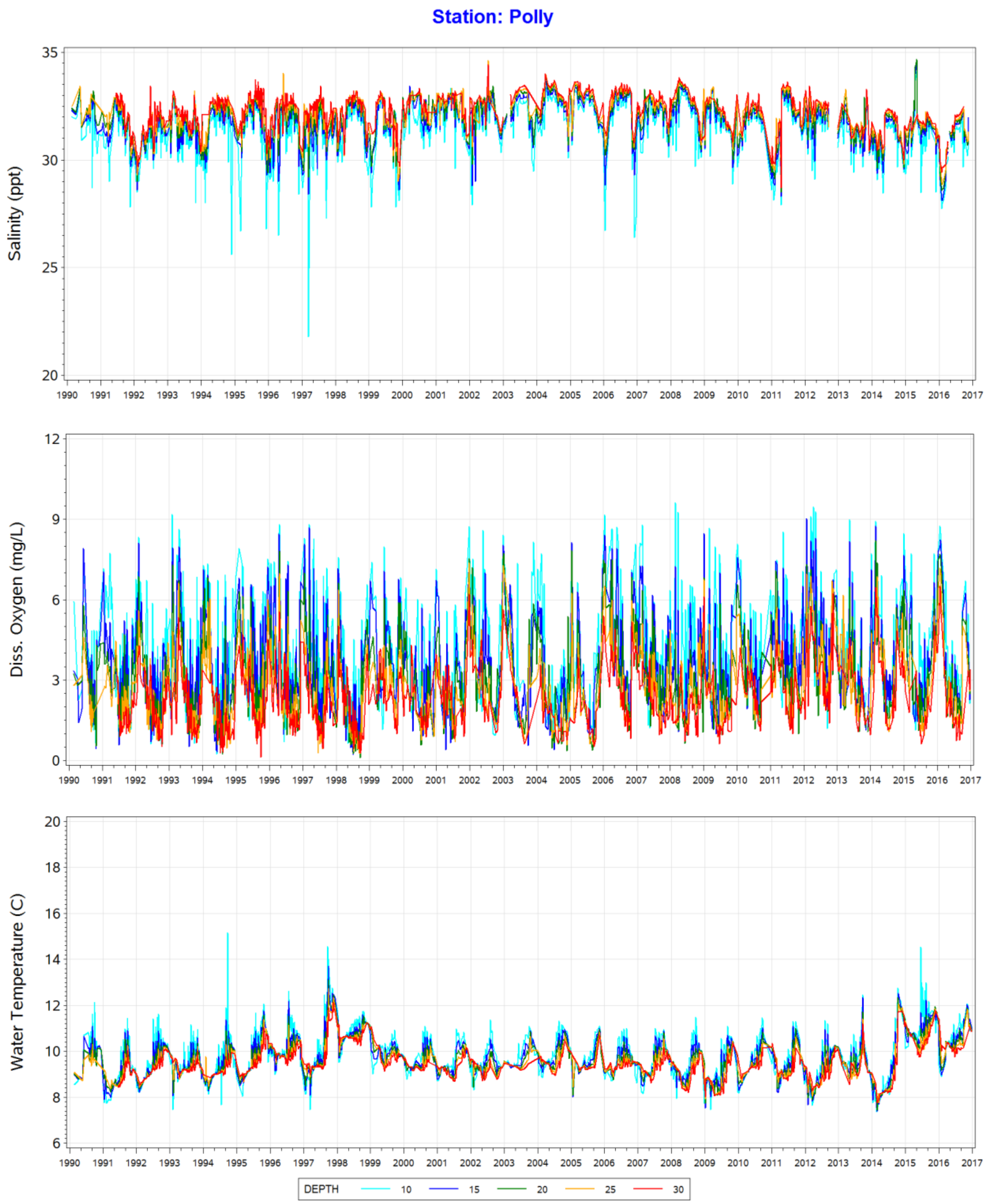


Figure 10. Salinity (top), DO (middle) and Temperature (bottom) at depth at Polly Point (PP-2) Station, 1990-2017.

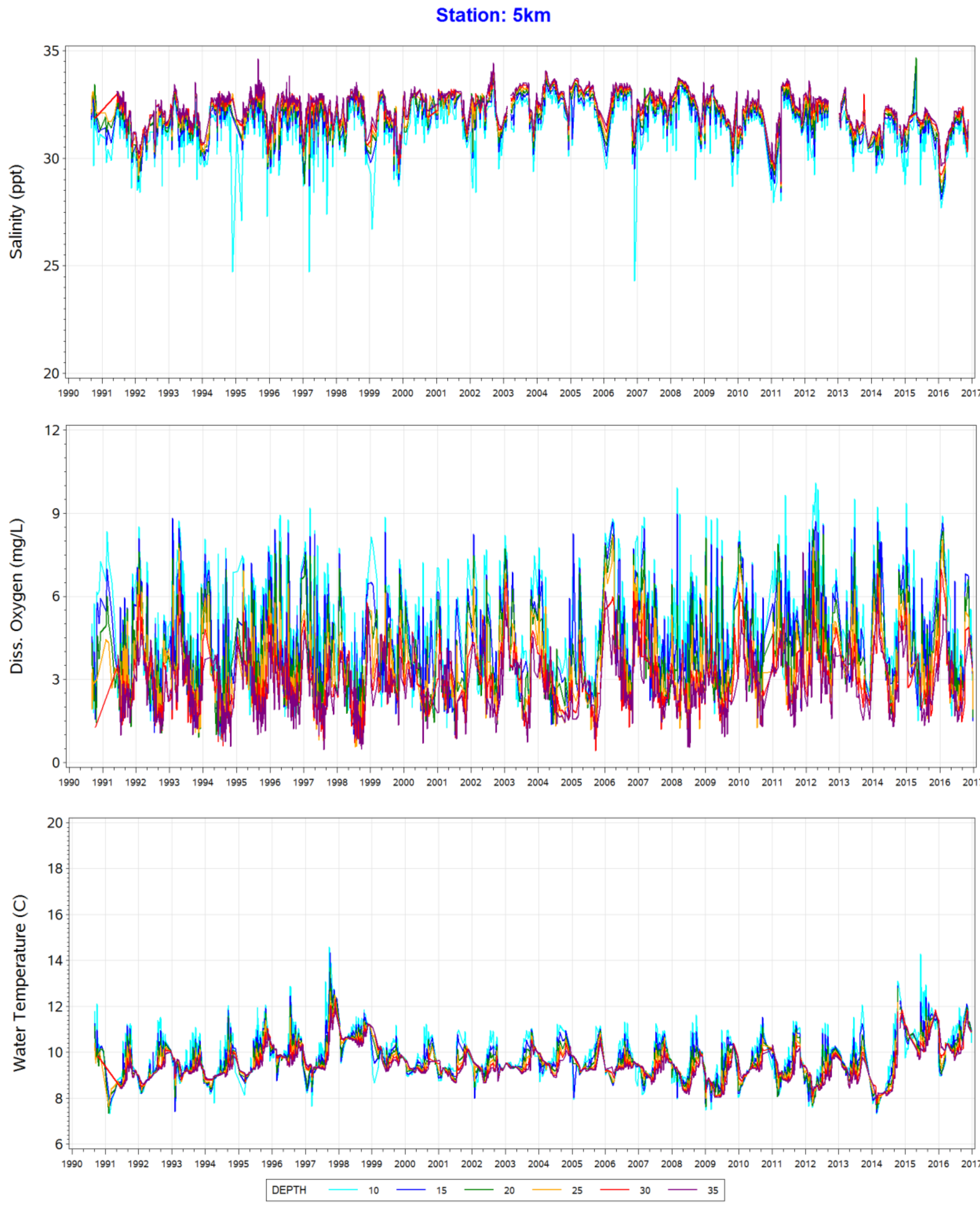


Figure 11. Salinity (top), DO (middle) and Temperature (bottom) at depth at 5KM Station, 1990-2017.

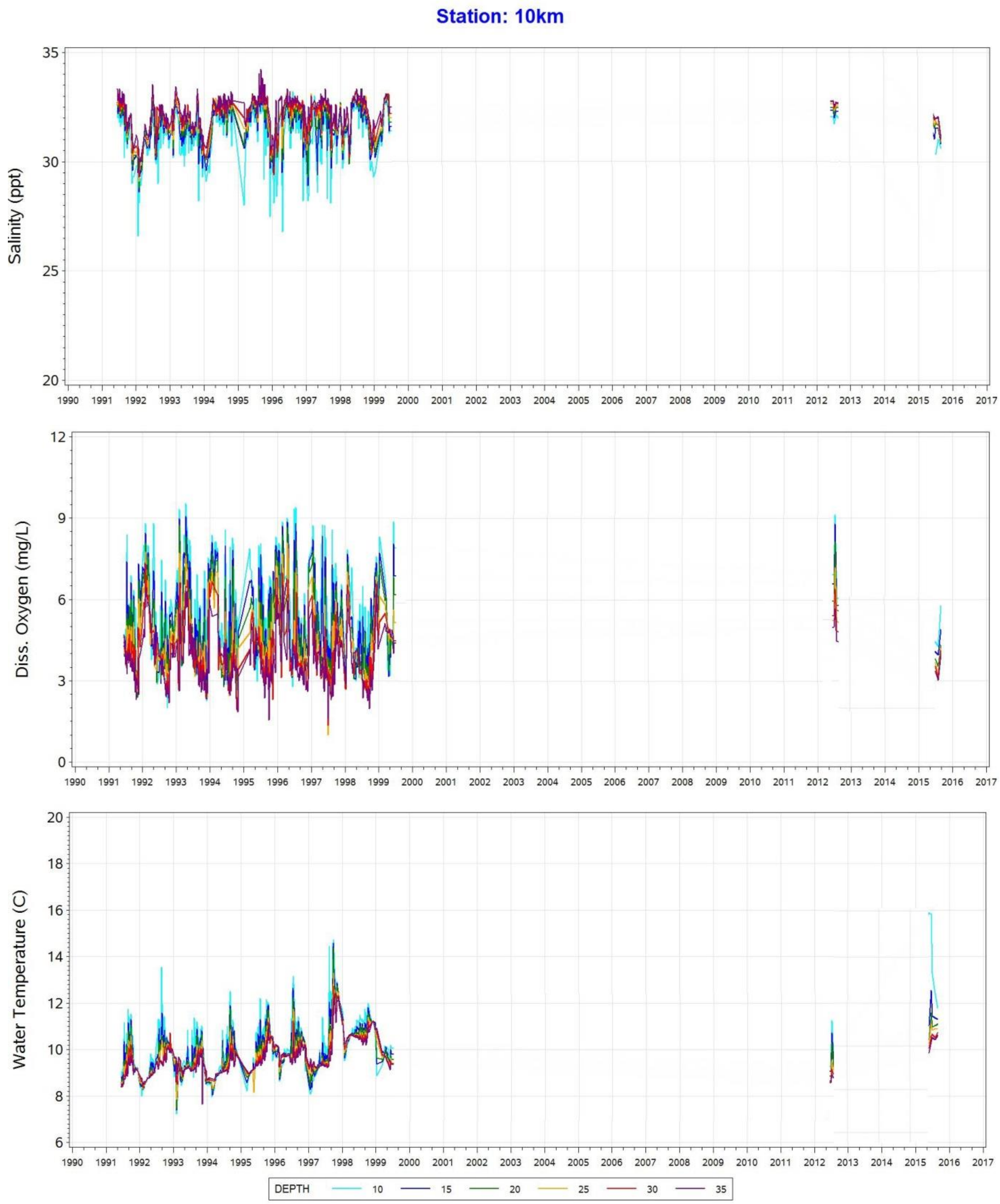


Figure 12. Salinity (top), DO (middle) and Temperature (bottom) at depth at 10KM Station, 1990-1999, 2012, 2015.

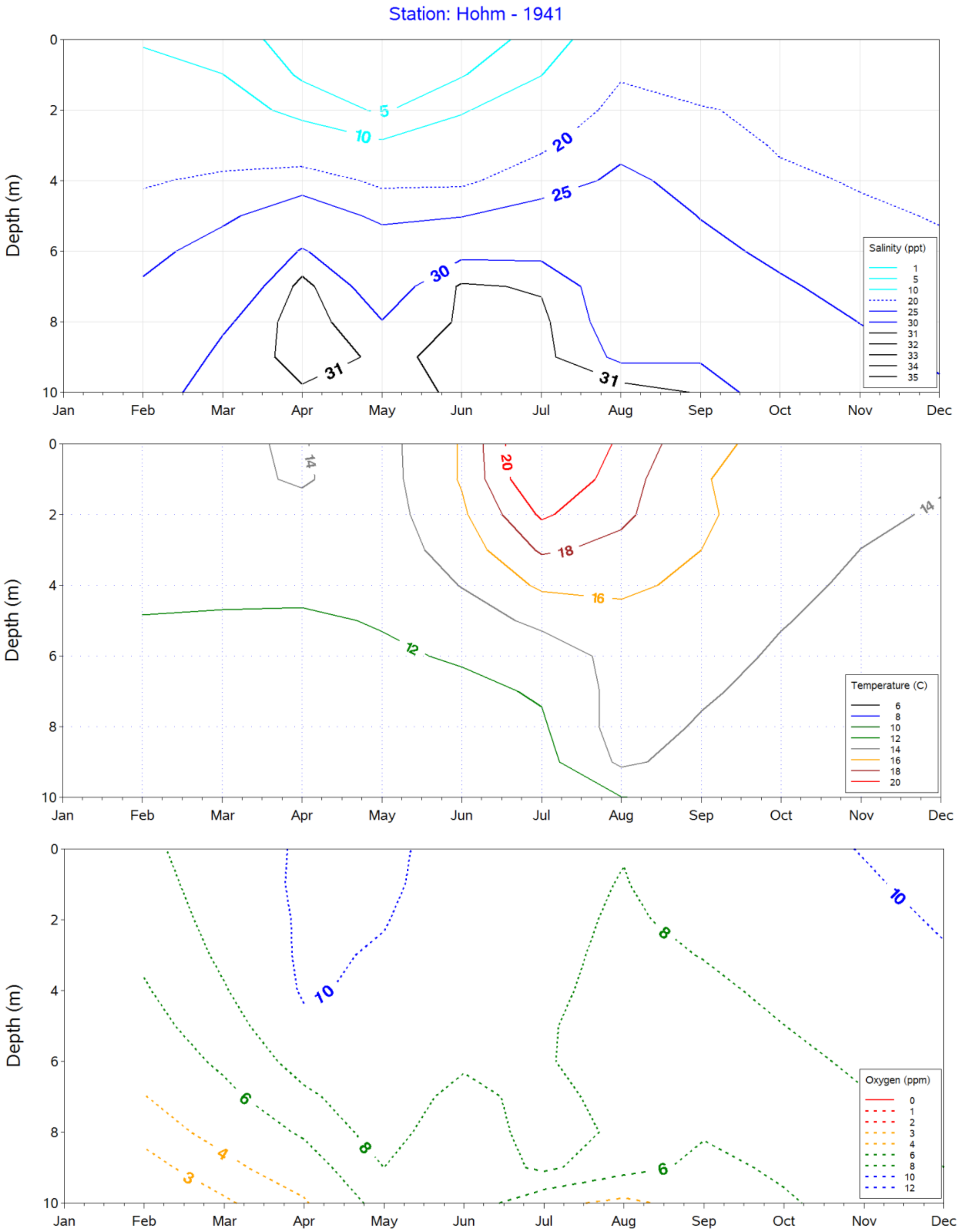
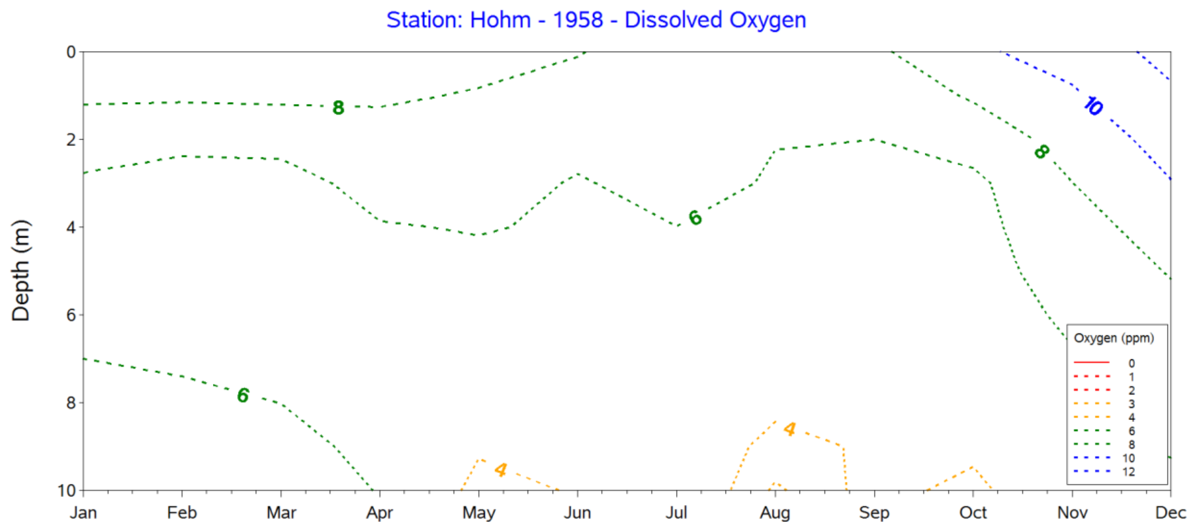


Figure 13. Hohm Station, 1941. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.



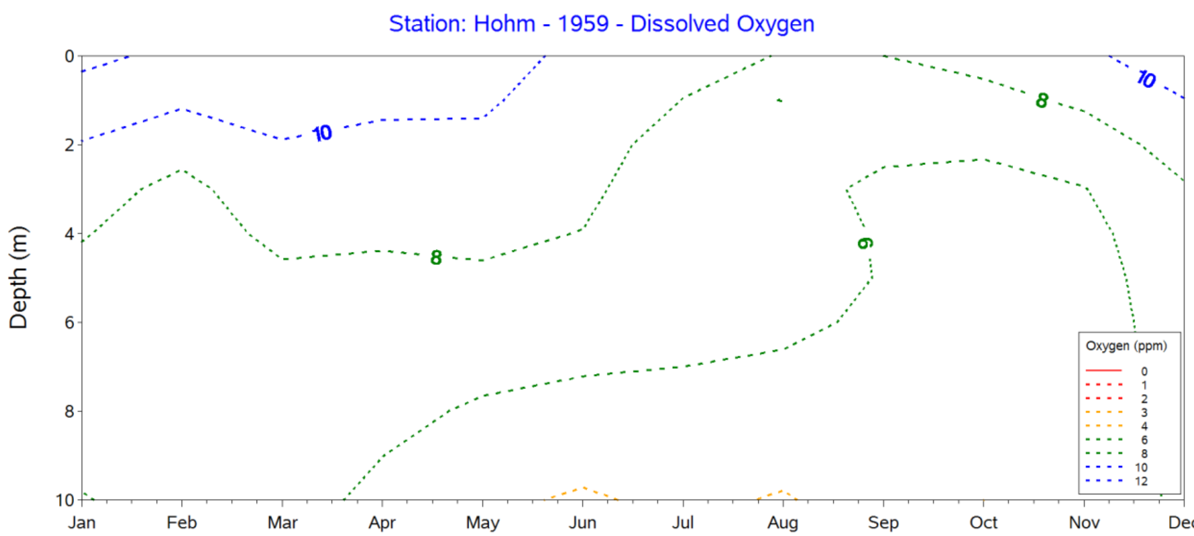


Figure 14. Annual flux in Dissolved Oxygen in 1958 (top) and 1959 (bottom) at depth at Hohm Station. (No temperature or salinity data available.)

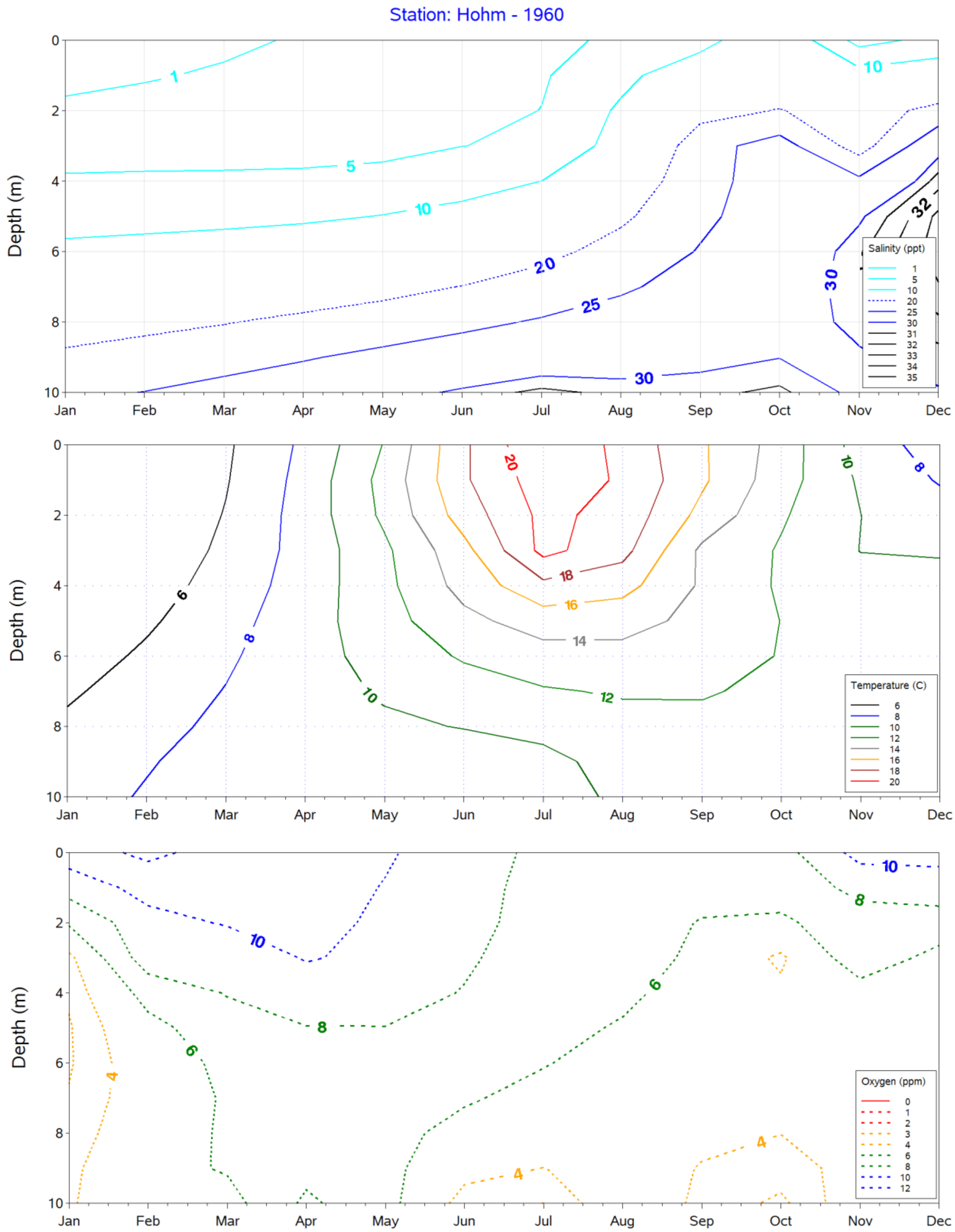


Figure 15. Hohm Station, 1960. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

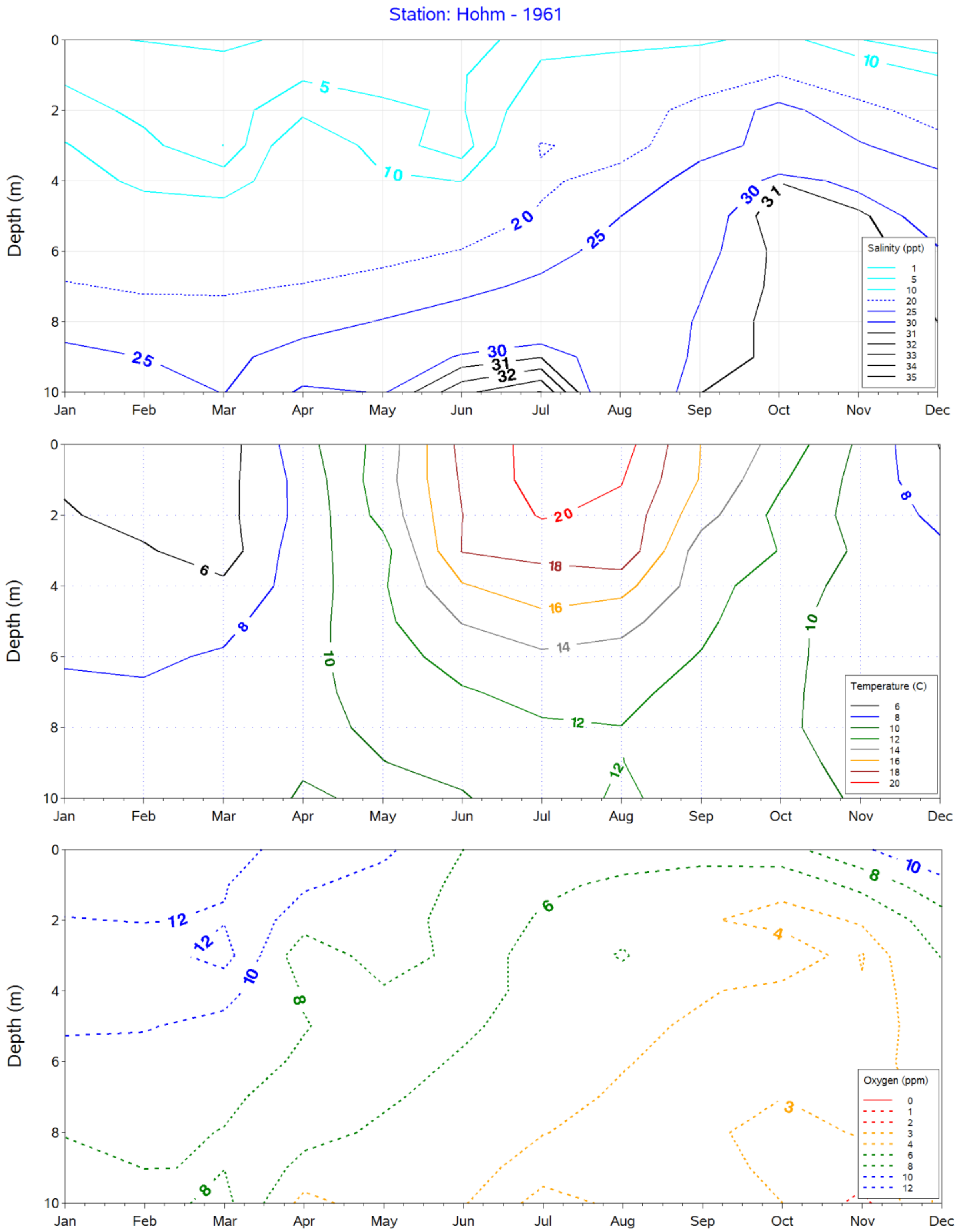


Figure 16. Hohm Station, 1961. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

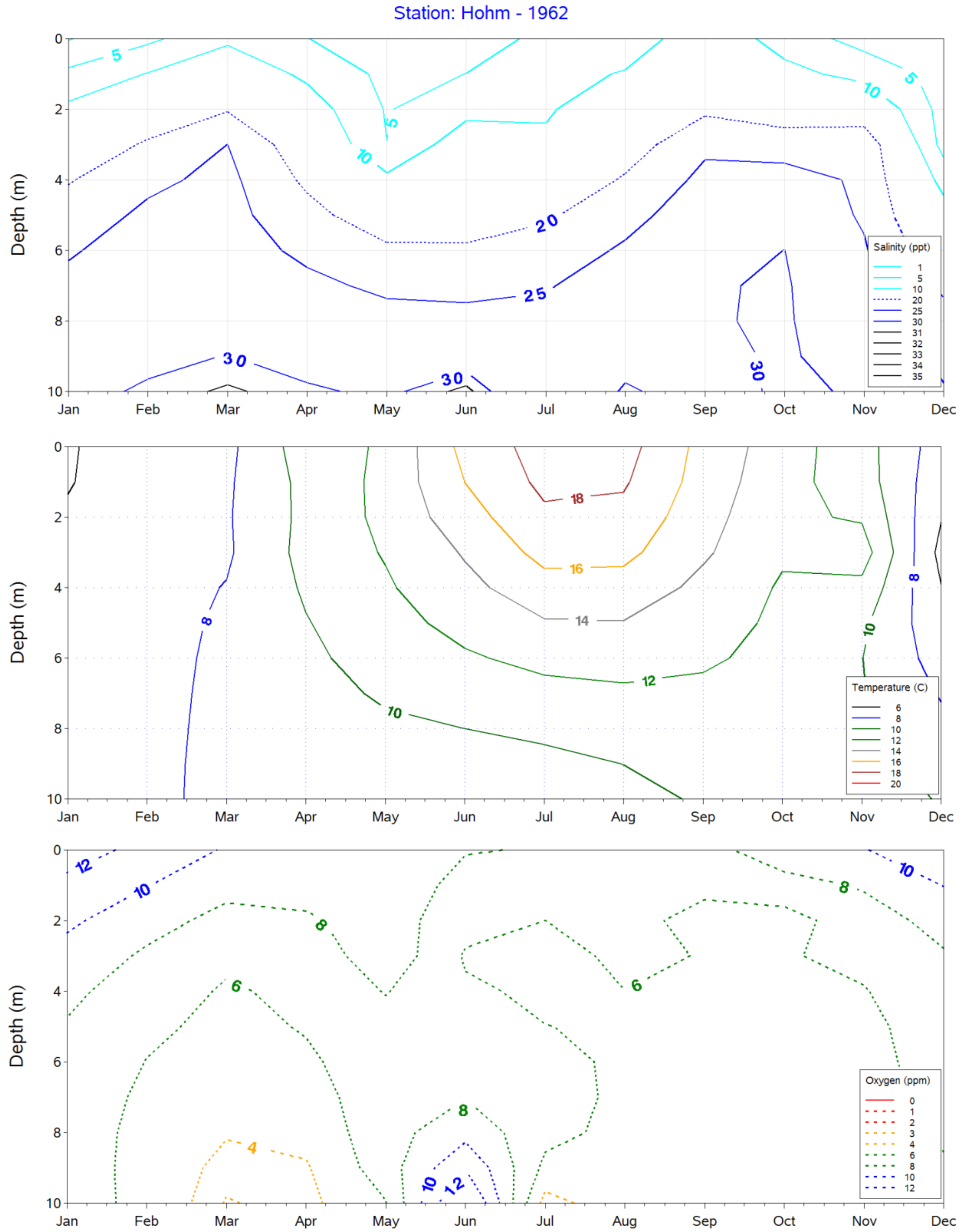


Figure 17. Hohm Station, 1962. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

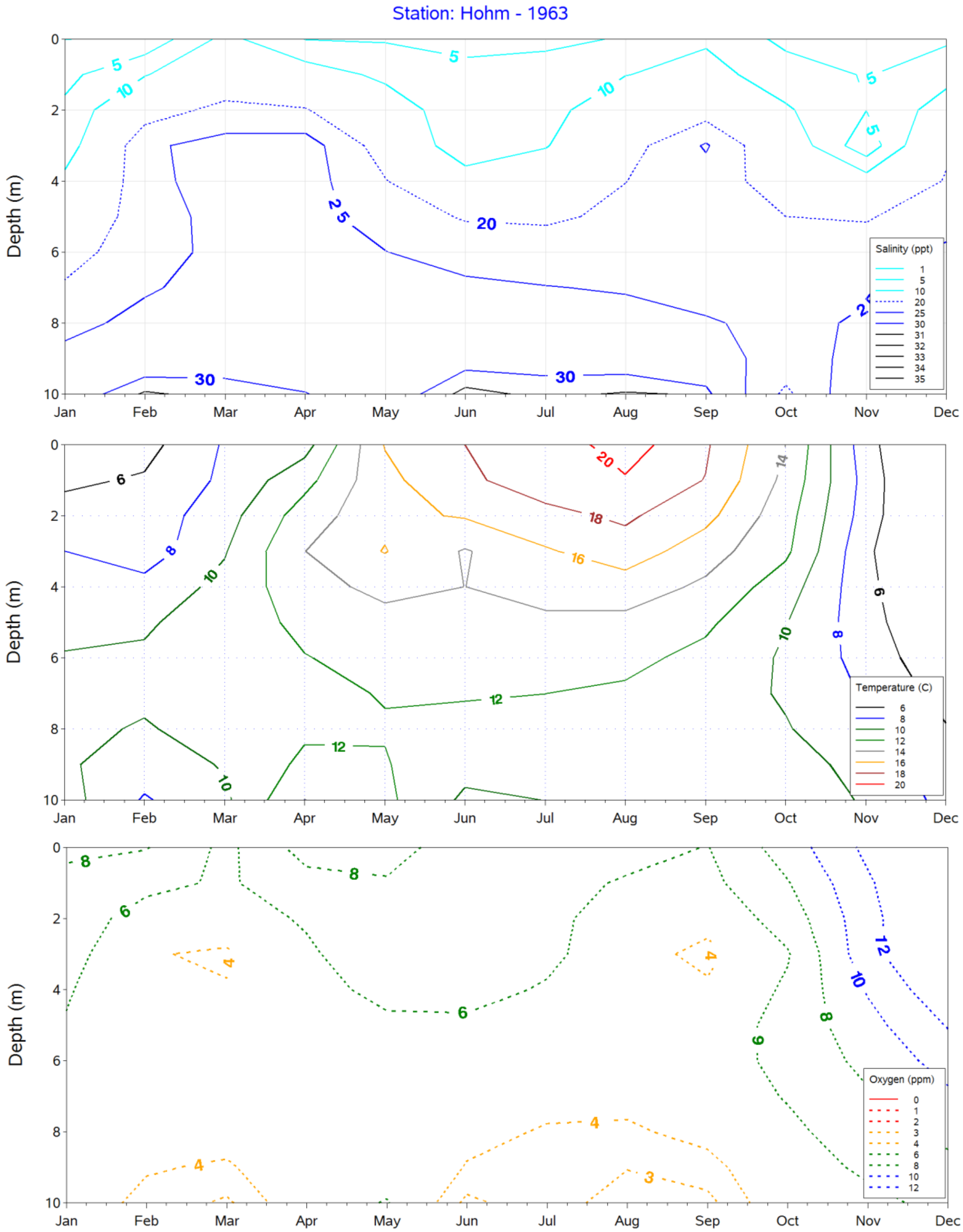


Figure 18. Hohm Station, 1963. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

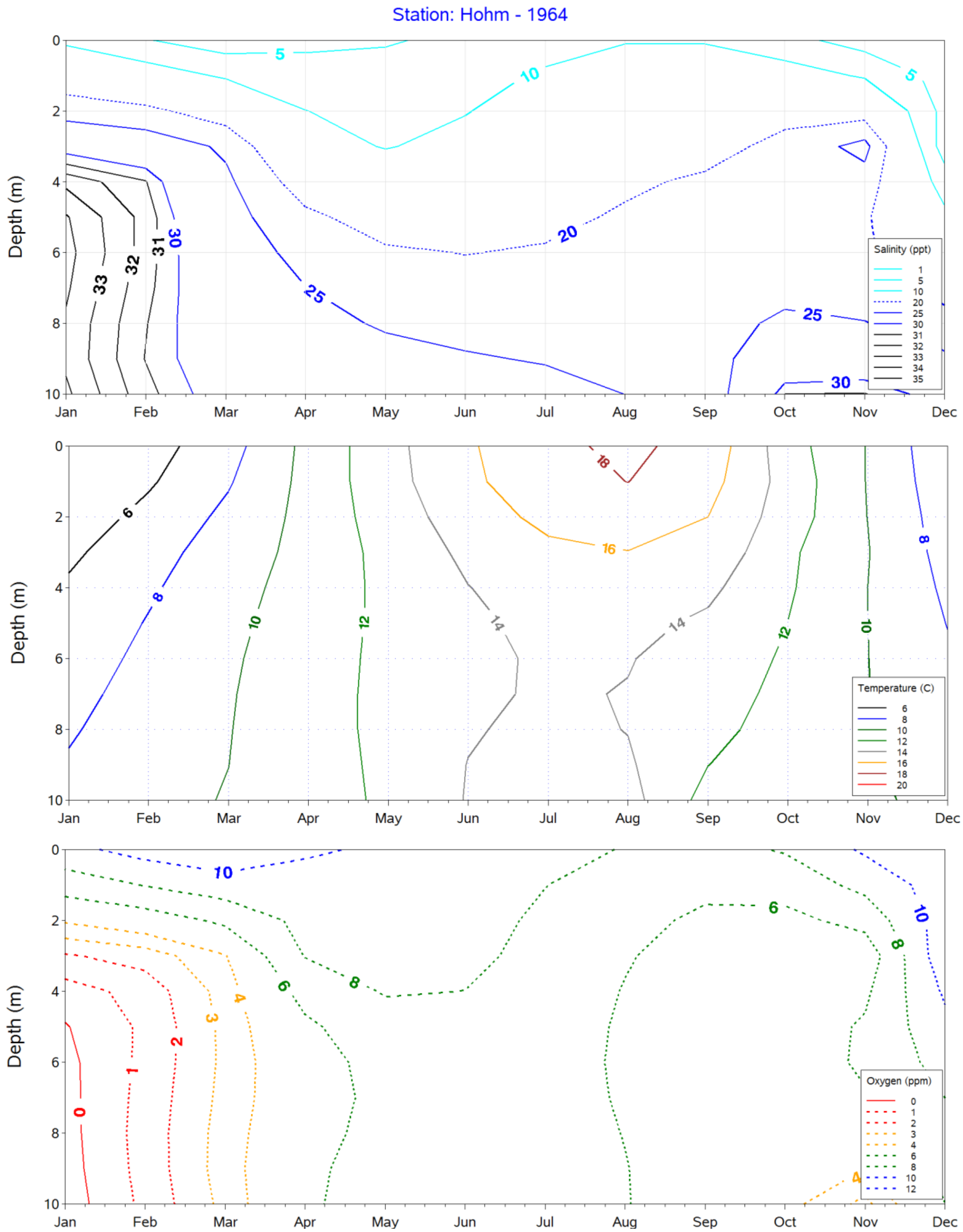


Figure 19. Hohm Station, 1964. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

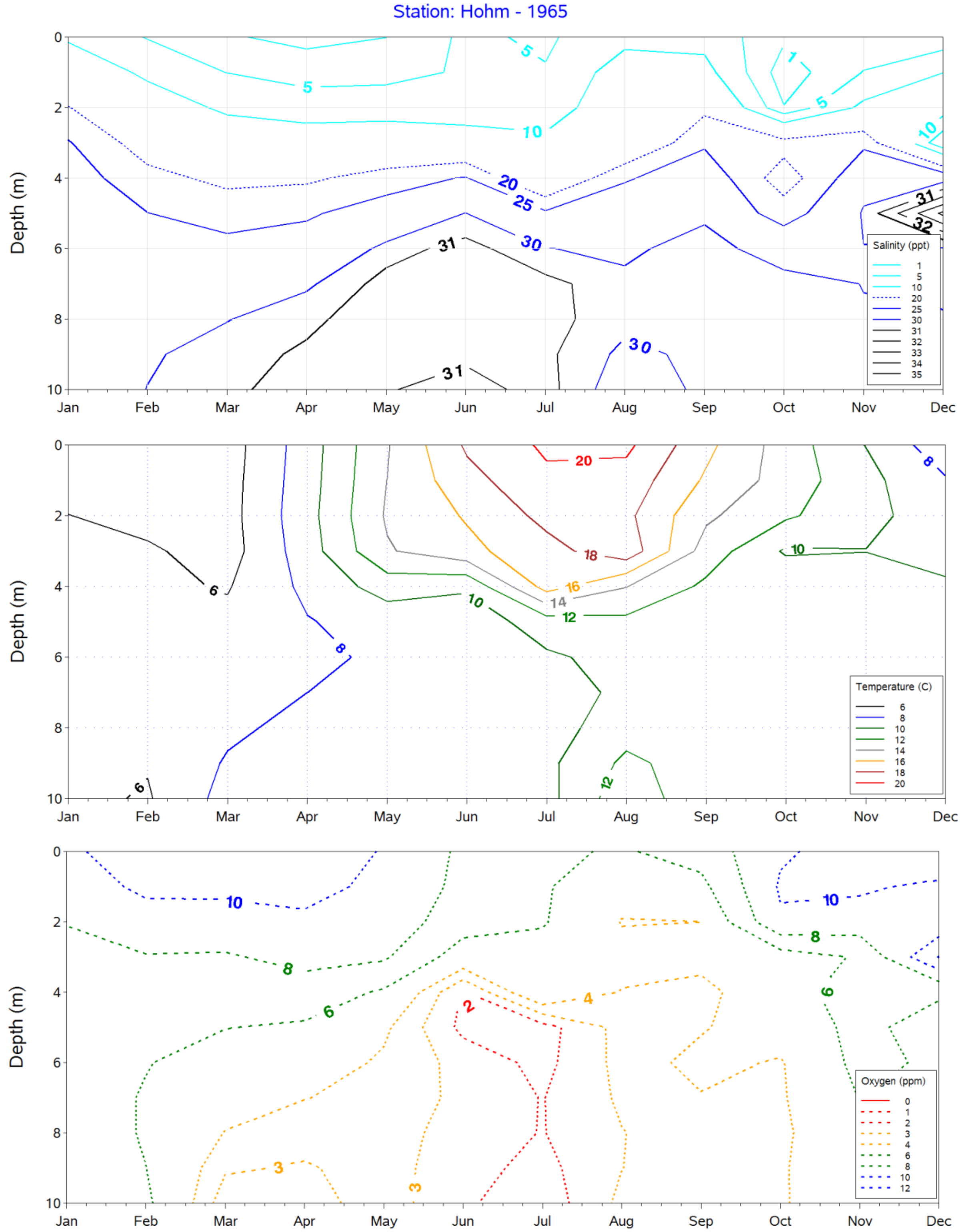


Figure 20. Hohm Station, 1965. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

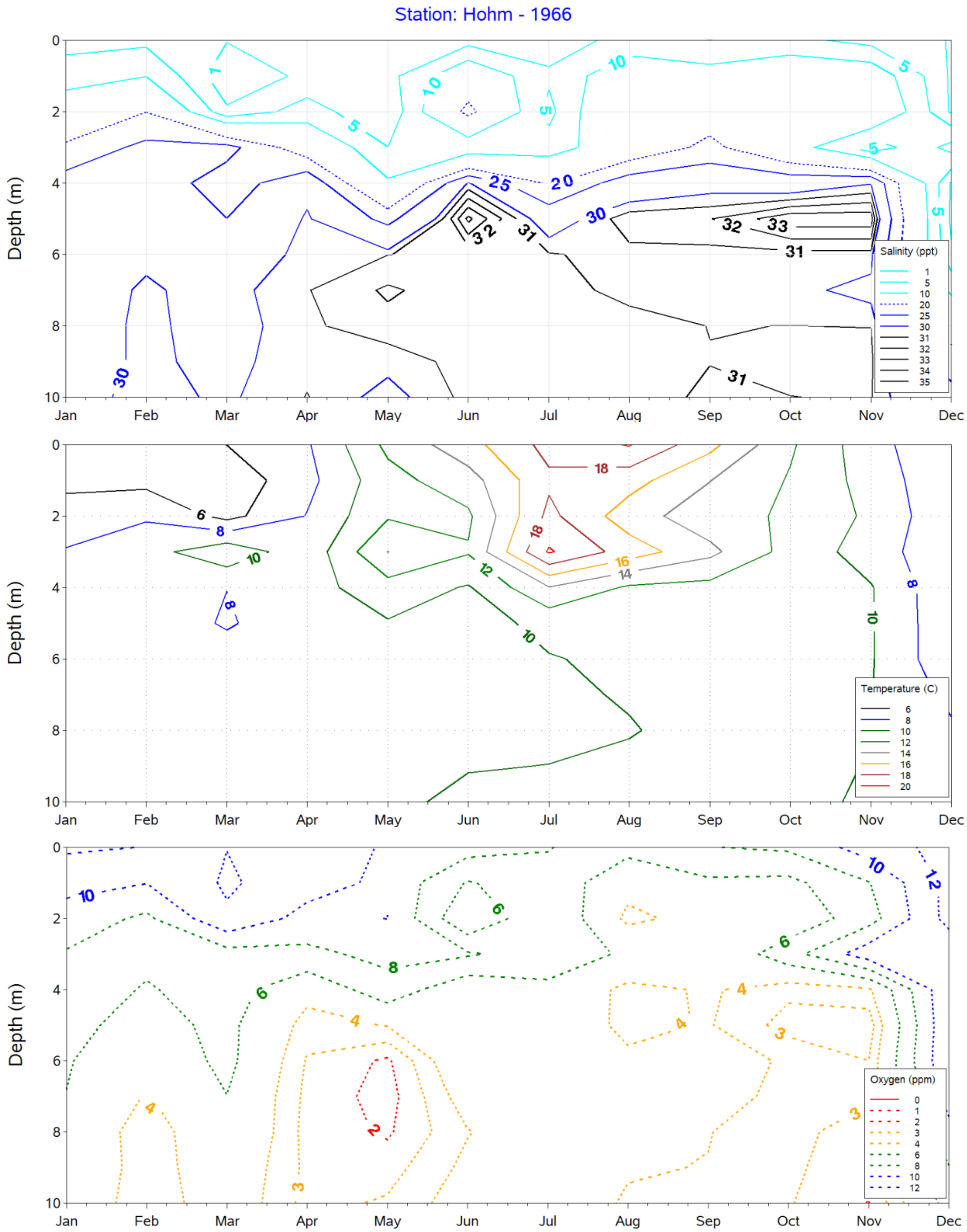


Figure 21. Hohm Station, 1966. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

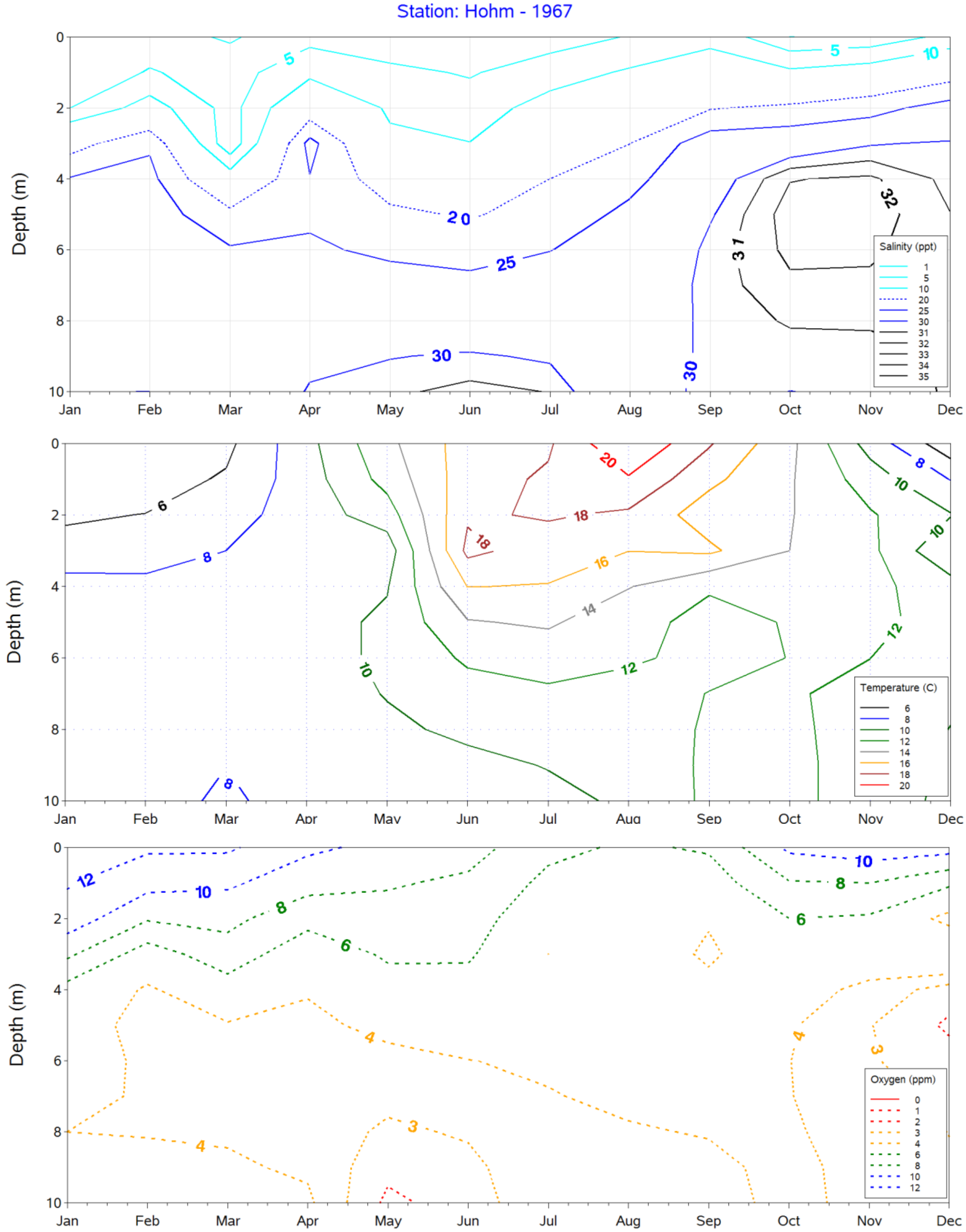


Figure 22. Hohm Station, 1967. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

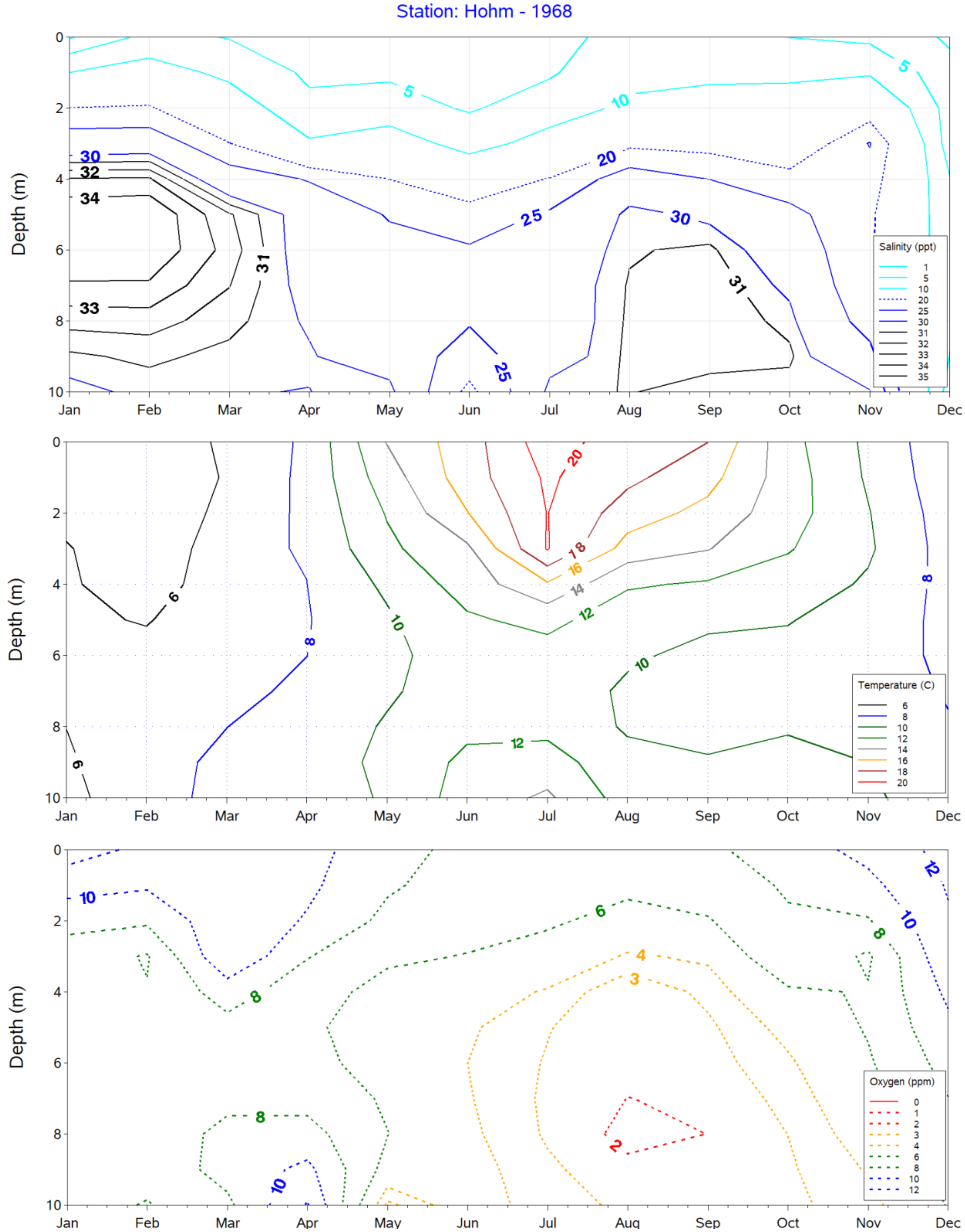


Figure 23. Hohm Station, 1968. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

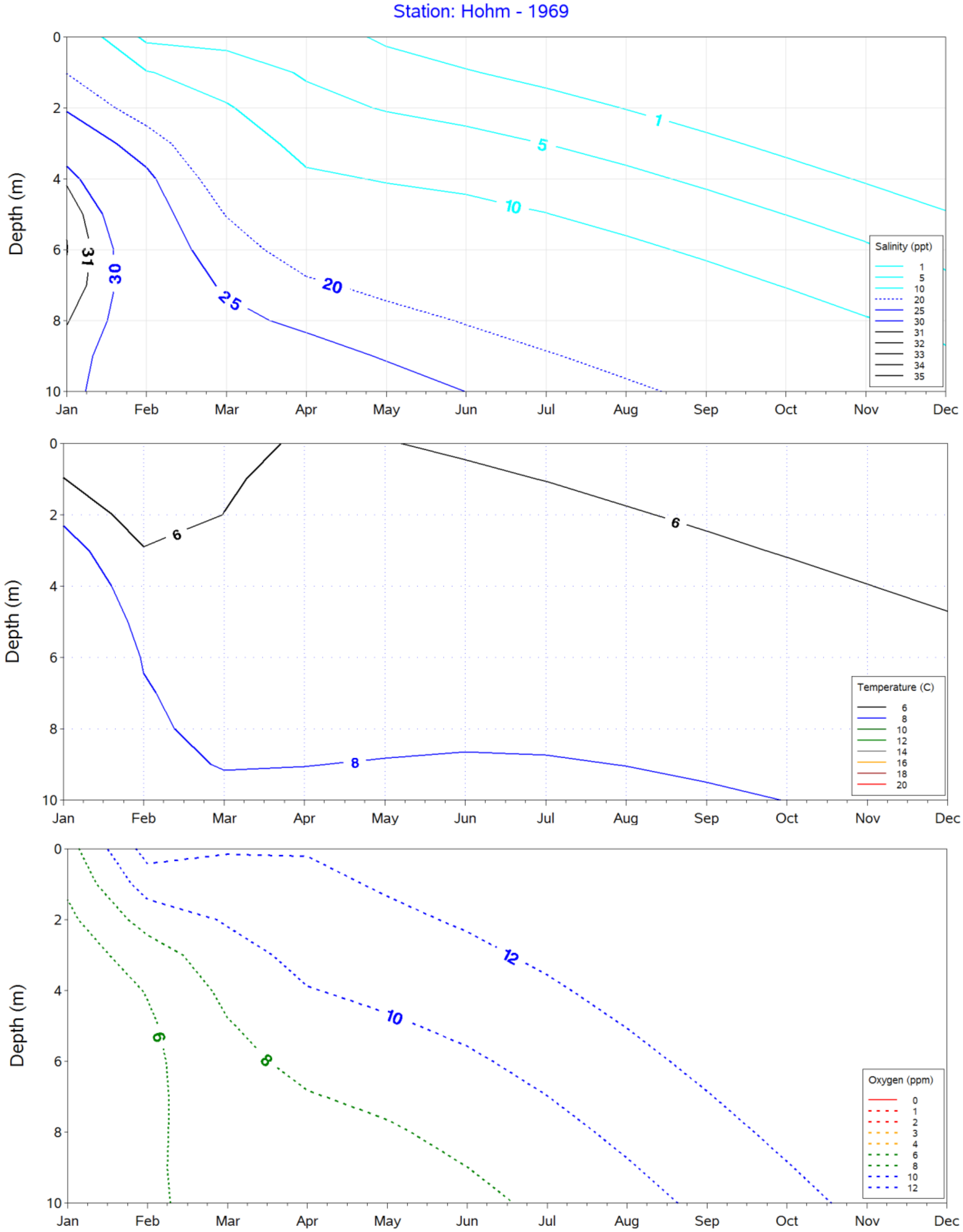


Figure 24. Hohm Station, 1969. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

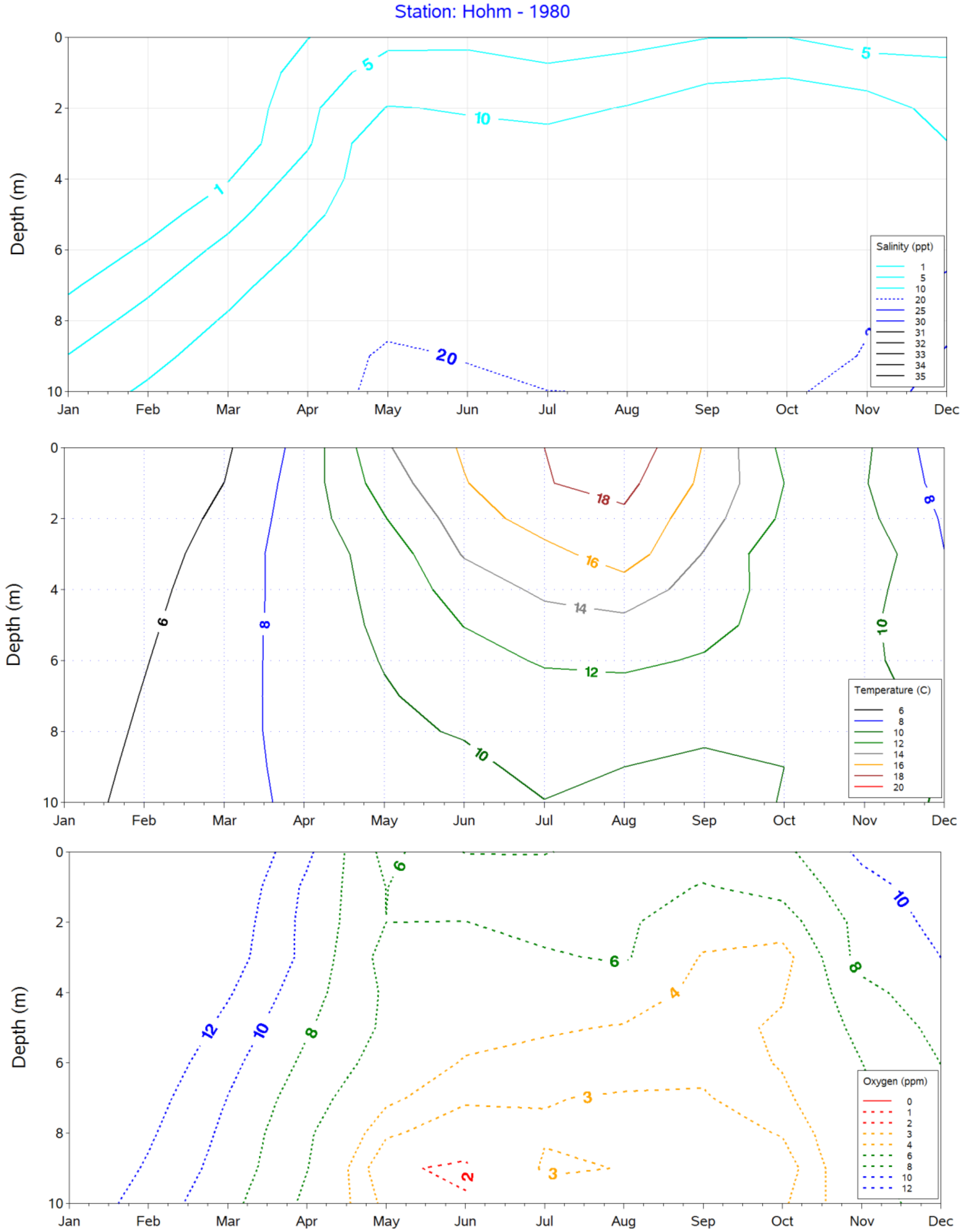


Figure 25. Hohm Station, 1980. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

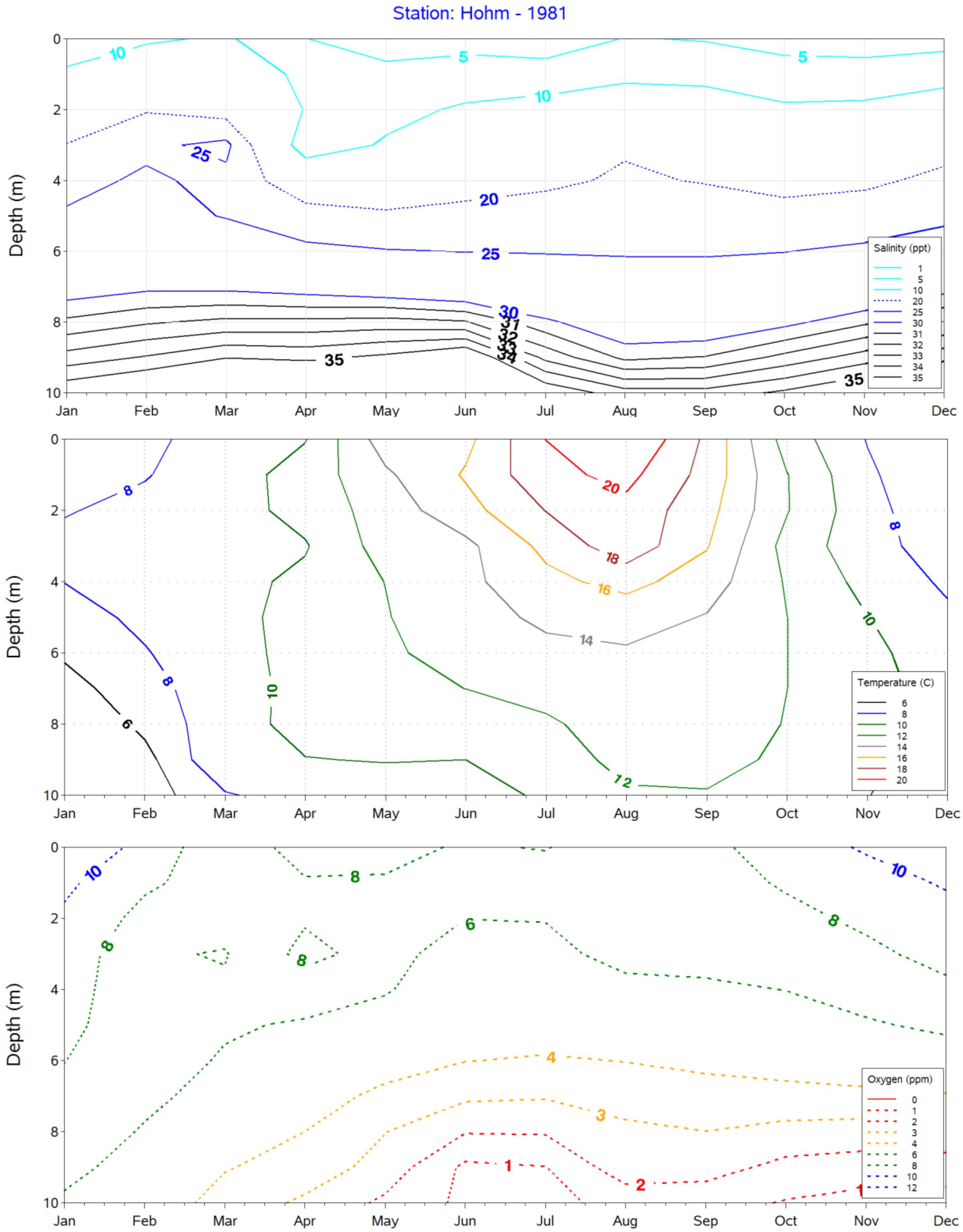


Figure 26. Hohm Station, 1981. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

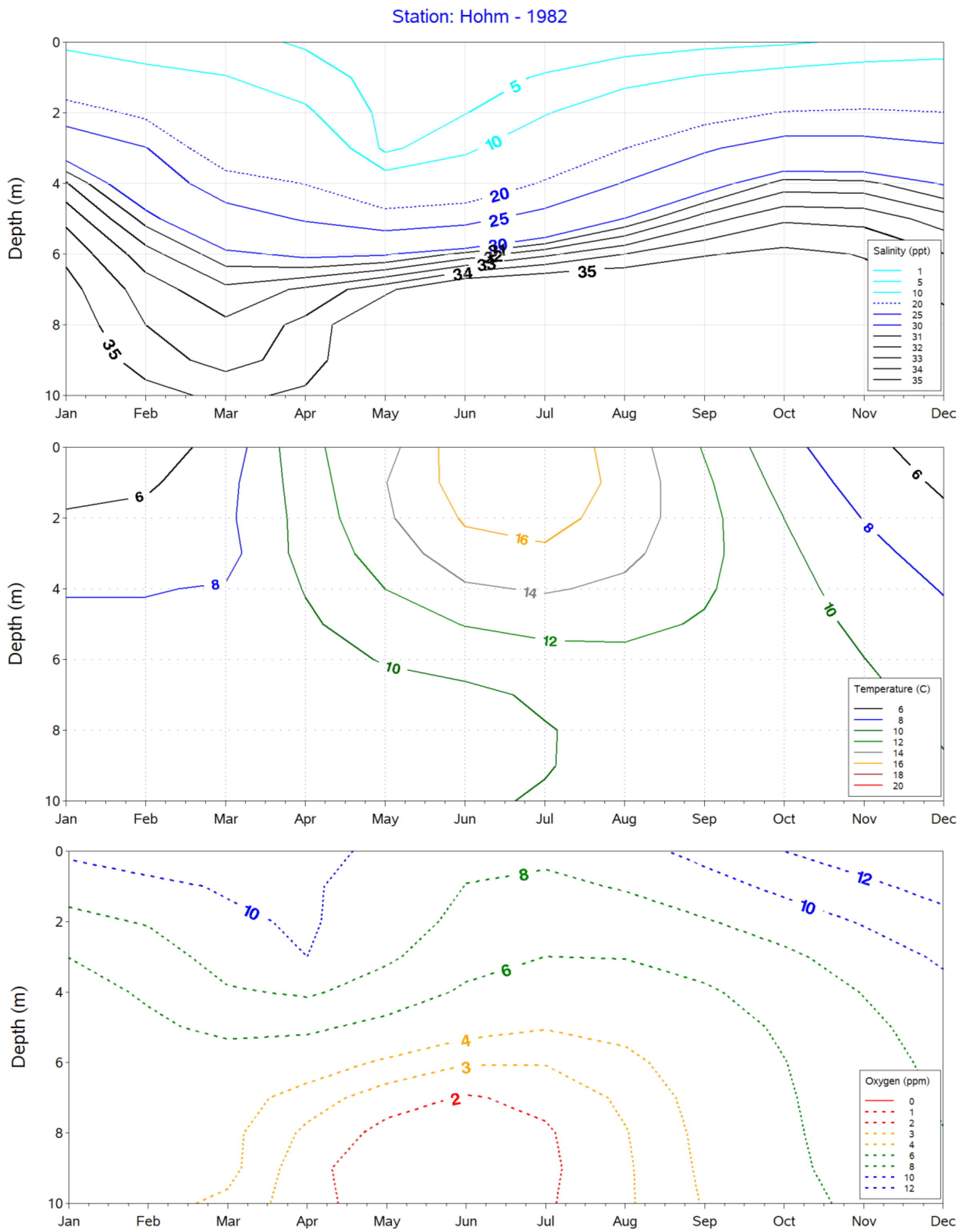


Figure 27. Hohm Station, 1982. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

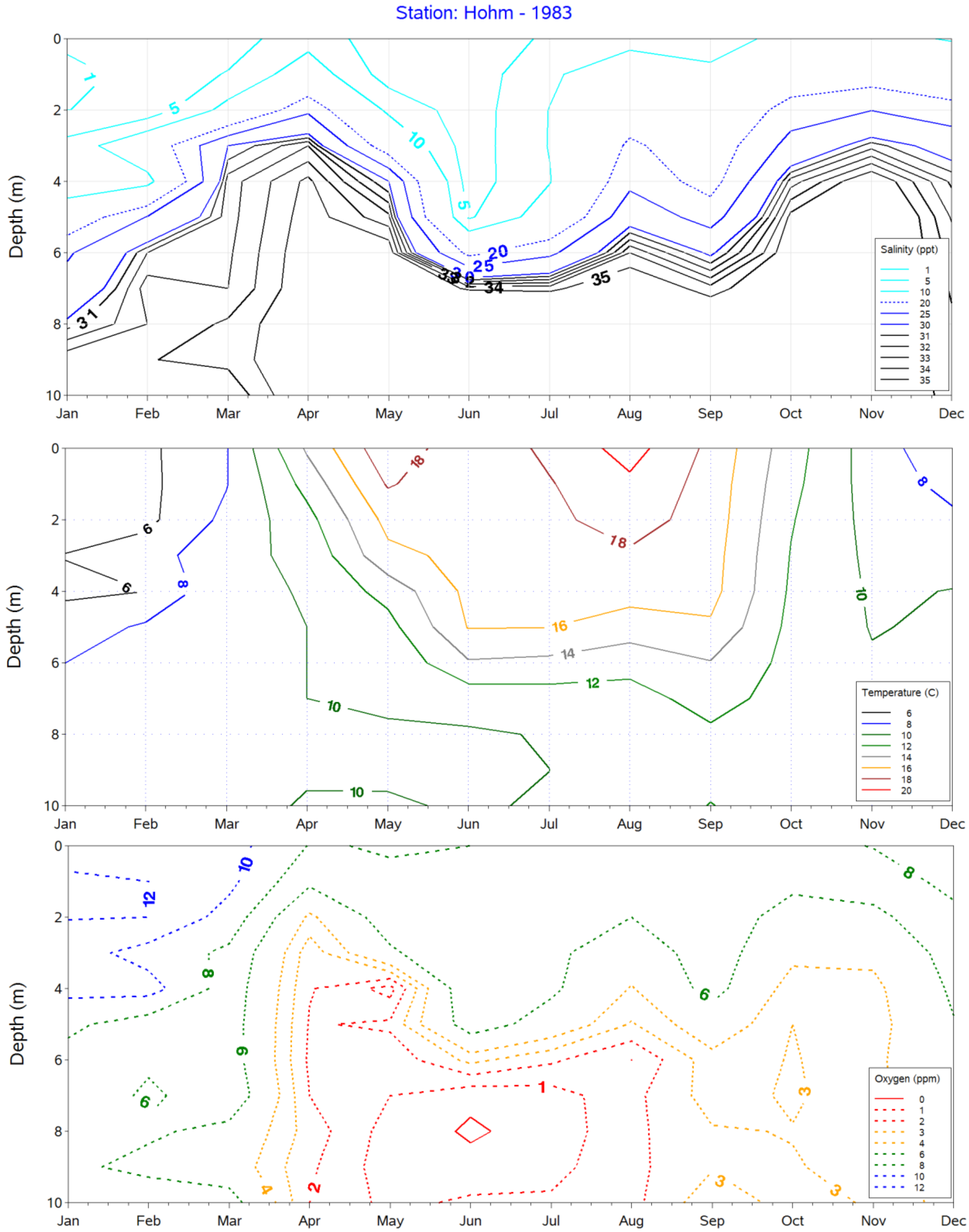


Figure 28. Hohm Station, 1983. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

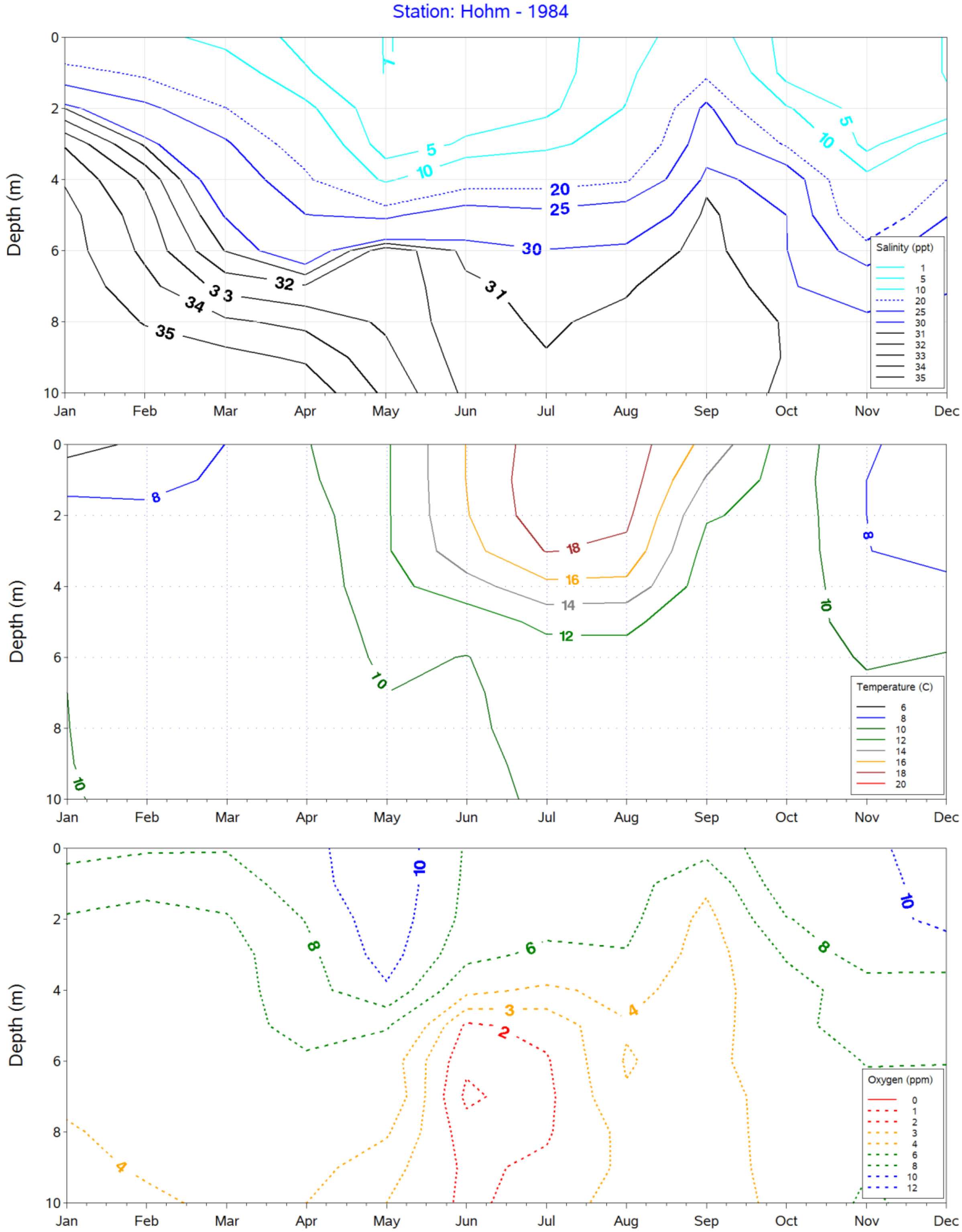


Figure 29. Hohm Station, 1984. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

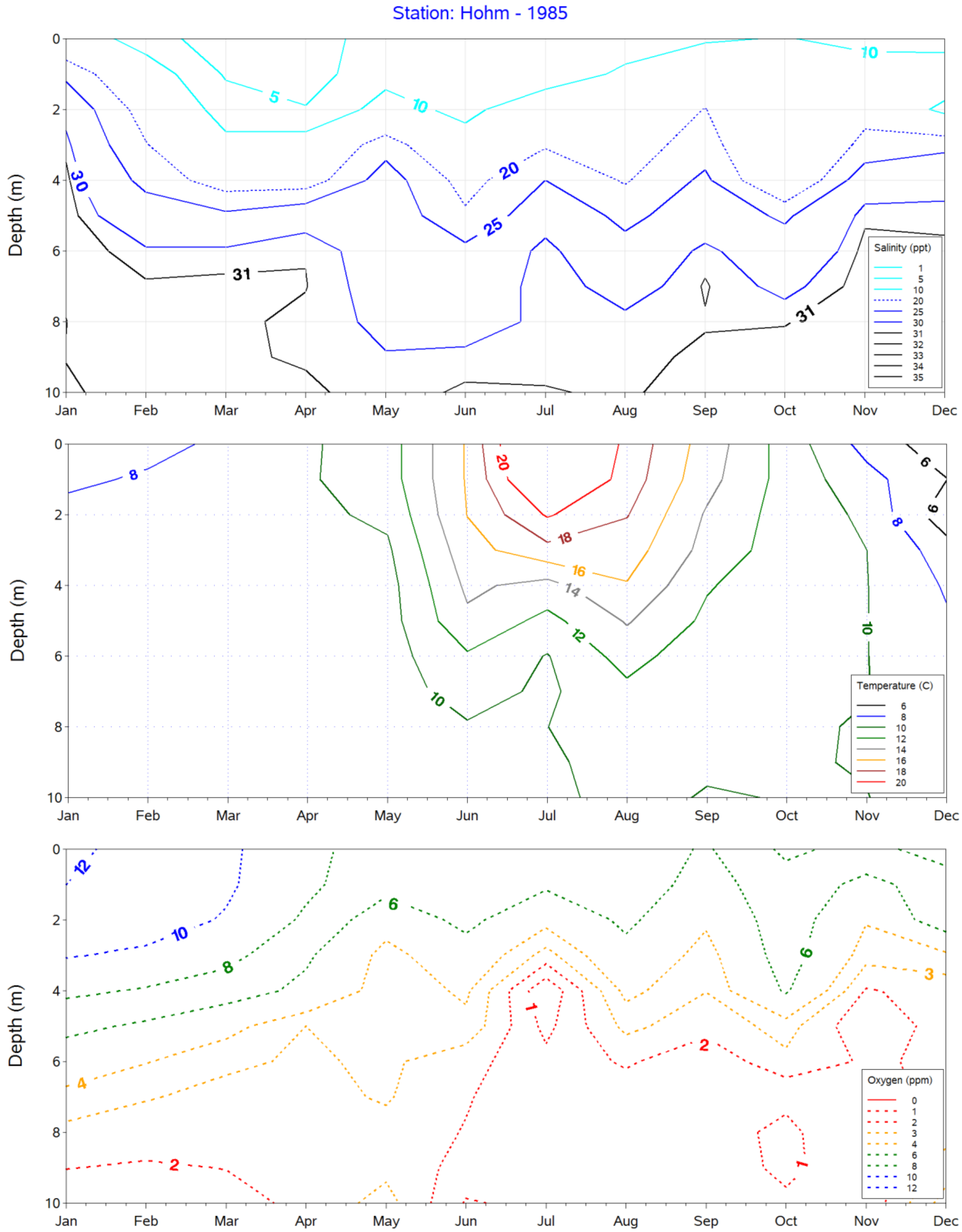


Figure 30. Hohm Station, 1985. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

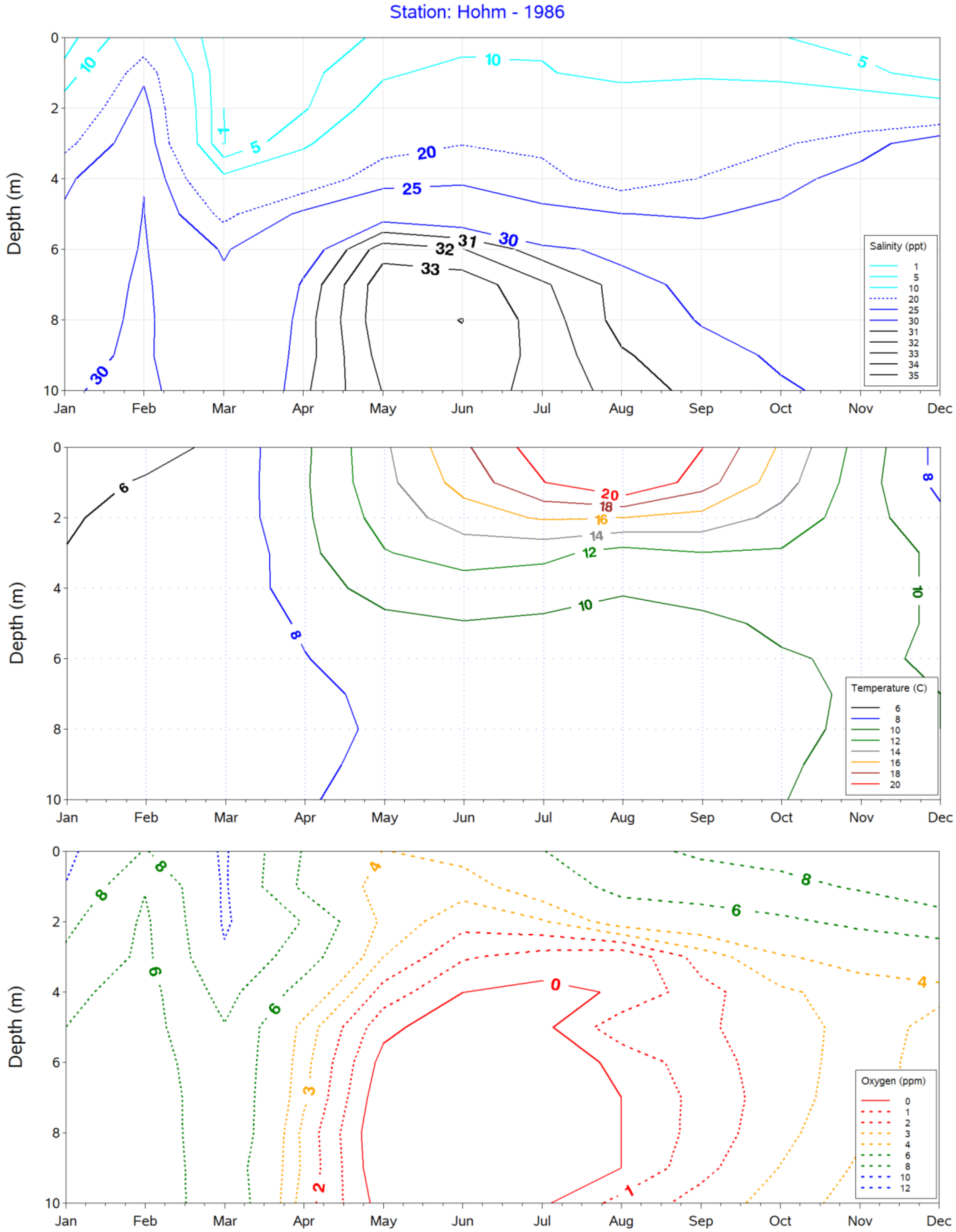


Figure 31. Hohm Station, 1986. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

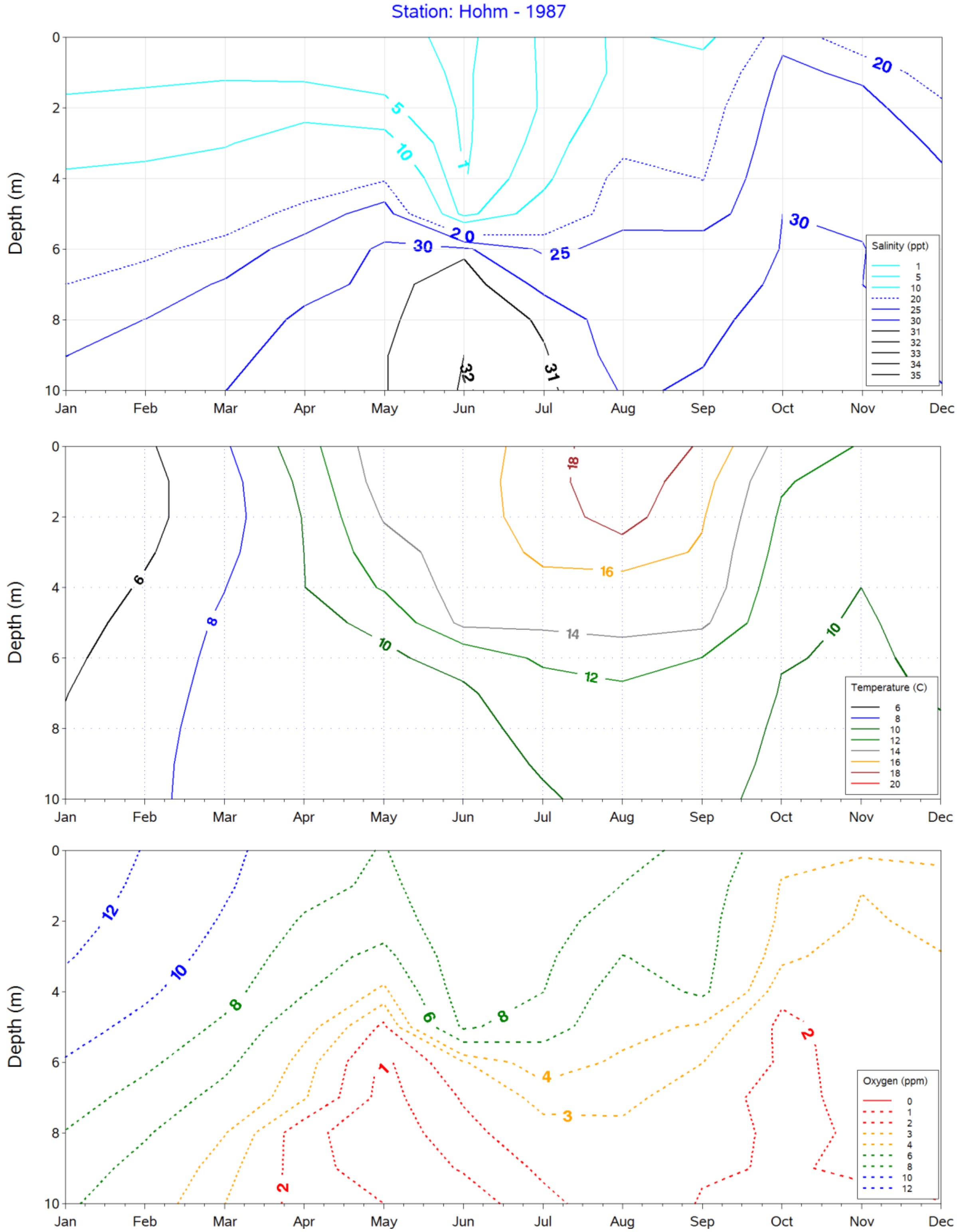


Figure 32. Hohm Station, 1987. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

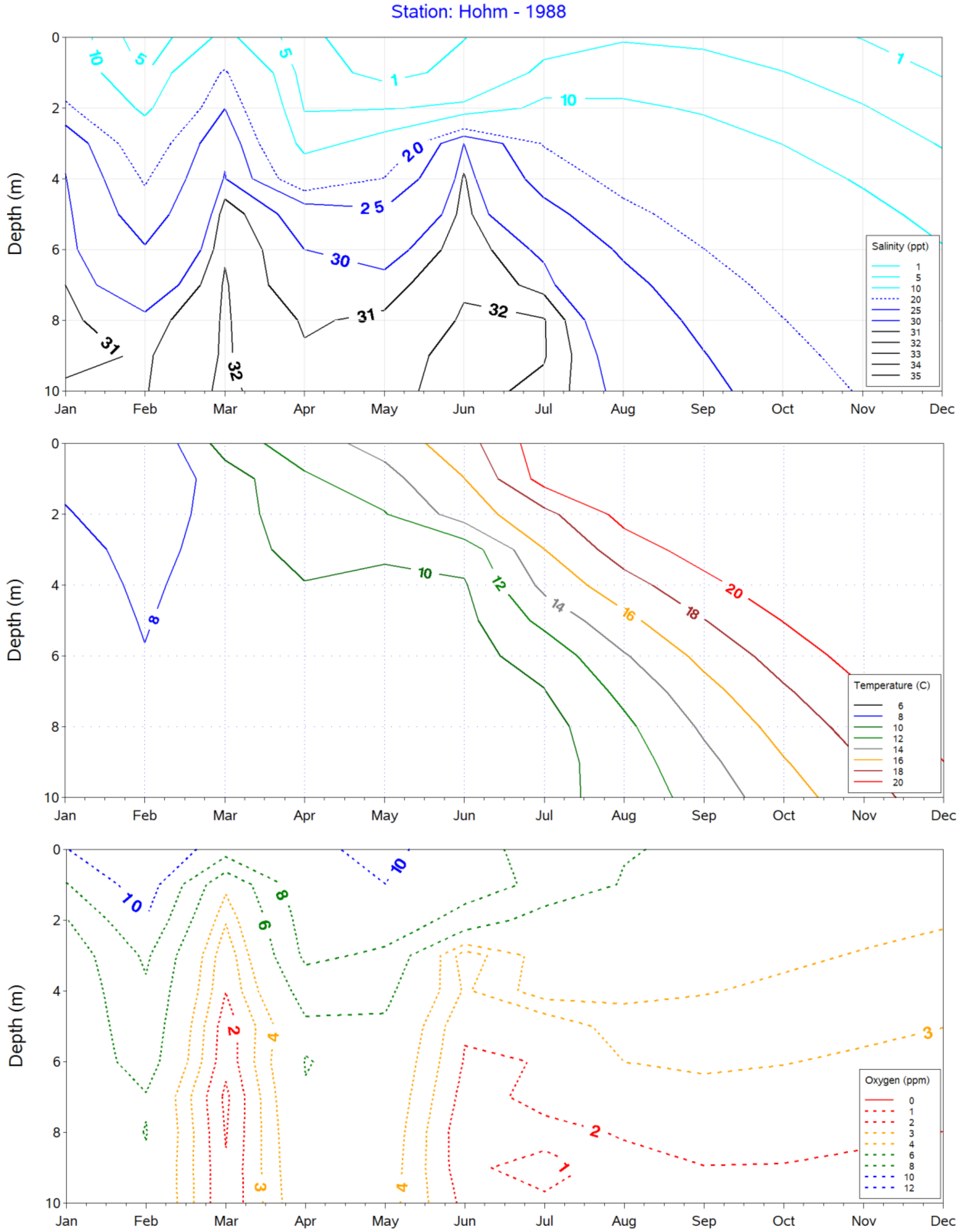


Figure 33. Hohm Station, 1988. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

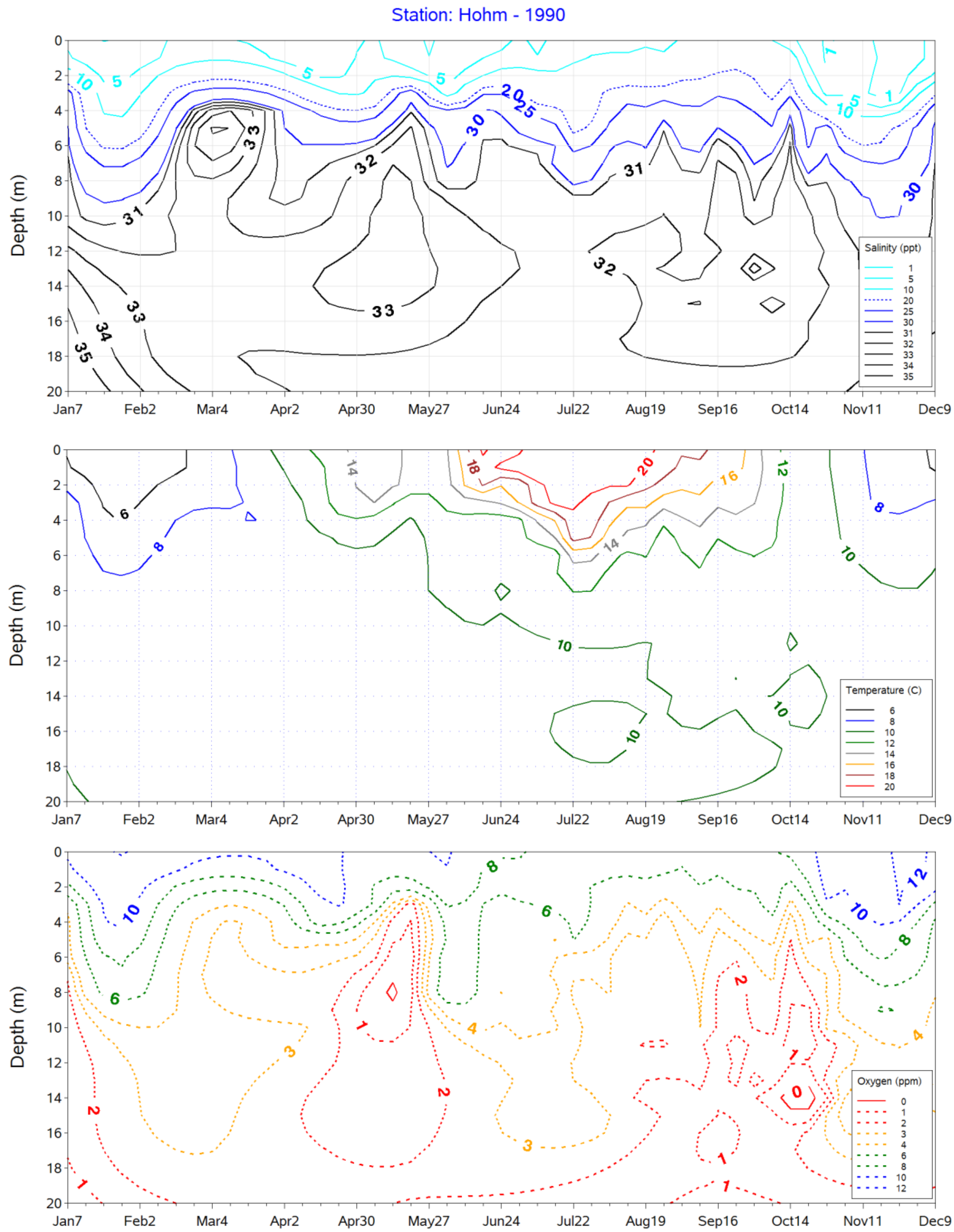


Figure 34. Hohm Station, 1990. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

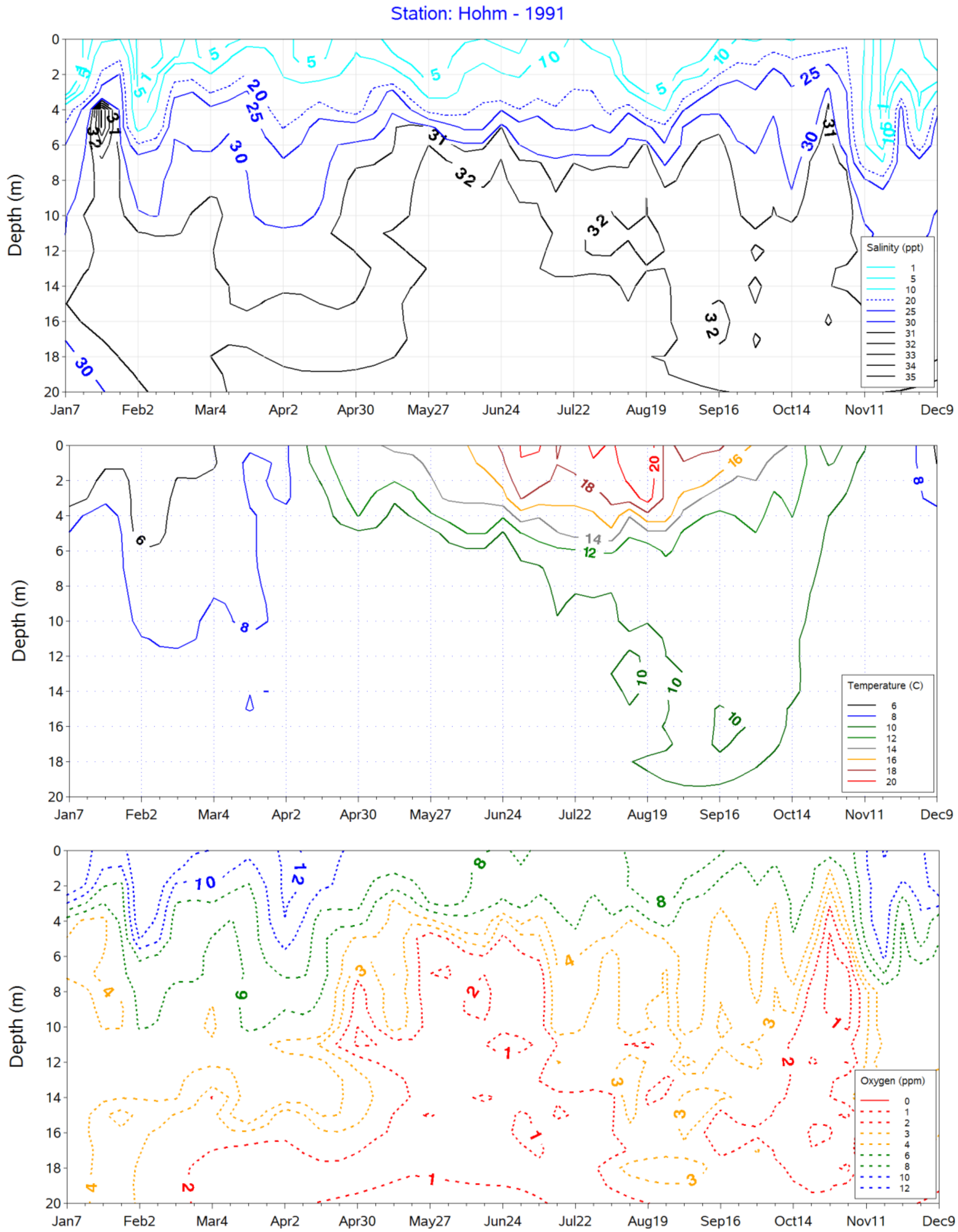


Figure 35. Hohm Station, 1991. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

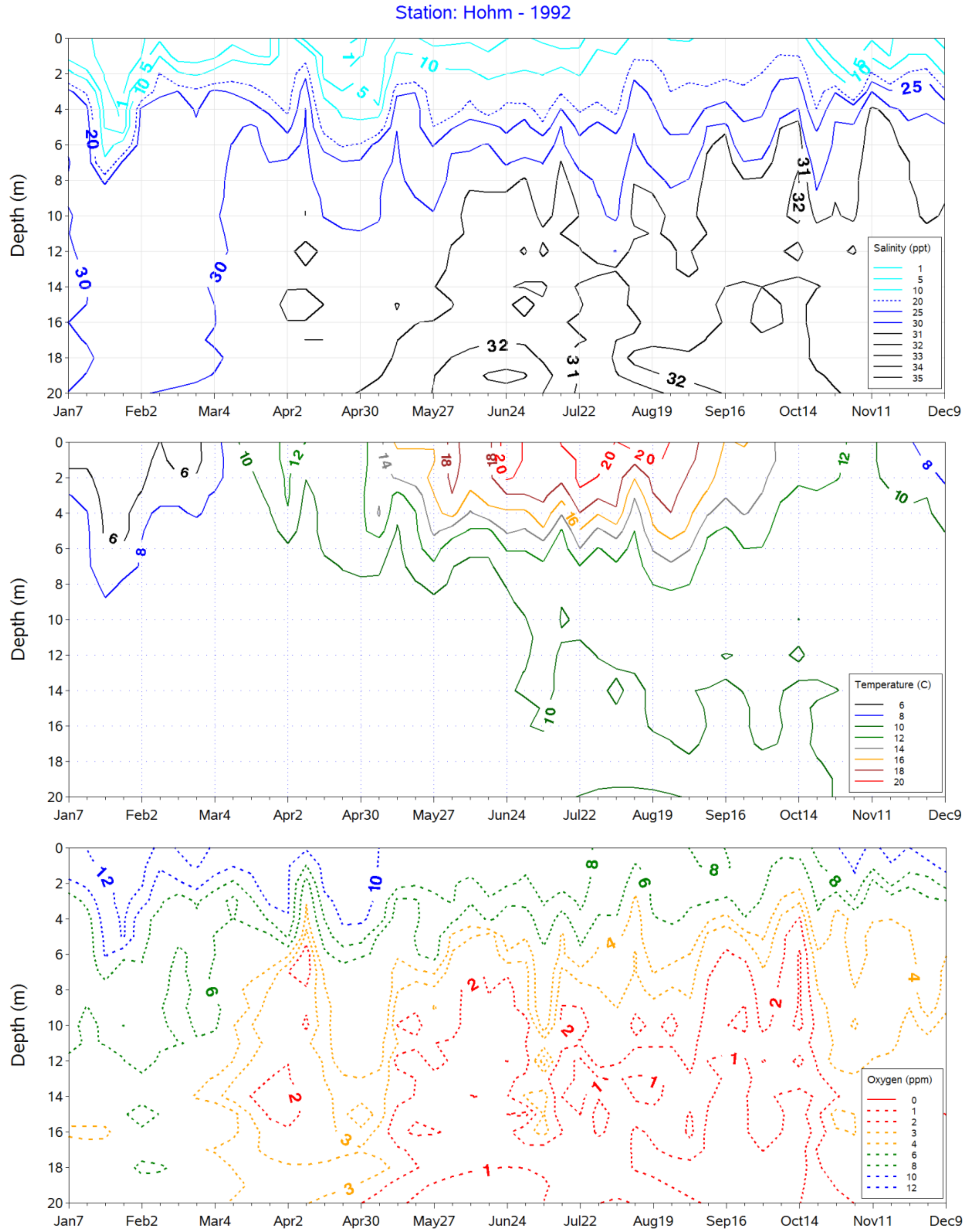


Figure 36. Hohm Station, 1992. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

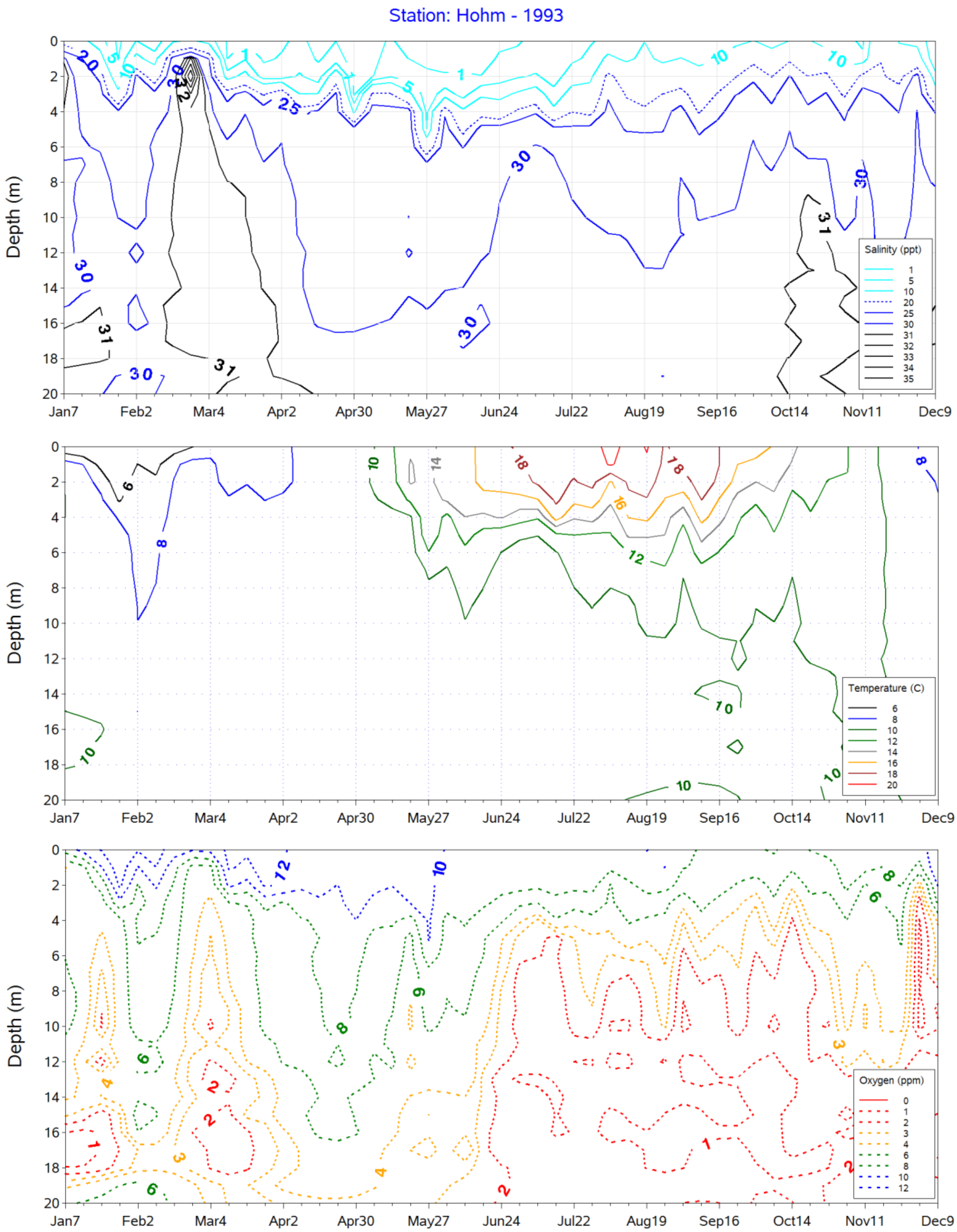


Figure 37. Hohm Station, 1993. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

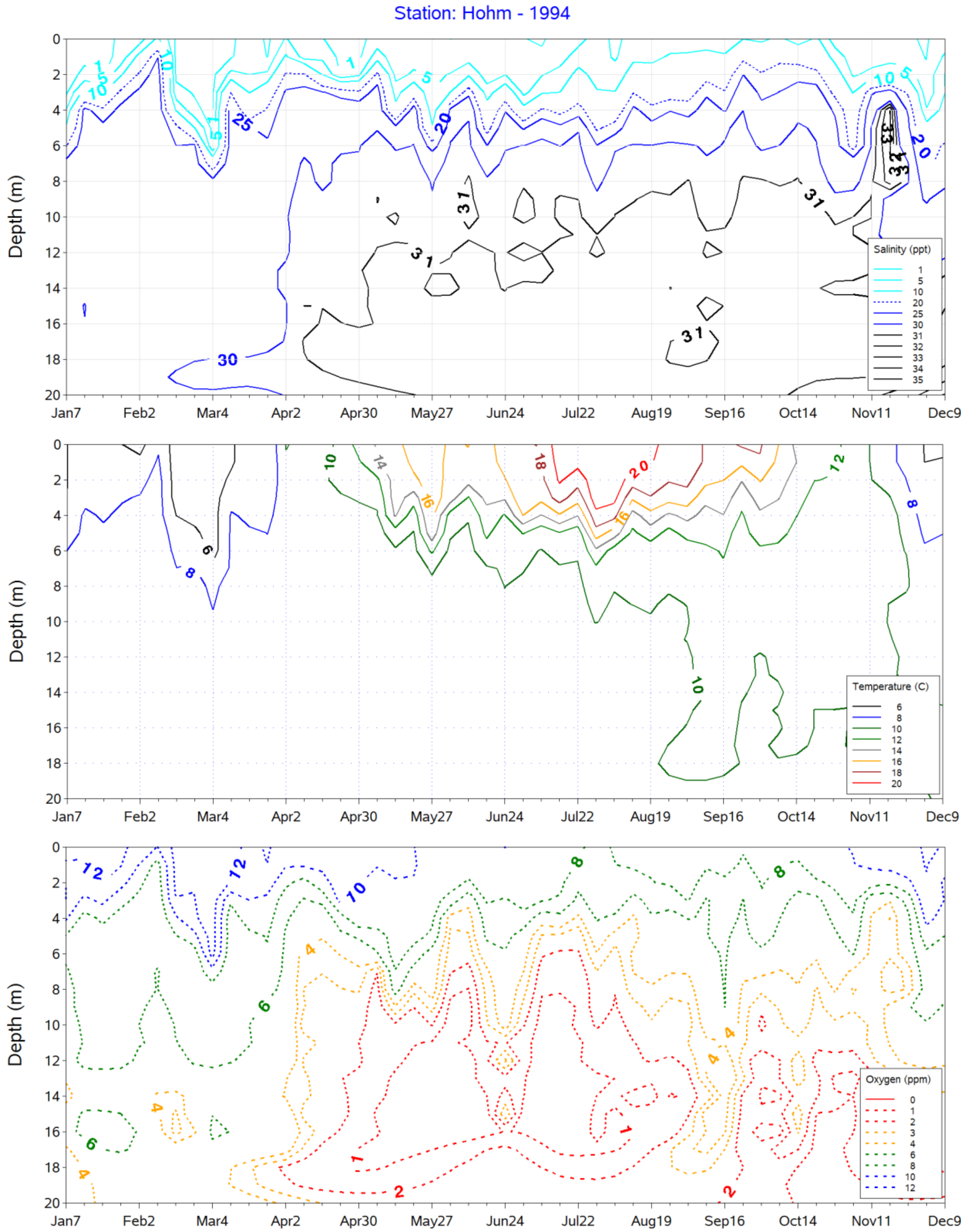


Figure 38. Hohm Station, 1994. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

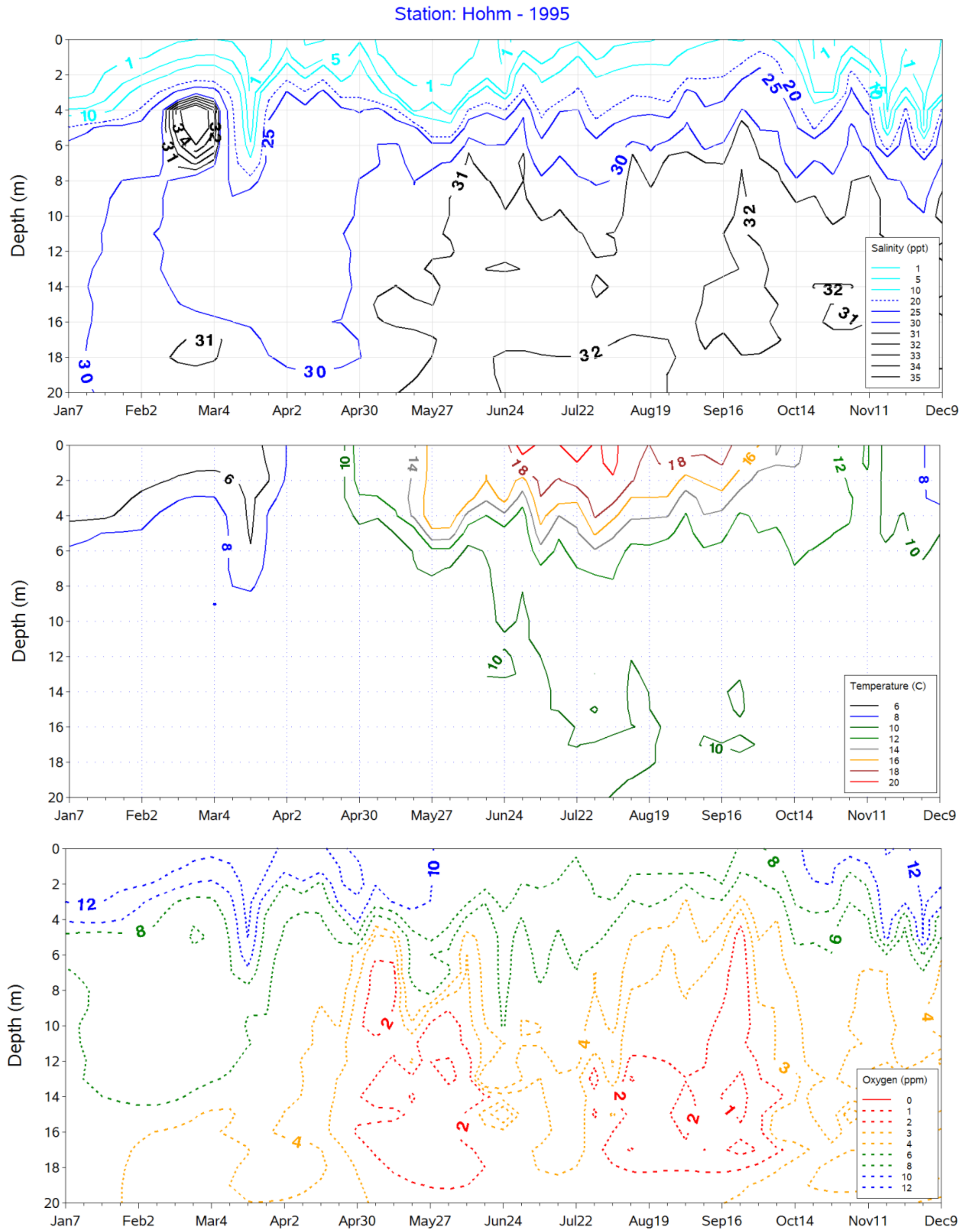


Figure 39. Hohm Station, 1995. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

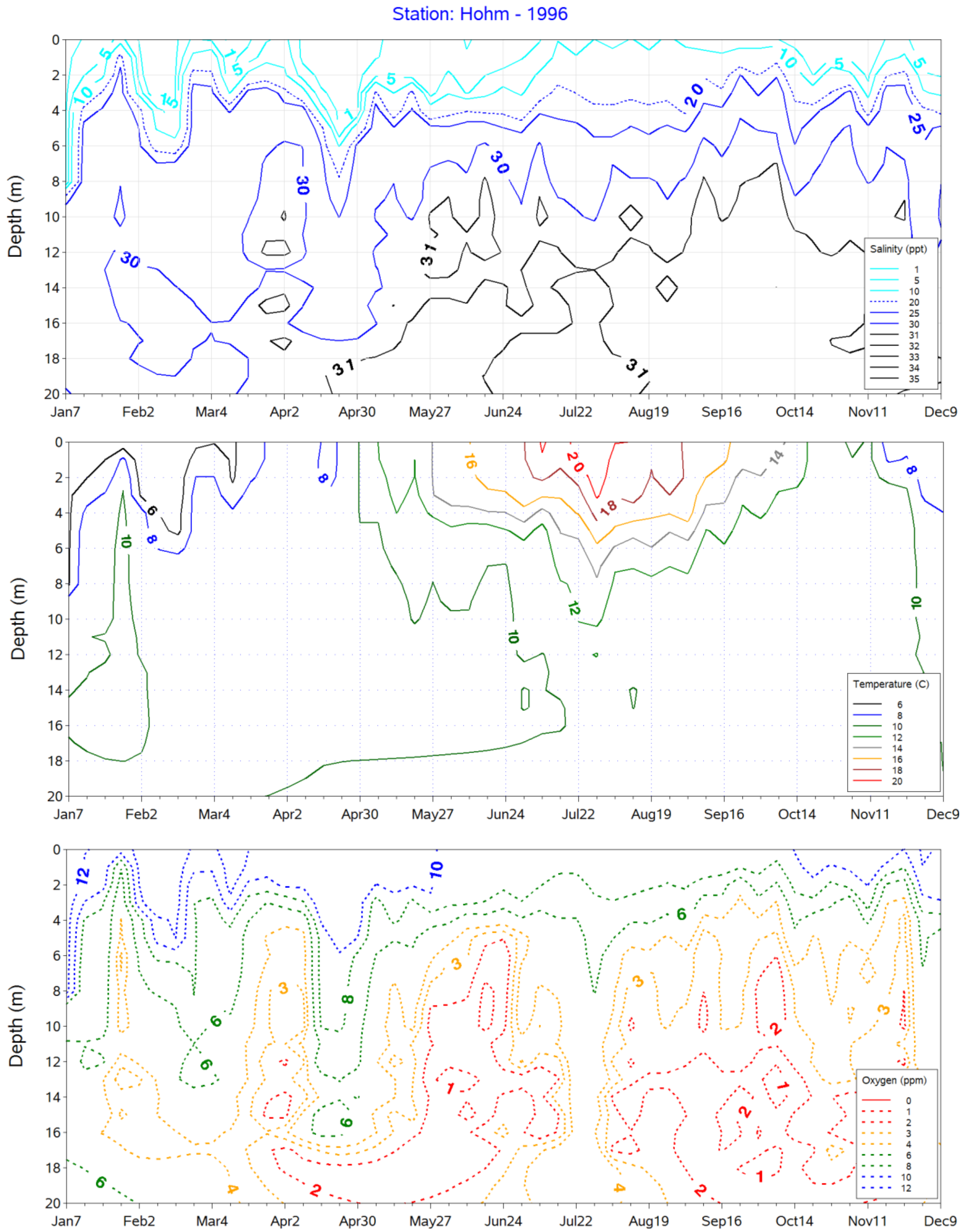


Figure 40. Hohm Station, 1996. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

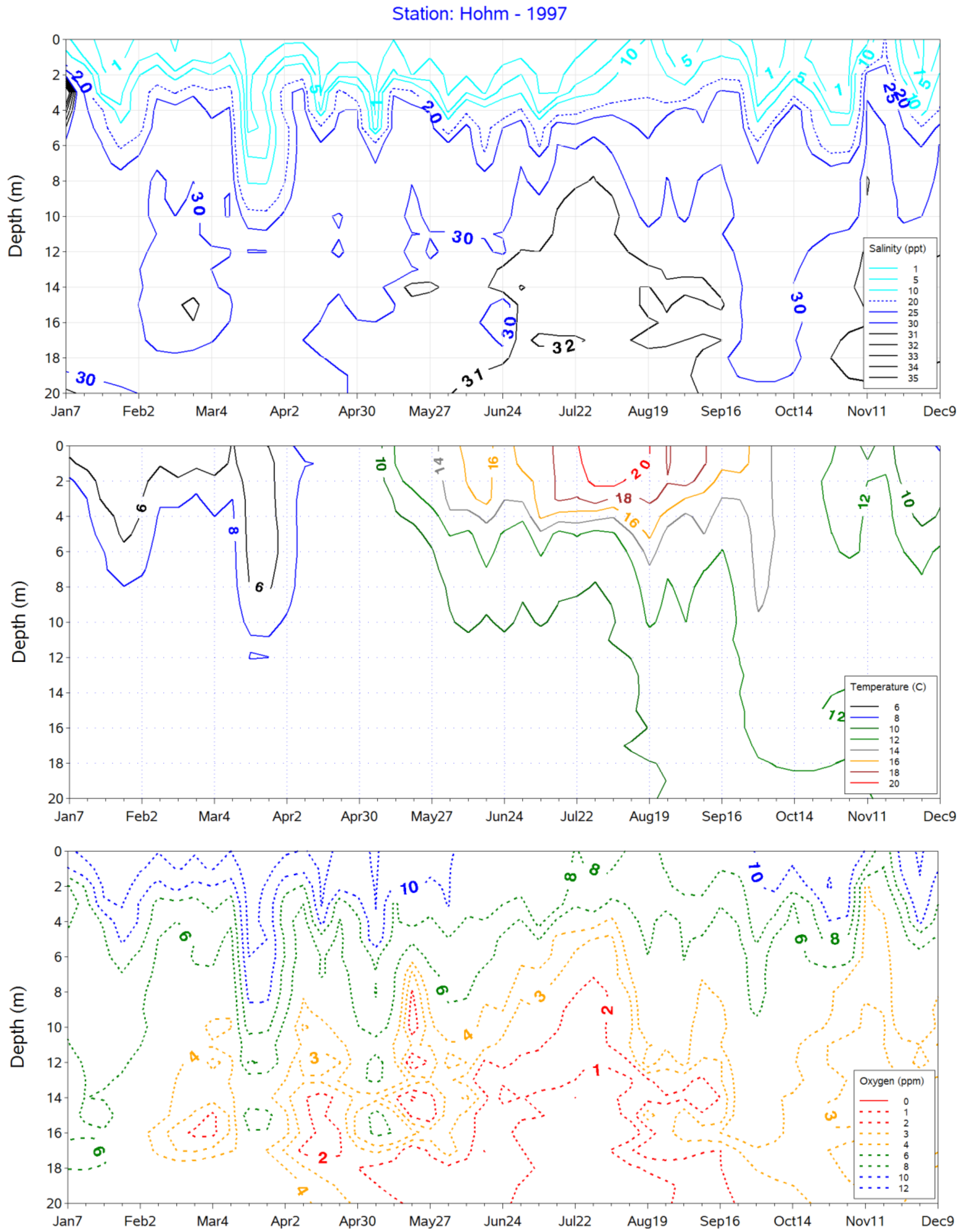


Figure 41. Hohm Station, 1997. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

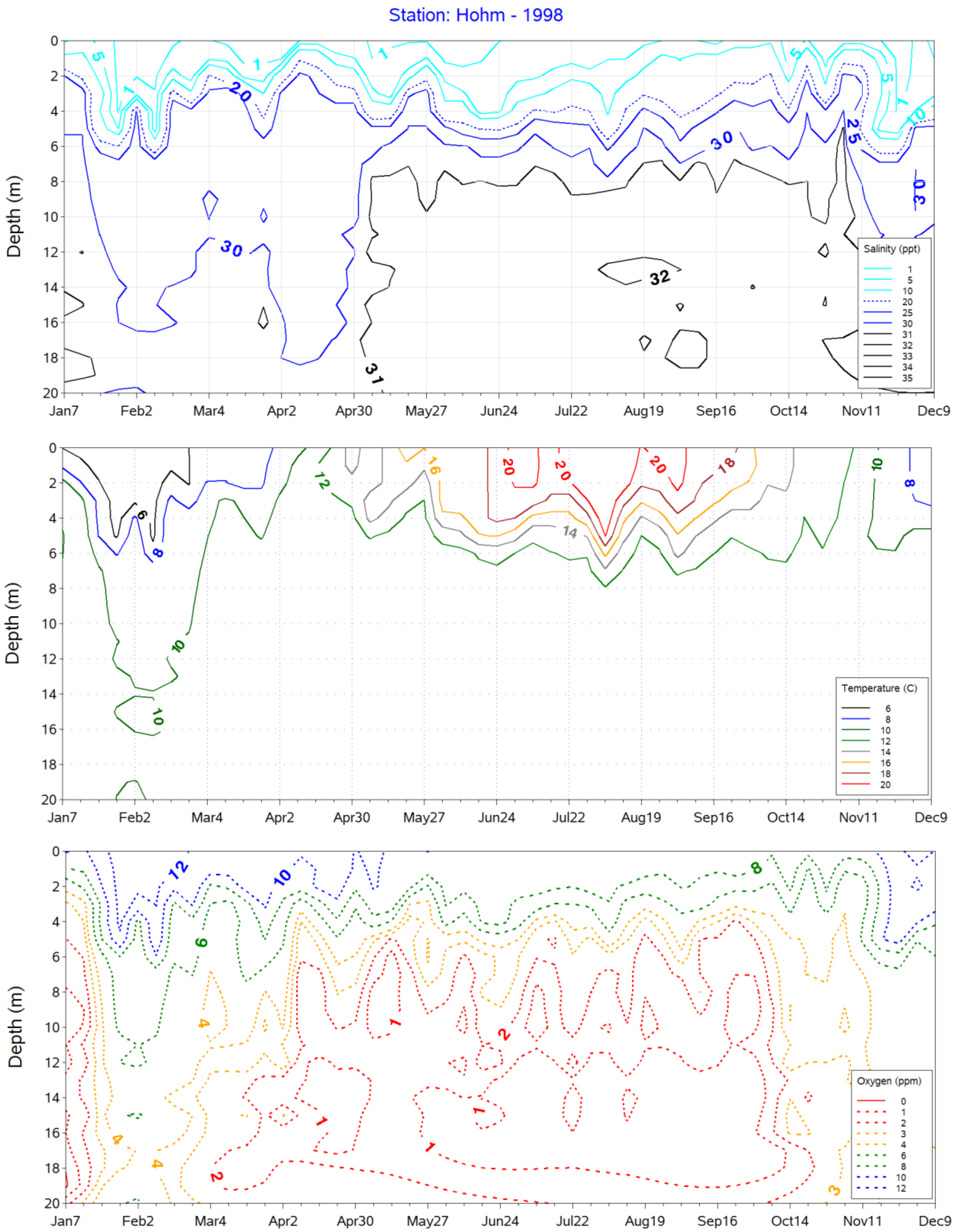


Figure 42. Hohm Station, 1998. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

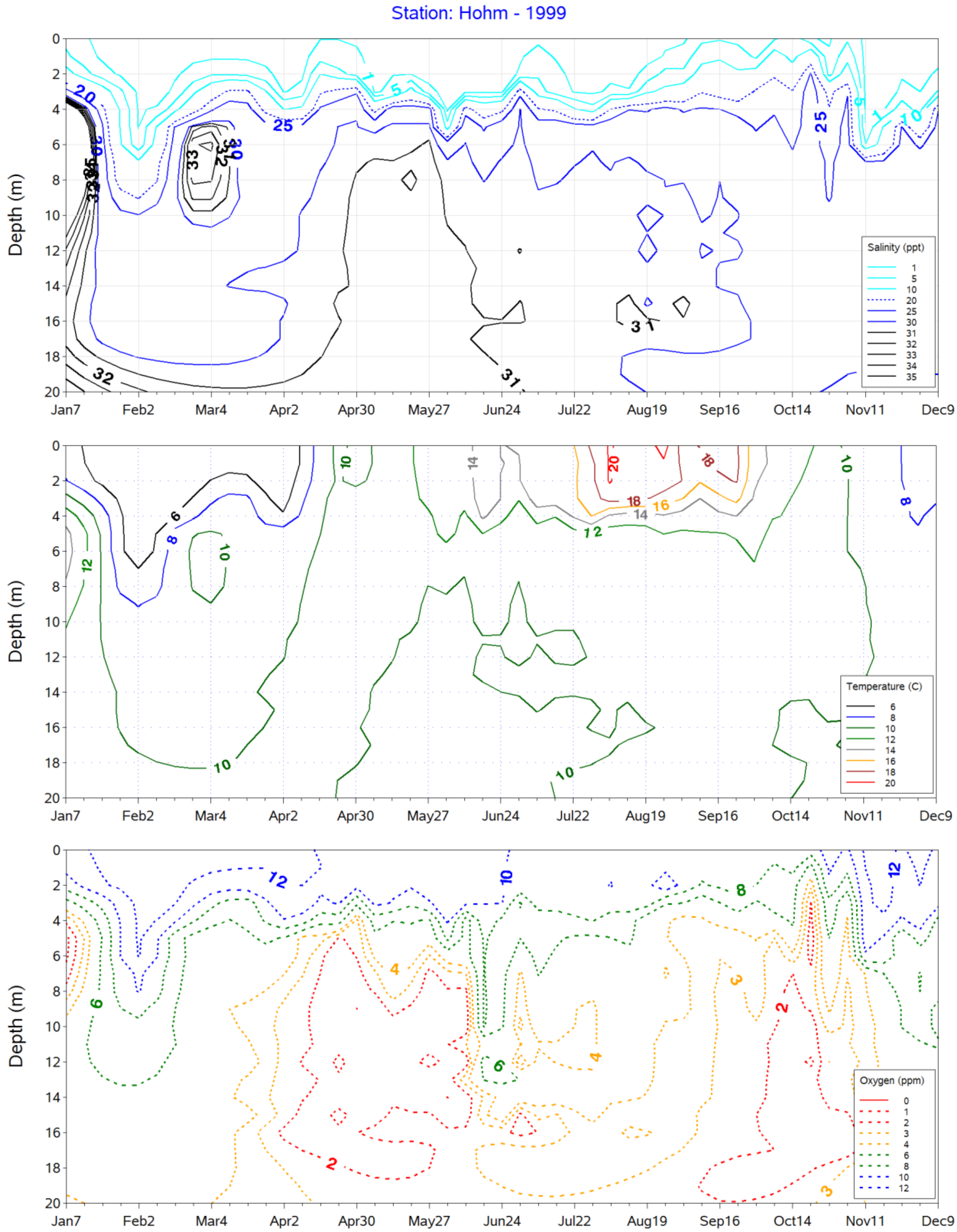


Figure 43. Hohm Station, 1999. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

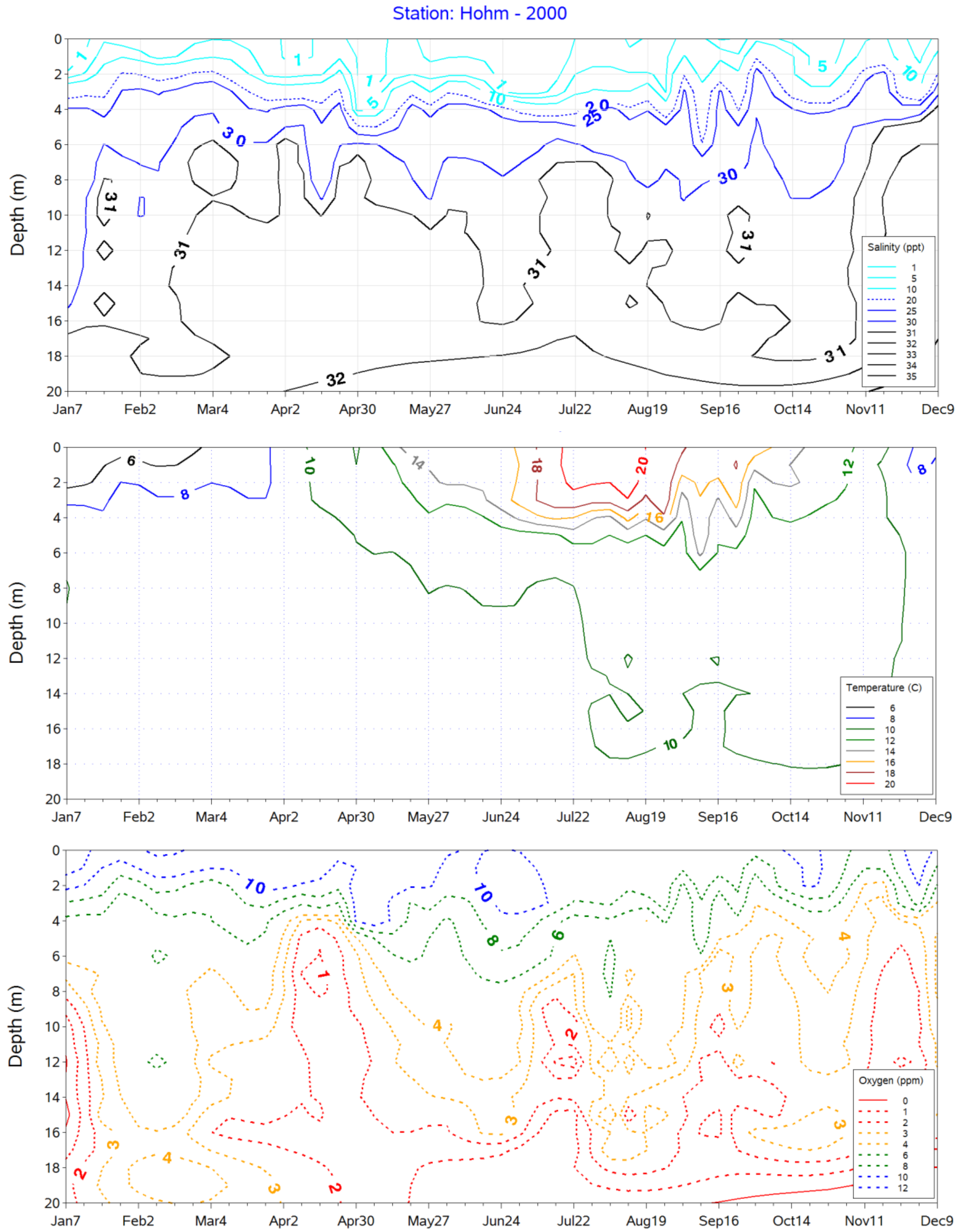


Figure 44. Hohm Station, 2000. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

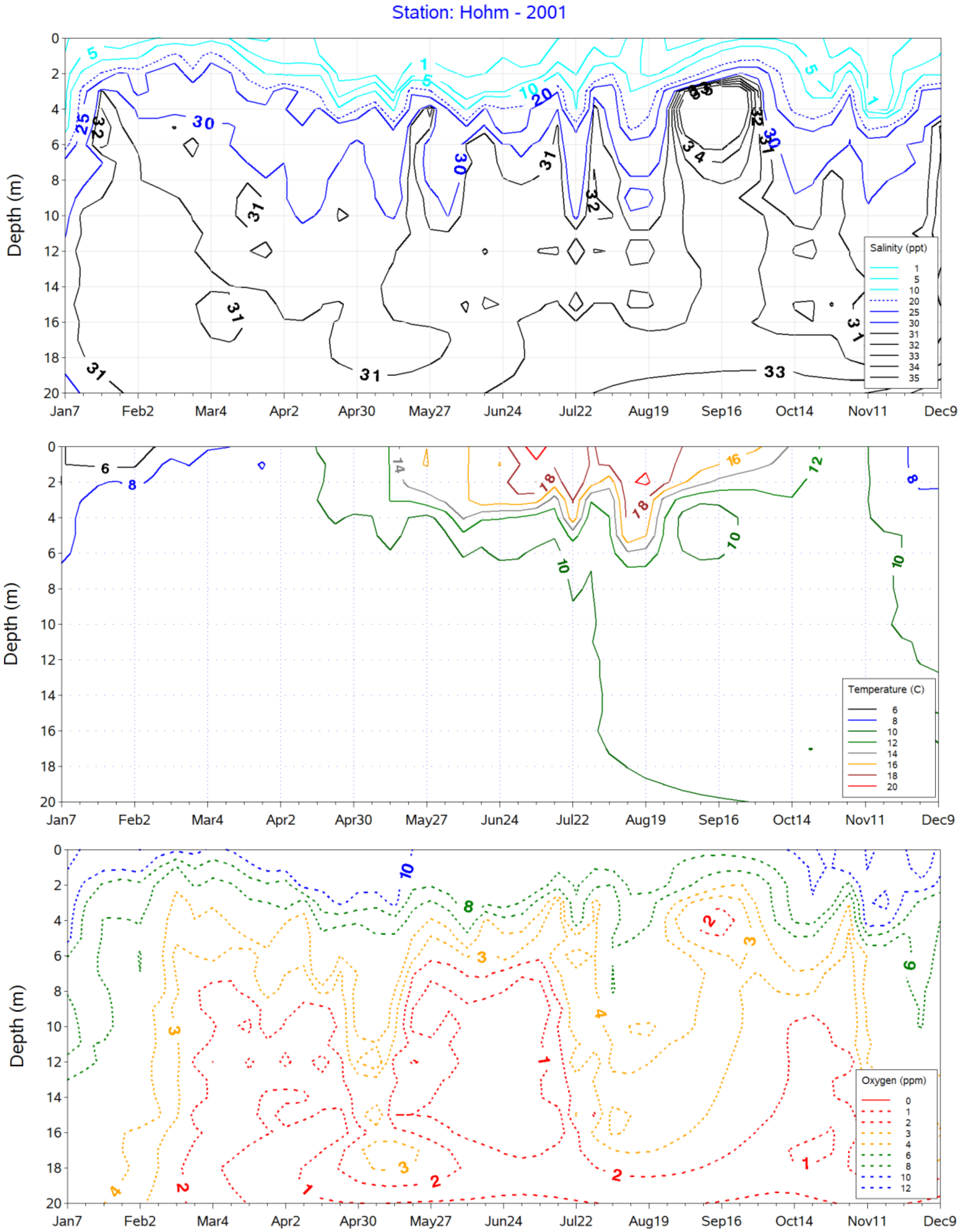


Figure 45. Hohm Station, 2001. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

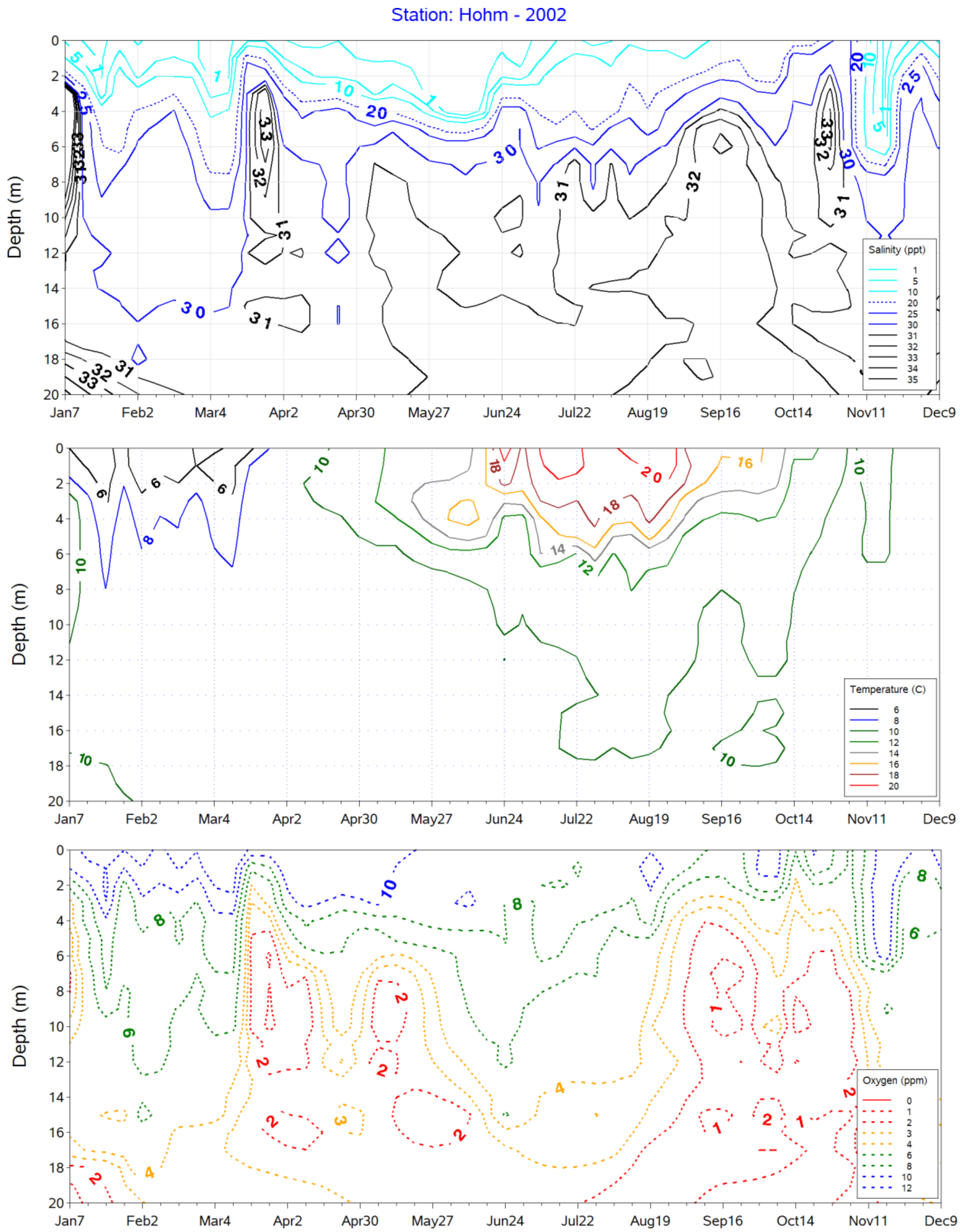


Figure 46. Hohm Station, 2002. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

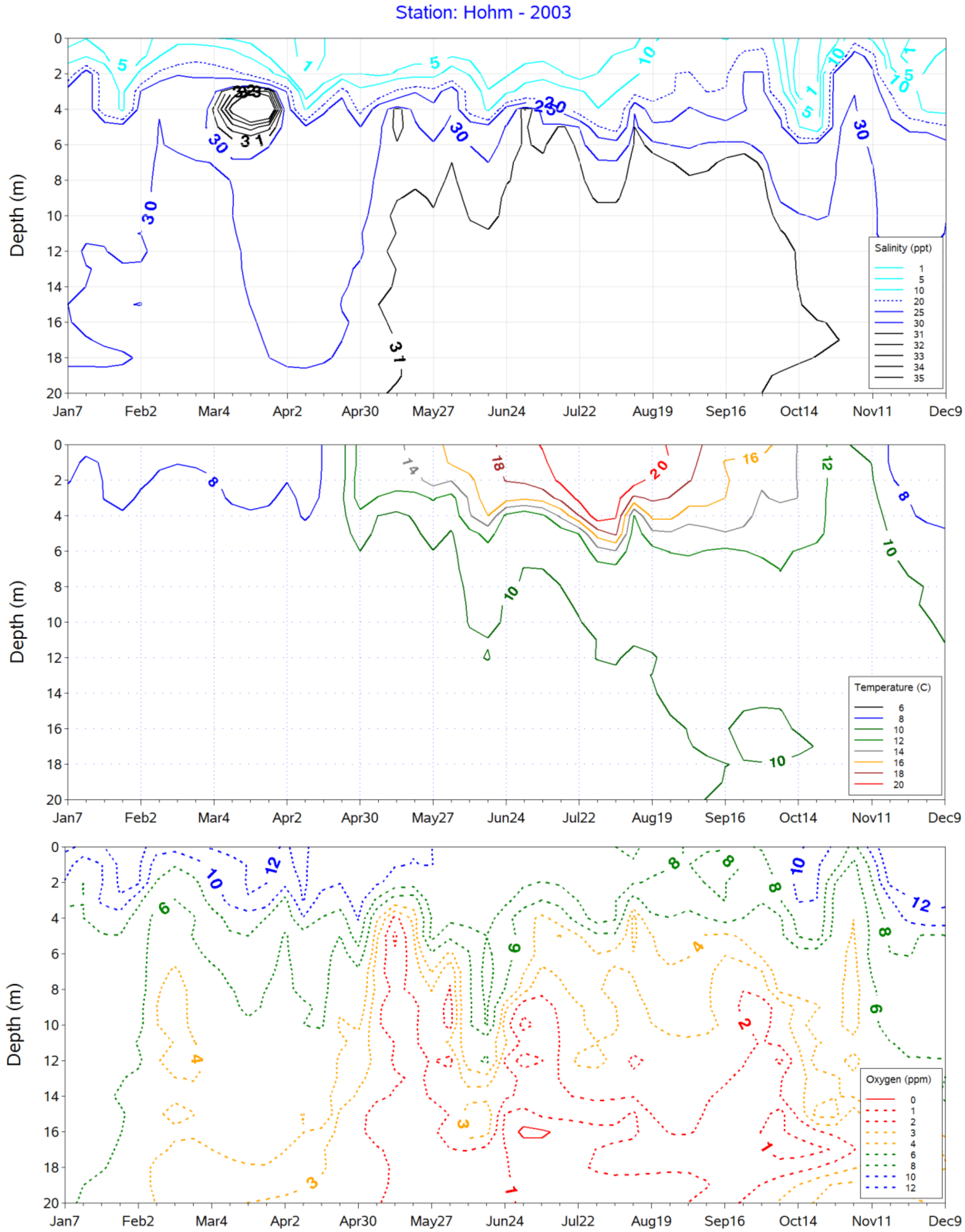


Figure 47. Hohm Station, 2003. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

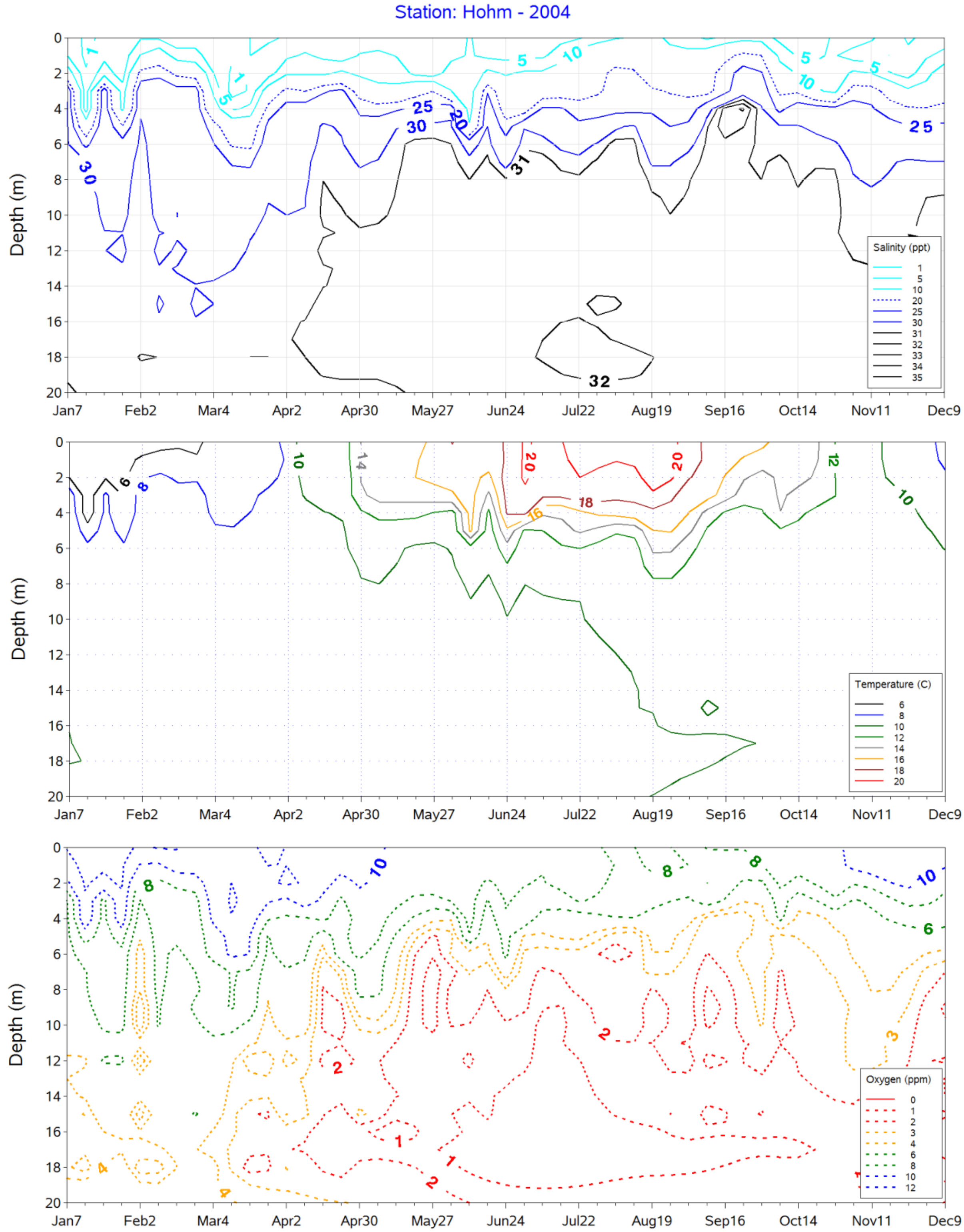


Figure 48. Hohm Station, 2004. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

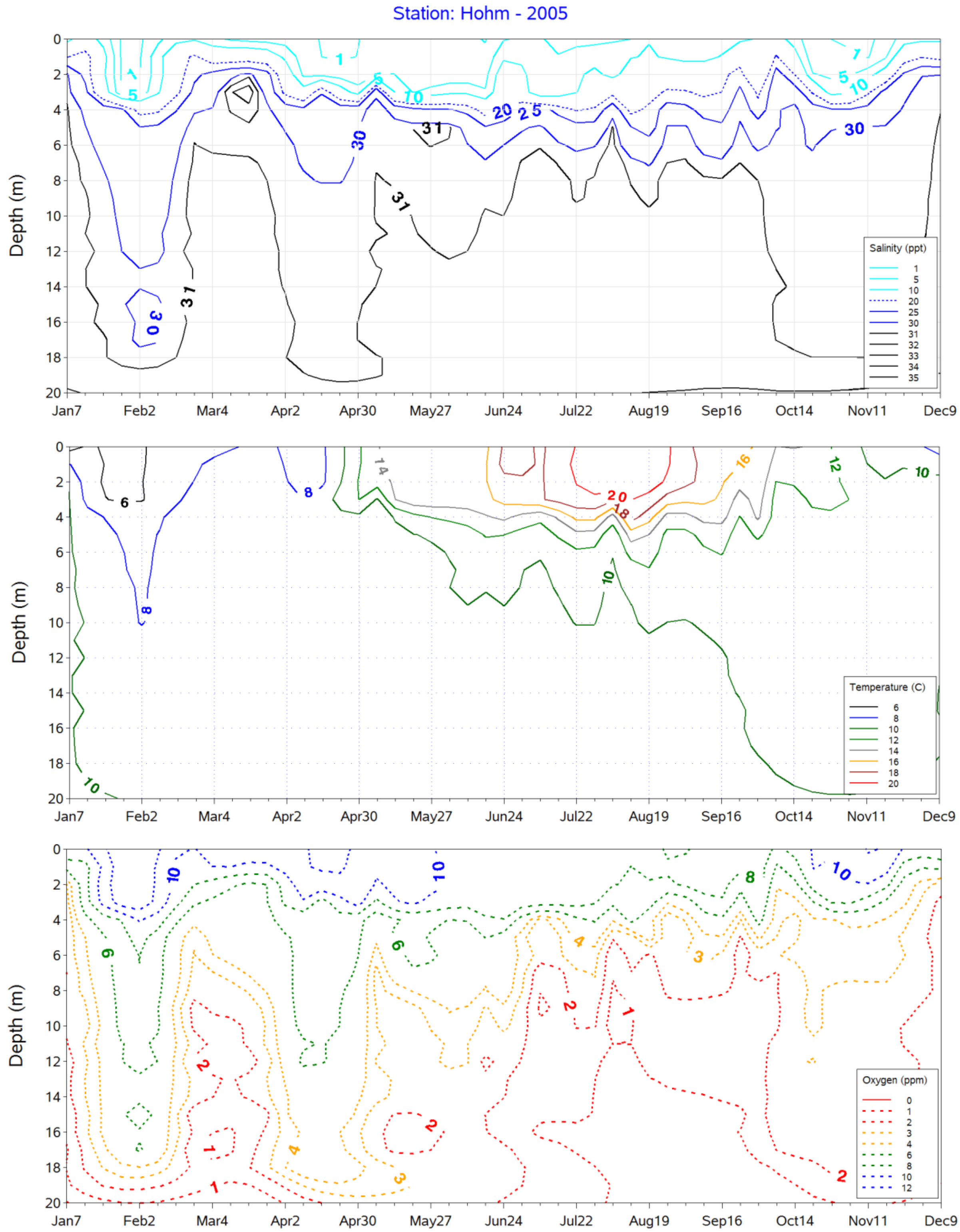


Figure 49. Hohm Station, 2005. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

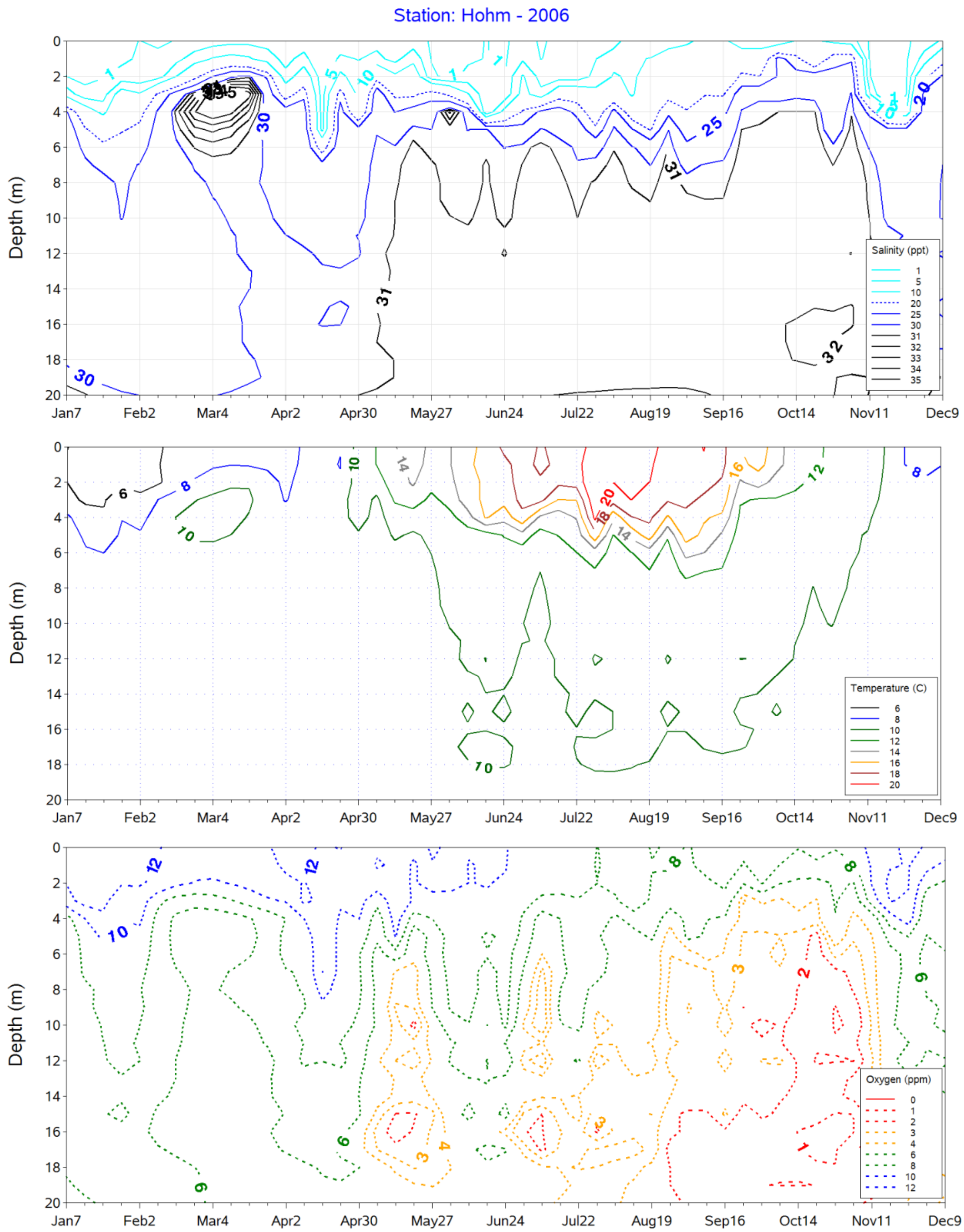


Figure 50. Hohm Station, 2006. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

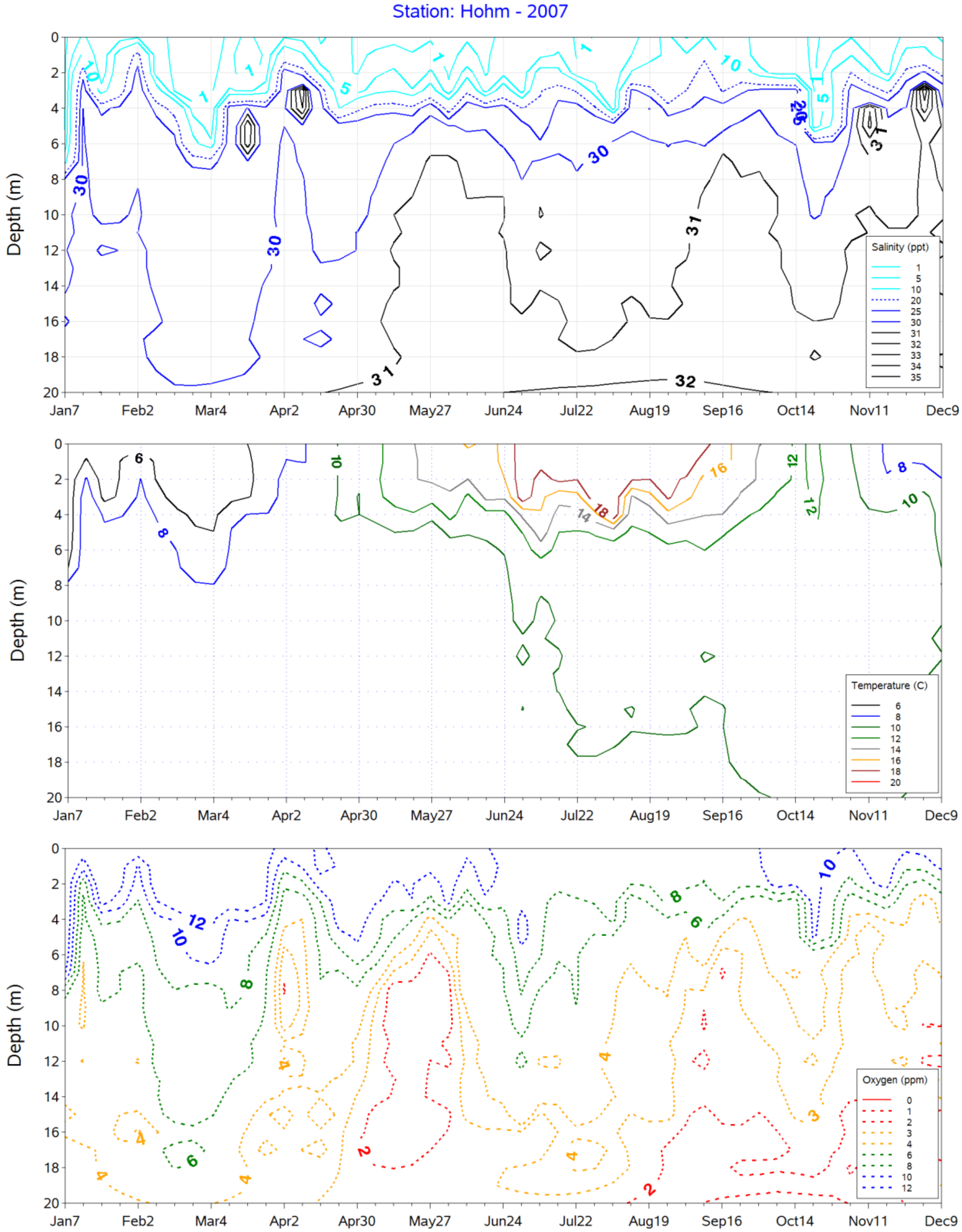


Figure 51. Hohm Station, 2007. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

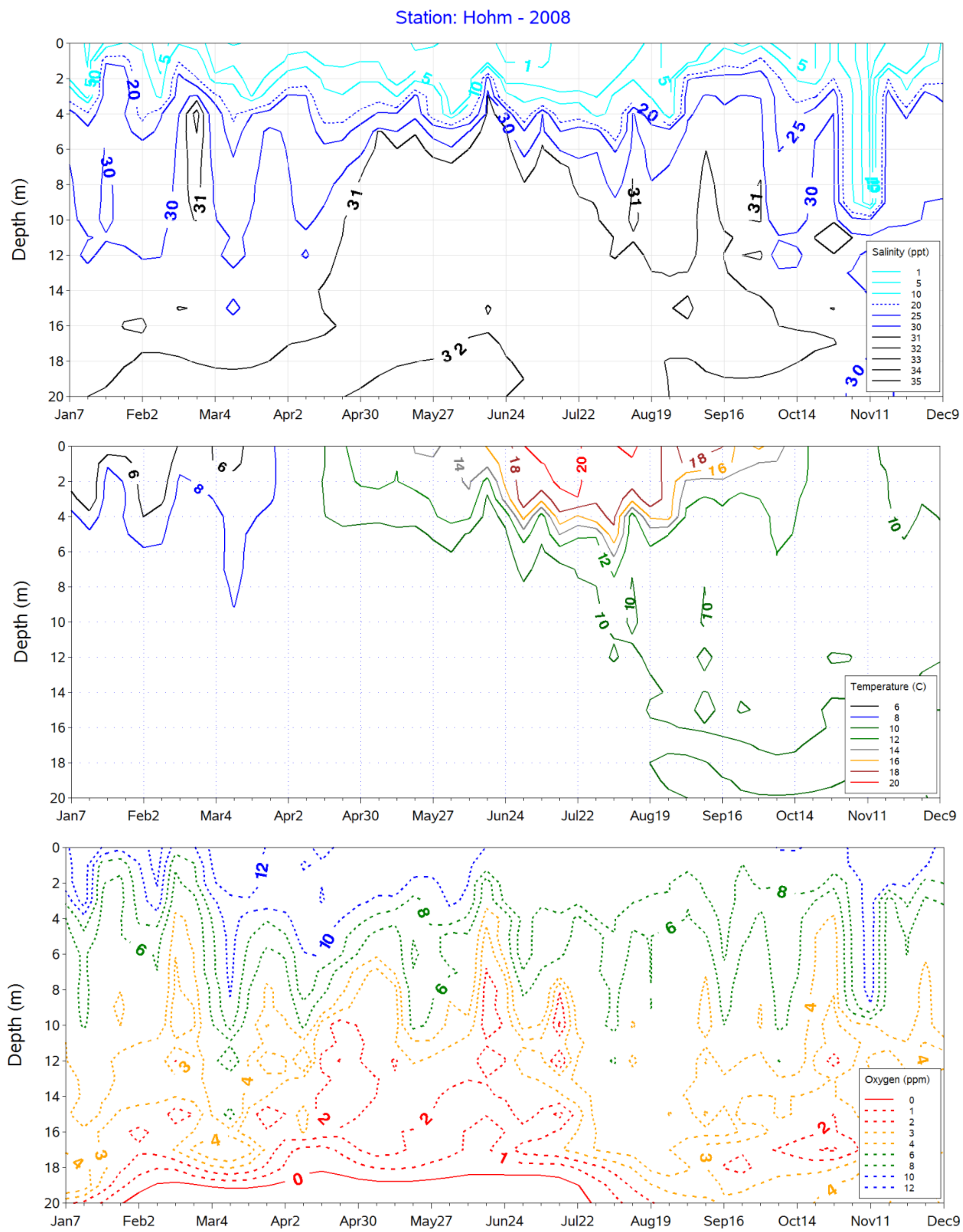


Figure 52. Hohm Station, 2008. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

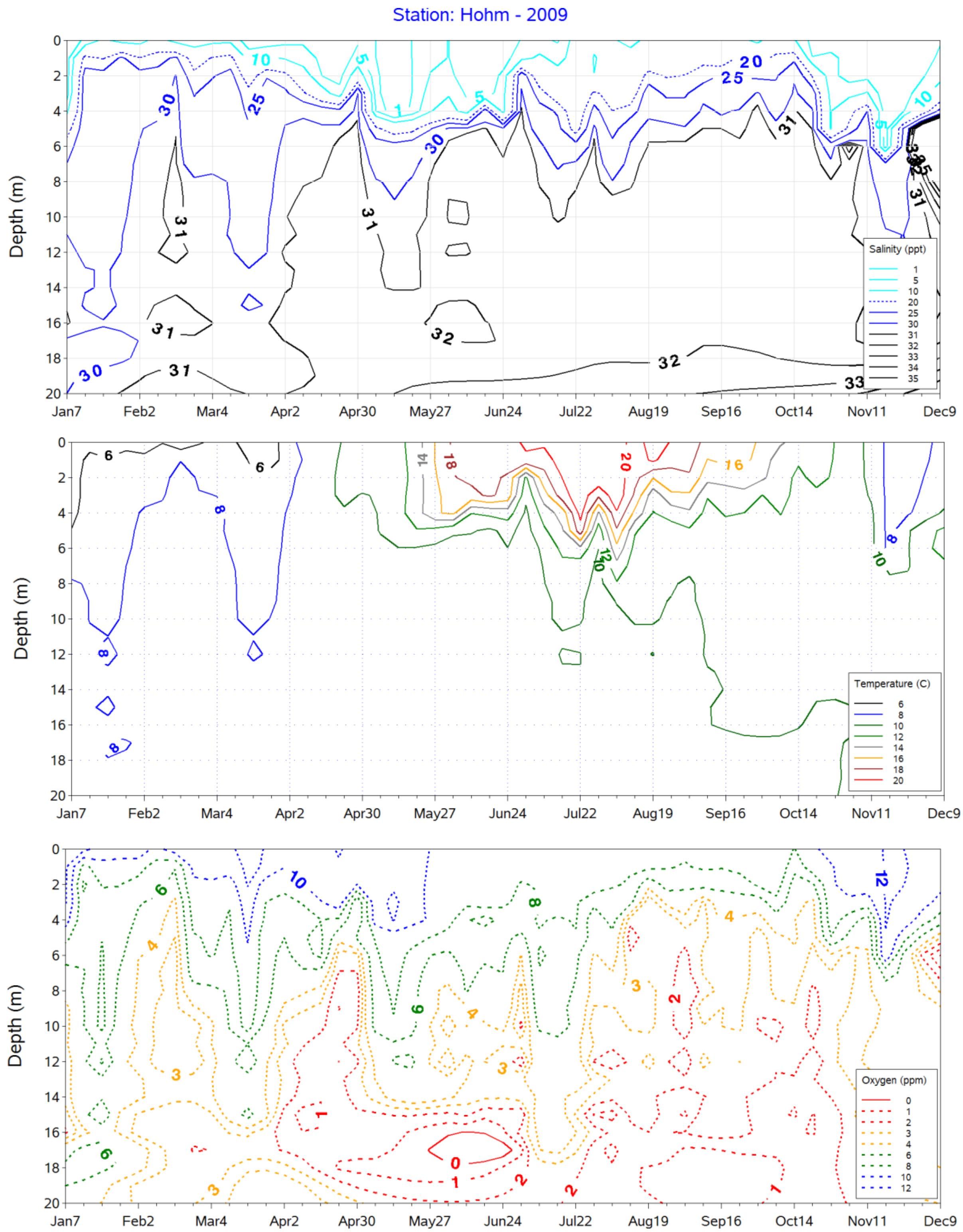


Figure 53. Hohm Station, 2009. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

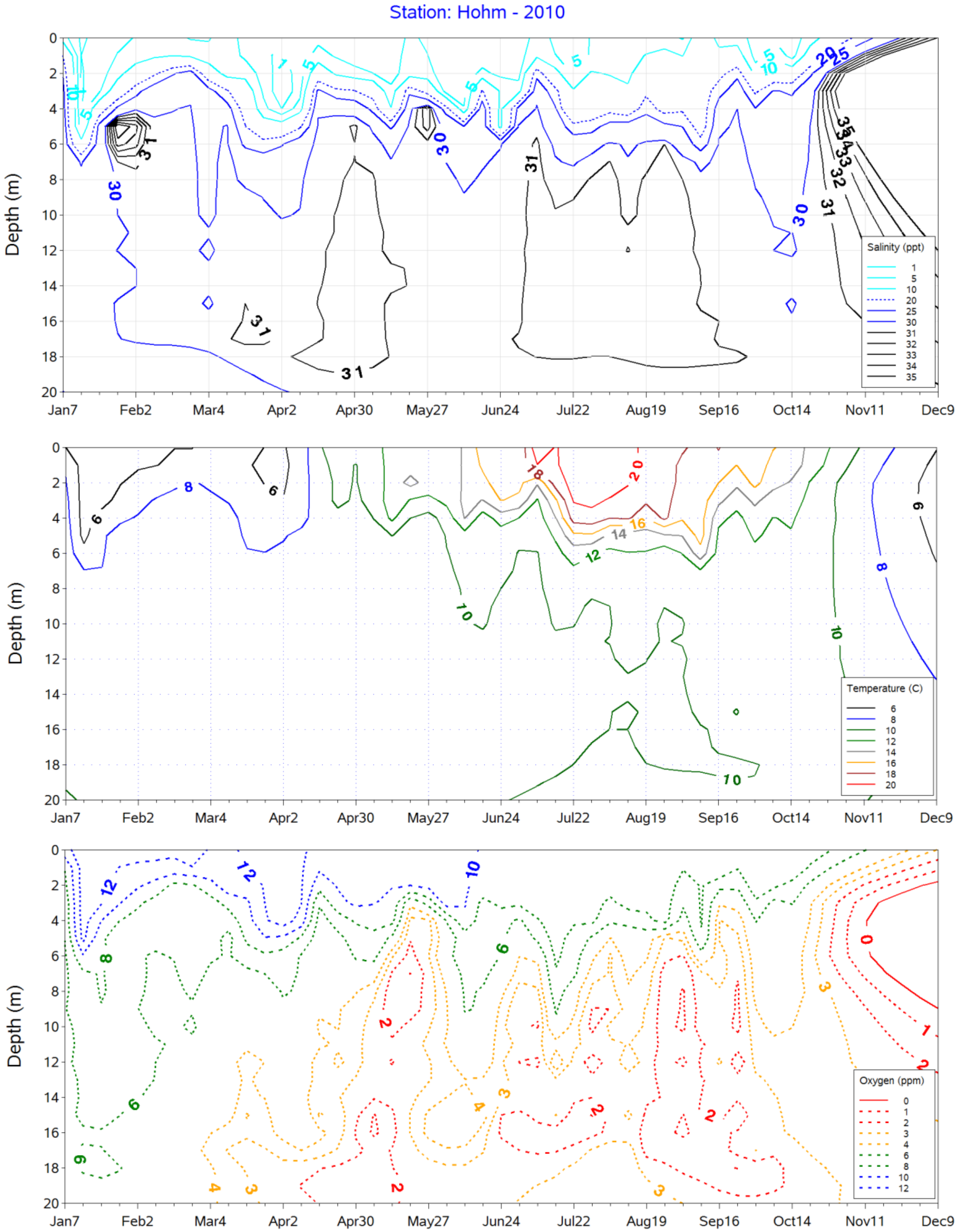


Figure 54. Hohm Station, 2010. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

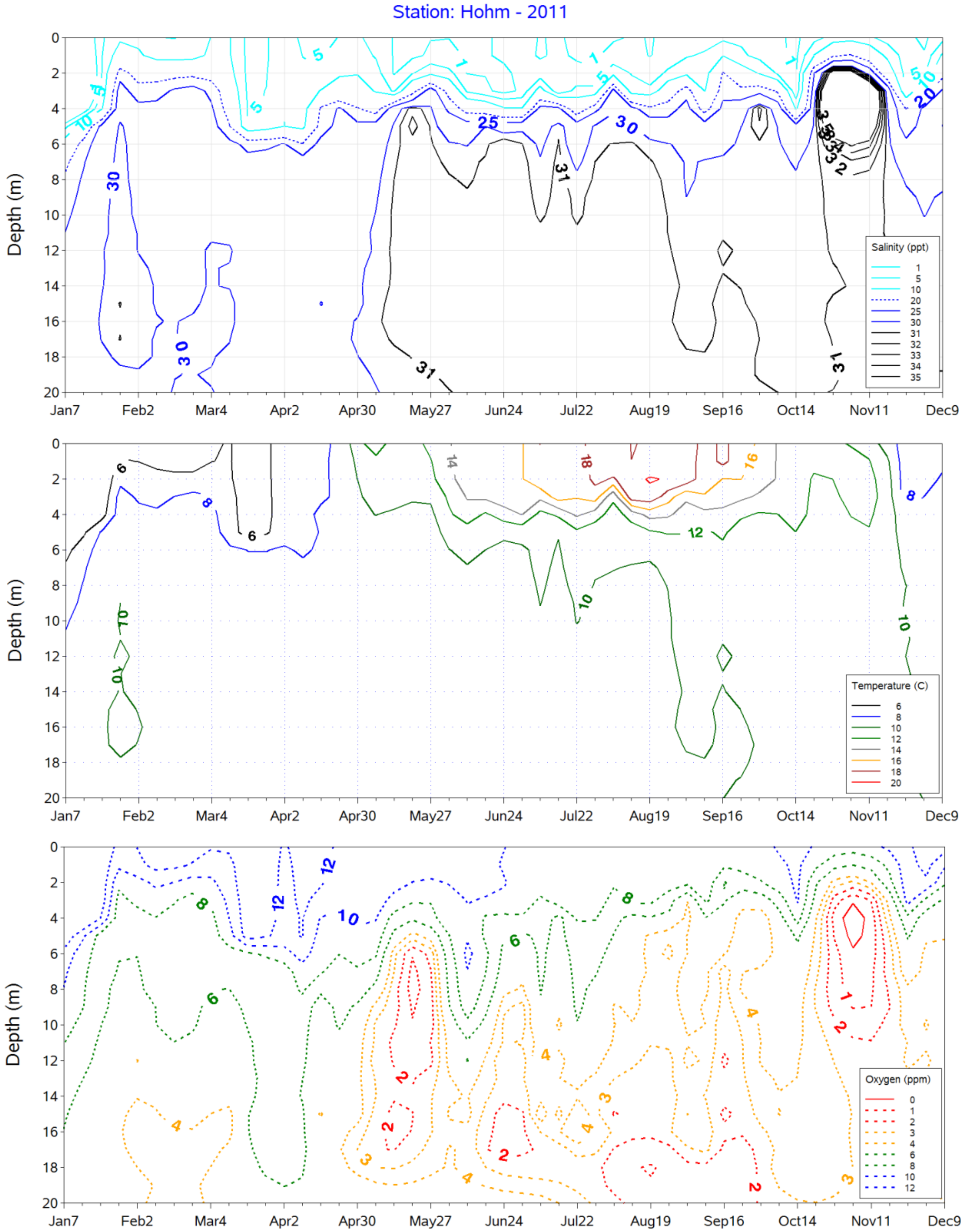


Figure 55. Hohm Station, 2011. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

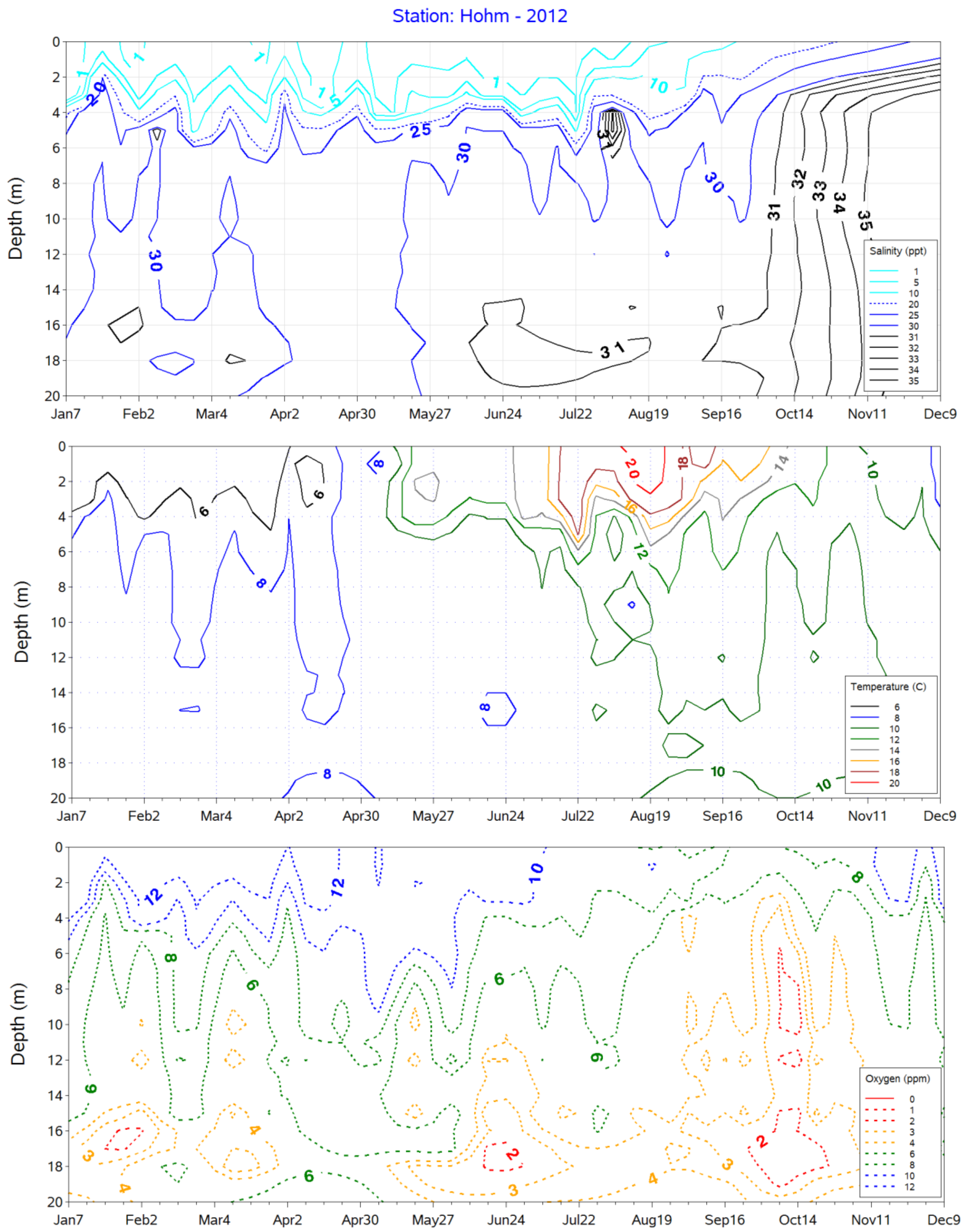


Figure 56. Hohm Station, 2012. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

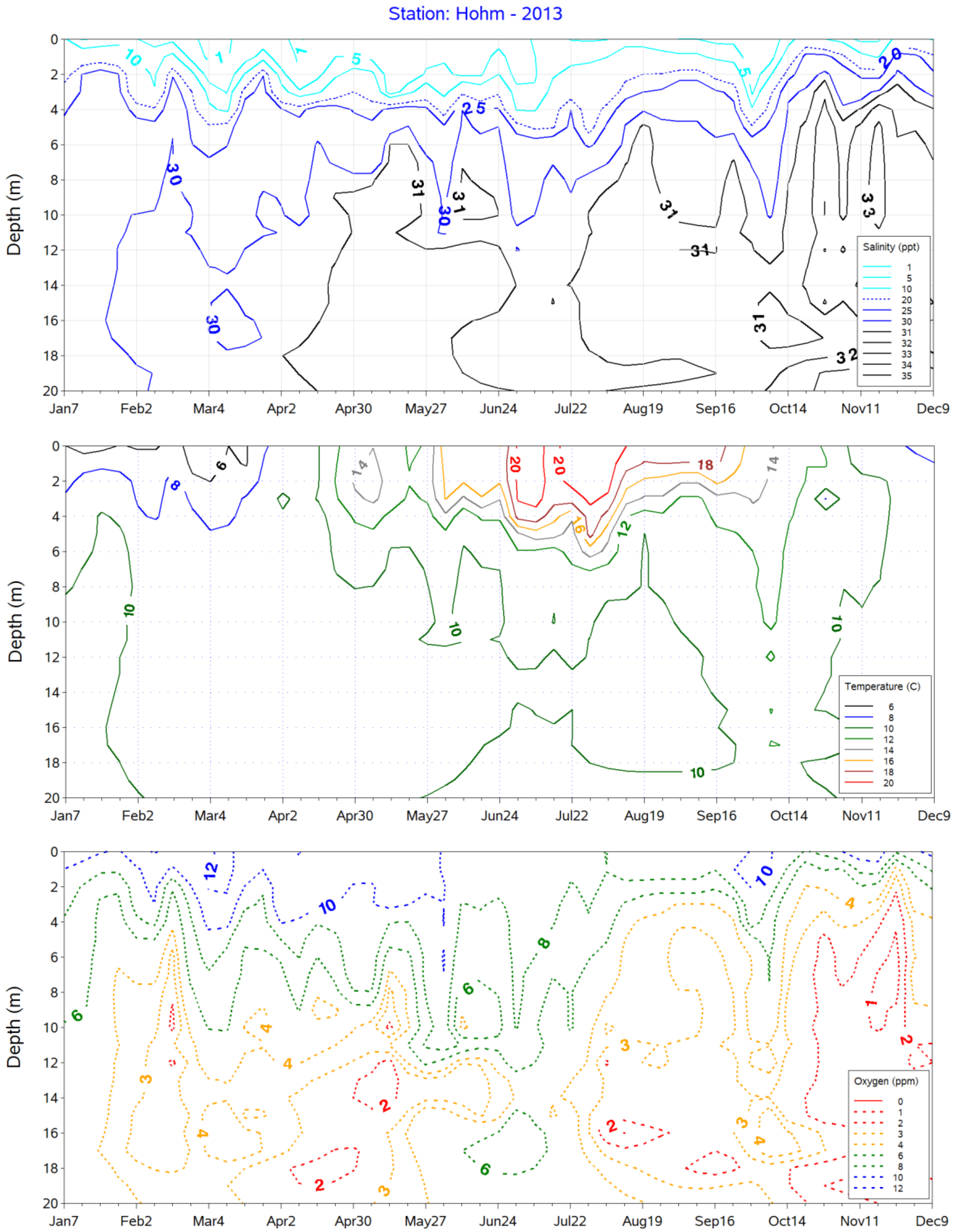


Figure 57. Hohm Station, 2013. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

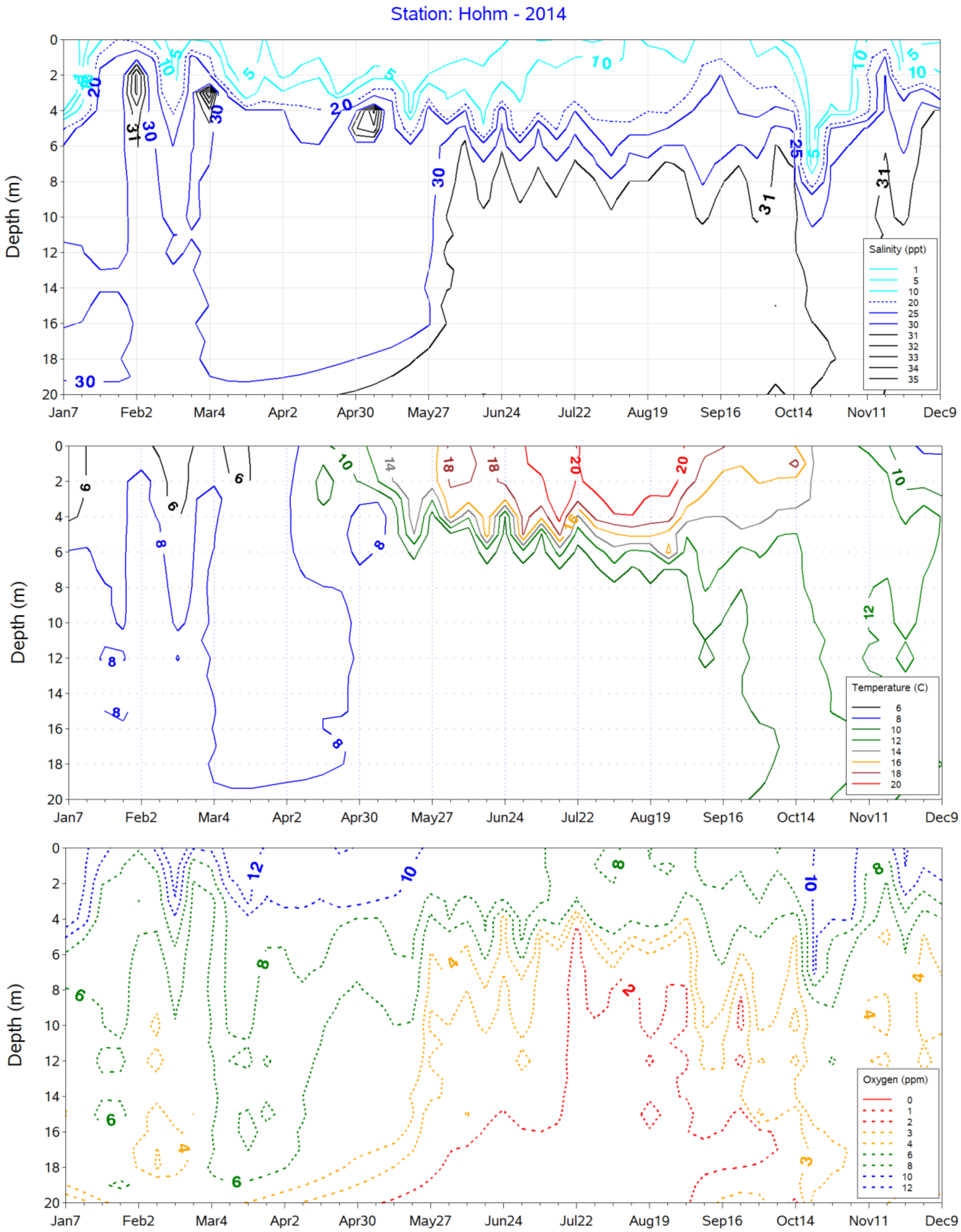


Figure 58. Hohm Station, 2014. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

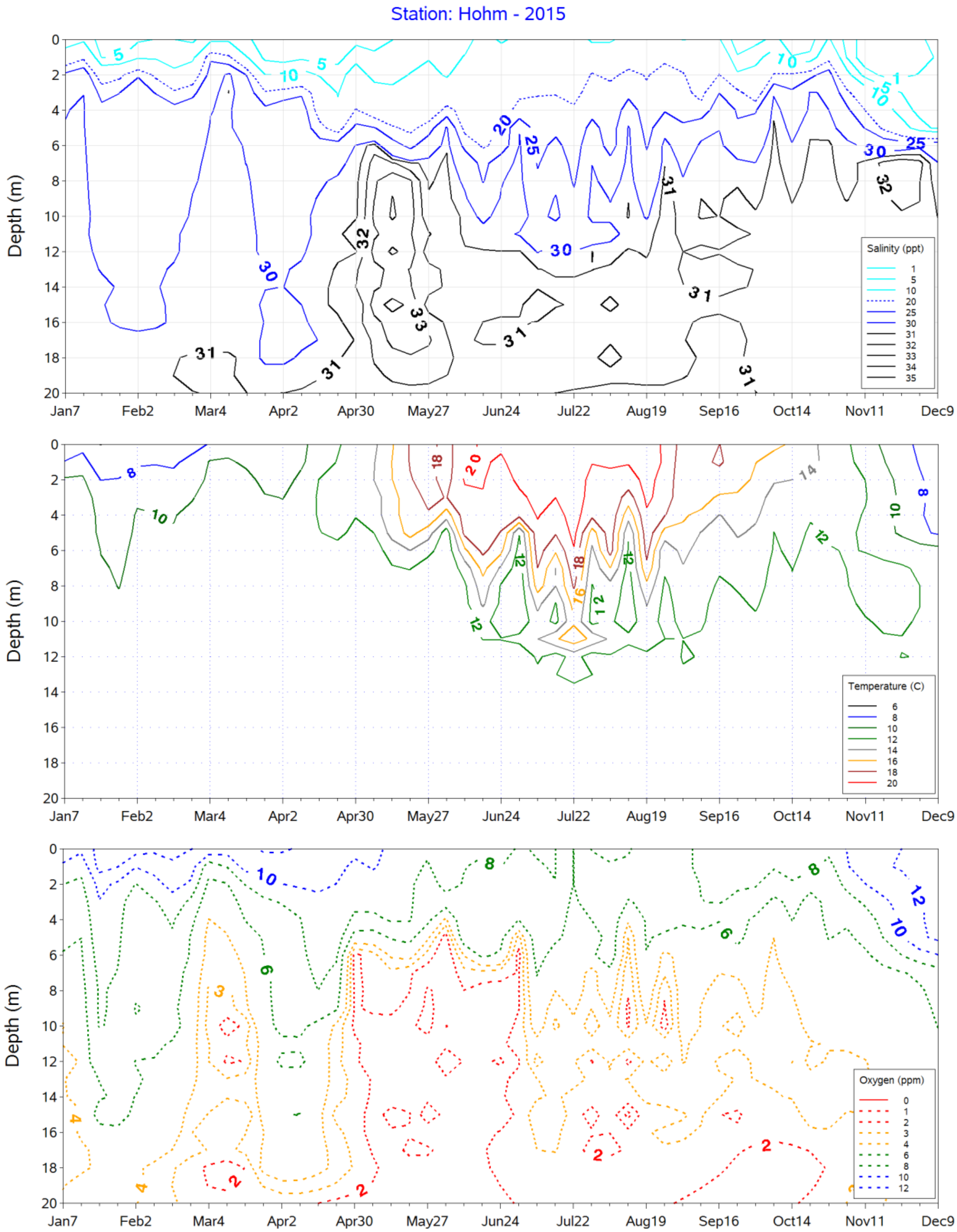


Figure 59. Hohm Station, 2015. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

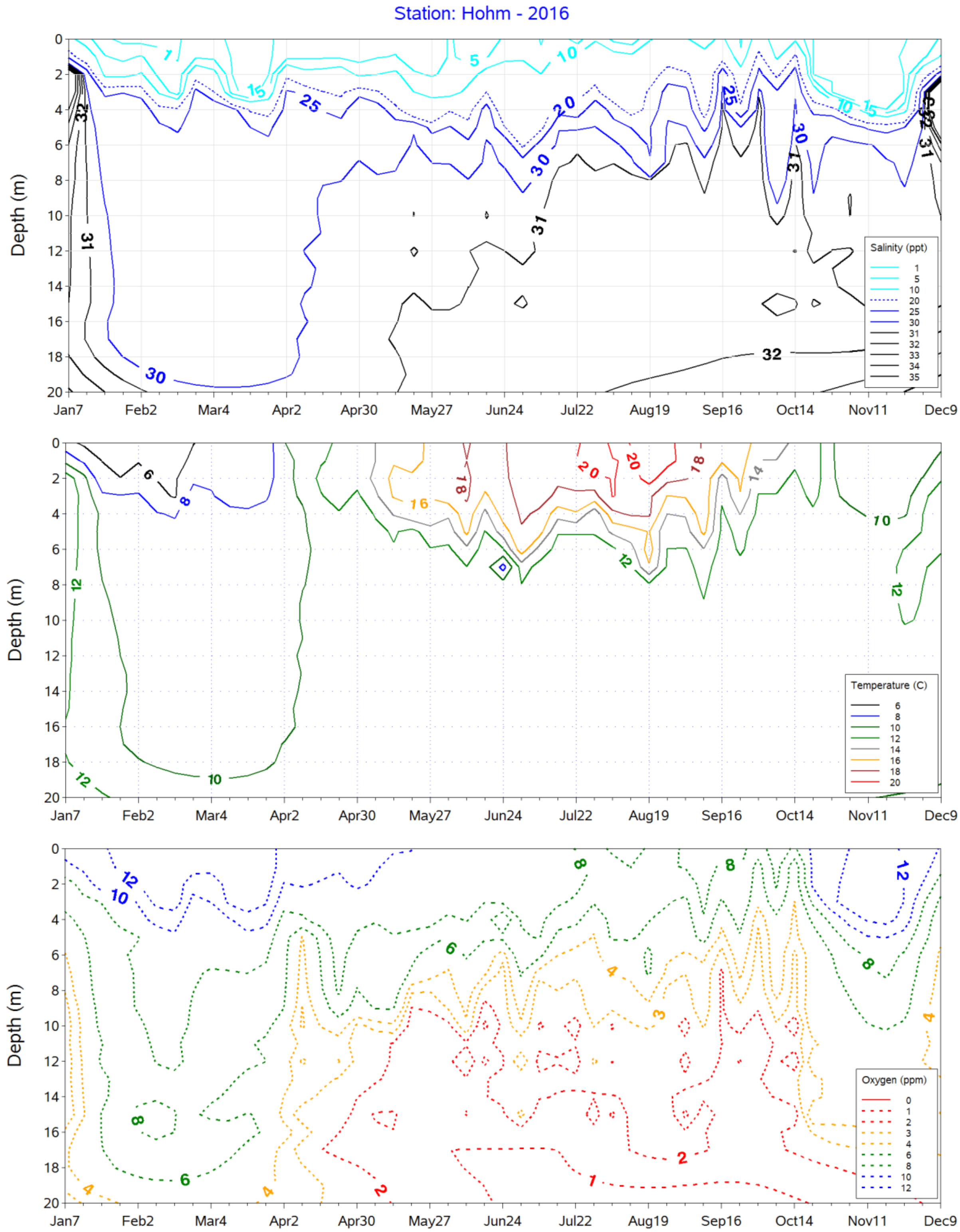


Figure 60. Hohm Station, 2016. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

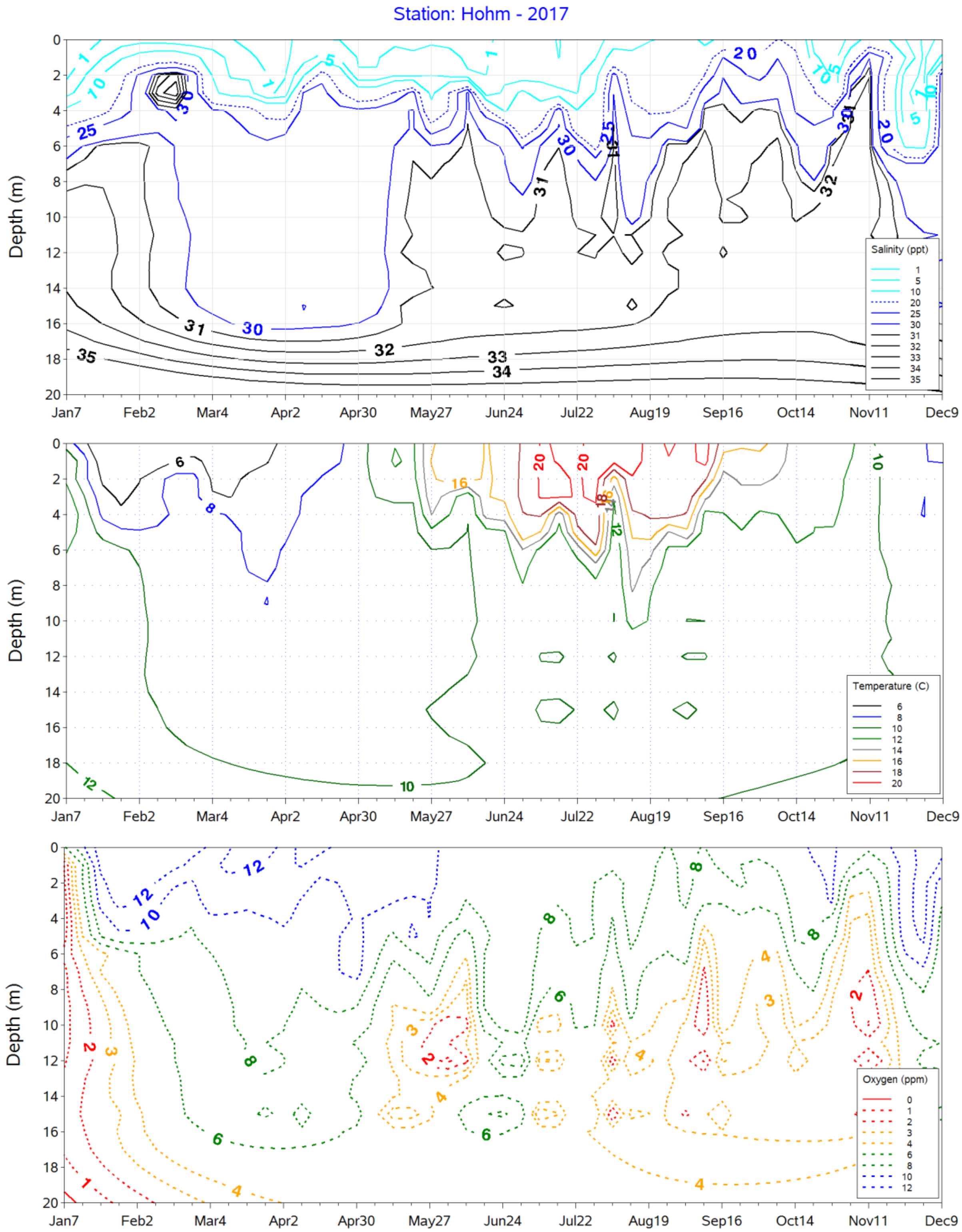


Figure 61. Hohm Station, 2017. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

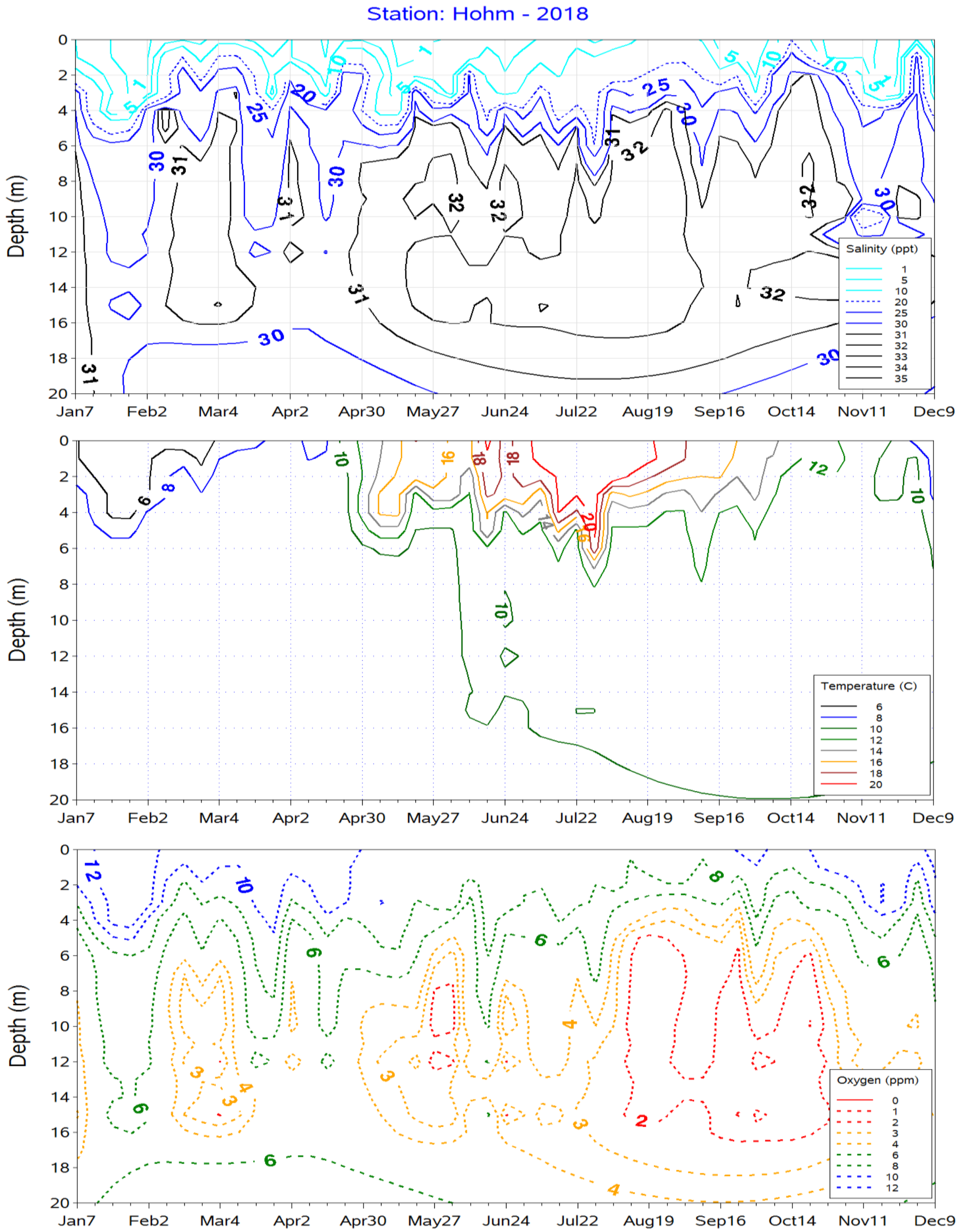


Figure 62. Hohm Station, 2018. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

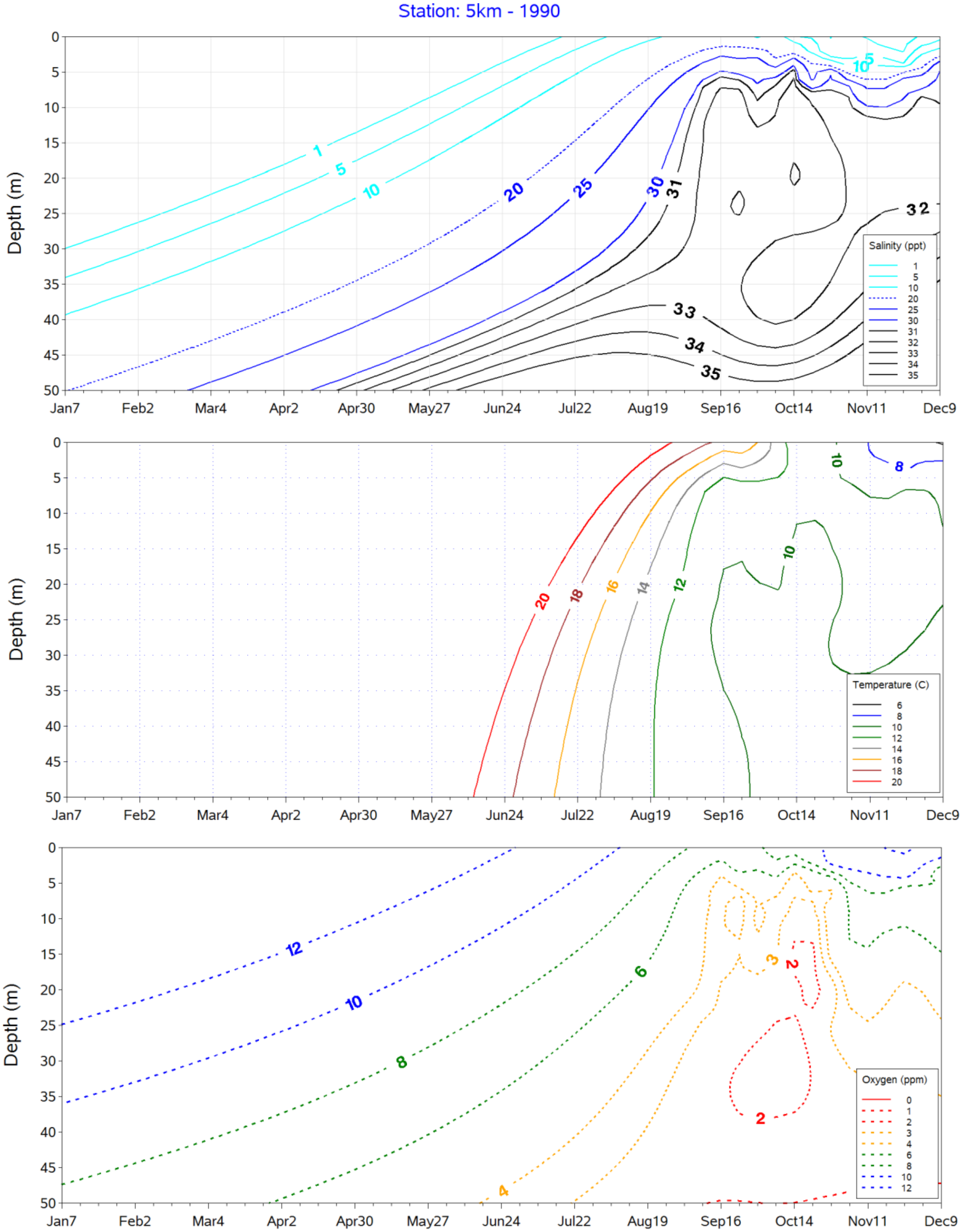


Figure 63. Station 5KM, 1990. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth, September – December only.

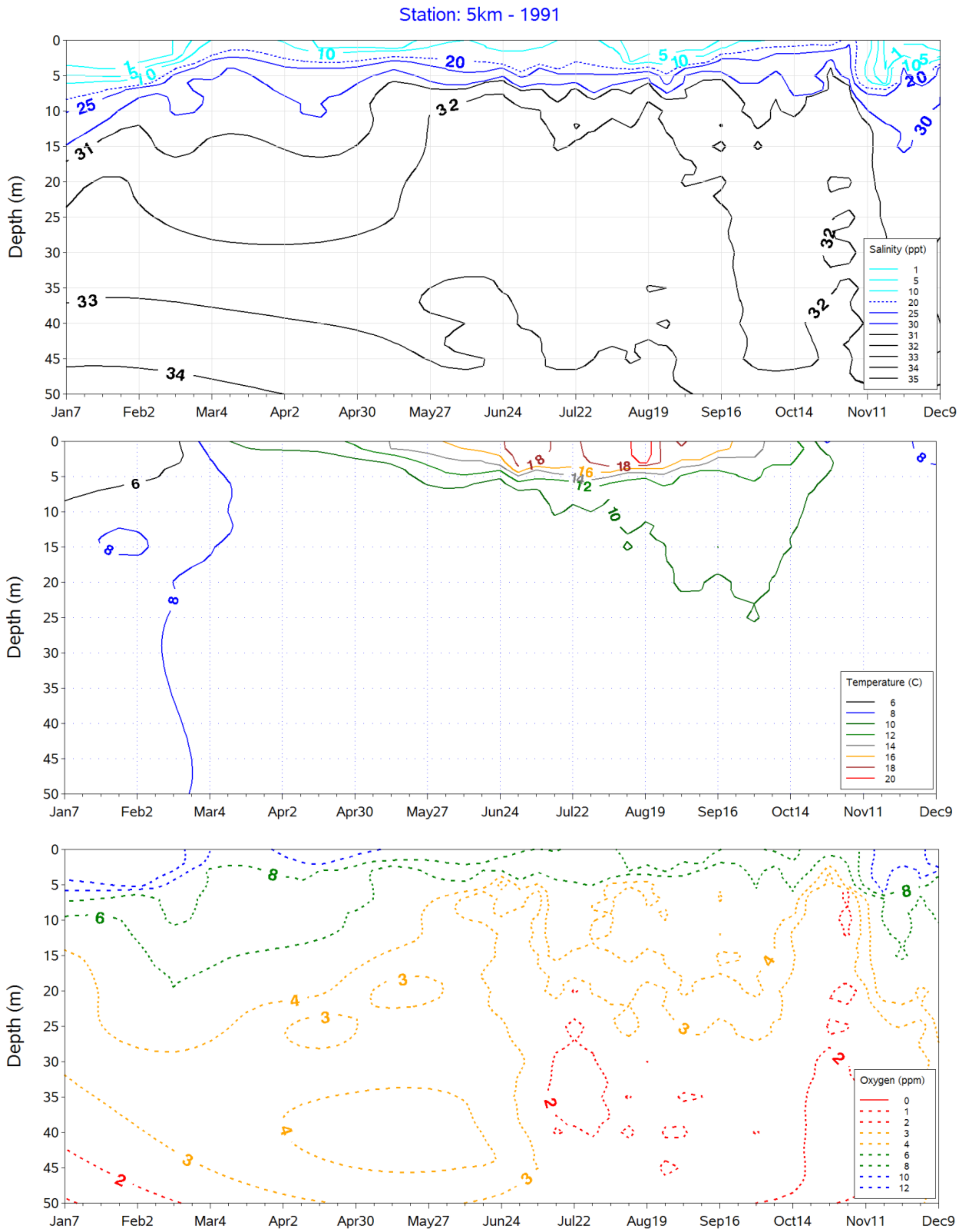


Figure 64. Station 5KM, 1991. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

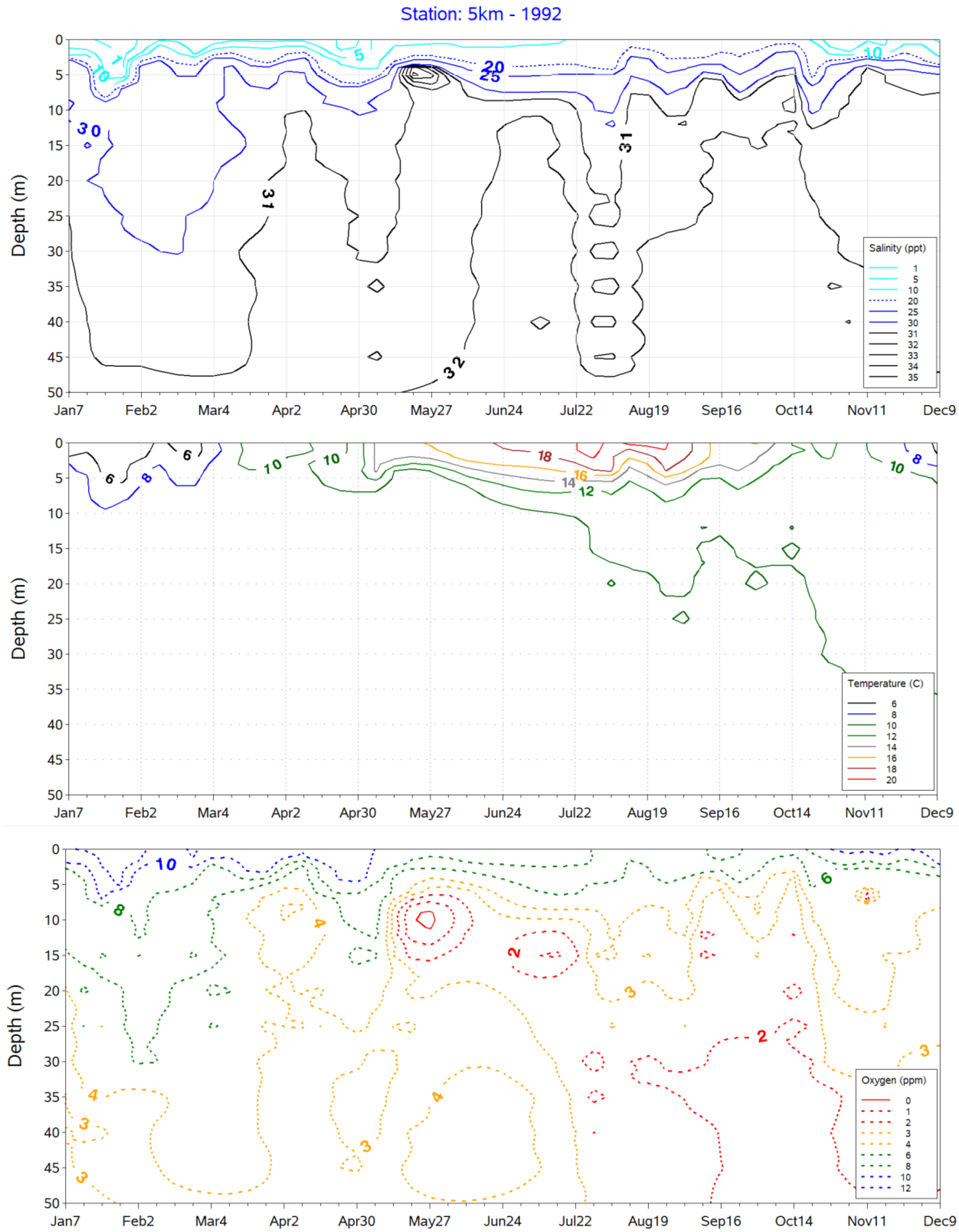


Figure 65. Station 5KM, 1992. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

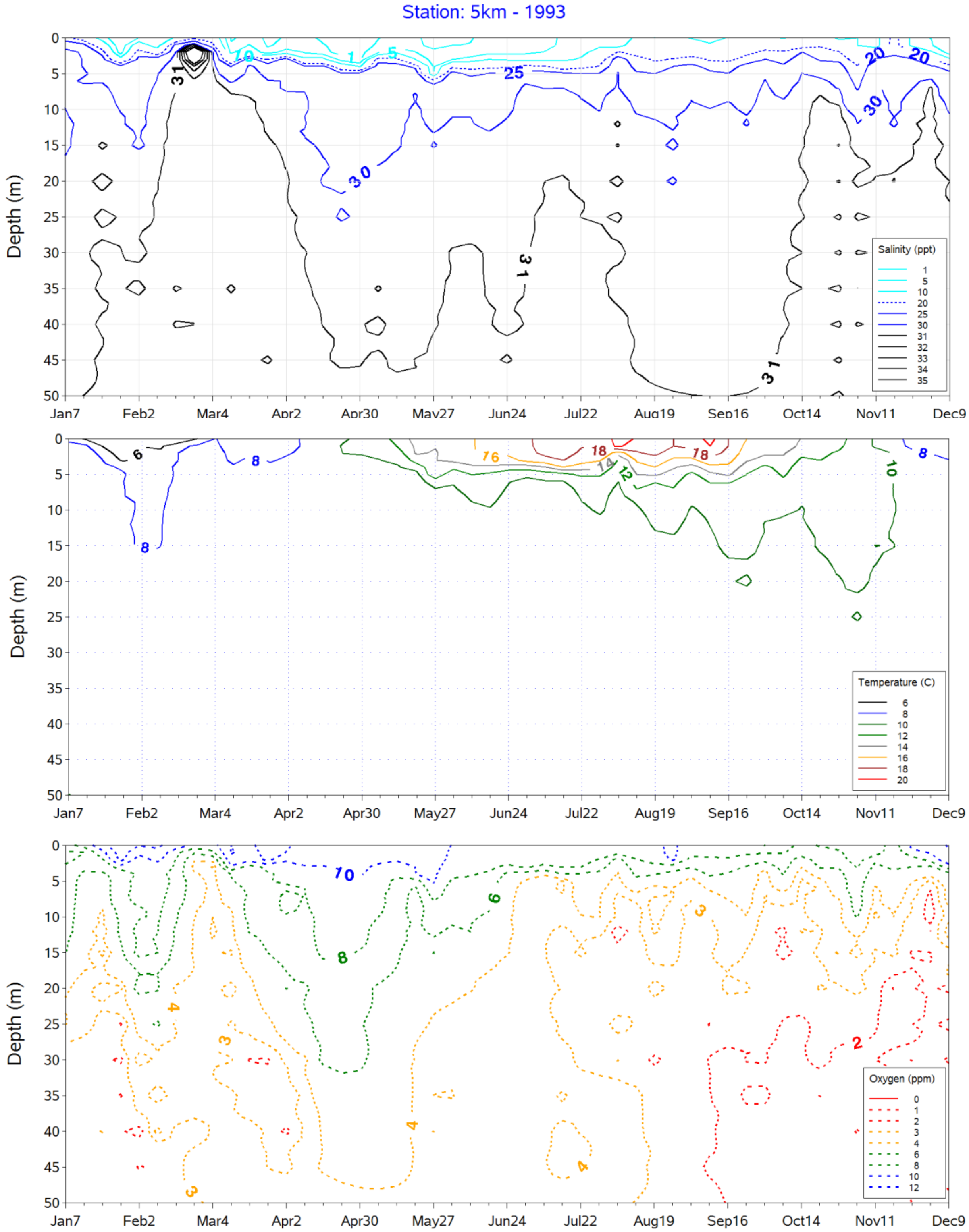


Figure 66. Station 5KM, 1993. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

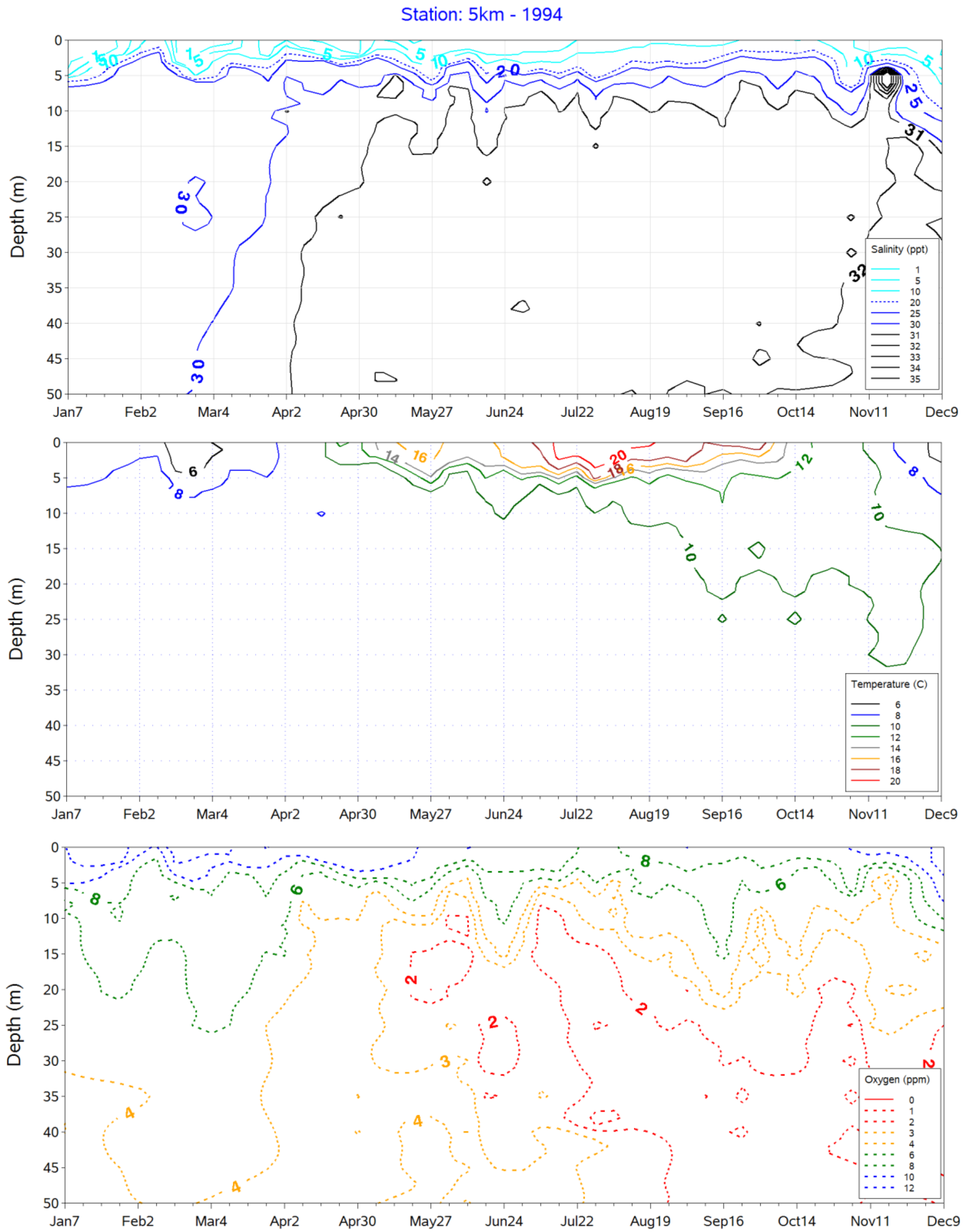


Figure 67. Station 5KM, 1994. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

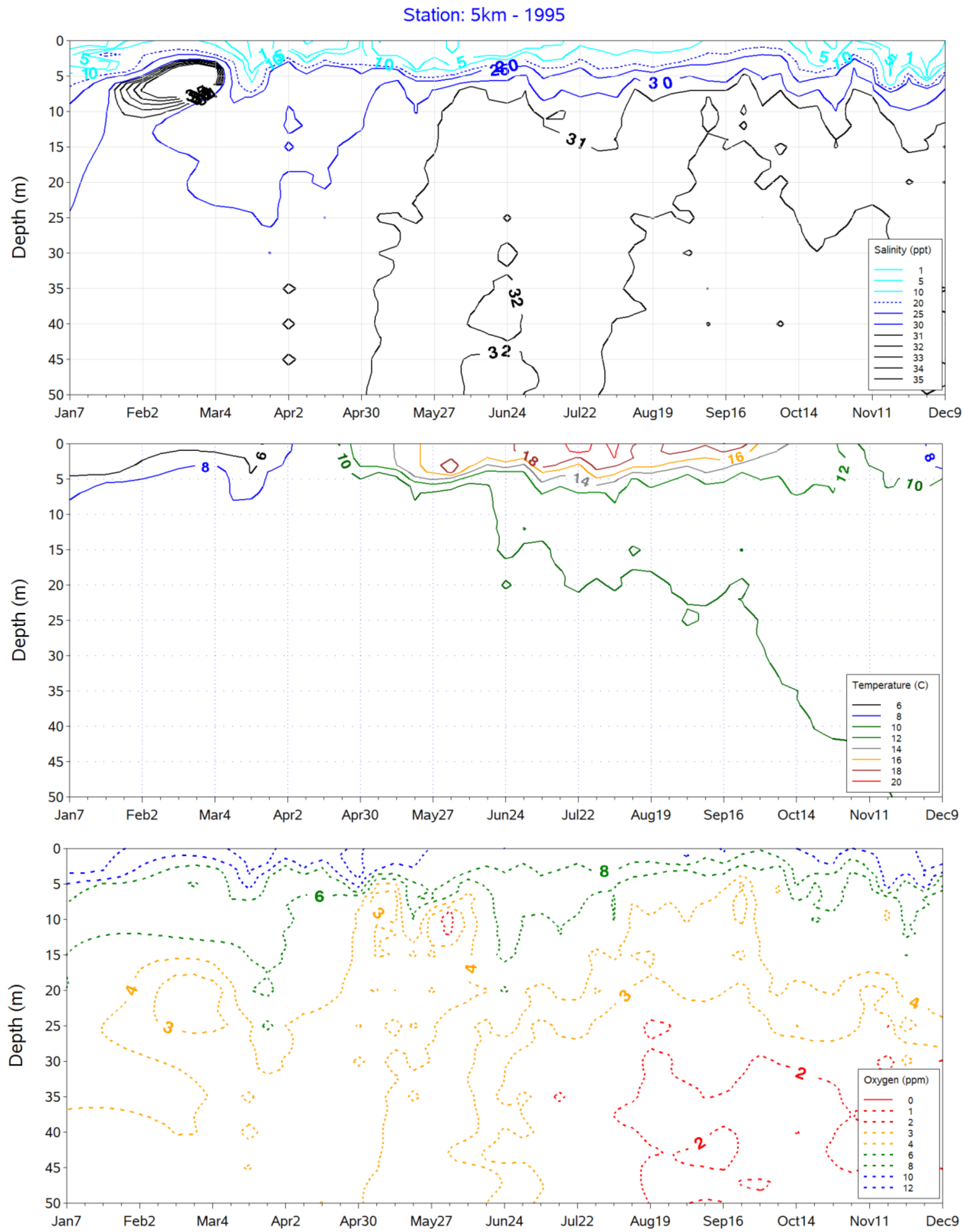


Figure 68. Station 5KM, 1995. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

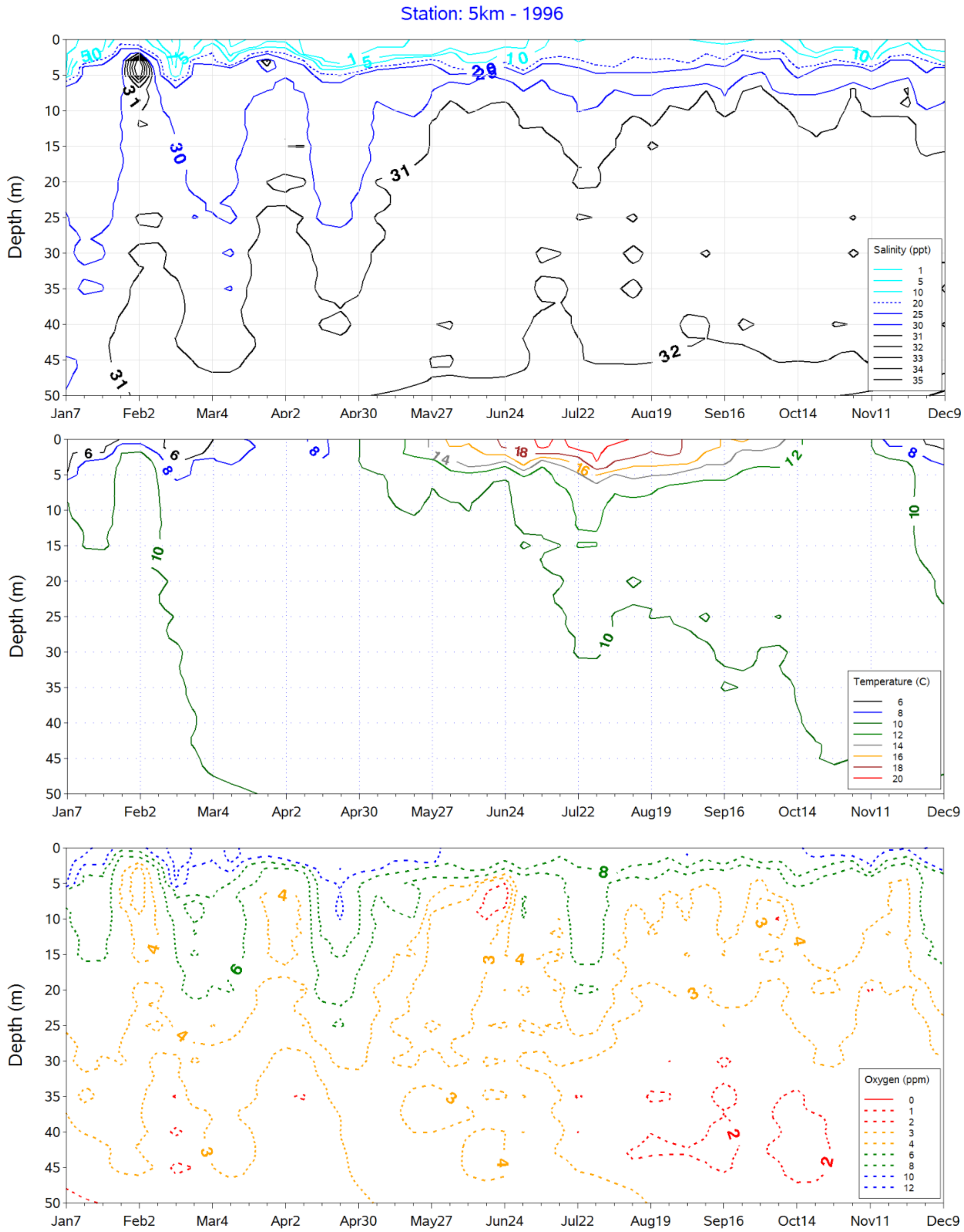


Figure 69. Station 5KM, 1996. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

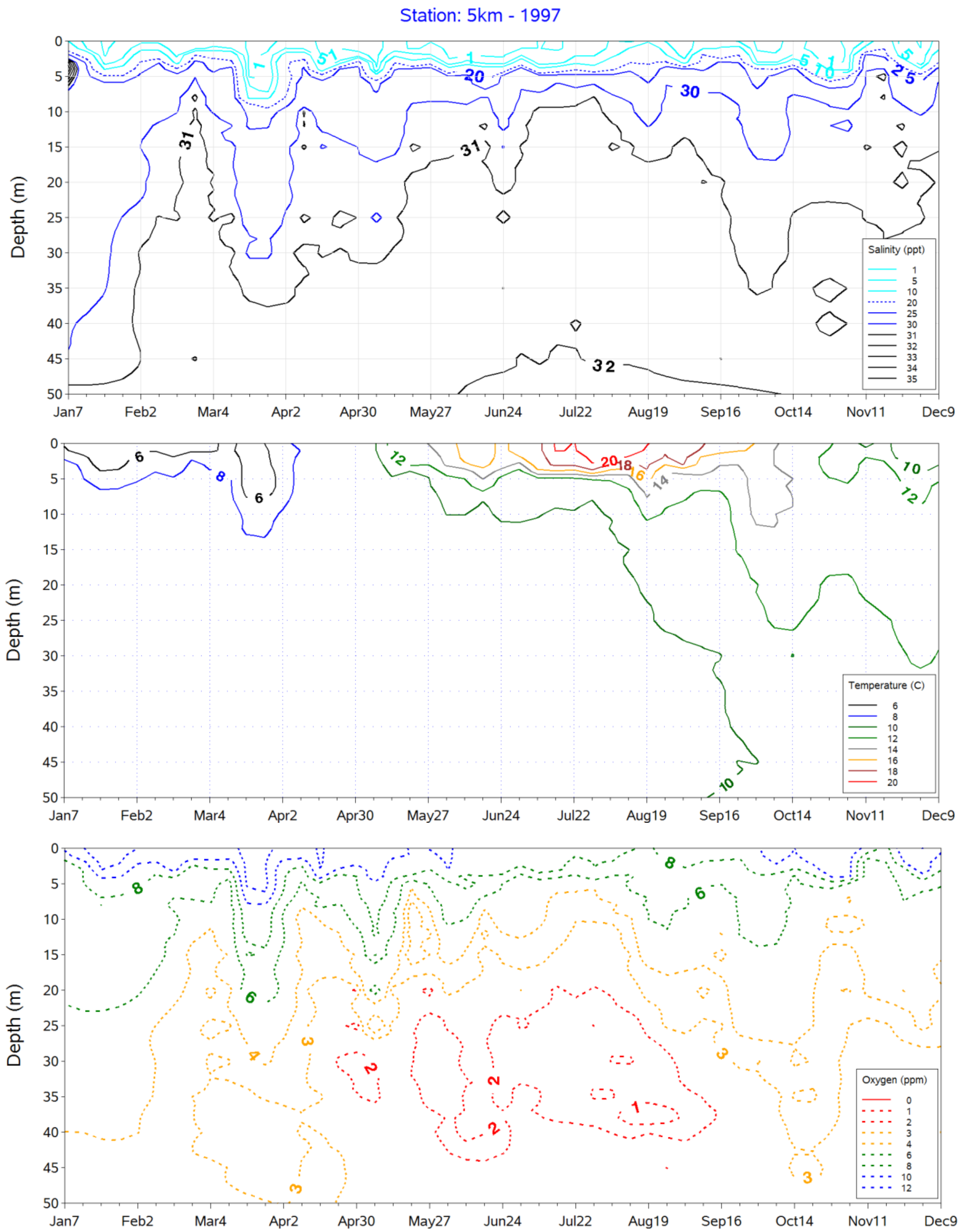


Figure 70. Station 5KM, 1997. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

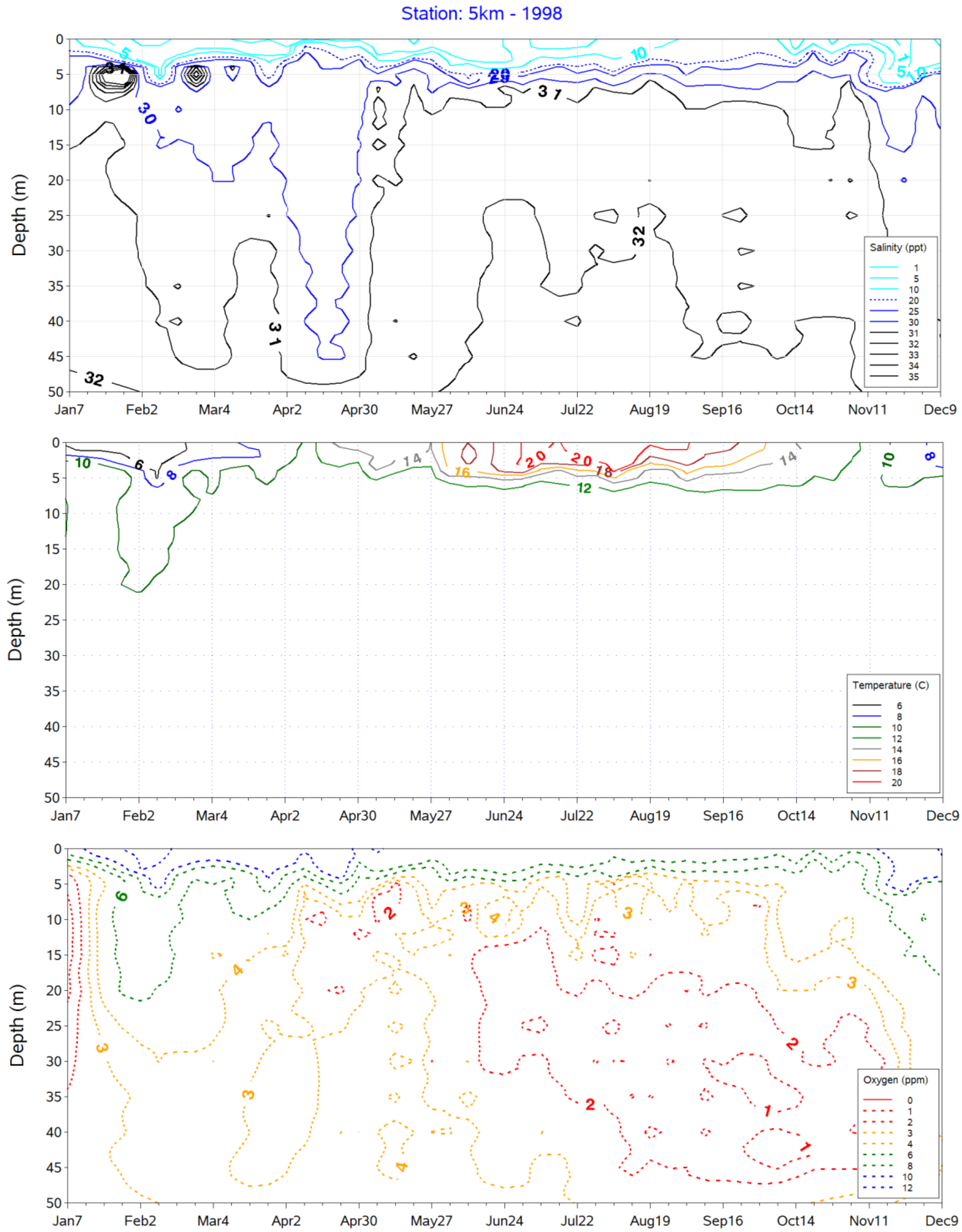


Figure 71. Station 5KM, 1998. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

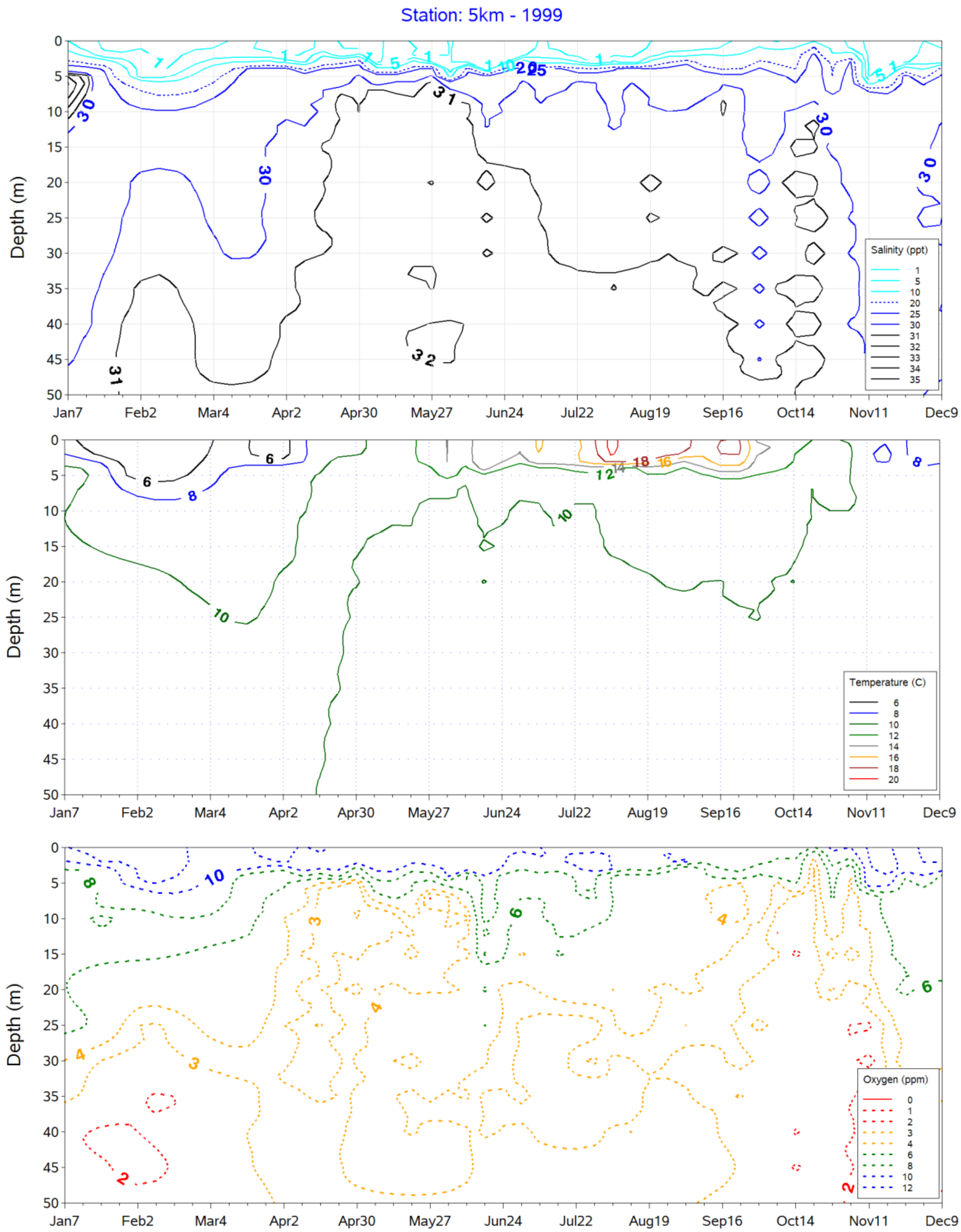


Figure 72. Station 5KM, 1999. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

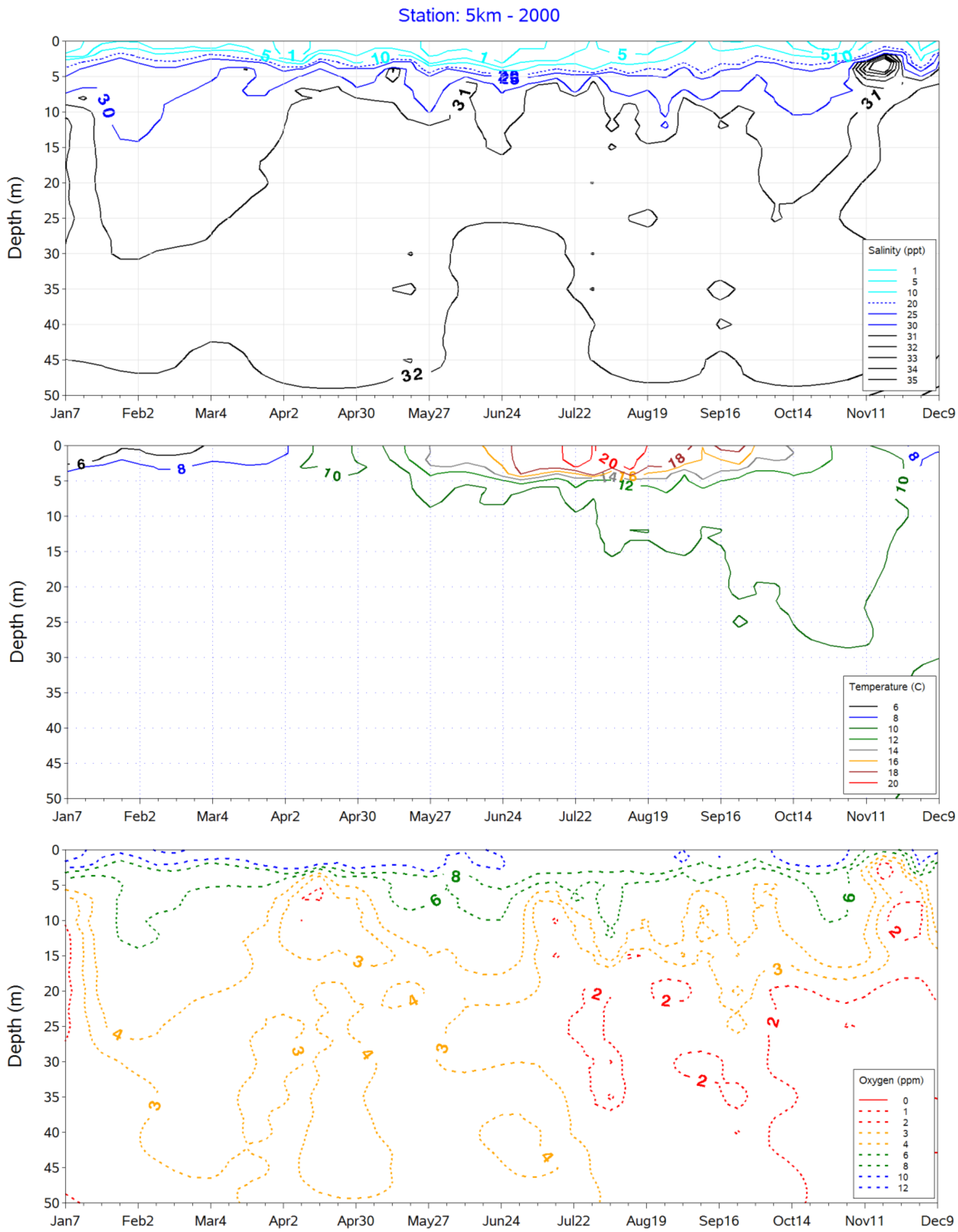


Figure 73. Station 5KM, 2000. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

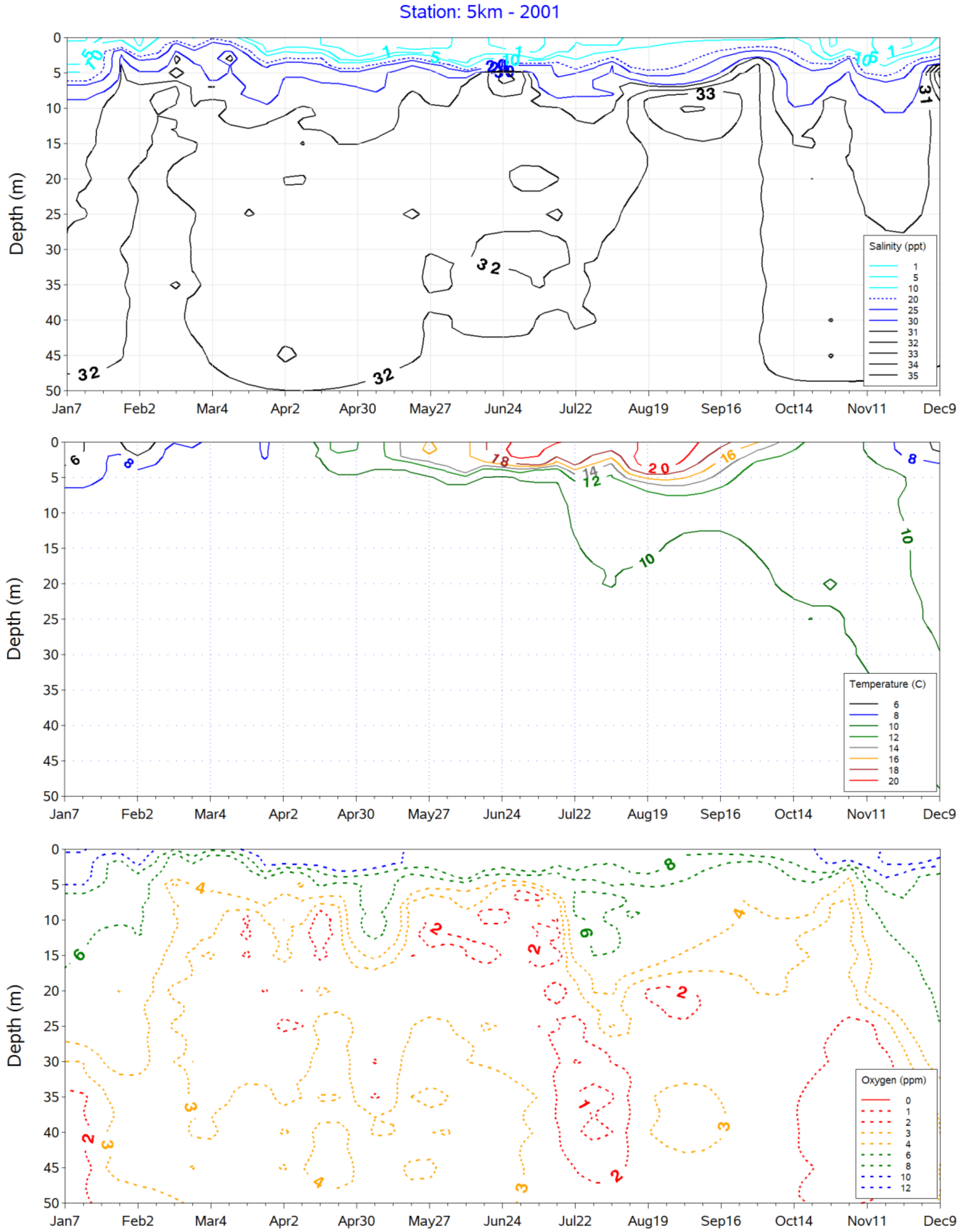


Figure 74. Station 5KM, 2001. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

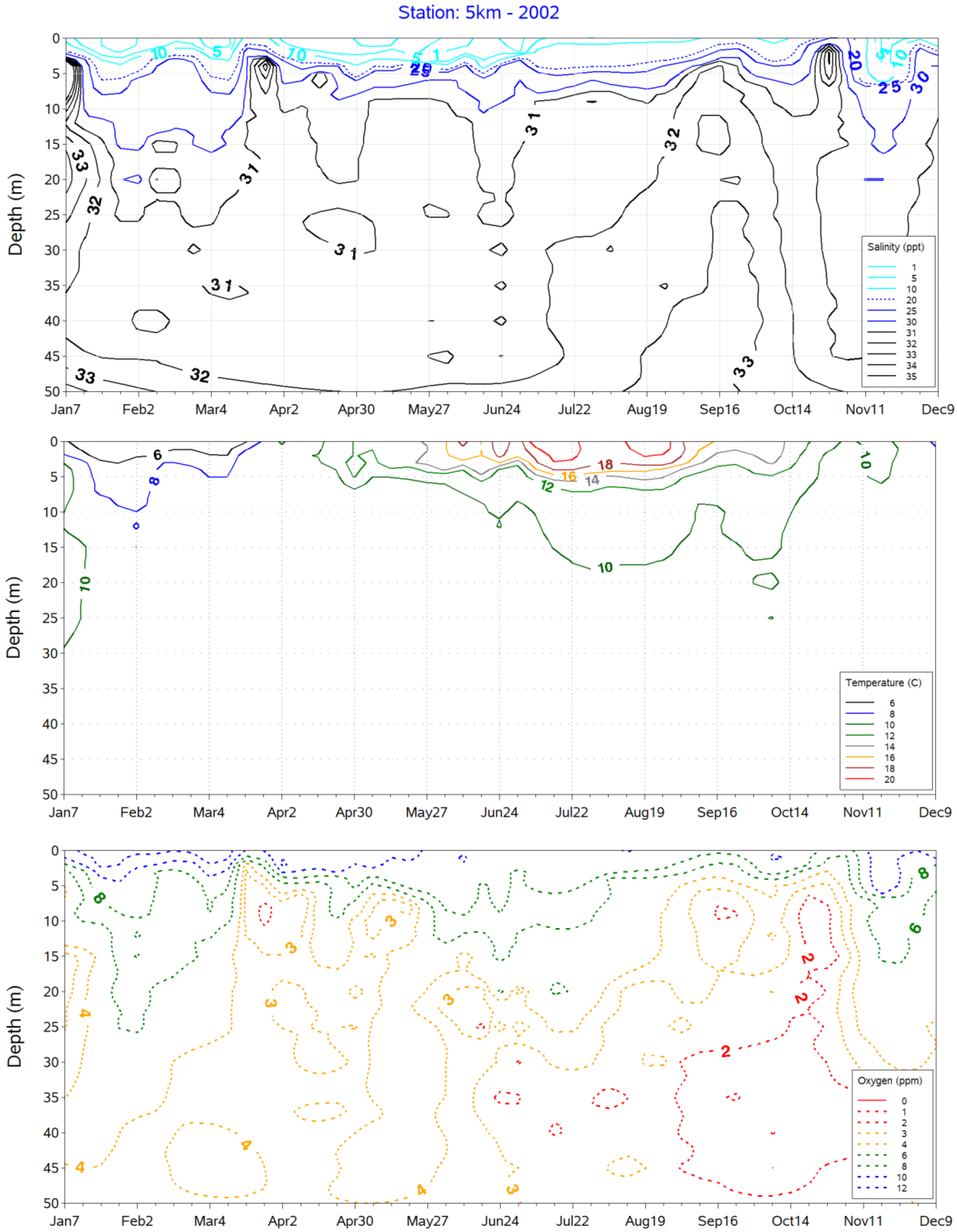


Figure 75. Station 5KM, 2002. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

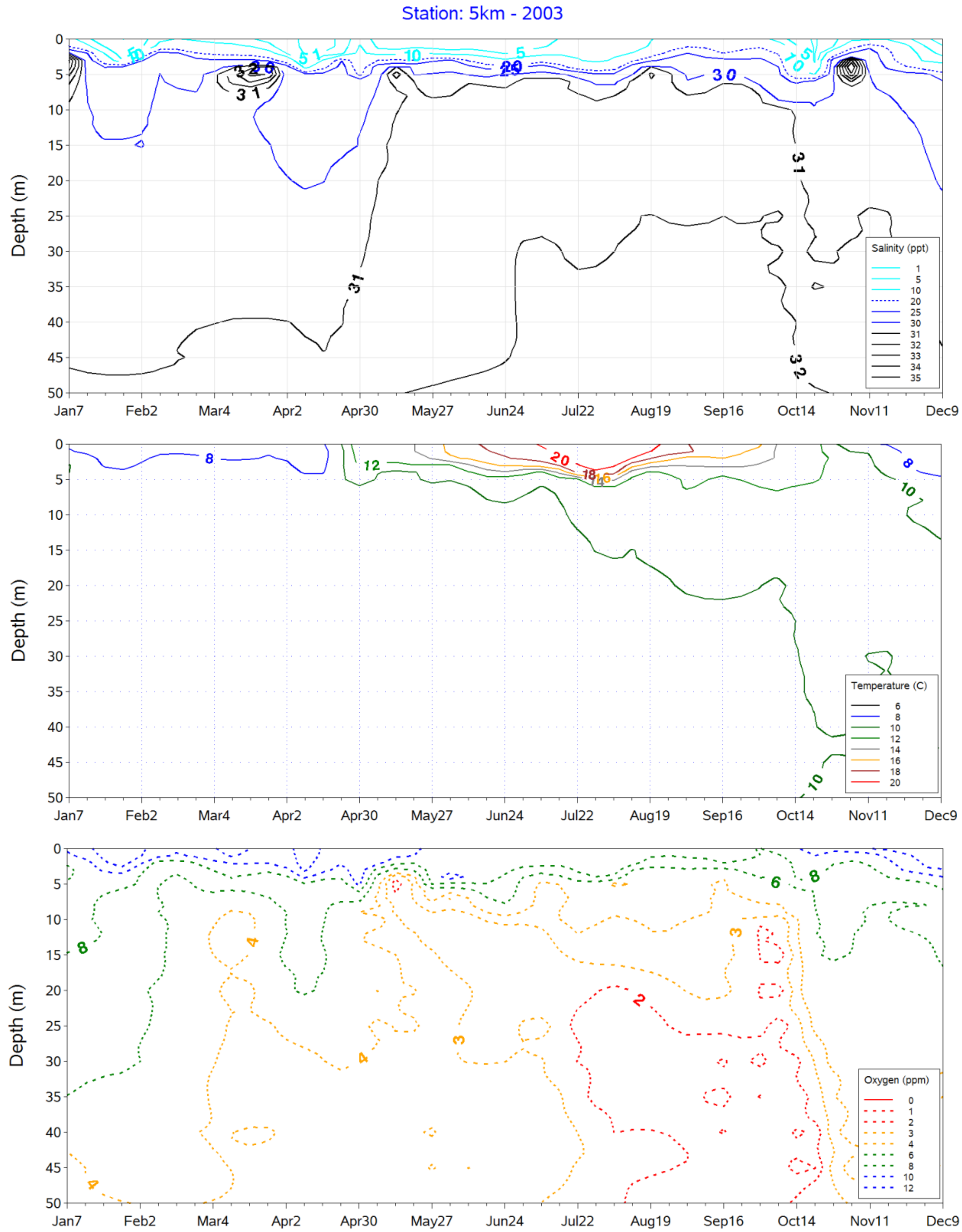


Figure 76. Station 5KM, 2003. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

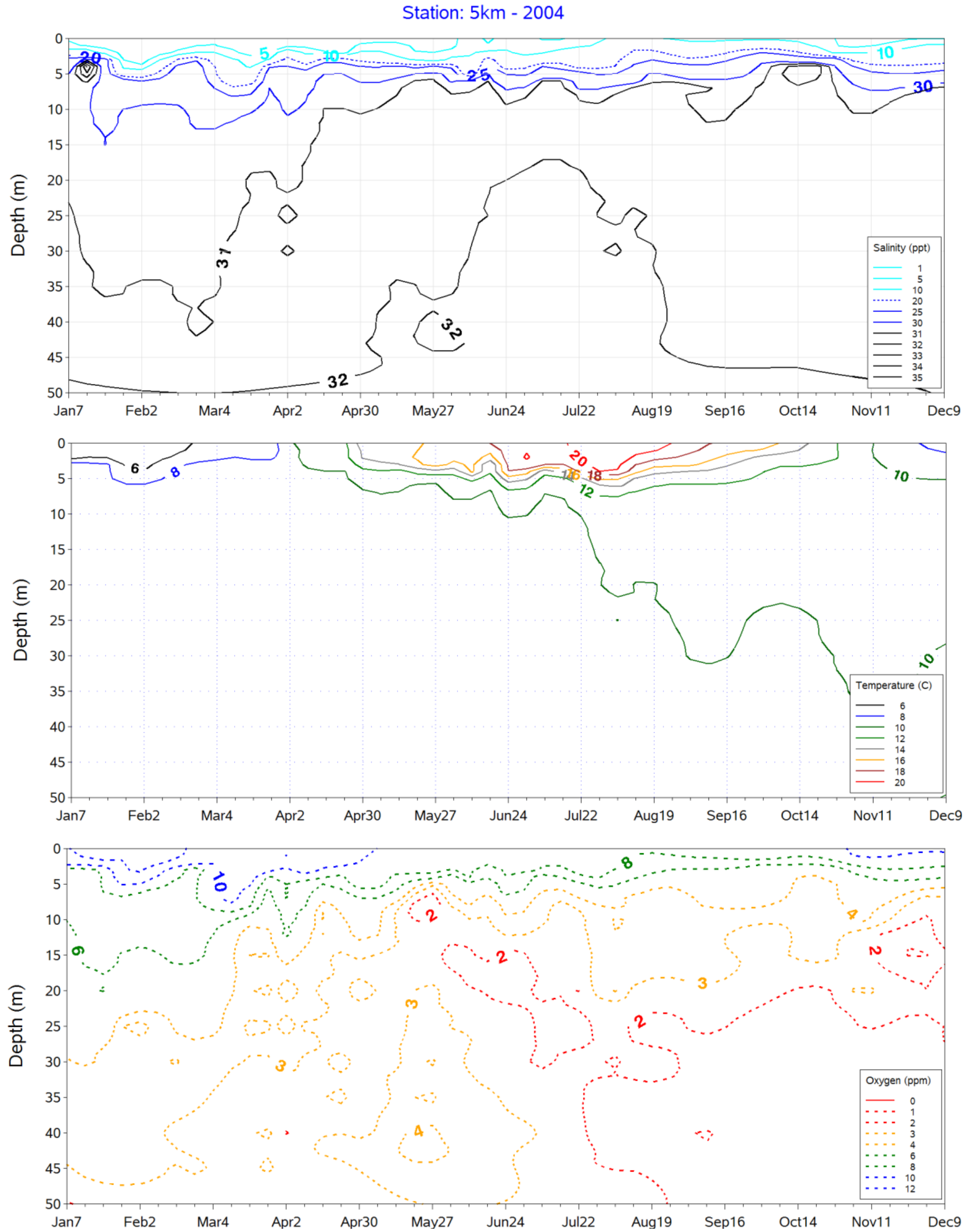


Figure 77. Station 5KM, 2004. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

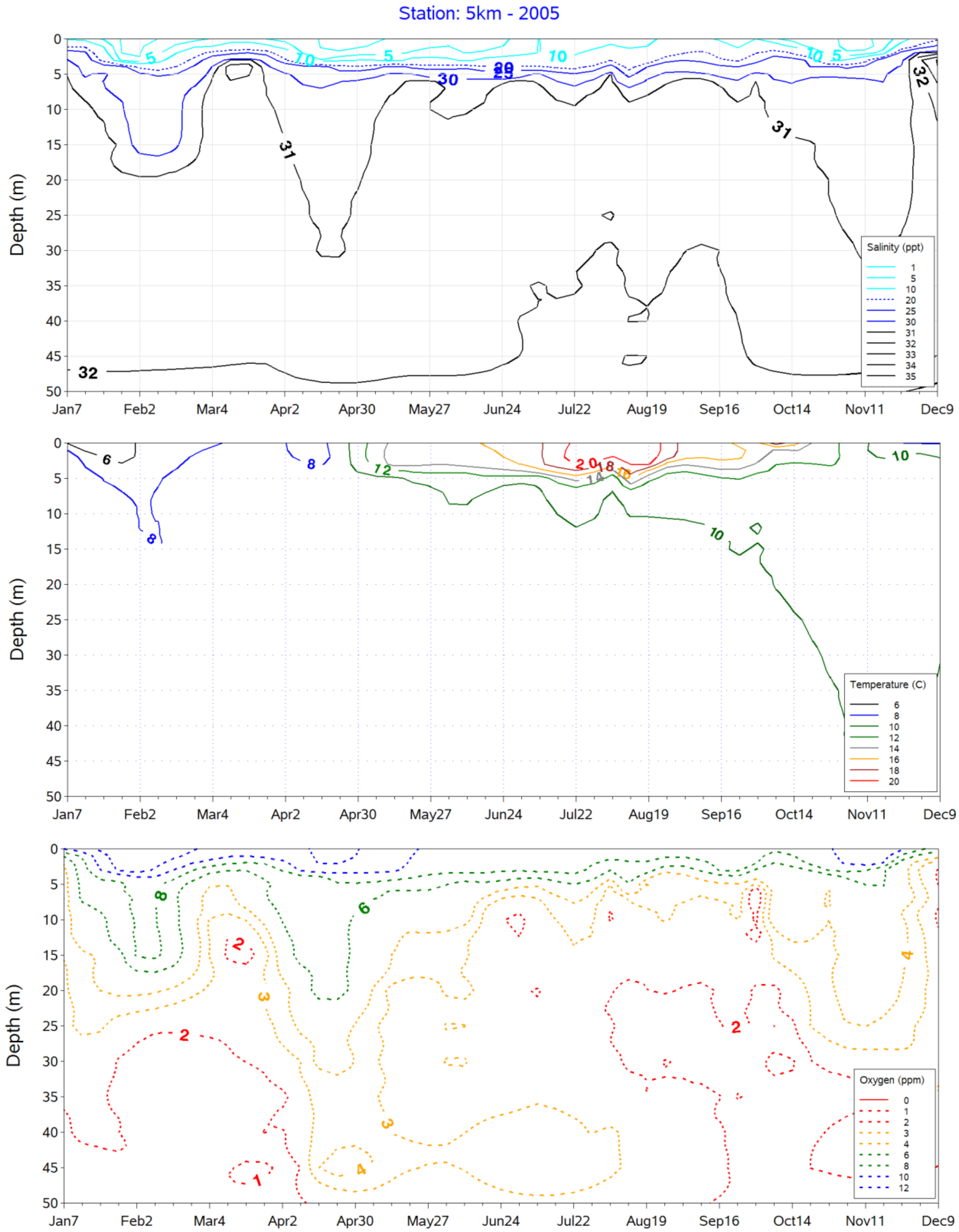


Figure 78. Station 5KM, 2005. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

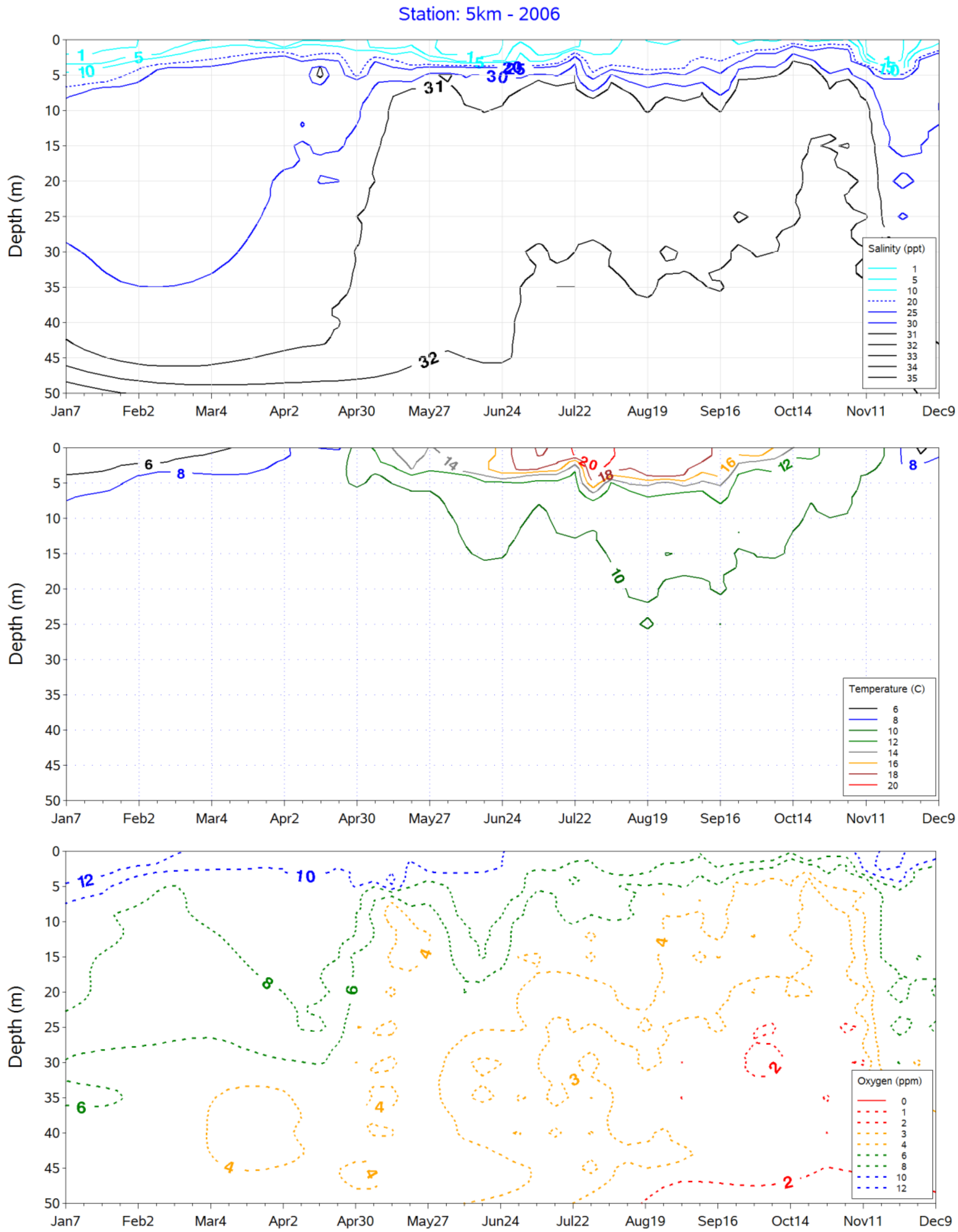


Figure 79. Station 5KM, 2006. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

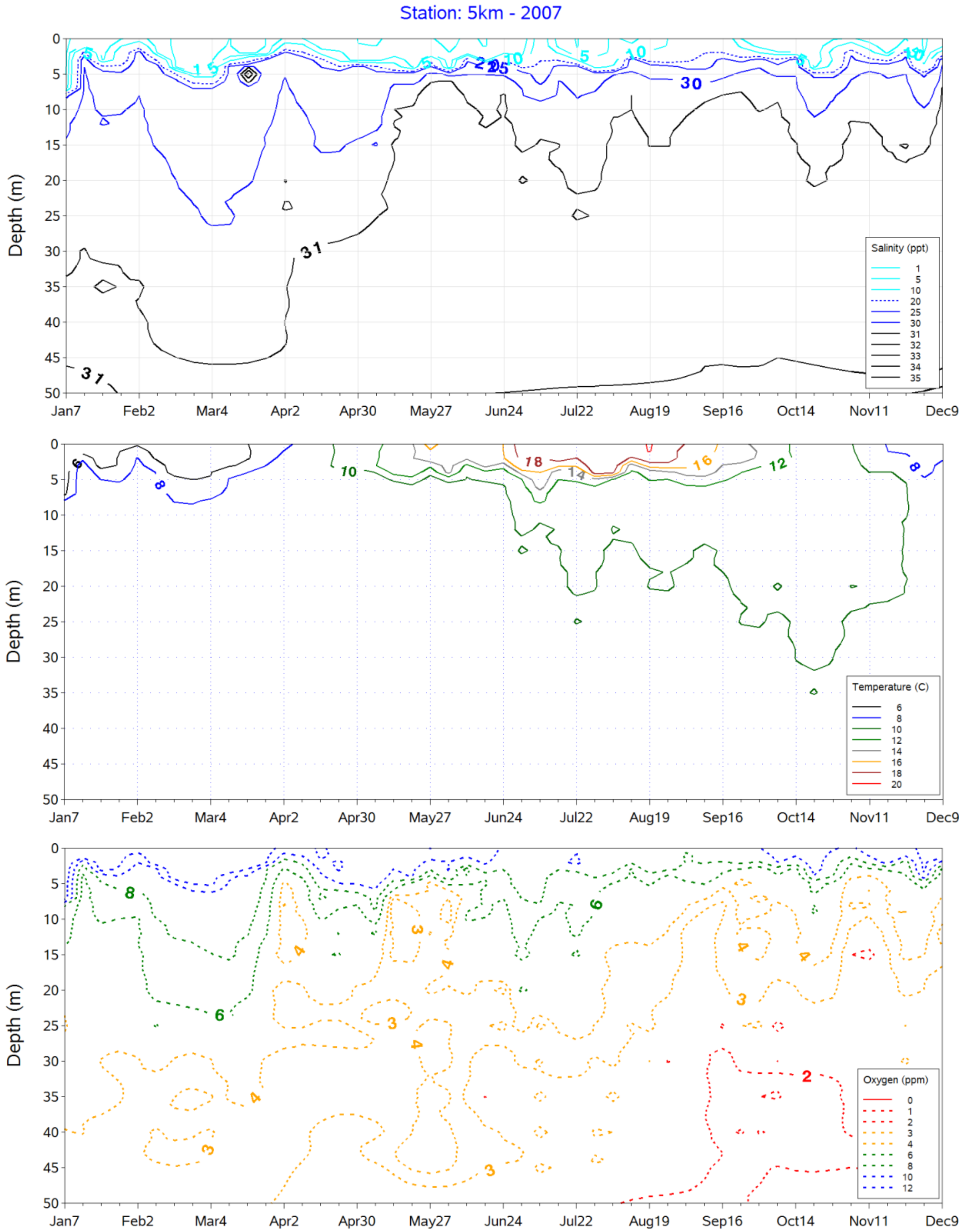


Figure 80. Station 5KM, 2007. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

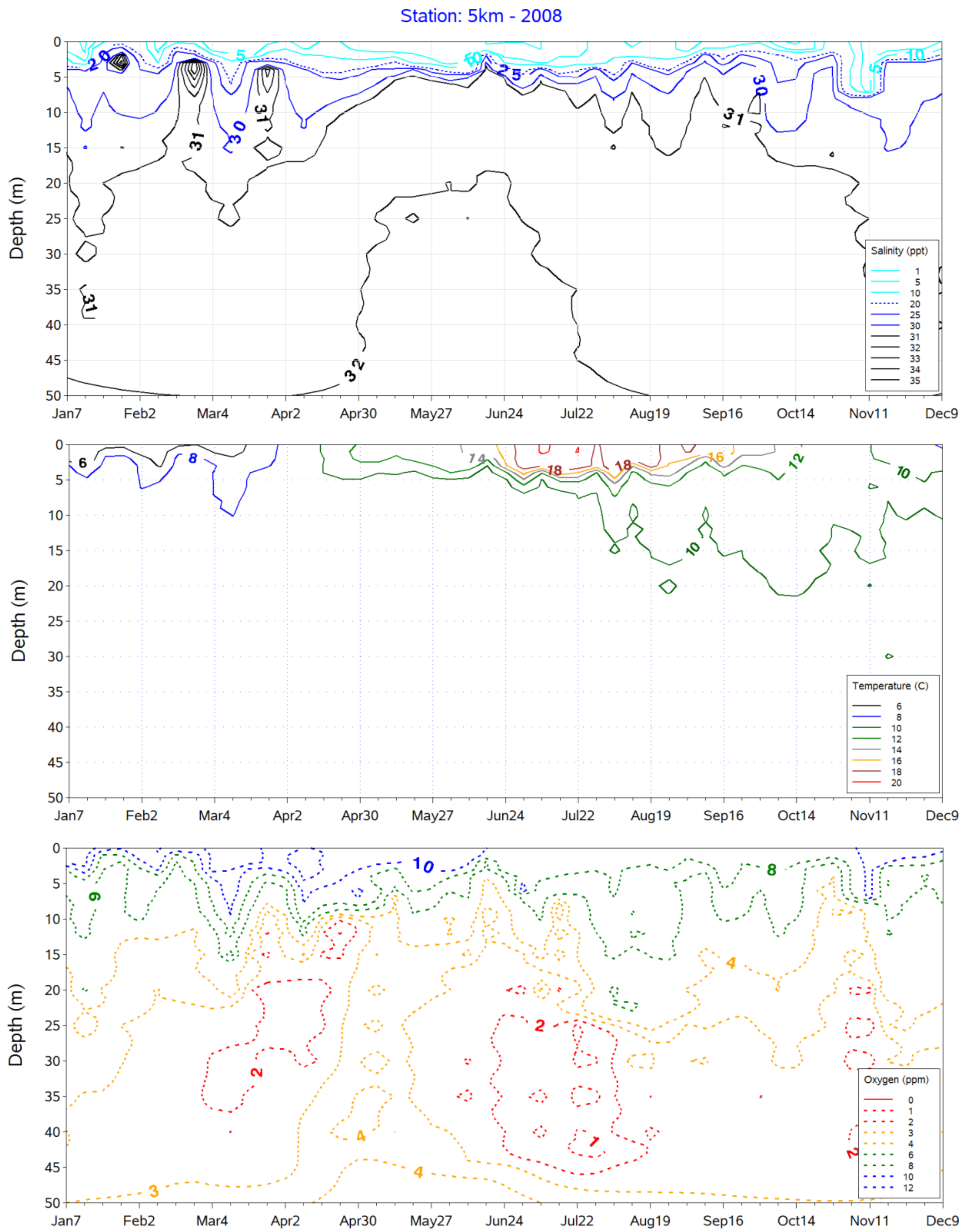


Figure 81. Station 5KM, 2008. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

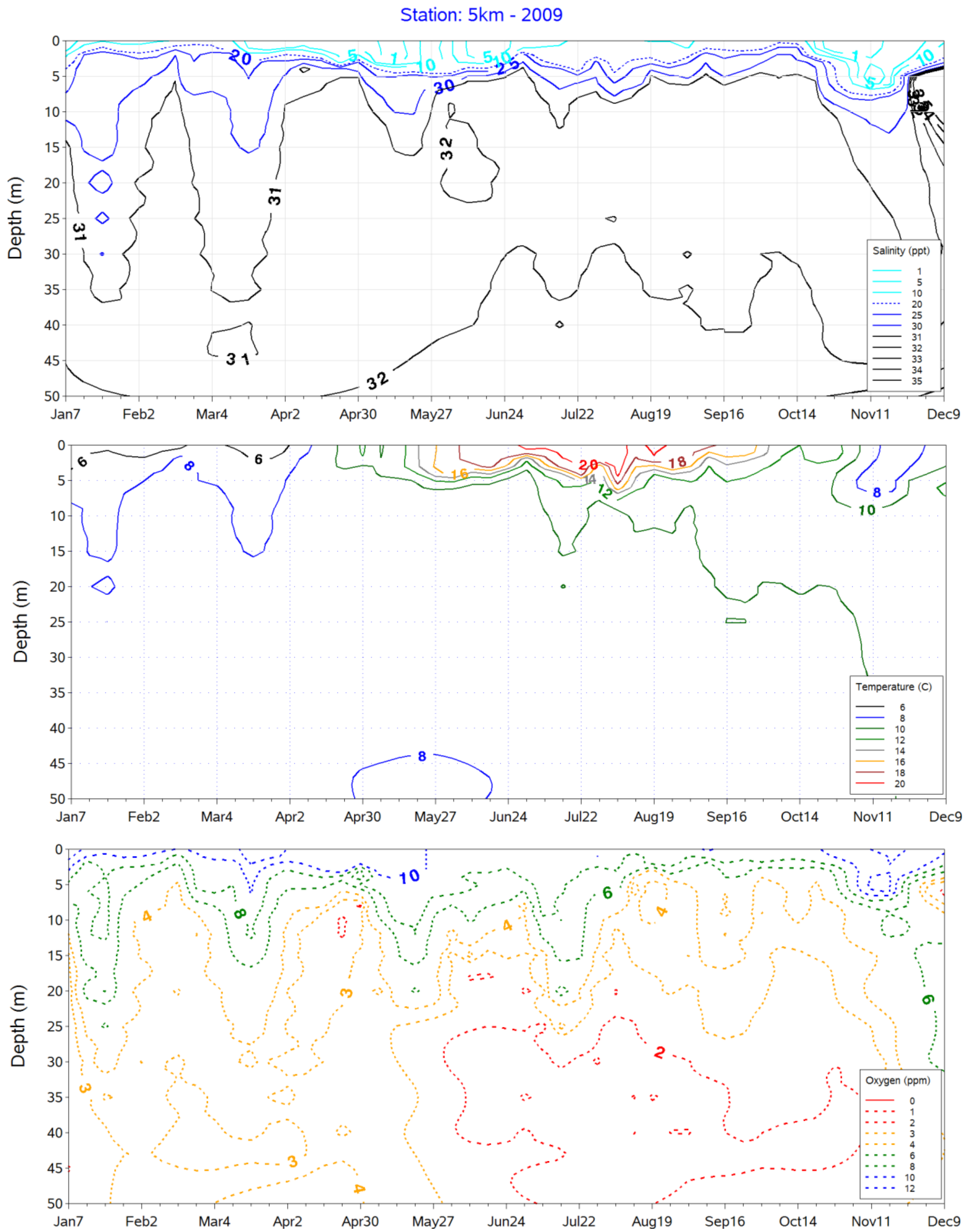


Figure 82. Station 5KM, 2009. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

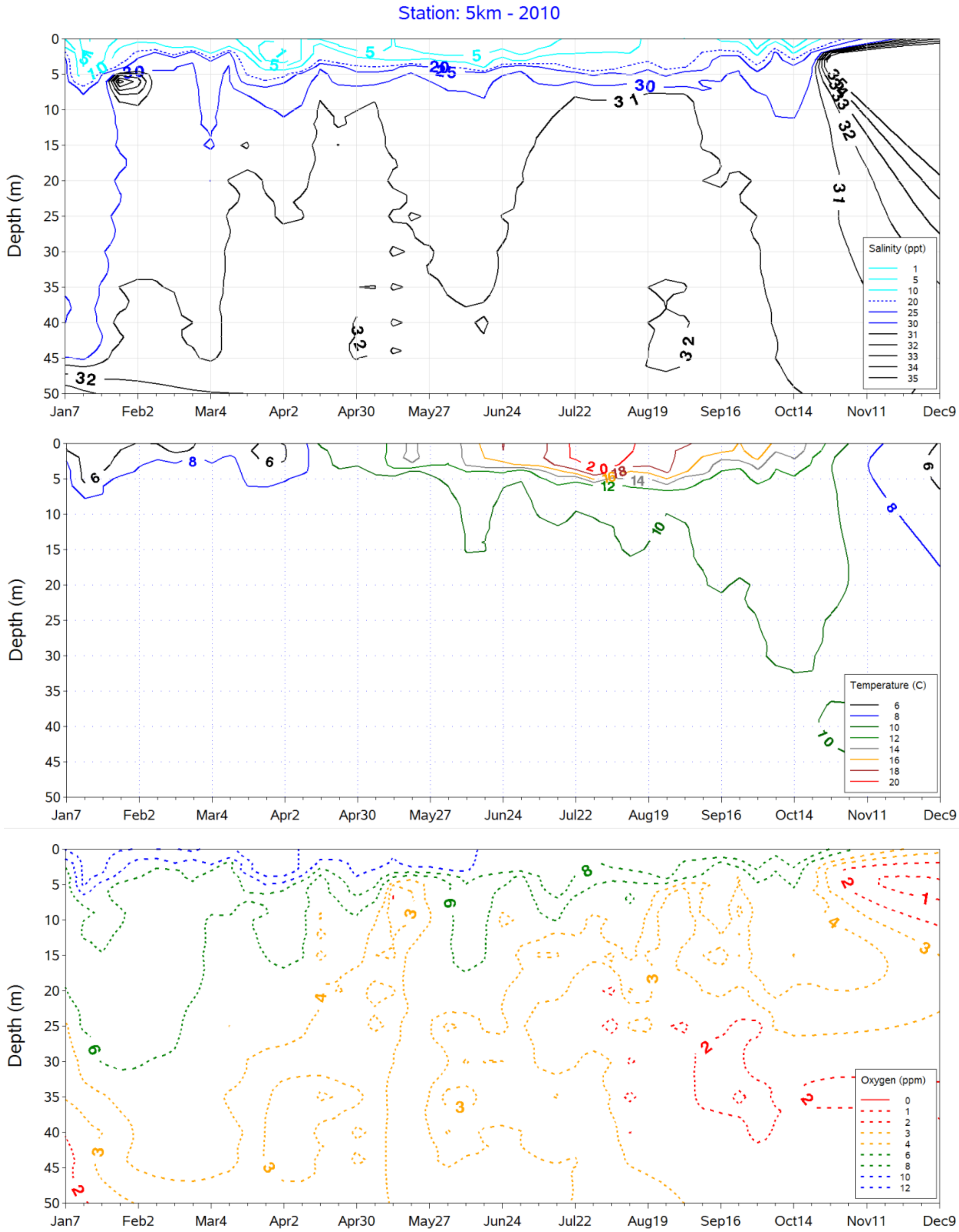


Figure 83. Station 5KM, 2010. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

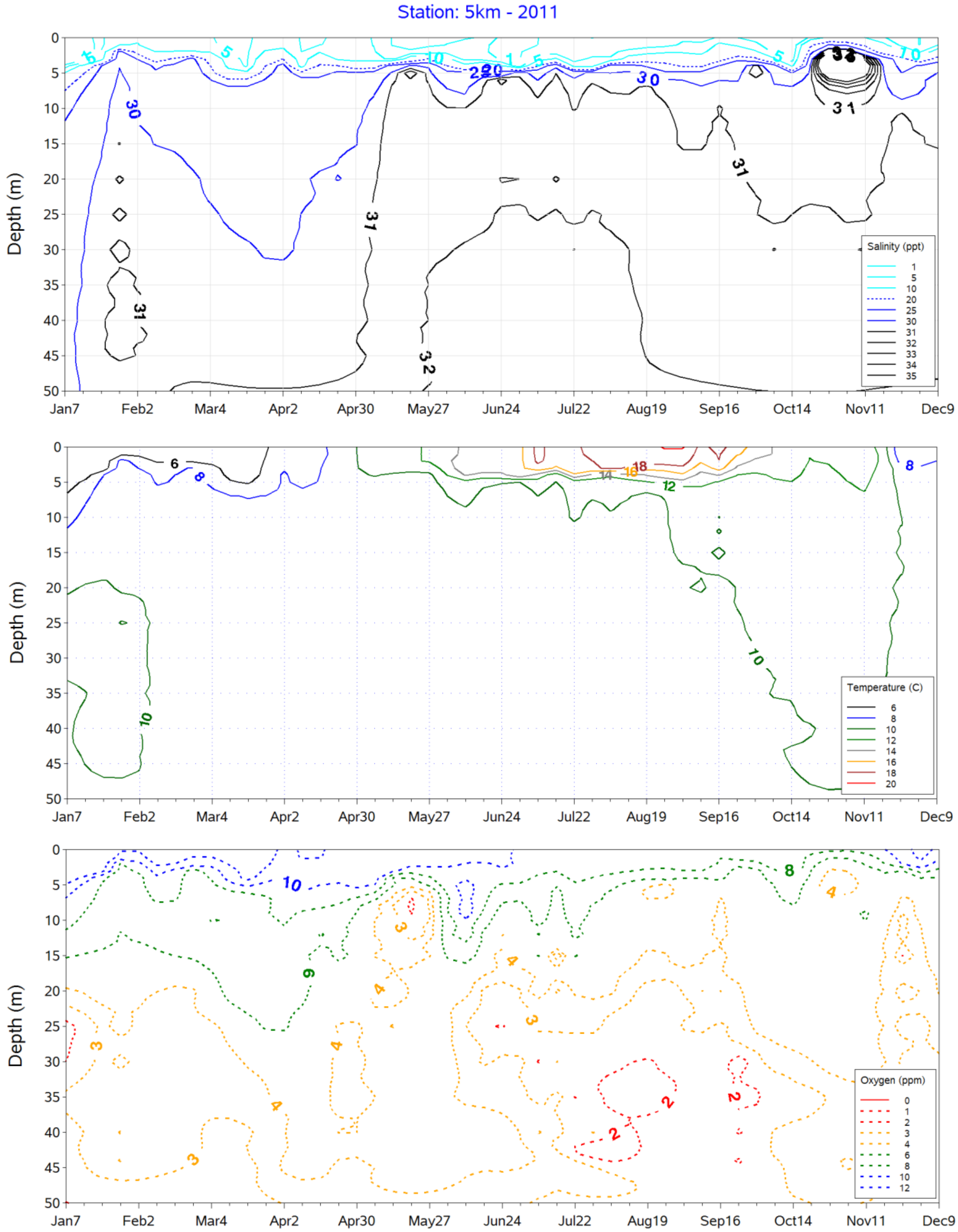


Figure 84. Station 5KM, 2011. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

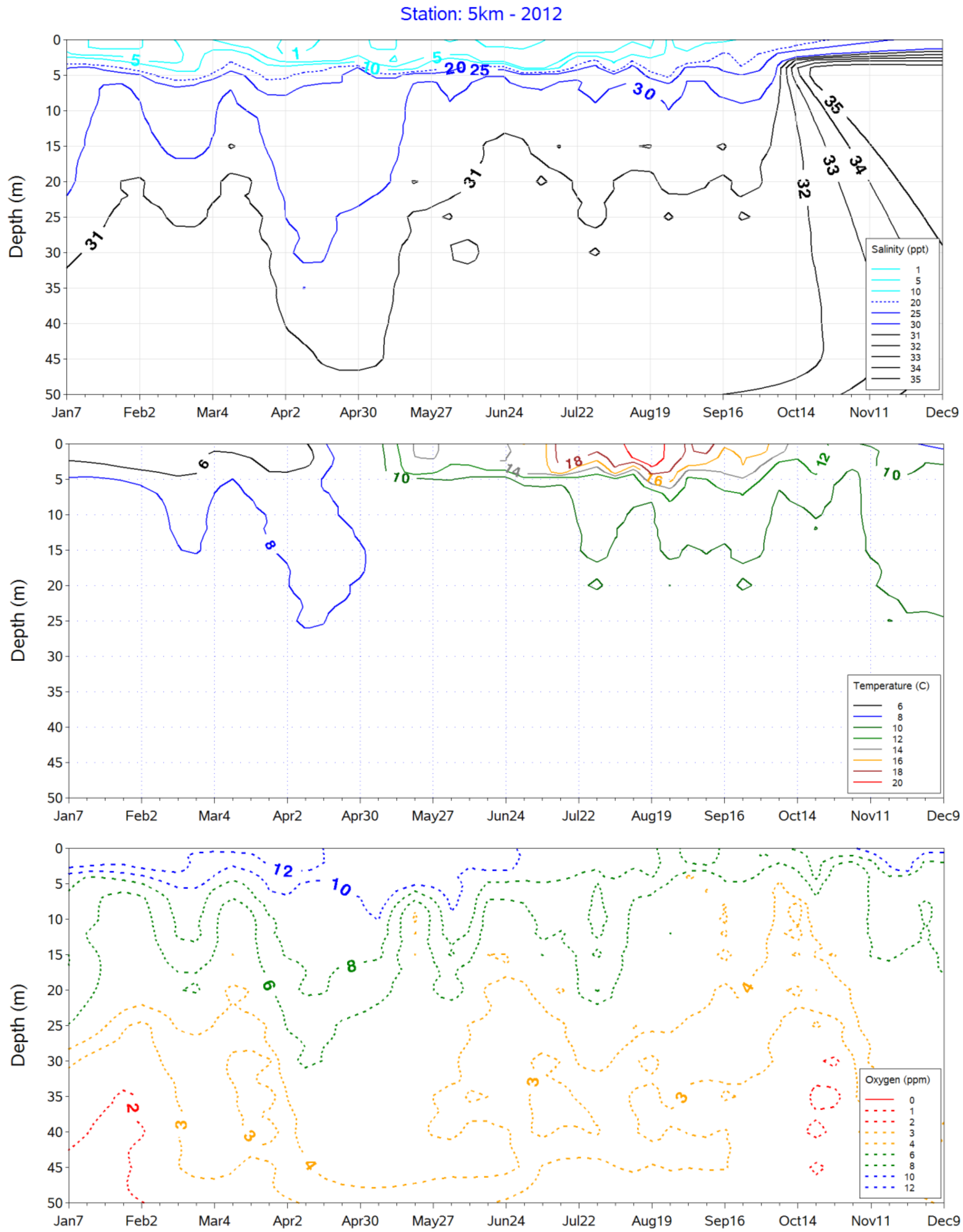


Figure 85. Station 5KM, 2012. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

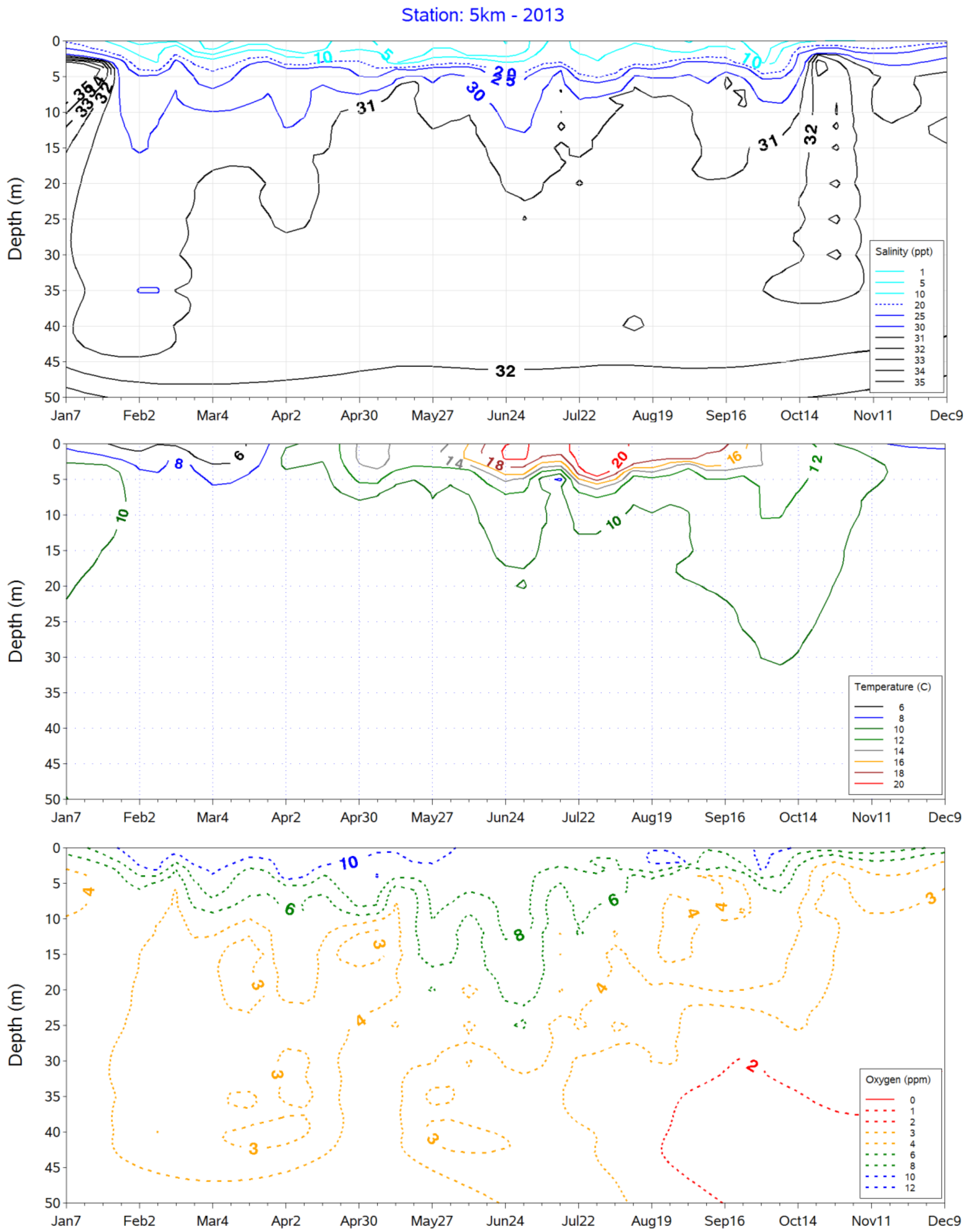


Figure 86. Station 5KM, 2013. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

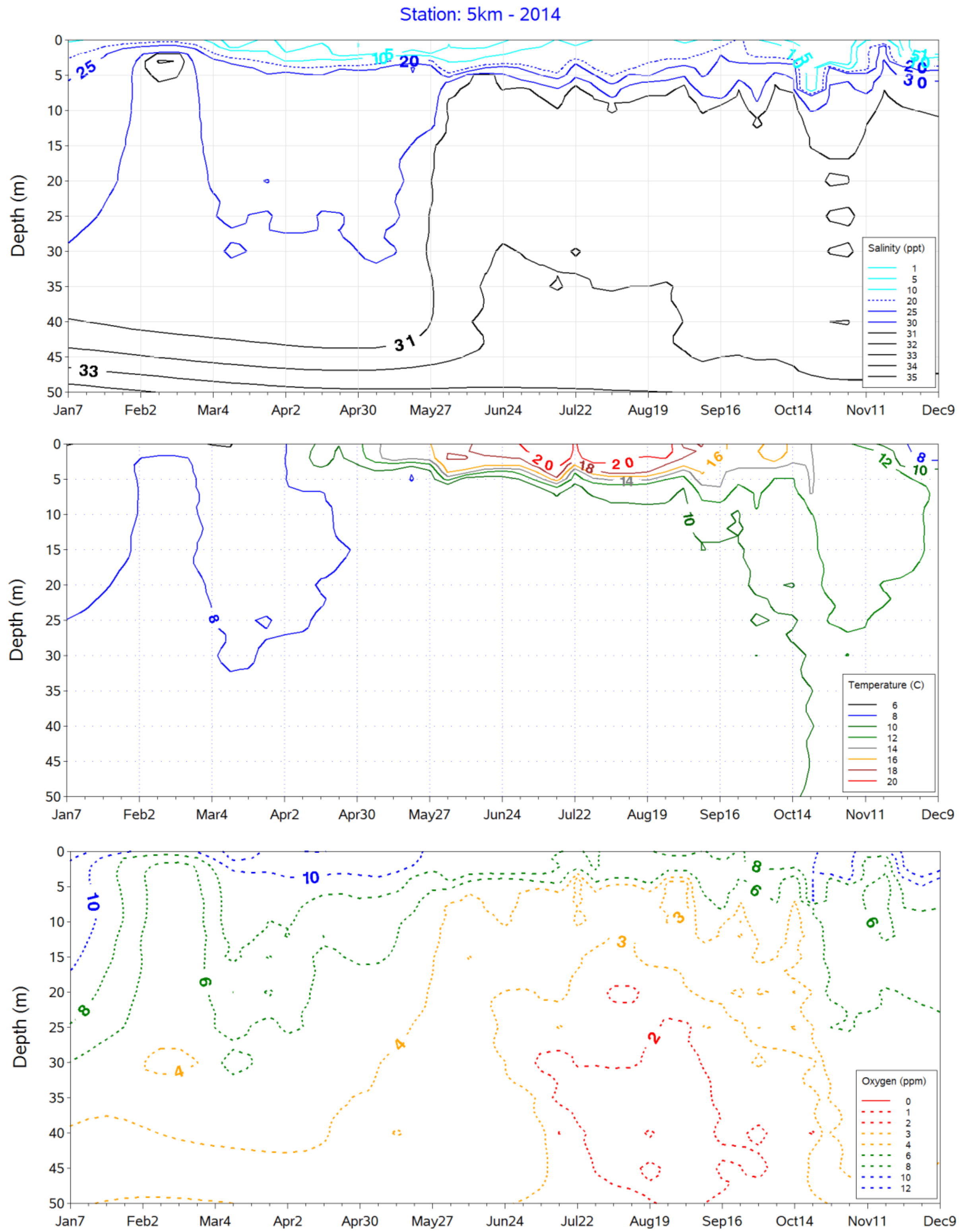


Figure 87. Station 5KM, 2014. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

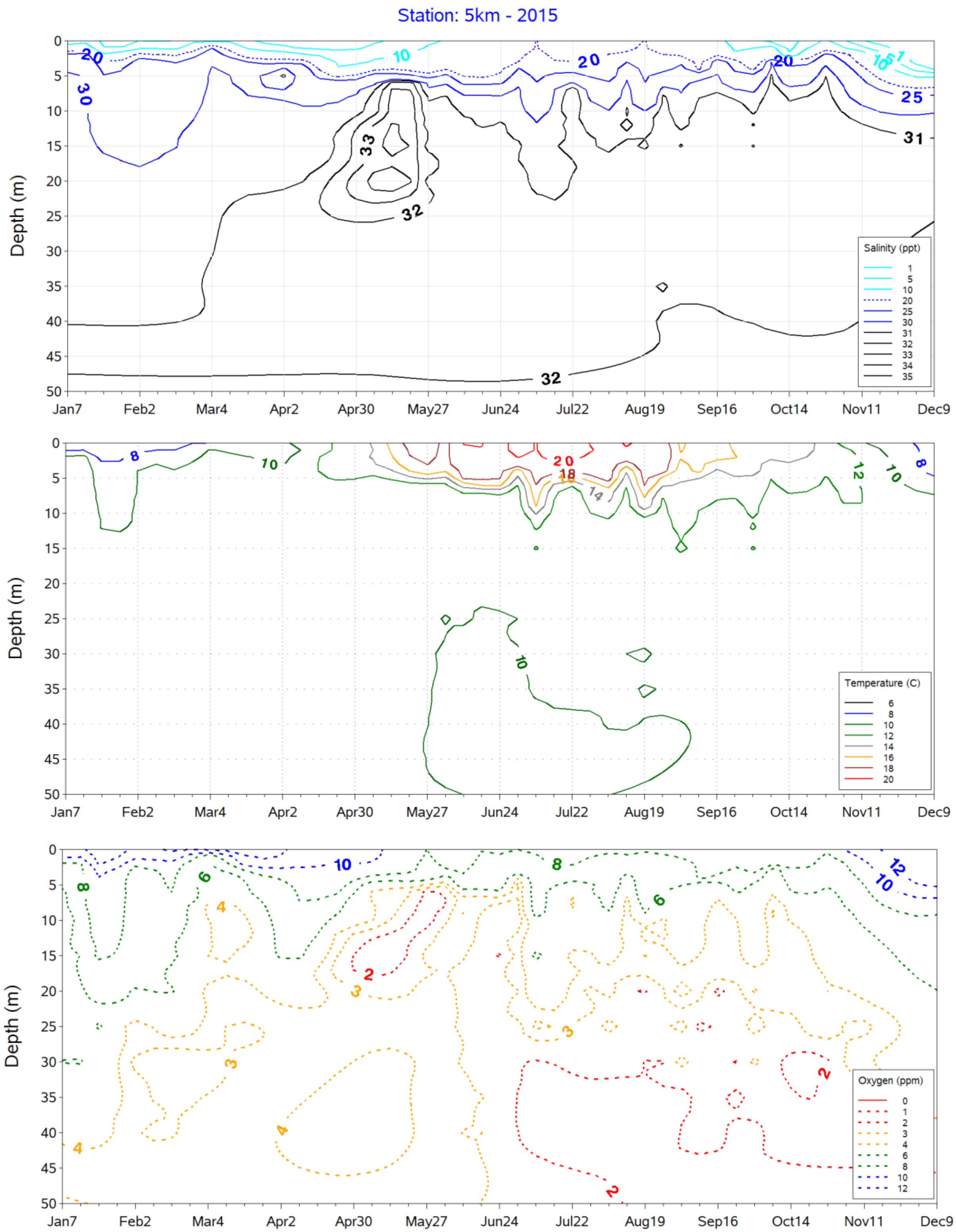


Figure 88. Station 5KM, 2015. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

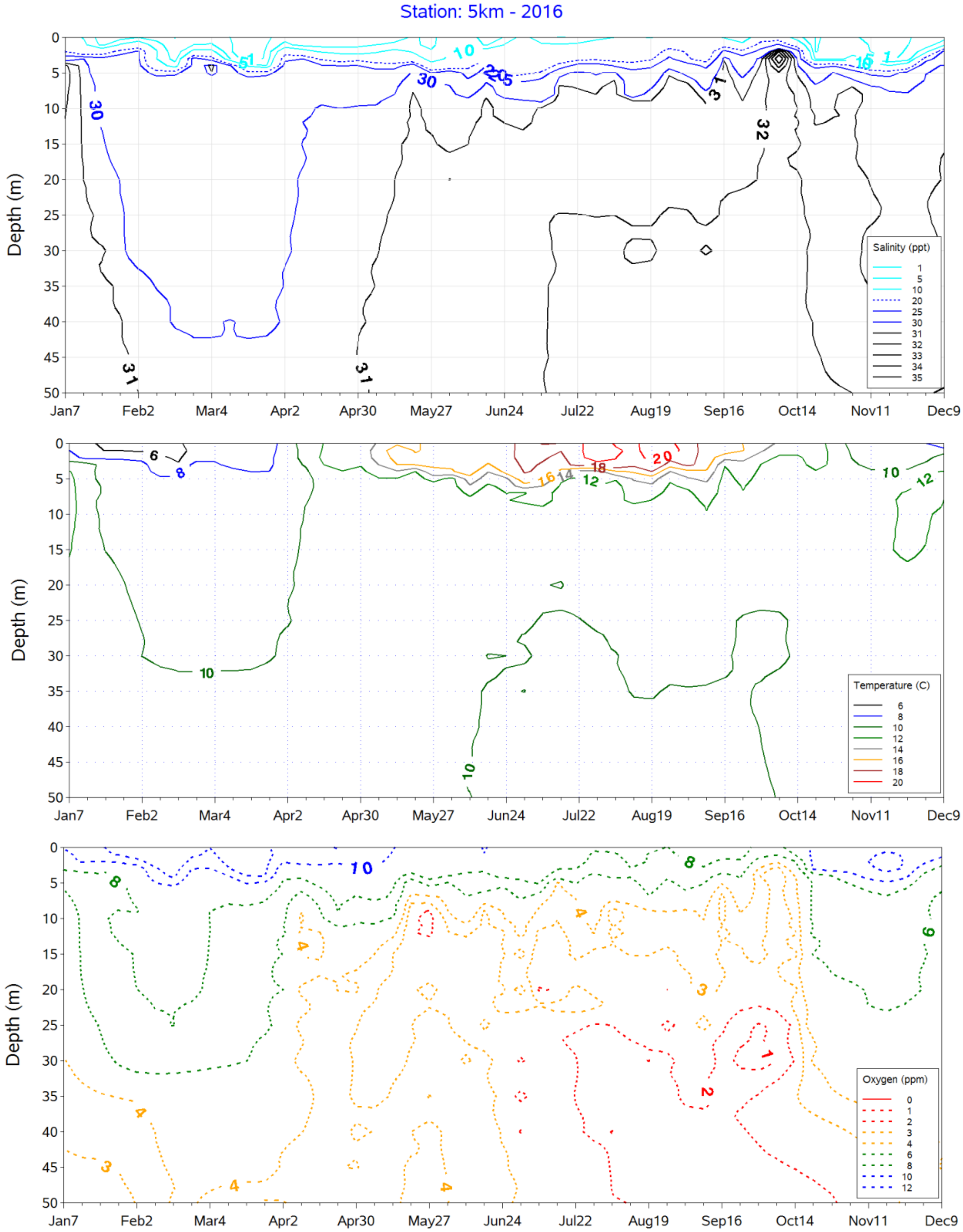


Figure 89. Station 5KM, 2016. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

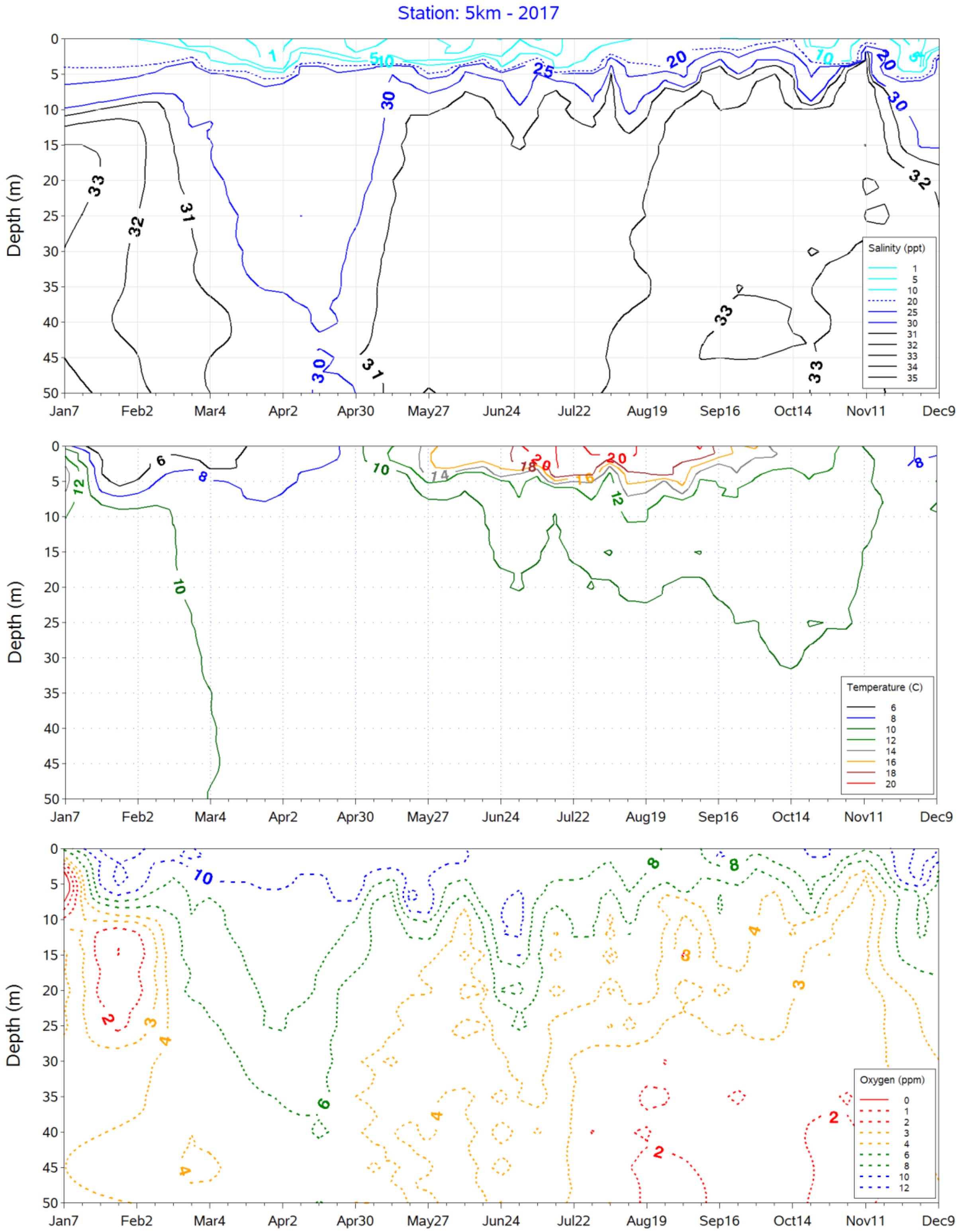


Figure 90. Station 5KM, 2017. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

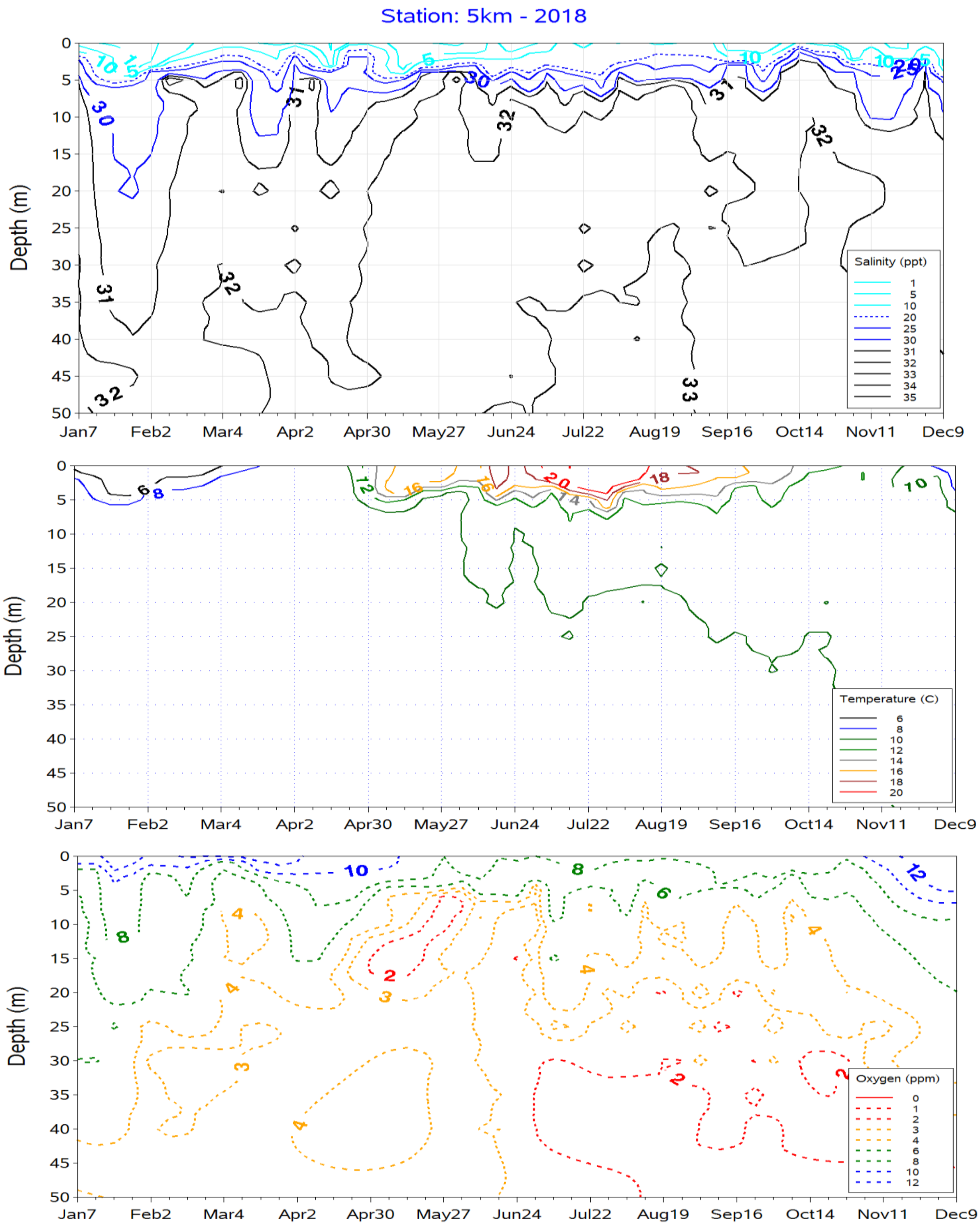


Figure 91. Station 5KM, 2018. Annual flux in mean Salinity (top), Temperature (middle), and Dissolved Oxygen (bottom) at depth.

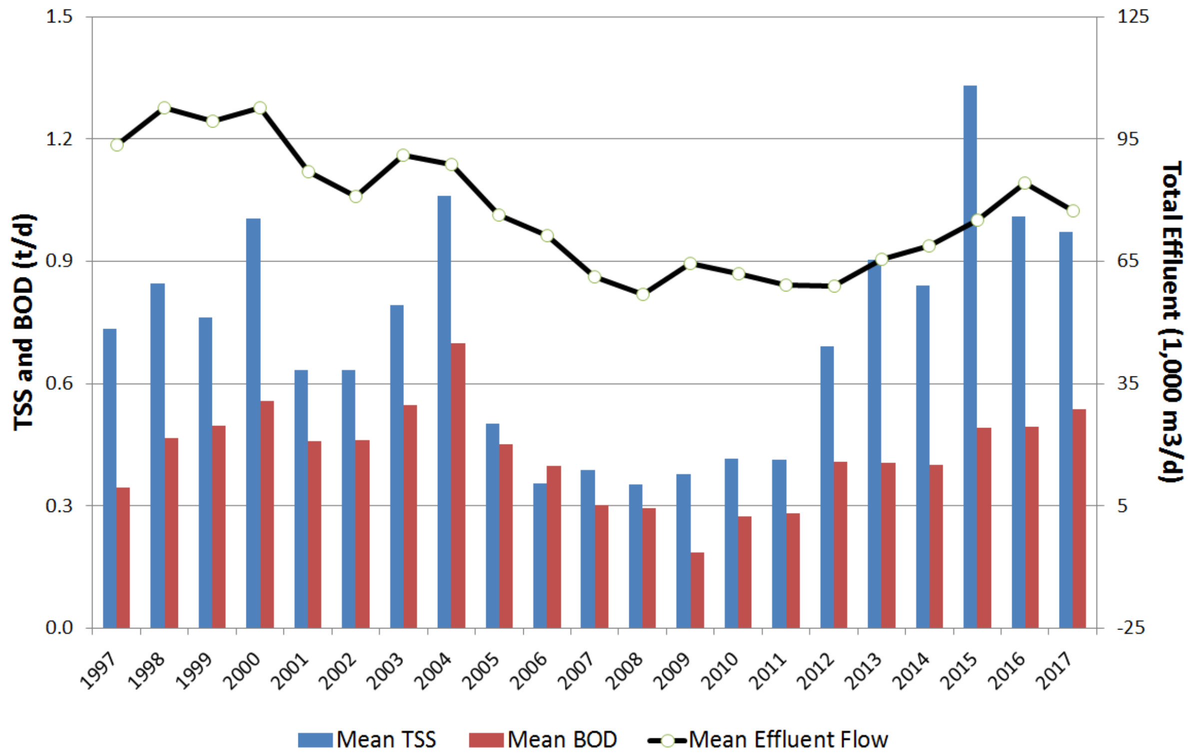


Figure 92. Annual mean Effluent volume (1,000 m^3/d), Total Suspended Solids (TSS: 1,000 m^3/d), and Biochemical Oxygen Demand (BOD: 1,000 m^3/d) discharged after primary and secondary treatment by the mill. Source: ENVIRONMENT CANADA (1997-2001) and CATALYST PAPER CORPORATION (2002-2017).

APPENDICES

Appendix A. Anomalous observations were annotated (in comments fields) and either corrected (and flagged with DATA QUALITY FLAG = 1), or retained in the database as is but flagged for omission (i.e. OMIT field = YES; DATA QUALITY FLAG = 9), for records with the following data issues:

- **Water Temperature**
  - Where Temperature > 25 °C (out of range)
  - Where Date = (15OCT93 and Depth=40), Temp => 9.6 (transcription error)
  - Where Date = (09NOV93 and Depth=(35 or 40), Temp => 9.6 (transcription error)
- **Dissolved Oxygen**
  - Where DO concentration > 25 ppt (out of range)
  - Where DO % saturation > 125% (out of range)
- **pH**
  - Where Depth = 2.6 and Date=(26AUG92) and Station = (PA05) (interpolated)
  - Where Depth = 11.1 and Date=(05OCT92) and Station = (PAOUT) (outlier)
  - Where Date=(11AUG93) and Station = (Hohm, 5KM) and pH>9.9 (flagged as suspicious; not omitted)
  - Where Date=(04MAR94) and Station = (Polly) and pH>9.5 (flagged as suspicious; not omitted)
  - Where Depth = 9 and Date=(14SEP94) and Station = (Polly) (interpolated)
  - Where Depth = 6 and Date=(20MAY12) and Station = (5KM) (interpolated)
  - Where Depth = 2 and Date=(10DEC12) and Station = (Polly) (interpolated)
- **Salinity**
  - Where Salinity > 35 ppt (out of range)
  - Where Depth >= 9 m and Salinity < 11 ppt (out of range)
  - Where Depth >=10 and Date=(06MAY15 or 20MAY15) and Station = (PP-2 or 5KM) (severe cable angle problem)
  - Where Depth = 30 and Date=(27APR16) and Station = (PP-2) (data error)
  - Where Depth = 15 and Date=(18DEC17) and Station = (PP-2), then Salinity changed to 30.7 (data error)
  - Where 01APR09 <= Date <= 01MAY11, and 15APR13-31DEC15 (*Hydrolab 4A* CTD unit) (possible probe failure or calibration solution error). Refers to unexplained 1.5-3.0 ppt drop in mean salinity for all stations and depths. This was not accompanied by significant changes in water temperature, DO, or

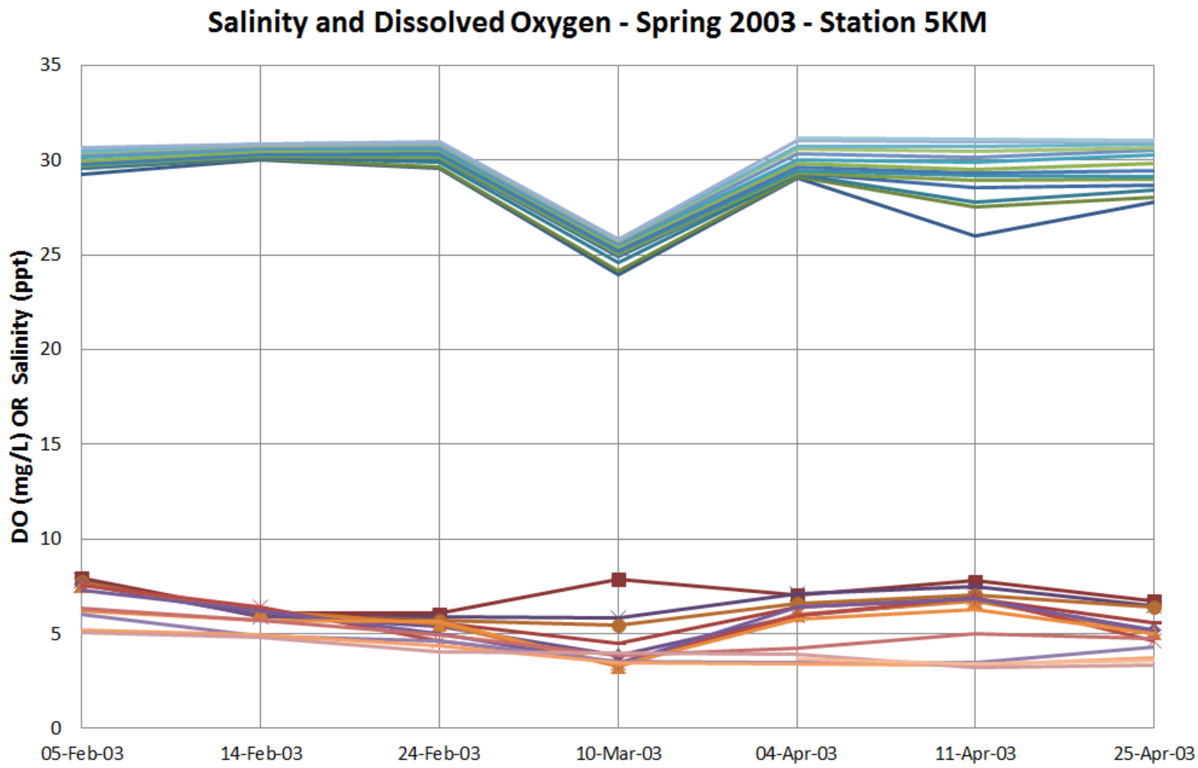
pH. Independent data (Pawlowicz 2017)[27] from CTD surveys in Barkley Sound (near Sarita; April 2004 - September 2013) were correlated with the mill data in the upper inlet (HOHM, POLLY POINT, and 5KM stations) to identify reference surveys for re-estimation of anomalous CPC data, using sub-halocline readings (depth: 20-30 m). The weekly mean difference between estimated and recorded mill salinity values was used to adjust all observed salinity observations upwards for the time-span above, and these data were tagged with a caution flag (Omit flag = 1).

- Where 01JAN93 <= Date <= 31DEC02 (*Hydrolab S3* CTD unit) (possible probe failure or calibration solution error). Refers to unexplained 1.5-3.0 ppt increase in mean salinity for all stations and depths, as determined from analysis of means (P < 0.001) relative to previous and subsequent time-periods with different CTD equipment. This was not accompanied by significant changes in water temperature, DO, or pH. Independent salinity data were not available against which to calibrate the DOMP data for this CTD unit. Parametric analysis of means was used to identify the mean monthly difference between sub-halocline salinity readings (depth 30 m) from the *Hydrolab Surveyor 3* (1993-2002) versus other CTD datasets, including the Sarita Hole time-series (2003-2013; Pawlowicz 2017), mid-inlet stations surveyed by DFO (unpublished, 2015), and Station 5KM salinity values from the *Hydrolab Surveyor 2* (1990-1992), the *Eureka Manta 2* (2016-2017), and the adjusted *Hydrolab 4A* salinity data (2003-2015). The monthly mean difference between estimated and recorded mill salinity values was used to adjust all observed salinity observations downwards for the time-span above; any resulting surface Salinity values < 0 were set to 0. Adjusted data were tagged with a caution flag (Omit flag = 1).
- Where Date = (10MAR03 or 28MAR03) (possible probe failure). Refers to an unexplained 5 ppt drop in salinity for March 10th and March 28th surveys at all sub-halocline depth levels and stations, from ~30 ppt to ~24-25 ppt (Appendix B). While sub-halocline temperatures averaged 9.4-9.5 °C for all surveys (no change) between February 28th and April 4th, DO concentrations rose slightly at most station-depths by ~1 mg/L, and pH fell slightly (<1 pH) during March, potentially indicative of a brief but significant freshwater incursion[28]. It was concluded that the salinity data at all stations for both March surveys in 2003 be excluded from analyses (Omit flag = 9).

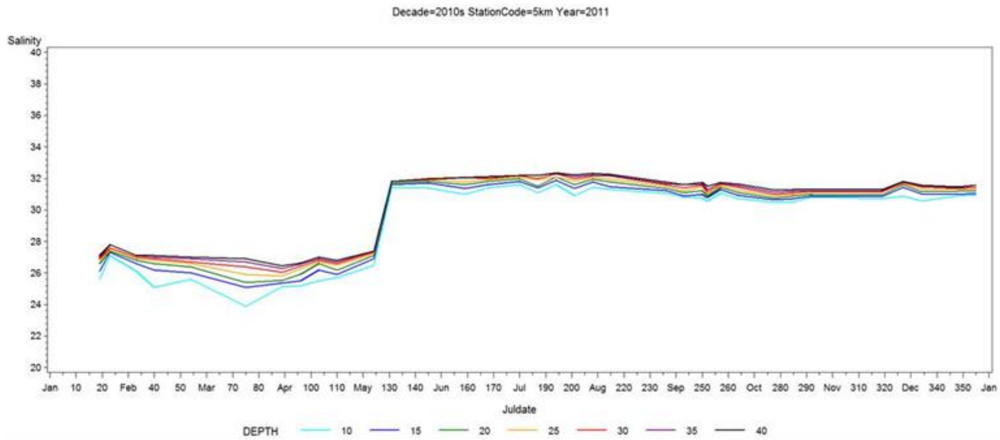
[27] These data are not included in the ALBERNI INLET PHYSICAL-CHEMICAL WATER PROPERTIES database at this time. Contact Rich Pawlowicz (Earth, Ocean and Atmospheric Sciences, UBC, Vancouver).

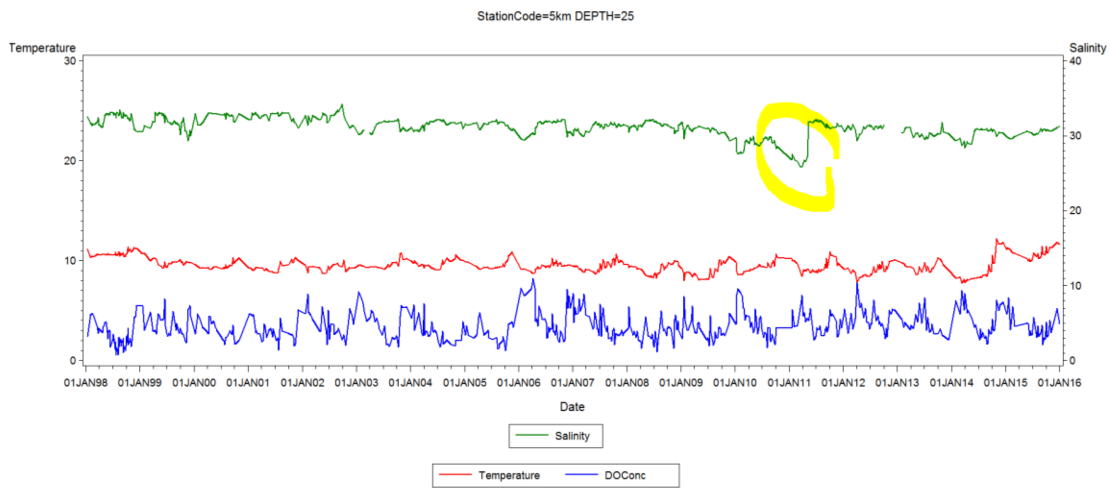
[28] Though an early March rain event occurred which was associated with higher Somass watershed flows, it is highly unlikely that freshwater inputs would be measurable at sub-halocline depths in the outer harbour (Polly Point PP-2) or beyond (5KM). CPC field notes and the annual DO Interpretative summary (Hatfield 2004) noted the salinity change without attribution to technical causes such as an equipment failure or calibration problem with the *Hydrolab 4A Mini-Sonde* which was implemented in January 2003 (pers. comm., Larry Cross, Environment Manager, Catalyst Paper Corporation).

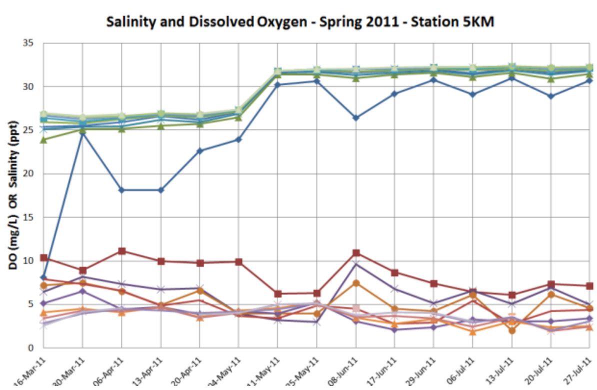
Appendix B. Anomalous decrease in Salinity at all stations and depths on March 10th, 2003. Station 5KM shown only. Spring 2003 salinity (blue-green lines) and DO (reddish lines) at depths 5 - 45 m (no apparent corresponding changes in either water temperature or pH), showing flux in DO concurrent with drop in salinity.



Appendix C. Anomalous increase in Salinity at all stations and depths on May 11th, 2011. Station 5KM shown only. Top: annual flux in salinity observations at depths 5 – 45 m, 2011. Middle: multi-year flux in salinity, temperature, and DO. Bottom: Spring 2011 salinity (blue-green lines) and DO (reddish lines) at depths 5 - 45 m (no apparent corresponding changes in either water temperature or pH), showing drop in DO concurrent with increase in salinity.







Appendix D. DOMP Salinity Data Adjustments, 1993-2002 and 2009-2015

Issue

Salinity readings for most months associated with CTD units *Hydrolab Surveyor 3* appear to be biased high (1993-2002), and *Hydrolab 4A* appear to be biased low for some years (2009-2015), relative to independent contemporary CTD data from Barkley Sound (Pawlowicz 2017: *Seabird SBE19*) spanning 2004-2013, and DFO/SIRE *YSI-2000* data surveyed in 2015 (Figure 93).

Hydrolab Surveyor 4A

Comparison of *Hydrolab 4A* salinity readings (at Station 5KM, depth = 30 m) to contemporary data from Barkley Sound (2004-2013, *Seabird SBE19*, depth = 30 m) indicates downward bias in *Hydrolab* readings from April 2009 through May 2011, and after May 2013 (Figure 94). Independent mid-inlet CTD data from DFO surveys (Hyatt et al., summer 2015) also indicate that the *Hydrolab* negative bias likely persisted through to December 2015, after which the *Hydrolab* CTD unit was replaced by CATALYST PAPER CORPORATION (CPC).

The Seabird data also corroborate some years of CPC data: 2004-2008. The linear relationship between *Hydrolab 4A* salinity and *Seabird SBE19* salinity for the years 2004-2008 ($r^2 = 0.68$, $P < 0.001$; Figure 95) was used to reconstruct *Hydrolab Surveyor 4A* readings for the anomalous months from April 2009 through May 2011, and post May 2013.

Coarse adjustments were then made to the *Hydrolab 4A* salinity readings by adding the mean monthly difference between estimated and recorded readings (Table 13) to all stations and depths for the anomalous time period (April 2009 - May 2011, and May 2013 – December 2015). The results for 2009-2011 are plotted in Figure 96.

Hydrolab Surveyor S3

No independent calibration data were available for the previous *Hydrolab Surveyor 3* time-series, thus the only option was to compare monthly means between CTD datasets. Ultimately, the mean monthly differences between *Hydrolab Surveyor 3* and adjusted *Hydrolab 4A* readings were calculated (Table 14) and used to adjust *Hydrolab Surveyor 3* salinity readings downwards for all stations and depths.

Results

Analysis of mean sub-halocline salinity (depth 30 m) for CTD units after adjustments to *Hydrolab Surveyor 3* and *Hydrolab 4A* salinity readings indicated no significant differences ($\alpha = 0.05$) between monthly means.

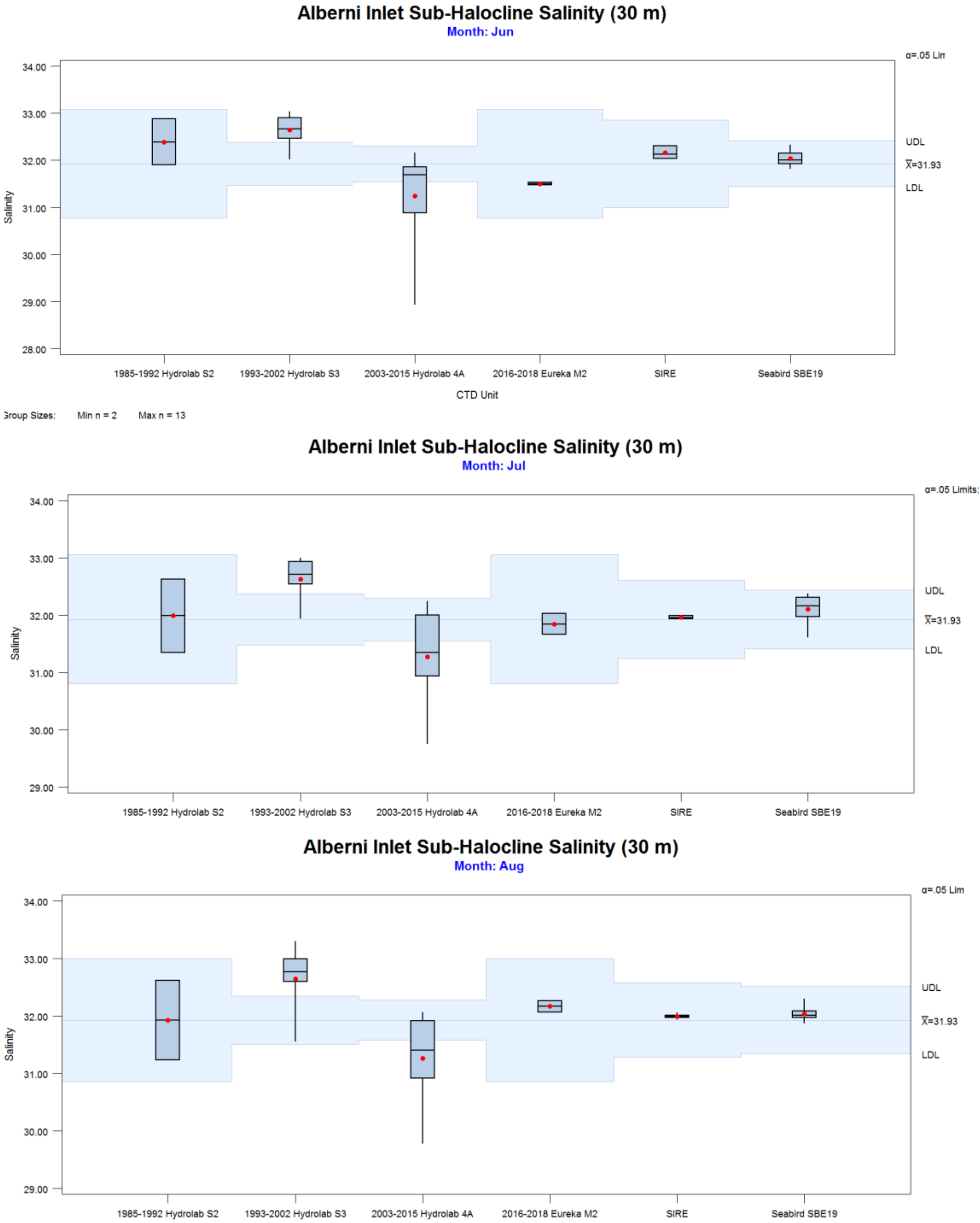


Figure 93. Salinity readings for most months associated with CTD units *Hydrolab Surveyor 3* appear to be biased high (1993-2002), and *Hydrolab Surveyor 4A* appear to be biased low for some years (2009-2015), relative to other DOMP CTD units, including independent data (Seabird SBE19) spanning 2004-2013, and DFO SIRE data surveyed in 2015.

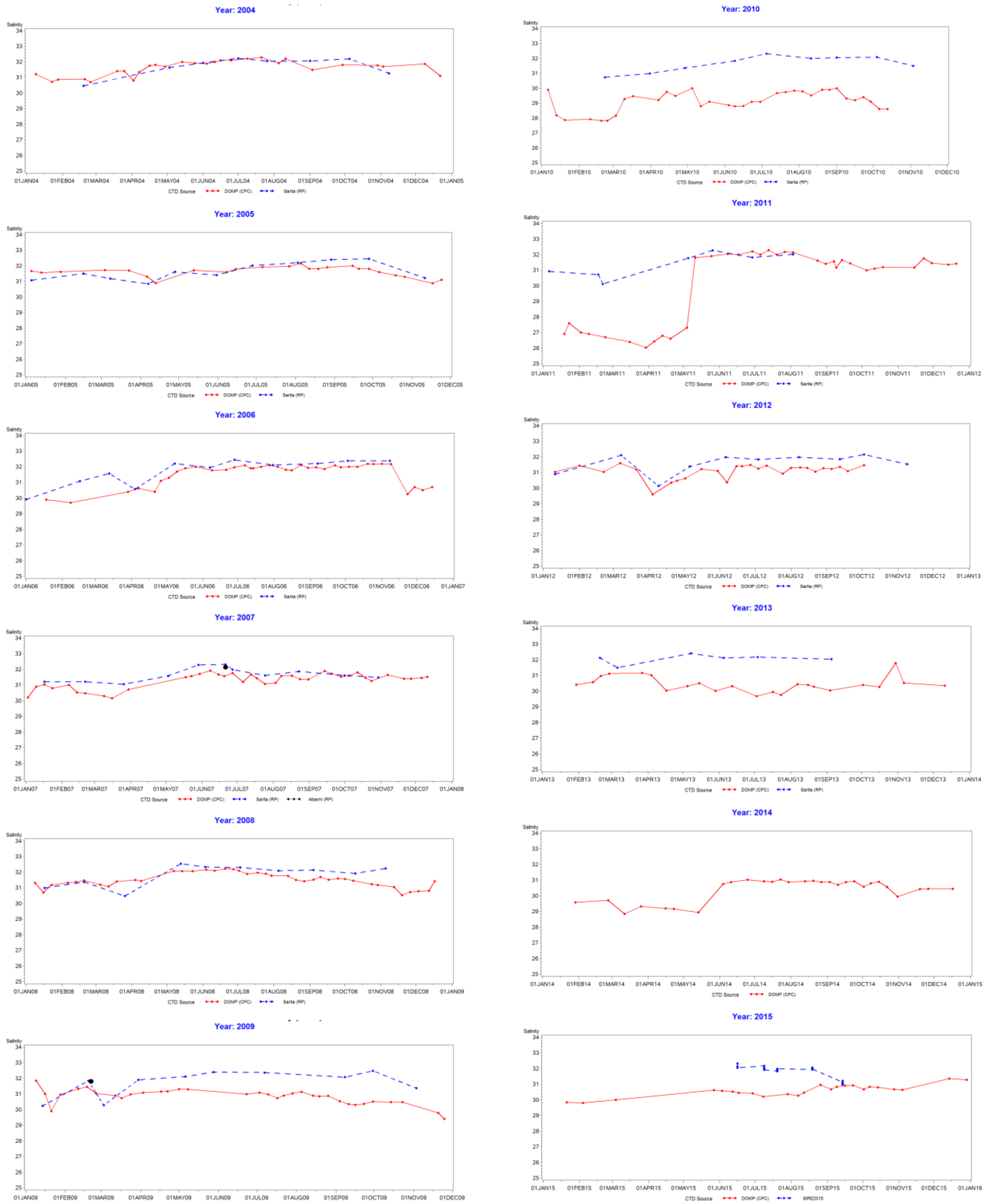


Figure 94. Comparison of *Hydrolab Surveyor 4A* salinity readings (red), relative to independent data (Seabird SBE19, blue) indicates downward bias in Hydrolab readings from April 2009 through May 2011, and after May 2013.

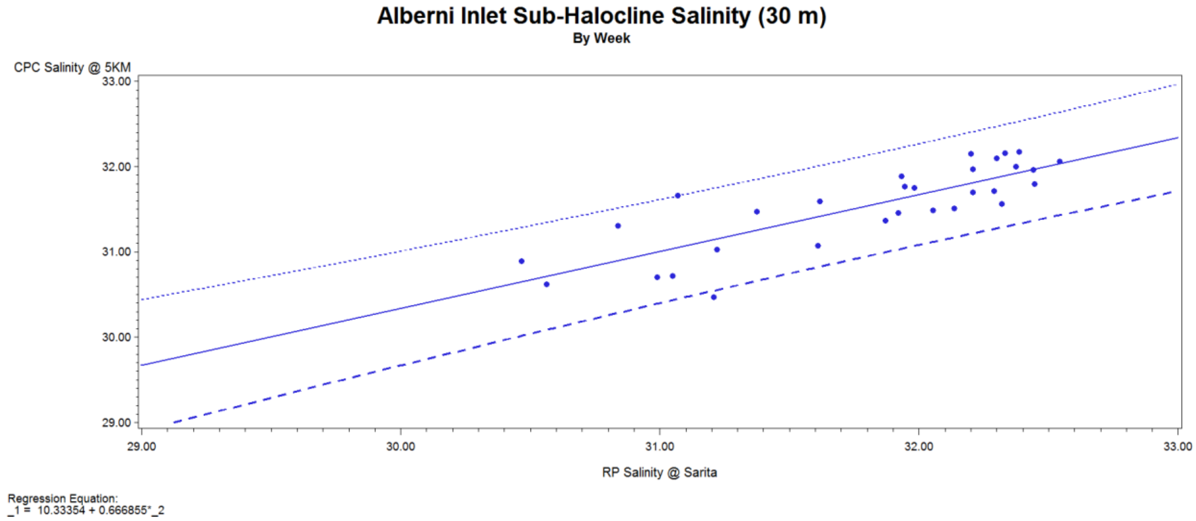


Figure 95. Linear regression of *Hydrolab Surveyor 4A* salinity readings as a function of independent data (Seabird SBE19). R^2 = 0.68, N = 30, P < 0.001.

Year	Months	Adjustment
2009	April, May	+0.50
2009	June, July, August	+1.00
2009	September, October, November	+1.50
2010	January 8-31	+2.00
2010	February	+3.00
2010	March – December	+2.00
2011	January, February, March, April	+3.75
2011	May 1-7	+3.75
2012	January – December	+0.00 (no change)
2013	April 8 – December 31	+1.50
2014	January – December	+1.00
2015	January – December	+1.00

Table 13. Positive salinity adjustment values applied to *Hydrolab 4A* readings for year and months listed.

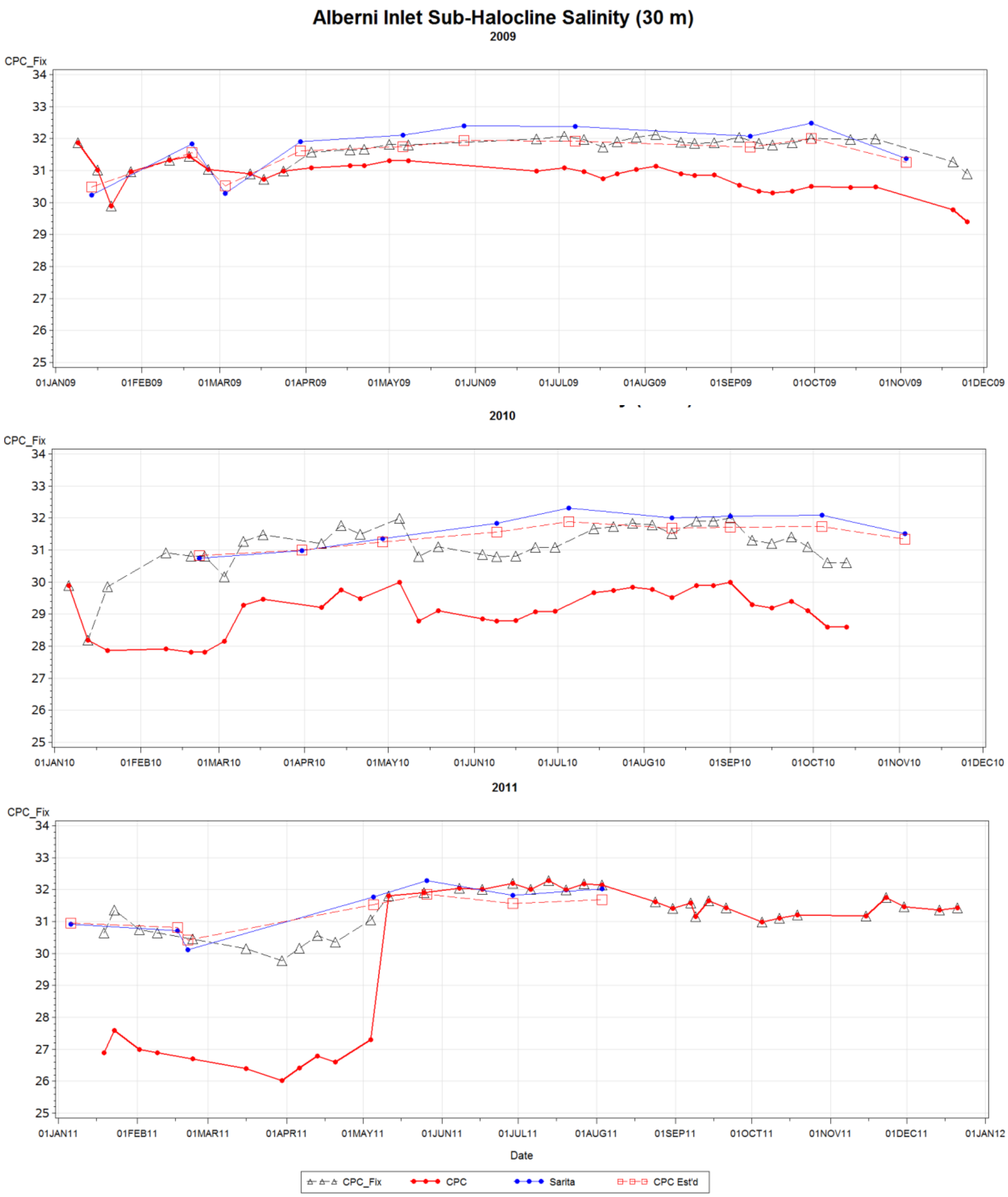


Figure 96. Observed *Hydrolab 4A* salinity readings (CPC: red solid line); independent CTD data (Pawlowicz 2017) from Barkley Sound, near Sarita (blue); estimated *Hydrolab* readings based on CPC/Sarita regression relation (red squares); and adjusted *Hydrolab 4A* salinity estimates based on difference between observed and estimated *Hydrolab 4A* salinity values (black triangles). 2009-2011 only.

Year	Months	Adjustment
1993-2002	January	-1.16
1993-2002	February	-0.75
1993-2002	March	-1.33
1993-2002	April	-1.51
1993-2002	May	-1.18
1993-2002	June	-1.04
1993-2002	July	-0.97
1993-2002	August	-0.94
1993-2002	September	-0.84
1993-2002	October	-0.85
1993-2002	November	-0.71
1993-2002	December	-0.00 (no change)

Table 14. Negative salinity adjustment values applied to *Hydrolab Surveyor 3* readings for year and months listed.

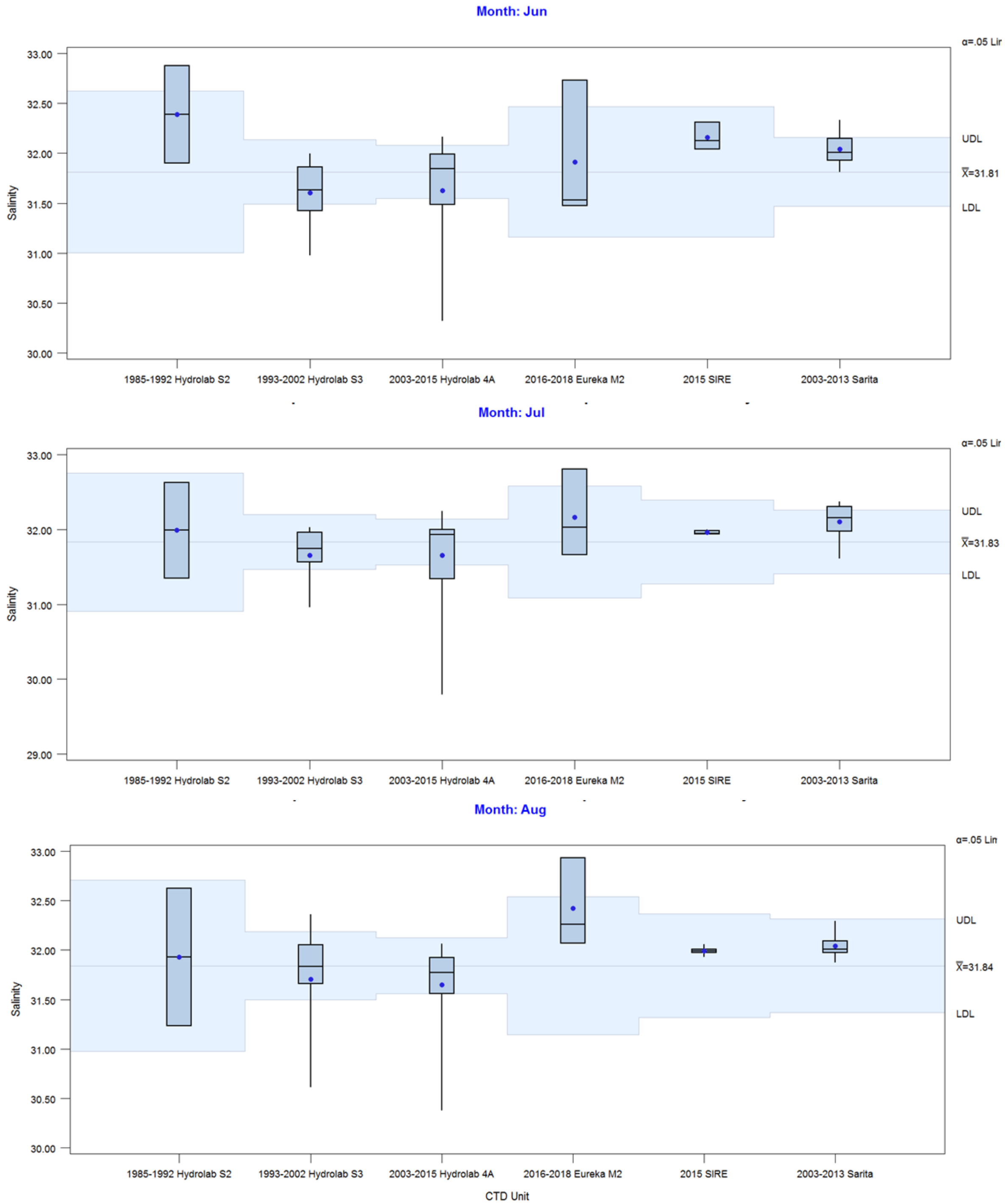


Figure 97. Analysis of mean sub-halocline salinity (depth 30 m) for CTD units after adjustments to *Hydrolab Surveyor 3* and *Hydrolab 4A* salinity readings indicating no significant differences between monthly means.