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Using Radio-archival Tags to Determine the Swimming Depth, Movements,Thermal Conditions, and Exposure to Elevated Temperatures for Yukon River Chinook Salmon Stocks

J. H. Eiler, A. N. Evans, and M. M. Masuda

September 2022

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NOAA FISHERIES

Using Radio-archival Tags to Determine the Swimming Depth, Movements,Thermal Conditions, and Exposure to Elevated Temperatures for Yukon River Chinook Salmon Stocks

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ABSTRACT

Increasing temperatures potentially threaten a variety of anadromous and freshwater fish populations. Information on distribution, movements, and behavior in relation to local conditions is critical for assessing the status of these populations, and predicting their response to the changing environment. Radio-archival tags provided site-specific information on swimming depths and river temperatures encountered by Yukon River Chinook salmon during the spawning migration in 2002-2004. Upriver movements were characterized by continuous and highly variable fluctuations in depth. Similar temperature profiles were observed for fish within a stock, and differences among stocks within regions were minimal. Comparable temperatures were also encountered by fish of different stocks traveling along the same migratory routes. Elevated temperatures (≥ 18°C) were observed during all three years of the study, but they were more prevalent in lower mainstem reaches during 2004, ranging from 60% to 73% of the time within this section of the basin. However, the migratory patterns exhibited by the fish did not indicate a negative response to these conditions. Although thermal conditions were generally cooler during 2002-2003, elevated temperatures were observed in the upper main stem. Temperatures in terminal tributaries varied by year and stock and often exceeded the upper threshold generally considered optimal for spawning (13°C), but signs of impaired behavior or pre-spawning mortality were not observed. Residency in terminal tributaries averaged 419 hours (17.5 days), ranging from 133 hours to 915 hours. Using radio-archival tags substantially increased the number of tags recovered, with a recovery rate (74%) considerably higher than reported for most archival tag studies. The ability to obtain larger and more representative samples is a major advantage for addressing research and management issues. Radio-archival tags also enhanced the

quality of the data, providing a non-invasive method for collecting multiple location-based observations, information that would be difficult to obtain using more traditional sampling methods.

CONTENTS*

Abstract iii

List of Tables vii

List of Figures ix

List of Appendices xi

Introduction 1

Materials and Methods 2

Study Area 2

Fish Capture and Tagging 3

Fish Tracking and Tag Recovery 5

Swimming Depth and Water Temperature 6

Temperature Control Tests 7

Results 8

Tagging and Tag Recovery 8

Swimming Depth and Water Temperatures 9

Exposure to Elevated Temperatures 10

Upriver Migration 10

Terminal Tributaries 11

Assessing Fish Behavior and Status 12

Temperature Control Tests 14

Discussion 14

Swimming Depth and Water Temperature 15

* Click on page numbers to navigate document.

Elevated Temperatures during the Upriver Migration....16
Temperatures in Terminal Tributaries....17
Comparing the Utility of Radio-archival and Traditional Archival Tags....18
Traditional Archival Tags....18
Radio-archival Tags....20
Acknowledgments....23
Citations....25
Tables....35
Figures....41
Appendices....55

* Click on page numbers to navigate document

LIST OF TABLES

Table 1. Number, age, and length (mid-eye to fork of tail) of Chinook salmon tagged with radio-archival tags in the Yukon River basin during 2002-2004. Percentages by age class are in parentheses 35

Table 2. Recovery of Chinook salmon tagged with radio-archival tags in the Yukon River basin during 2002-2004. Percentages of the number of fish tracked upriver are in parentheses 35

Table 3. Last location of radio-archival tagged Chinook salmon recovered in the Yukon River basin during 2002-2004. Percentages of the total number of fish recovered are in parentheses 36

Table 4. Average exposure (h) to temperatures ≥ 18°C by region, reach, and year for radio-archival tagged Chinook salmon during the spawning migration in the Yukon River basin. Percentage of the total hours within the reach is in parentheses. Percentages >60% are highlighted 37

Table 5. Average residency (h) in terminal spawning tributaries with tracking stations near the river mouth by region, stock, and year for radio-archival tagged Chinook salmon in the Yukon River basin. Standard deviation (SD) and range are shown....38

Table 6. Average exposure (h) to temperature ranges by year, region, and stock for radio-archival tagged Yukon River Chinook salmon in terminal spawning tributaries with tracking stations near the tributary mouth. Percentage of the total hours within the tributary is in parentheses. Percentages > 60% are highlighted....39

* Click on page numbers to navigate document

LIST OF FIGURES

Figure 1. Map of the Yukon River basin showing the regional areas, major drainages, tagging site, tracking stations on both the main rivers and associated tributaries, and the final location of radio-archival tagged Chinook salmon harvested in fishery or recovered in spawning tributaries. Main river reaches (Y=Yukon main stem, K=Koyukuk, T=Tanana, and P=Porcupine) are also indicated 41

Figure 2. Chinook salmon run timing (based on catch per unit effort data at the tagging site) and the number of radio-archival tagged fish released in the Yukon River basin during 2002-2004. The status of the fish, including the number recovered in terminal spawning tributaries, harvested in mainstem fisheries, and not recovered, is shown...42

Figure 3. Regional recoveries (%) of Yukon River Chinook salmon tagged with radio-archival tags during 2002-2004. Fish harvested in mainstem fisheries in the Lower Yukon, Middle Yukon, and Yukon Flats were potentially in transit to areas farther upriver ...43

Figure 4. Regional map of the Lower Yukon, Middle Yukon, and Upper Koyukuk showing the major drainages, tagging site, tracking stations, and final location of radio-archival tagged Chinook salmon harvested in fishery or recovered in spawning tributaries during 2002-2004 44

Figure 5. Regional map of the Tanana River showing the major drainages, tracking stations, and final location of radio-archival tagged Chinook salmon harvested in fishery or recovered in spawning tributaries during 2002-2004.....45

Figure 6. Regional map of the Yukon Flats and Porcupine River showing the major drainages, tracking stations, and final location of radio-archival tagged Chinook salmon harvested in fishery or recovered in spawning tributaries during 2002-2004.....46

Figure 7. Regional map of the Upper Yukon showing the major drainages, tracking stations, and final location of radio-archival tagged Chinook salmon harvested in fishery or recovered in spawning tributaries during 2002-2004.....47

Figure 8. Average exposure (h) to temperatures ≥ 18°C by year and reach for radio-archival tagged Chinook salmon during the spawning migration in the Yukon River basin. Hours with temperatures ≥ 21°C are in red. Asterisks indicate that temperatures exceeded 18°C over 30% of the time (see Table 4) 48

Figure 9. Average exposure (h) to temperature ranges by year, stock, and reach for radio-archival tagged Chinook salmon during the spawning migration in the Yukon River basin 49

* Click on page numbers to navigate document

Figure 10. Exposure (h) to temperature ranges in terminal spawning tributaries by year and stock for individual radio-archival tagged Chinook salmon in the Yukon River basin. An "x" indicates fish that were captured alive (i.e., time of death from natural causes not determined) 50

Figure 11. Swimming depth and water temperatures encountered by a radio-archival tagged Chinook salmon caught in the Yukon River fishery. Hours after released at the tagging site, and the time of capture and recovery are shown. The last tracking station passed and the distance from the initial tracking station at Paimiut are indicated. Gray shading represents the time between 1800 and 0600 hours.....51

Figure 12. Swimming depth and water temperatures encountered by a radio-archival tagged Chinook salmon recovered on the spawning grounds in the Chandalar River. Hours after released at the tagging site, and the estimated time of death (green arrow) are shown. The last tracking station passed and the distance from the initial tracking station at Paimiut are indicated. Gray shading represents the time between 1800 and 0600 hours.....52

Figure 13. Temperatures recorded by radio-archival tags placed in a tank with varying water temperature (Trial 1). During the second trial, Tag 1 was submerged in river water flowing through a fish wheel live box. Adult salmon were tagged with tags 2 and 3 (placed in the stomach of the fish) and released into the live box.....53

* Click on page numbers to navigate document

LIST OF APPENDICES

Appendix 1. Description of the summary information for the swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon tagged with radio-archival tag in 2002-2004 57

Appendix 2. Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Lower Yukon in 2002-2004 61
- Innoko 63
- Anvik 94

Appendix 3. Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Upper Koyukuk in 2002-2004 143

Appendix 4. Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Middle Yukon in 2002-2004 157
- Tozitna 172
- Melozitna 181

Appendix 5. Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Tanana in 2002-2004 191
- Kantishna 193
- Tolovana 233
- Nenana 264
- Clear 284
- Chena 295
- Salcha 362
- Goodpaster 438
- Tanana River fishery 487

Appendix 6. Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Yukon Flats in 2002-2004 519
- Chandalar 521
- Sheenjek 561

Appendix 7. Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Upper Porcupine in 2002-2004 593

* Click on page numbers to navigate document

Appendix 8. Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks harvested in mainstem fisheries in 2002-2004 627
Lower Yukon fishery 629
Middle Yukon fishery 669
Yukon Flats fishery 781
Upper Yukon fishery 884

Appendix 9. Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Upper Yukon in 2002-2004 943
Charley 945
Klondike 956
Stewart 996
White 1007
Pelly 1016
Tatchun 1083
Big Salmon 1092
Teslin 1132
Headwaters 1190

Appendix 10. Average exposure (hours) to water temperature ranges during the spawning migration for Yukon River Chinook salmon stocks 1201

Appendix 11. Average exposure (hours) to water temperature ranges in terminal spawning tributaries for Yukon River Chinook salmon stocks 1207

* Click on page numbers to navigate document

INTRODUCTION

Chinook salmon (*Oncorhynchus tshawytscha*) rearing in the Bering Sea return to spawn in the Yukon River, a massive river basin that extends across central Alaska and northwestern Canada (JTC 2021). These returns are an integral part of the Yukon River ecosystem and are culturally important to people living along the river. Historically, Chinook salmon supported important subsistence and commercial fisheries throughout the basin, but dramatic declines in abundance since the late 1990s have resulted in diminished returns, severe reductions in harvests, and difficulties in meeting escapement goals (Evenson et al. 2009). Reductions in fish size and shifts in age composition to younger individuals have also been reported (Lewis et al. 2015, Ohlberger et al. 2018). These trends have created social and economic hardships in many rural communities along the river, as well as concern over the long-term health of the returns. Management is further complicated by allocation issues between U.S. and Canadian fisheries due to the transboundary nature of the drainage.

To address these concerns, research and assessment projects have been conducted to better characterize Chinook salmon returns and track population trends (ADFG 2013), including a basin-wide telemetry study conducted during 2002-2004 to determine the spawning distribution, stock composition, run timing, and migratory patterns of the returns (Eiler et al. 2014, 2015). As part of this study, Chinook salmon were tagged with radio-archival tags to provide information on the swimming depths of the fish and the water temperatures encountered during the spawning migration. In a companion paper, we discussed the patterns observed for regional components of the returns (Eiler et al. 2023). Here, we describe the swimming depths and thermal conditions encountered for individual stocks and fish. We also discuss the utility of

radio-archival tags for collecting telemetry and environmental data to address research and management issues on migratory fish in large river drainages.

MATERIAL AND METHODS

Study Area

The Yukon River basin drains a watershed of over 855,000 km^2. The main river alone (hereafter referred to as the main stem) flows for more than 3,000 km from its headwaters in Canada to the Bering Sea (Fig. 1). Several major tributaries flow into the main stem, including the Koyukuk and Tanana rivers in the United States; the Stewart, White, Pelly, and Teslin rivers in Canada; and the Porcupine River which transects both countries. The basin also includes numerous medium- and small-sized tributaries. Most areas are remote, with access limited to boat or aircraft. The Yukon River is also one of the largest drainages in North America in terms of annual discharge, and exhibits considerable seasonal variability with substantially greater flows during summer (Brabets et al. 2000, Yang et al. 2009). The entire drainage freezes over during winter, with ice breakup during the spring. Several reaches are extremely turbid during the summer from glacial runoff, including the Tanana River, White River, and sections of the main stem downstream of these tributaries. River elevation ranges from sea level to over 500 m in the upper headwaters.

The main stem is relatively deep, with channel depths exceeding 20 m in the lower river compared to 12-14 m downstream of the Yukon-Tanana River confluence and 8-10 m near the U.S.-Canada border; distances of ~ 1,100 km and 2,000 km from the river mouth, respectively. Most reaches consist of a primary river channel with occasional side channels and sloughs, although the main stem is extensively braided in the area commonly referred to as the Yukon

Flats. Sections of the Tanana River, White River, and the Canadian main stem are also highly braided. Regional designations (Fig. 1) are based on the geographic location and geomorphology of the area (e.g., lower reaches of the Porcupine River are included as part of the Yukon Flats due to similarities in landscape and river characteristics).

Subsistence and commercial fishing occur throughout the basin with most effort concentrated near villages along the main stem (JTC 2021). Fish are also harvested in reaches of the Koyukuk, Tanana, Chandalar, Porcupine, Stewart, Pelly, and Teslin rivers. Limited sport fishing takes place in a number of clear-water tributaries. The fisheries are managed to provide essential spawning escapements, subsistence harvests for local residents, and commercial and sport fishing opportunities when sufficient fish are available.

Fish Capture and Tagging

Adult Chinook salmon were captured from early June to mid-July near the village of Russian Mission (~ 300 km from the river mouth, Fig. 1). The capture and handling methods are described by Eiler et al. (2014). Briefly, the fish were caught with drift gill nets specifically designed to minimize capture-related injuries. The nets were monitored continually and the fish removed immediately after capture. Fish were randomly selected for tagging (a maximum of two fish per drift) and placed in a neoprene-lined tagging cradle submerged in a trough filled with river water. Fresh water was continually pumped into the trough while the fish were being processed. Anesthesia was not used during the tagging procedure.

Fish were tagged with radio-archival tags manufactured by Advanced Telemetry Systems (Isanti, Minnesota)[1]. The tags (which were 6.6 cm long, 2.0 cm in diameter, had a 30-cm transmitting antenna, and weighed 20 g) had a minimum battery life of 90 days. Each tag included a radio transmitter that emitted a unique pulse-coded signal on a single frequency (151.033 MHz), making it possible to effectively track the fish while still identifying specific individuals. The transmitter was also equipped with a motion sensor and activity monitor (Eiler 1995). The motion sensor inserted additional signal pulses (distinct from the basic signal pattern) each time the transmitter moved. The activity monitor changed the signal from the basic pattern to an inactive mode if the motion sensor was not triggered for 24 hours; the signal reverted to the original pattern if the motion sensor was activated. Fish with transmitters that continually registered as inactive over three consecutive days were assumed to have died.

The archival component of the tag recorded water temperature and depth every 3 minutes. The temperature sensor was accurate to ± 0.5°C and was capable of responding rapidly to temperature changes. Tags transferred from 25°C water (room temperature) to 3°C water accurately reflected the temperature change in less than 2 minutes (Advanced Telemetry Systems, Isanti, MN, unpublished data). Depth estimates were based on information from the tag's pressure sensor and were accurate to ± 1.0 m (Advanced Telemetry Systems, unpublished data). Since pressure decreases with increasing elevation, these data were adjusted to account for changes in elevation as the fish moved upriver. Signal pattern information from the transmitter's activity monitor (i.e., active or inactive mode) was also recorded every 3 minutes during 2003-2004.

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

The tags were gently inserted through the mouth and placed in the stomach of the fish. The fish were also marked externally with pink spaghetti tags attached below the dorsal fin as described by Wydoski and Emery (1983) to help identify individuals caught in fisheries or located on the spawning grounds. Fish length (mid-eye to fork of tail) was recorded, and scales were collected to provide age data as described by DeVries and Frie (1996). Information on sex was not collected due to the lack of distinct external characteristics during this stage of the upriver migration. Fish were released back into the main stem immediately after tagging. Handling and tagging, from removal from the net to release, took about 6 to 8 minutes.

Fish Tracking and Tag Recovery

Fish that moved upriver were tracked with remote tracking stations as described by Eiler (1995, 2012). The stations were located on important travel corridors and major tributaries of the drainage (Fig. 1). Fish within reception range were detected and recorded by the station. The information collected included the identity of the fish, the date and time it was present at the site, signal strength of the transmitter, and its relative position in relation to the station (i.e., upriver or downriver from the site). Changes in signal strength and the relative position of the fish were used to determine when it moved past the station. Due to the isolated nature of the sites, telemetry data were transmitted every hour to a geostationary operational environmental satellite (GOES), relayed to a receiving station operated by NOAA, National Environmental Satellite and Data Information Service, and accessed daily via the Internet (Eiler and Masters 2000).

Aerial surveys were conducted to locate fish between station sites and upriver of stations on terminal tributaries. Both fixed-wing aircraft and helicopters were used as described by Eiler

(2012). Tracking receivers equipped with an integrated GPS receiver were used to identify and record the locations. Helicopters were used to access the sites to recover the tags so that the archival data could be downloaded. Fish recovered intact (i.e., alive or a recent mortality) were necropsied to determine their general condition. Tagged fish were also caught in fisheries and salmon assessment projects (e.g., enumeration weirs, test fisheries), and steps were taken to encourage the return of any tags recovered. Posters and informational material were distributed to local communities and resource agencies, and a reward program was initiated to provide additional incentive to fishermen.

Tracking-station data were systematically reviewed post-season to determine when fish passed the station sites and to confirm that the movements represented a sequential series of locations. Aerial survey data were used to corroborate these results. Fish that passed the first station site (Paimiut, Fig. 1), located 62 km upriver from Russian Mission, were considered to have resumed upriver movements.

Swimming Depth and Water Temperature

Swimming depth and water temperature were summarized for each fish by year, reach, region, and final destination (stock). Chinook salmon often exhibit a post-tagging response immediately after release (Eiler et al. 2014) that could confound the information obtained between the tagging site and Paimiut. These data were excluded from the analysis. Depth and temperature data upstream of Paimiut (designated as Km 0) were linked to the position of the fish when it passed the station sites. Location estimates between sequential stations were interpolated based on the known distance and time taken by the fish to travel between sites. The

movement rate of the fish within the reach was assumed to be constant. The metric "hours after release" was used instead of distance when comparing data that included records from terminal tributaries, since the absence of tracking stations in the upper reaches of these drainages limited information on the movement patterns of the fish as they approached their spawning grounds. Fish passing lower river stations (particularly Paimiut and the Yukon-Anvik River confluence) were occasionally not detected, presumably due to reduced signal reception associated with the deeper depths and local topography of these sites. In these cases, station passage was estimated by prorating the overall movement rate from the combined reach to the two separate reaches based on stock-specific movement rates from the 2002-2004 basin-wide telemetry study (Eiler et al. 2015).

Temperature Control Tests

Control tests were conducted to compare ambient water temperature with the temperatures recorded by radio-archival tags placed in the stomach of the fish. Three tags were initially submerged in a tank of water for 34 hours with temperatures ranging from 5°C to 20°C to compare differences between tags (Trial 1). The tags were then placed in a fish-wheel live box (described by Meehan 1961) that was 180 cm long, 80 cm wide, and had a water depth of 95 cm (Trial 2). Tag 1 was submerged to a depth of 50 cm in river water flowing through the live box. Live adult salmon were tagged with the two remaining tags (Tag 2 and Tag 3) and allowed to swim freely in the live box. The tags were recovered after 6 hours and the archival data downloaded.

RESULTS

Tagging and Tag Recovery

A total of 137 Chinook salmon were tagged with radio-archival tags, including 23 fish in 2002, 37 fish in 2003, and 77 fish in 2004 (Table 1). Tagging was expanded in 2004 to include early and late-run fish (Fig. 2). Four-ocean age fish (i.e., fish remaining in the marine environment for four years) were the predominant age class comprising 61.6% of the sample. The remaining fish consisted primarily of 3-ocean age fish (22.4%), with smaller numbers of younger (9.6%) and older (6.4%) individuals. The fish averaged 815 mm (SD = 106 mm) in length, ranging from 560 mm to 1,060 mm.

The fish responded well to the capture and handling procedures, with most (135, 98.5%) moving upriver, including two individuals with malfunctioning tags that were not detected by the stations but subsequently caught in mainstem fisheries. A total of 133 fish were tracked upriver, with most either caught in fisheries or located in terminal reaches of the basin (Fig. 2). Two fish were never located after release, and either regurgitated their tags, were tagged with malfunctioning transmitters, or died near the tagging site due to handling, predation, or undocumented encounters in the local fishery.

Ninety-five (71.4%) tags were recovered, including 35 (26.3%) returned by fishermen and 60 (45.1%) retrieved during spawning ground surveys (Table 2). Tags recovered in terminal tributaries were widely distributed, with 25 stocks represented (Table 3, Fig. 3). Upper Yukon and Tanana fish were the predominant components, with both comprising ~ 28% of the sample. Smaller numbers of fish were recovered in other regional areas, collectively comprising 18% of the sample. Final destination was not designated for fish harvested in non-terminal reaches of the

main stem, since these fish were potentially in transit to areas farther upriver. Annual differences in distribution during 2002-2004 are described by Eiler et al. (2023).

The fish traveled to areas throughout the basin, shown sequentially in Figures 4-7. Those recovered in terminal spawning areas were often clustered in several principal tributaries. Of the 31 fish returning to the Tanana River, 22 (71.0%) were recovered in the Chena, Salcha, and Goodpaster rivers (Fig. 5). Clusters of fish were also located in the Anvik River (Fig. 4) and Chandalar and Sheenjek rivers (Fig. 6). Upper Yukon fish were more widely distributed, with most located in large- (Stewart, Pelly, White, and Teslin) and medium-sized (Klondike, Big Salmon) rivers (Fig. 7). Fishery recoveries were scattered from the lower river to the upper reaches of the basin, including 24 fish (25.3%) caught in mainstem fisheries in the Lower Yukon, Middle Yukon, and Yukon Flats.

Swimming Depth and Water Temperature

Information on upriver movements, swimming depth, and water temperatures encountered during the upriver migration was summarized for each fish by year, reach, time since release at the tagging site, distance traveled upriver, region, and final destination (stock). Fish harvested in mainstem fisheries were assumed to be in transit to areas farther upriver, and were considered separately since their final destination was unknown. These data are available online (Eiler., J. H., A. N. Evans, and M. M. Masuda, 2022. Alaska Fisheries Science Center/ABL: Yukon Chinook Salmon Upriver Movements, Swimming Depth and Water Temperature 2002-2004. NOAA Open Data Dissemination, https://www.fisheries.noaa.gov/import/item/67520). Appendix 1 describes the series of figures used to characterize depth and temperature data. Appendices 2-9 present these data by region,

stock, and the individual fish belonging to that stock. The patterns exhibited by the regional components of the return are described by Eiler et al. (2023).

Exposure to Elevated Temperatures

Upriver Migration. The amount of time that fish encountered elevated temperatures (defined here as ≥ 18°C) during the upriver migration varied by year and reach. During 2004, exposure to these conditions averaged over 200 hours for fish moving through reaches Y2, Y3, and Y4, representing 69%, 73%, and 60% of their time within the reach, respectively (Table 4, Fig. 8). Temperatures in excess of 21°C were also recorded. Exposure to elevated temperatures was minimal in the upper basin during 2004. Elevated temperatures were encountered less frequently in 2002-2003, with exposure to these conditions typically < 30% in mainstem reaches. Only fish traveling through the Yukon Flats (Reach Y4) in 2003 experienced greater exposure (averaging 43%). Conversely, elevated temperatures were more prevalent in Reaches Y5 and Y6 during 2002-2003 than in 2004.

Dissimilar patterns were observed as fish left the main stem and entered other river drainages. The fish traveling through the lower Koyukuk River (Reach K1) during 2004 encountered temperatures ≥ 18°C for 110 hours, representing 75% of the time it was within the reach (Table 4, Fig. 8). Conversely, fish in the Tanana River experienced minimal exposure to elevated temperatures during 2004, and this level was seldom observed in 2002 and 2003. Exposure to elevated temperatures was also negligible in the Porcupine River.

Stock-specific patterns were also observed during the upriver migration. Although temperatures ≥ 18°C were encountered during all three years of the study, they were less

prevalent in 2002, regularly observed in 2003, and relatively widespread in 2004 (Fig. 9). Upper Yukon stocks exhibited similar yearly patterns, with warmer conditions in the lower main stem and cooler temperatures as the fish moved farther upstream in 2004. Elevated temperatures were less prevalent in the lower main stem and more evident farther upriver during 2002-2003 (Appendix 9). Similar patterns were observed for the other upper basin stocks (Appendix 6, Appendix 7). Tanana stocks exhibited these annual patterns in the lower main stem, but temperatures seldom exceeded 18°C upriver of the Manley tracking station during all three years of the study (Appendix 5). Temperatures encountered by minor stocks in the Lower Yukon (Appendix 2) and Middle Yukon (Appendix 4) during 2004 often exceeded 18°C, and may reflect different swimming patterns and increased bank orientation as the fish neared their terminal tributaries. Although Innoko River fish traveled < 50 km upstream from Paimiut before reaching the Yukon-Innoko River confluence, the slower swimming speeds (Eiler et al. 2015) and the shallower swimming depths (Eiler et al. 2023) exhibited by this stock may account for the extended duration and warmer temperatures experienced in Reach Y1.

Terminal Tributaries. Forty-five fish were recovered in terminal tributaries that had tracking stations near the river mouth. Thirty-nine of these fish died from natural causes prior to recovery, providing a complete record of their residency, swimming depth, and temperature profile during this period. Residency within terminal tributaries averaged 419 hours (17.5 days), ranging from 133 hours to 915 hours (Table 5, Fig. 10). Salcha River fish during 2004 had the shortest residency, averaging 221 hours (9.2 days). Fish spawning in the adjacent Chena River were comparable, averaging 241 hours (10.0 days). However, fish in other tributaries were active for extended periods, such as a fish in 2004 that was alive for 38 days after leaving the main stem and entering the Anvik River.

The temperatures encountered by fish in terminal tributaries varied by year and stock. Temperatures in lower- and middle-basin tributaries were predominantly < 13°C during 2003 (Table 6, Fig. 10), whereas intermediate temperatures (13°C to < 18°C) were more prevalent for Upper Yukon fish. For example, fish in the Teslin River during 2003 were frequently exposed to intermediate temperatures, ranging from 66.4% to 81.6% of their time within the tributary. Temperatures ≥ 18°C were only encountered for a limited time (8 h) by a fish in the lower Pelly River. Warmer temperature were more prevalent during 2004. Although temperatures < 13°C were often experienced by Tanana fish, intermediate temperatures were more frequent in other tributaries, particularly those in the lower and middle basin. Temperatures ≥ 18°C were also encountered, but typically occurred as fish left the main stem and entered terminal tributaries, with cooler temperatures as they traveled farther upstream to spawning grounds (Appendices 2-9). Some differences were observed among regional stocks. For example, temperatures in the Pelly and Teslin rivers were predominantly within the intermediate range during 2004, whereas those in the Big Salmon River were mostly < 13°C. Although the small sample of fish in 2002 limits inter-annual comparisons, elevated temperatures were evident for a number of stocks.

Assessing Fish Behavior and Status

The telemetry and archival data obtained during the study provided detailed information that was useful in assessing the behavior and status of the fish. For example, Fish 2004_3005 was harvested in the Canadian fishery near Dawson, Yukon Territory (Appendix 8). The fish was caught just before midnight (23:52) on 8 July 2004 at a depth of 2.5 m after traveling 27.5 days and ~ 1,780 km upriver from Paimiut (Fig. 11). Although the swimming depth of the fish varied

within this stretch of river, temperature was relatively stable, averaging 16.3°C (SD = 0.5°C). The fish was removed from the net 11 hours after capture.

Detailed information was also obtained for fish recovered on the spawning grounds. After traveling 22.7 d and 1,230 km upriver from Paimiut, Fish 2002_3006 entered the Chandalar River and passed the tracking station near the river mouth (Fig. 12, Appendix 6). The fish continued moving upriver for 1.8 days, displaying the highly variable (albeit shallower) swimming depth pattern observed in the main stem. A distinctly different pattern was observed after hour 590, with depths predominantly > 2 m, suggesting that the fish had reached the spawning grounds. This pattern continued for 9.2 days, followed by increased variability after hour 800. Although the temperatures encountered by the fish harvested in the Canadian fishery were relatively stable as it moved upriver (Fig. 11), a distinct diel pattern was observed for the fish recovered on the spawning grounds, with temperatures declining during the evening and increasing during daylight hours (Fig. 12). The archival data suggests that death occurred during the morning of 22 July. Residency in the Chandalar River, based on passage by the tracking station and estimated time of death, was approximately 11.7 days.

Data from the radio-archival tags also made it possible to error check and interpret the telemetry data collected. During 2004, a fisherman caught one of the tagged fish in the lower main stem. Instead of returning it, he took the tag upriver and placed it in a mainstem tributary, where it was later recovered. Although this type of mischief occasionally occurs, the depth and temperature data from the tag, combined with the radio-tracking information, confirmed that the fish had not traveled to this area to spawn. The integration of activity-sensor data in the archival data stream during 2003-2004 also enhanced our ability to interpret the data obtained with respect to the movements and behavior of the fish.

Temperature Control Tests

A total of 676 temperature readings were recorded per tag for the three tags examined during Trial 1, ranging from 5.0°C to 21.0°C. Minimal differences were observed in the temperatures recorded among tags (Fig. 13), with an average difference of 0.08°C (SD = 0.12°C). Similar results were observed during the second trial, with no appreciable differences observed between the temperatures recorded by the tag placed directly in river water and those used to tag the fish. A total of 117 readings per tag were recorded during this trial, with water temperatures ranging from 4.5°C to 5.0°C. The average difference between tags was 0.02°C (SD = 0.16°C).

DISCUSSION

The declining abundance and altered run characteristics of Yukon River Chinook salmon are major concerns to the resource agencies managing the returns as well as the local communities that depend upon the resource. However, management and conservation efforts are often complicated by a number of factors, including the impact of changing conditions in both the marine and freshwater environment. Over the last several decades, major climatic changes have occurred in the northern Pacific, characterized by a general warming trend throughout the region (Walsh et al. 2011, Box et al., 2019). Numerous forecasts have predicted that this trend will continue in the foreseeable future (Vavrus et al. 2012, Hodson et al. 2013).

Warmer temperatures within the region will likely have a negative impact on northern populations of salmon. In addition to increased mortality (Berman 1990, Macdonald et al. 2000), elevated temperatures during the spawning migration have been linked to a wide range of negative effects, including reduced stamina and swimming speed (Quinn et al. 1997, Salinger and Anderson 2006), pronounced shifts in run timing (Hinch et al. 2012), disrupted migratory patterns (Strange 2010, Goniea et al. 2006), accelerated depletion of energy reserves (Fry 1971, Dahlke et al. 2020) and increased susceptibility to disease (Holt et al. 1975, Kocan et al. 2009). Although many of these factors are ostensibly sublethal, the additive and collateral effects may be sufficient to jeopardize both survival and reproductive success. It is likely that warmer temperatures will also have an adverse effect on other freshwater species. Understanding the migratory patterns of the fish in relation to the environmental conditions encountered can help in assessing the impact of these factors and managing fish populations.

Swimming Depth and Water Temperature

Swimming depth and the temperatures encountered during the spawning migration were determined for stocks of Yukon River Chinook salmon, and the individual fish within a stock. The patterns observed were comparable to those exhibited by the regional components of the returns (described by Eiler et al. 2023), suggesting that stock differences within a region were minimal. Similar patterns were also observed for fish from different regions and stocks traveling along the same migratory route.

All of the fish displayed a similar swimming pattern, characterized by continuous and highly variable fluctuations in depth. This pattern was observed throughout the upriver migration, with progressively shallower depths as the fish moved farther upstream. The variable

depths suggests that fish were traveling along the river bottom, based on the typical morphology of free-flowing rivers and the need of migrating salmon to conserve energy reserves (Eiler et al. 2023). This pattern is consistent with the premise that Chinook salmon are primarily bottom-oriented during the upriver migration.

Although individual variation was observed, the temperatures encountered during the upriver migration were similar for fish within a stock. Similar patterns were also exhibited among stocks within a region. For example, the temperature profiles displayed by Upper Yukon fish returning to the Pelly, Big Salmon, and Teslin rivers in 2004 all showed a pronounced increase as the fish moved through the lower main stem (with temperatures in excess of 20°C in reaches Y2 and Y3) and cooler temperatures as the fish moved farther upriver (Appendix 9). The conditions experienced by these stocks were considerably cooler in the lower main stem during 2003, with generally warmer or comparable temperatures in the upper reaches compared to 2004. Tanana stocks also displayed comparable intra-annual patterns (Appendix 5). Similar to the Upper Yukon stocks, temperatures encountered in the lower main stem were routinely warmer during 2004 than in the two previous years of the study, but a pronounced decline was observed during all three years after leaving the main stem, with temperatures seldom above 18°C upriver of the Manley tracking station.

Elevated Temperatures during the Upriver Migration. The temperature 18°C has often been considered the critical threshold associated with adverse effects on salmon during the spawning migration (von Biela et al. 2020, Jones et al. 2020), with temperatures above 21°C as the upper thermal limit (McCullough 1999, EPA 2013). However, regional and stock differences have been reported. Thermal conditions in the Columbia River commonly exceed 21°C (Keefer et al. 2008), and Strange (2010) proposed a lethal level of 23°C based on information from

Chinook salmon returning to the Klamath River (California, USA). Conversely, von Biela et al. (2020) reported substantial mortality for adult Chinook salmon captured in the lower Yukon River and held at 21°C for 4-5 hours. Studies have also suggested that prolonged exposure to high but presumably sublethal temperatures may have a profound effect. Berman (1990) reported that nearly all of the adult Chinook salmon exposed to 19°C temperatures over several weeks died. Extended exposure to elevated temperatures has also been linked to pre-spawning mortality and reduced reproductive success (Pankhurst and King 2010, Bowerman et al. 2018, Bowen et al. 2020).

Elevated temperatures were encountered during all three years of our study, particularly during 2004 when fish moving through the lower main stem were exposed to temperatures ≥ 18°C for extended periods. A similar pattern was observed for the fish traveling through the lower Koyukuk River. Although conditions within the basin were generally cooler during 2002-2003, elevated temperatures were encountered by fish traveling through upper reaches of the basin. However, in spite of the prolonged exposure to these conditions, the fish did not exhibit increased mortality or migratory patterns that would suggest a negative response. Most were either tracked to terminal tributaries or harvested in local fisheries. The factors associated with the response exhibited by the fish are discussed by Eiler et al. (2023).

Temperatures in Terminal Tributaries. Water temperatures in spawning areas used by Chinook salmon typically range from 2.2°C to 18.9°C, with conditions < 13°C generally considered optimal (McCullough 1999, EPA 2003). Temperatures above this level have been linked to lower fertilization rates, increased developmental abnormalities, and reduced embryo survival (McCullough 1999, Richter and Kolmes 2005). During our study, temperatures in Tanana River tributaries during 2002-2003 were predominantly below 13°C, but conditions in

other terminal tributaries (including those in the Tanana River during 2004) were often near or above this level. Exposure to warmer conditions was exacerbated by the diel pattern exhibited as fish approached and entered terminal tributaries, with temperatures often < 13°C at night, but above this threshold during the day (Eiler et al. 2023).

The impact of these temperature ranges on the behavior and reproductive success of the fish is not known. The individuals we recaptured on the spawning grounds in pre-spawning condition were not lethargic and did not exhibit any overt signs of impaired behavior. Females that had died and could be examined (minimal decomposition) had all spawned, suggesting that pre-spawning mortality was not prevalent. However, fully assessing the impact of warmer conditions on reproductive success (including the number of viable eggs produced and egg-to-fry survival) is a major challenge and was beyond the scope of this study.

Comparing the Utility of Radio-archival and Traditional Archival Tags

Traditional Archival Tags. Archival tags have been used to provide information on a variety of marine and freshwater fish (Bergstedt et al. 2003, Sims et al. 2003, Takahashi et al. 2003, Howell et al. 2010, Matsumoto et al. 2013, de Pontual et al. 2019). Although temperature and pressure (used to estimate depth) are routinely recorded, tags with specialized sensors can also measure light levels, changes in tag orientation, salinity, and various other factors (Schaefer et al. 2007, Teo et al. 2013, Thorstad et al. 2013). Archival tags have a number of advantages. Data can be collected at frequent intervals (every several minutes) over extended periods (from months to years), making it possible to examine both long-term and fine-scale patterns. The data are recorded as the fish moves through its environment, providing a detailed account of the

actual conditions encountered. Although anecdotal, the recovery of even a small number of tags may provide new information and insights into the habitat use and behavior of the fish that would be difficult to obtain using more traditional methods.

However, this technology has a number of limitations. Archival tags are relatively expensive (hundreds of dollars per tag) and must be recovered to download the information. Recovery rates are typically low, often < 20% of the tags deployed (Bergstedt et al. 2003, Hayes et al. 2011, Abascal et al. 2018), making it necessary to tag large numbers of fish to obtain adequate samples and representative results. Pop-up satellite archival tags that break away from the fish, float to the surface, and transmit the data via a satellite uplink have been used in settings where it is difficult to recover tags (e.g., the marine environment, large lake systems) to provide a more reliable method for retrieving the information (Arrizabalaga et al. 2008, Carlson et al. 2010, O'Neil et al. 2018), but in addition to the greater costs (thousands of dollars per tag, as well as the expense of accessing the data), these tags are bulkier than regular archival tags and must be attached externally, raising concerns about the potential effect on swimming performance and survival, particularly for smaller species and immature life stages (Jepsen et al. 2015). Linking the archival data to the location of the fish is also a problem for wide-ranging species because the movements between release and recovery are not known. Tags that record light levels to approximate latitude have been used to estimate the general location of fish in the marine environment, but they only provide large-scale positioning information (Nielsen et al. 2006, Erickson et al. 2011, Chittenden et al. 2012). Furthermore, this approach only provides nominal context for the data collected in spite of the large number of observations recorded.

Although the movements of riverine fish are restricted to more confined areas, tag recovery can still be a challenge, particularly in large river drainages. Recovery is simplified in

impounded rivers where fish passageways and holding structures facilitate recapture efforts, or in rivers with assessment projects (e.g., weirs, hatcheries) that process large numbers of fish. Extensive in-river fisheries can also increase the number of tags recovered, but these tags provide incomplete information for fish in transit to areas farther upstream or downstream from the recovery site.

Radio-archival Tags. Although limited to fresh water, radio-archival tags provide a number of advantages over traditional archival tags. During this study, recovery efforts were substantially improved by our ability to track the fish to their final destination, which significantly reduced the immediate search area despite the wide-ranging movements of the fish and the massive size and remote nature of the basin. The tracking methods used on the spawning ground were extremely effective at pinpointing the location of the fish, substantially increasing the number of tags recovered. Spawning ground recoveries accounted for 45% of the tags deployed during the study compared to 26% recovered in local fisheries. The ability to detect and locate tags in villages and fish camps also increased the number of fishery returns by providing an opportunity to meet and talk with fishermen, and explain the importance of the information provided by the tags. The combined recovery rate during this study (over 71%) was considerably higher than reported for most archival tag studies.

Radio-archival tags also improved the quality of the data obtained during the study, providing a non-invasive method to obtain multiple observations during the upriver migration and while fish were on the spawning grounds. The telemetry information collected made it possible to geo-reference the archival data with the location of the fish as they moved upriver, making it possible to characterize the swimming depths and environmental conditions within different sections of the basin. Although our study relied primarily on passage and movement

rate data from fixed tracking station sites, combining archival data with fine-scale positioning information from mobile surveys (e.g., boat tracking, aerial surveys) would substantially enhance the resolution of the location estimates and provide a powerful tool for collecting site-specific information to address a wide range of research objectives and management issues, such as determining the distribution, movements, and habitat use of local populations, assessing the status of the fish, and evaluating the effects of climate and habitat changes (e.g., logging, mining, development) on local conditions and fish behavior. That being said, the data provided by radio-archival tags represent what the fish is experiencing at a particular location and time. It does not necessarily reflect conditions in the general vicinity, particularly in complex environments where localized areas may contain a high degree of habitat heterogeneity. Supplemental information, including visual observations in situ, and systematic habitat sampling, would help address these limitations and improve our understanding of what the archival data represent.

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Table 1. -- Number, age, and length (mid-eye to fork of tail) of Chinook salmon tagged with radio-archival tags in the Yukon River basin during 2002-2004. Percentage by age class is in parentheses.

	Fish	Age				Length (mm)	
Year	(n)	2-ocean	3-ocean	4-ocean	> 4-ocean	Average, SD	Range
2002	23		4 (18.2)	18 (81.8)		836, 71	695-935
2003	37		8 (23.5)	22 (64.7)	4 (11.8)	846, 93	670-1,025
2004	77	12 (17.4)	16 (23.2)	37 (54.6)	4 (5.8)	794, 117	560-1,060
Total	137	12 (9.6)	28 (22.4)	77 (61.6)	8 (6.4)	815, 106	560-1,060

Table 2. -- Recovery of Chinook salmon tagged with radio-archival tags in the Yukon River basin during 2002-2004. Percentages of the number of fish tracked upriver are in parentheses.

	Tracked	Spawning ground survey		Fishery		All
Year	upriver	Recovered	Not recovered[2]	Returned	Not returned	recoveries
2002	23	6 (26.1)	5 (21.7)	12 (52.2)		18 (78.3)
2003	37	17 (45.9)	12 (32.4)	6 (16.2)	2 (5.4)	23 (62.2)
2004	73[1]	37 (50.7)	16 (21.9)	17 (23.3)	3 (4.1)	54 (74.0)
Total	133	60 (45.1)	33 (24.8)	35 (26.3)	5 (3.8)	95 (71.4)

[1]Excludes two fish with malfunctioning tags that moved upriver and were caught in fisheries
[2]Tags located but not accessible.

Table 3. -- Final location of radio-archival tagged Chinook salmon recovered in the Yukon River basin during 2002-2004. Percentages of the total number of fish recovered are in parentheses. Asterisks indicate fish recovered in non-terminal areas and likely in transit to areas farther upriver.

		Final location			
Region	Stock	2002	2003	2004	All years
Lower Yukon	Innoko			2	2 (2.1)
	Anvik			4	4 (4.2)
	Lower Yukon fishery*	2		1	3 (3.2)
Middle Yukon	Melozitna			1	1 (1.1)
	Tozitna		1		1 (1.1)
	Middle Yukon fishery*	3	2	6	11 (11.6)
Upper Koyukuk	South Fork			1	1 (1.1)
Tanana	Kantishna			3	3 (3.2)
	Tolovana	1		1	2 (2.1)
	Nenana		2		2 (2.1)
	Clear			1	1 (1.1)
	Chena		1	5	6 (6.3)
	Salcha		2	5	7 (7.4)
	Goodpaster	1	2	1	4 (4.2)
	Tanana fishery*			2	2 (2.1)
Yukon Flats	Chandalar	2	1		3 (3.2)
	Sheenjek	2			2 (2.1)
	Yukon Flats fishery*	1	3	6	10 (10.5)
Porcupine	Porcupine fishery*		1	1	2 (2.1)
Upper Yukon	Charley			1	1 (1.1)
	Klondike			3	3 (3.2)
	Stewart	1			1 (1.1)
	White			1	1 (1.1)
	Pelly		3	3	6 (6.3)
	Tatchun	1			1 (1.1)
	Yukon main stem		1		1 (1.1)
	Big Salmon		1	2	3 (3.2)
	Teslin		3	2	5 (5.3)
	Upper headwaters			1	1 (1.1)
	Upper Yukon fishery*	4		1	5 (5.3)
Total		18	23	54	95

Table 4. -- Average exposure (h) to temperatures ≥ 18°C by region, reach, and year for radio-archival tagged Chinook salmon during the spawning migration in the Yukon River basin. Percentage of the total hours within the reach is in parentheses. Percentages > 60% are highlighted. Reaches are shown in Figure 1.

		Exposure (h)		
Region	Reach	2002	2003	2004
Lower Yukon	Y1	25 (27.8)	1 (1.6)	67 (27.8)
Lower Yukon - Middle Yukon	Y2	0.1 (0.6)	44 (14.8)	270 (68.8)
Upper Koyukuk	K1			112 (74.9)
Middle Yukon	Y3	0	48 (24.8)	201 (73.3)
Tanana	T1	0	0	28 (19.2)
	T2	0	0	5 (1.6)
Yukon Flats	Y4	23 (4.1)	143 (43.1)	225 (59.8)
Porcupine	P1			5 (9.9)
	P2			3 (3.6)
Upper Yukon	Y5	62 (23.4)	71 (21.2)	0.7 (0.7)
	Y6	44 (27.1)	34 (21.2)	0
	Y7	13 (12.5)	12 (15.2)	15 (12.4)
	Y8	0	5 (9.9)	11 (8.4)
	Y9	0	0	0

Table 5. -- Average residency (h) for fish in terminal spawning tributaries by region, stock, and year for radio-archival tagged Chinook salmon tracked to rivers in the Yukon River basin with tracking stations near the tributary mouth. Standard deviation (SD) and range are shown.

				Residency (h)		
Region	Stock	Year	Fish (n)	Average (h)	SD	Range
Lower Yukon	Innoko	2004	2	481	146	378 - 584
	Anvik	2004	4	548	247	385 - 915
Upper Koyukuk	South Fork	2004	1	662		
Middle Yukon	Melozitna	2004	1	579		
Tanana	Chena	2003	1	515		
		2004	4	241	45	186 - 284
	Salcha	2003	2	290	90	226 - 353
		2004	3	221	101	133 - 331
	Goodpaster	2002	1	446		
		2003	1	478		
		2004	1	314		
Yukon Flats	Chandalar	2002	2	383	146	280 - 486
		2003	1	468		
	Sheenjek	2002	2	425	269	235 - 615
Upper Yukon	Stewart	2002	1	635		
	Pelly	2003	3	472	96	369 - 559
		2004	2	384	176	259 - 508
	Big Salmon	2003	1	372		
		2004	2	353	69	304 - 401
	Teslin	2003	2	404	149	299 - 509
		2004	2	638	234	472 - 804
Total			39	419	170	133 - 915

Table 6. -- Average exposure (h) to temperature ranges by year, region, and stock for radio-archival tagged Yukon River Chinook salmon in terminal spawning tributaries with tracking stations near the tributary mouth. Percentage of the total hours within the tributary is in parentheses. Percentages > 60% are highlighted.

				Exposure (h)		
Year	Region	Stock	Fish (n)	< 13°C	13°C to < 18°C	≥ 18°C
2002	Tanana	Goodpaster	1	295 (66.1)	151 (33.9)	
	Yukon Flats	Chandalar	2	5 (1.0)	329 (86.9)	49 (12.1)
	Yukon Flats	Sheenjek	2	128 (30.0)	297 (70.1)	
	Upper Yukon	Stewart	1	528 (83.1)	101 (15.8)	7 (1.1)
2003	Middle Yukon	Tozitna	1	688 (91.4)	65 (8.6)	
	Tanana	Chena	1	515 (100)		
	Tanana	Salcha	2	253 (87.4)	37 (12.6)	
	Tanana	Goodpaster	2	346 (86.9)	43 (13.1)	
	Yukon Flats	Chandalar	1	284 (60.5)	185 (39.5)	
	Upper Yukon	Pelly	3	248 (52.6)	217 (46.0)	8 (1.4)
	Upper Yukon	Big Salmon	1	325 (87.2)	48 (12.8)	
	Upper Yukon	Teslin	3	115 (25.0)	379 (75.0)	
2004	Lower Yukon	Innoko	2	160 (27.4)	288 (64.6)	33 (8.1)
	Lower Yukon	Anvik	4	24 (4.6)	478 (87.4)	46 (8.0)
	Upper Koyukuk	South Fork	1	226 (34.2)	331 (50.1)	104 (15.7)
	Middle Yukon	Melozitna	1	13 (2.2)	381 (65.8)	185 (32.0)
	Tanana	Chena	4	160 (67.2)	82 (32.9)	
	Tanana	Salcha	5	54 (42.1)	110 (57.7)	< 1 (0.2)
	Tanana	Goodpaster	1	280 (89.2)	34 (10.8)	
	Upper Yukon	Pelly	3	81 (17.1)	305 (81.3)	4 (1.6)
	Upper Yukon	Big Salmon	2	304 (84.4)	49 (15.6)	
	Upper Yukon	Teslin	2	109 (17.1)	529 (83.0)	

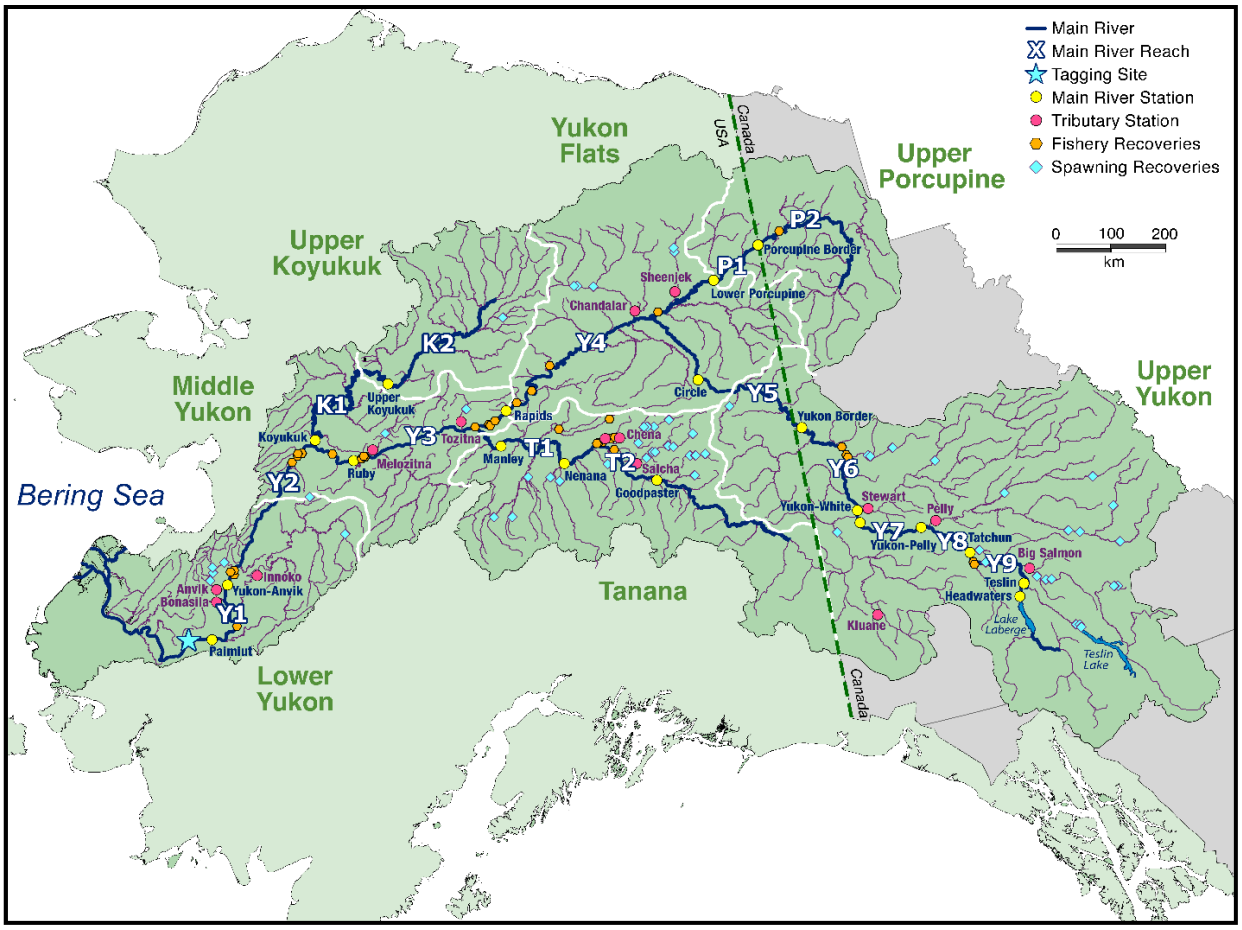


Figure 1. -- Map of the Yukon River basin showing the regional areas, major drainages, tagging site, tracking stations on both the main rivers and associated tributaries, and the final location of radio-archival tagged Chinook salmon harvested in fishery or recovered in spawning tributaries. Main river reaches (Y = Yukon main stem, K = Koyukuk, T = Tanana, and P = Porcupine) are also indicated.

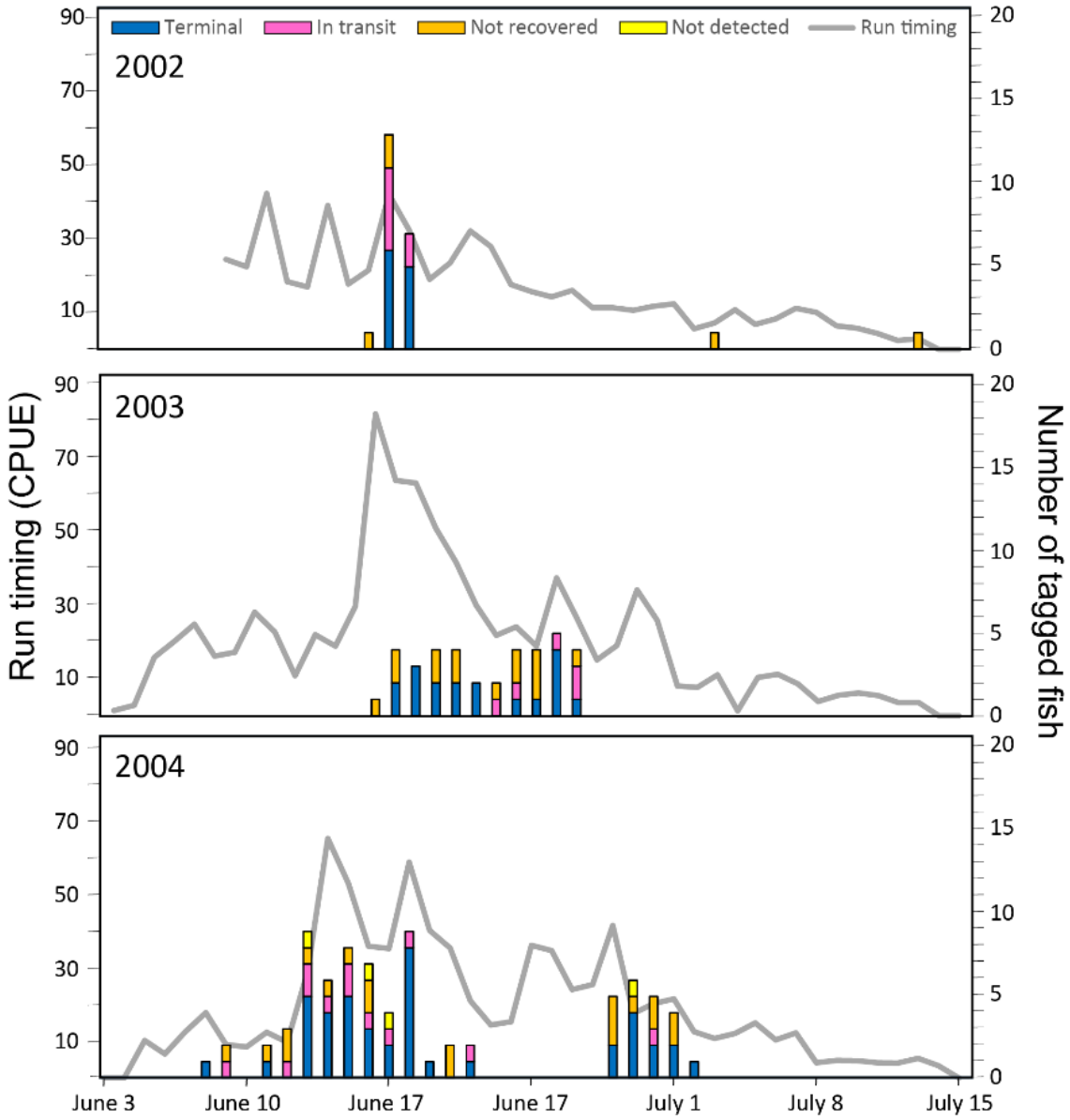


Figure 2. -- Chinook salmon run timing (based on catch per unit effort data at the tagging site) and the number of fish tagged with radio-archival tags in the Yukon River basin during 2002-2004. The numbers of fish recovered (in terminal spawning areas or while in-transit to their final destination), not recovered, and not detected after release by tagging date are shown.

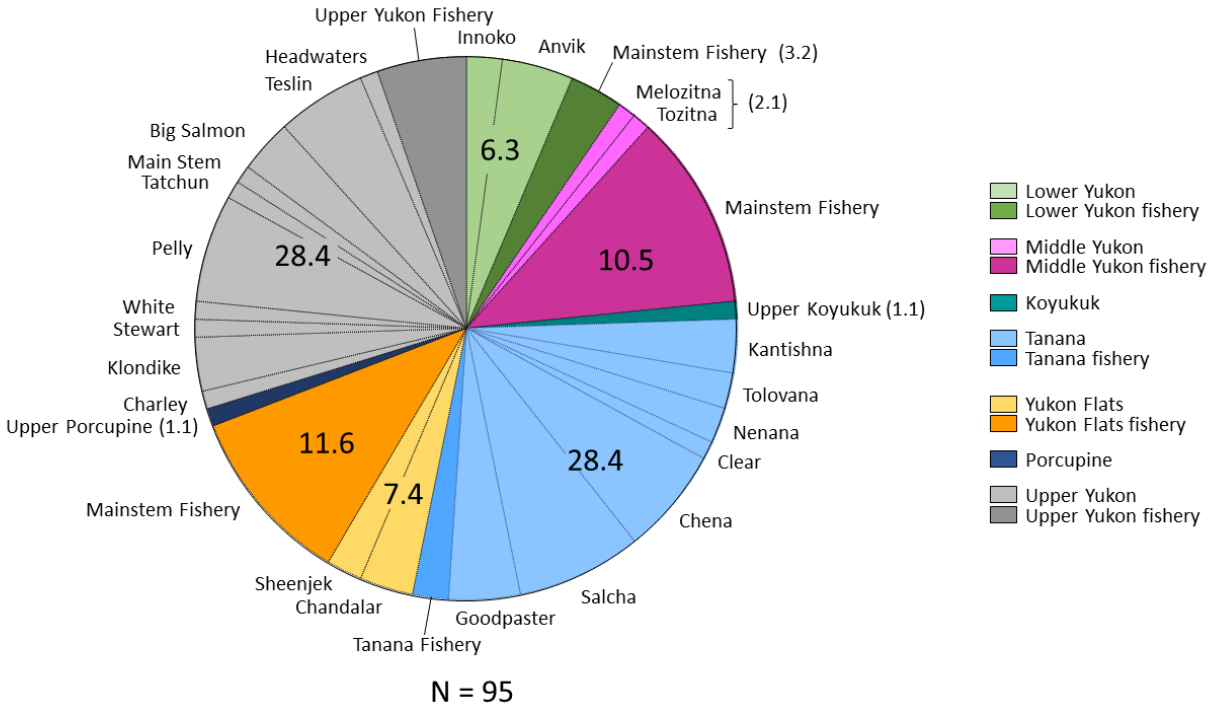


Figure 3. -- Recovery of radio-archival tagged Chinook salmon by region and stock, including fish harvested in non-terminal fisheries (final destination unknown). Regional percentages are shown. The number and proportion of fish recovered by stock is presented in Table 3.

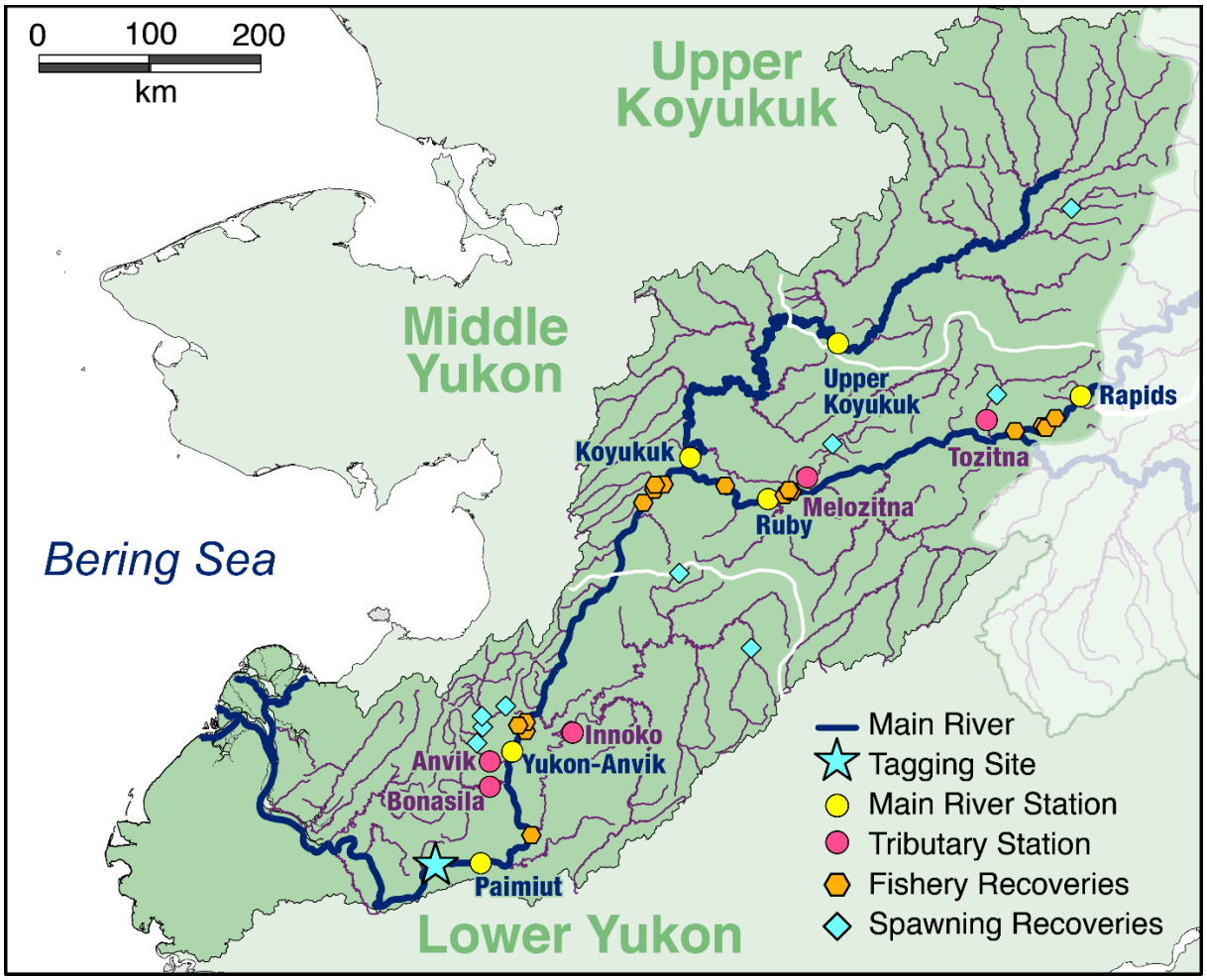


Figure 4. -- Map of the Lower Yukon, Middle Yukon, and Upper Koyukuk showing the major drainages, tagging site, tracking stations on both the main rivers and associated tributaries, and final location of radio-archival tagged Chinook salmon harvested in fisheries or recovered in spawning tributaries.

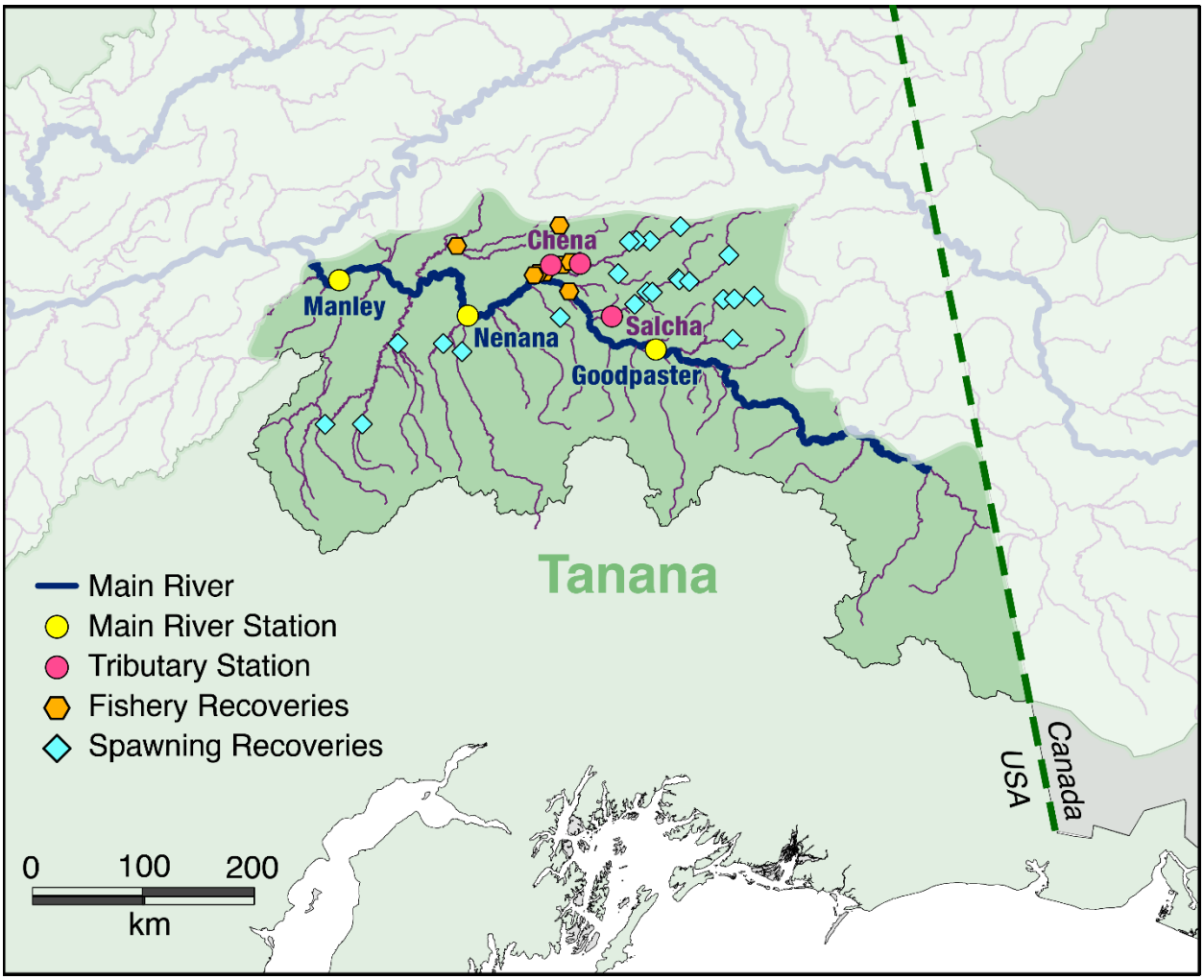


Figure 5. -- Map of the Tanana showing the major drainages, tracking stations on both the main river and associated tributaries, and final location of radio-archival tagged Chinook salmon harvested in fisheries or recovered in spawning tributaries.

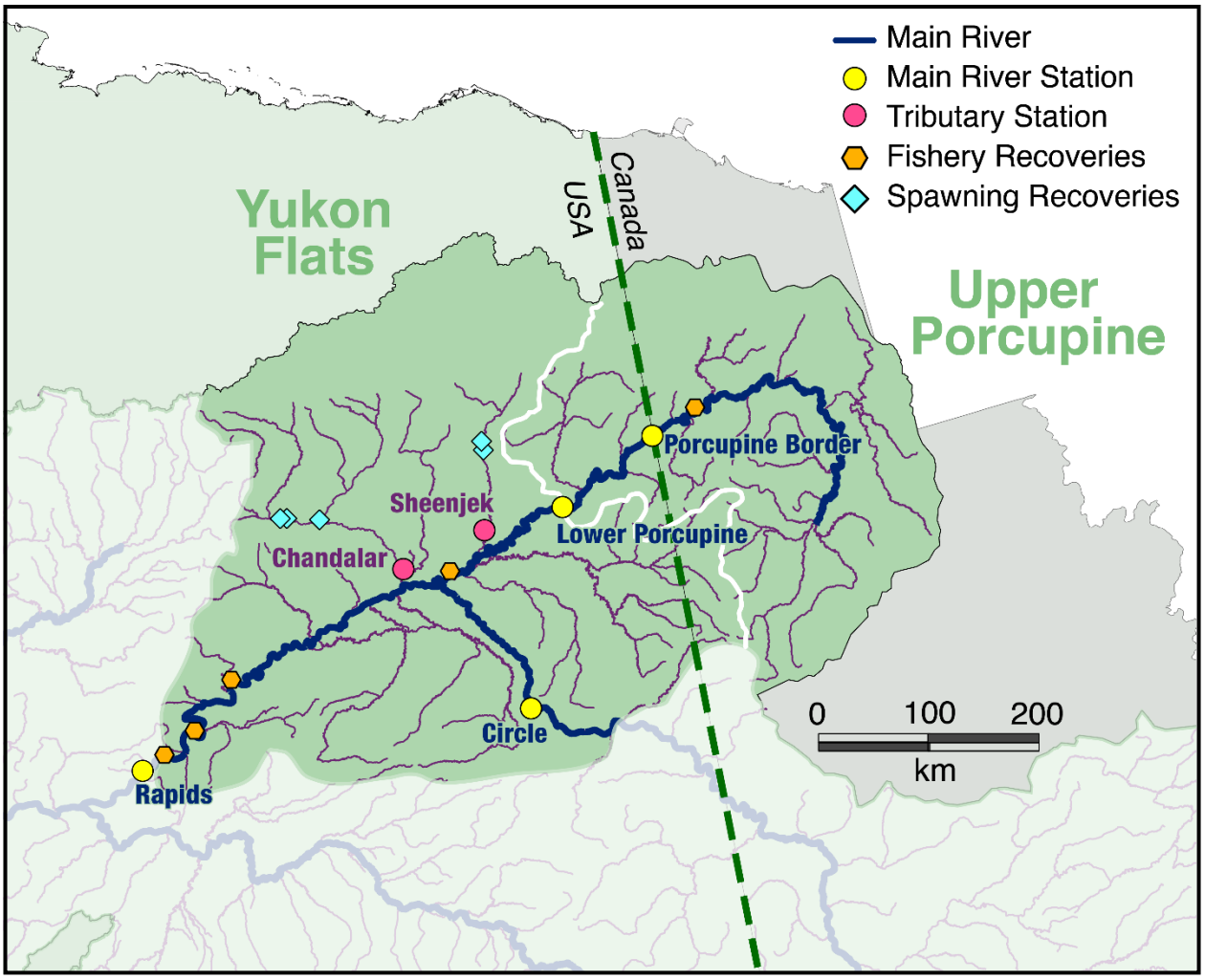


Figure 6. -- Map of the Yukon Flats and Upper Porcupine showing the major drainages, tracking stations on both the main river and associated tributaries, and final location of radio-archival tagged Chinook salmon harvested in fisheries or recovered in spawning tributaries.

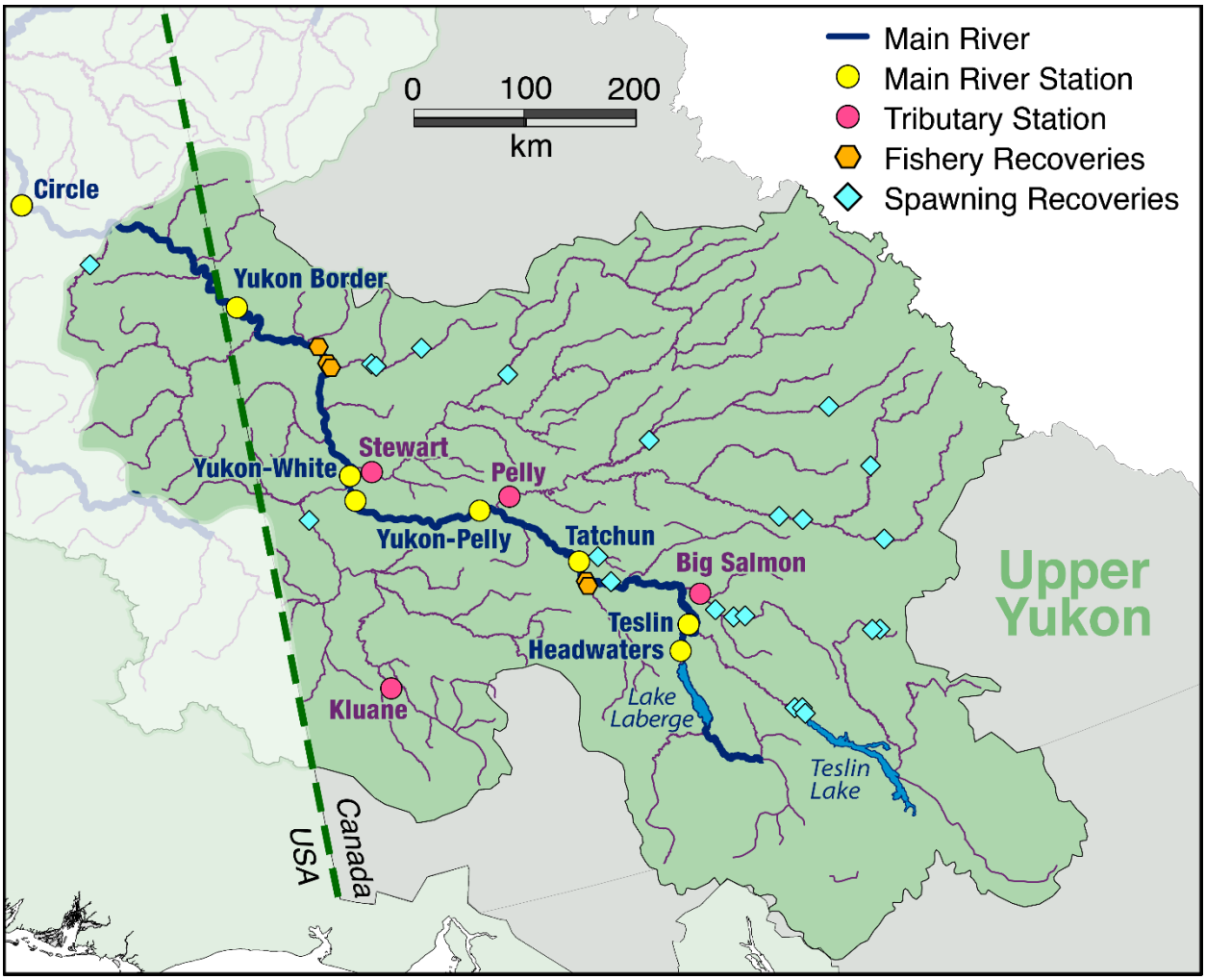


Figure 7. -- Map of the Upper Yukon showing the major drainages, tracking stations on both the main river and associated tributaries, and final location of radio-archival tagged Chinook salmon harvested in fisheries or recovered in spawning tributaries.

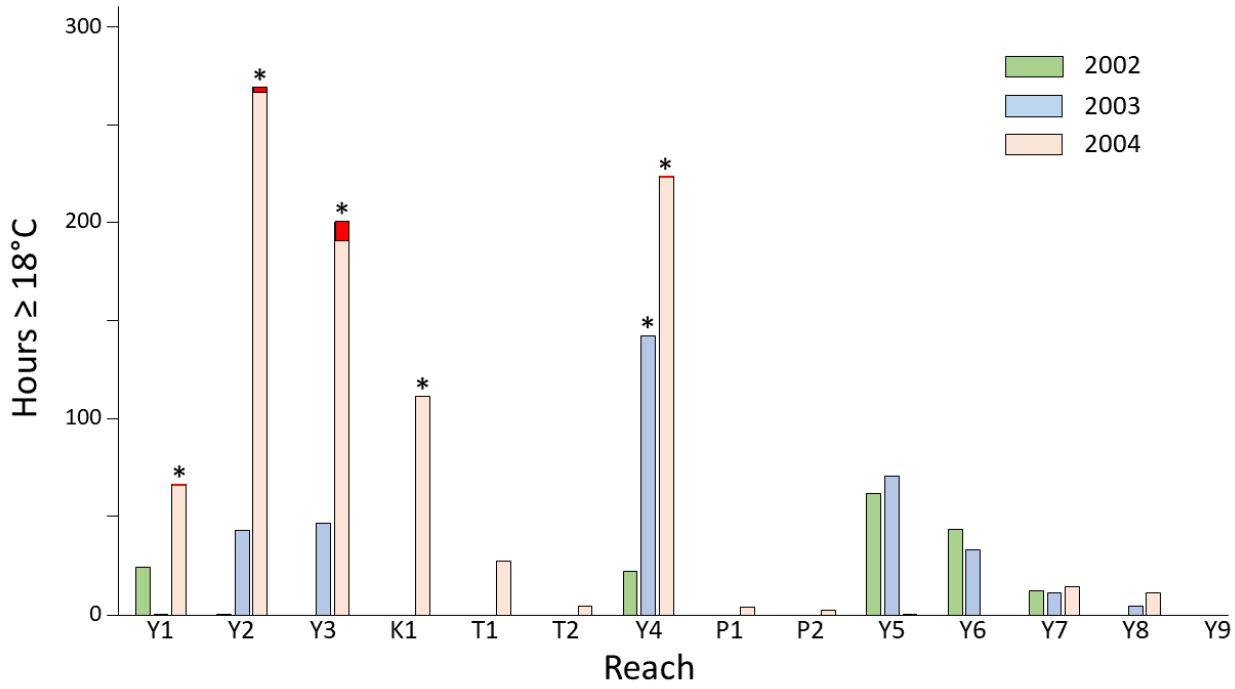


Figure 8. -- Average exposure (h) to temperatures ≥ 18°C by year and reach for radio-archival tagged Chinook salmon during the spawning migration in the Yukon River basin. Hours with temperatures ≥ 21°C are in red. Asterisks indicate that temperatures exceeded 18°C over 30% of the time (see Table 4). Reaches are shown in Figure 1.

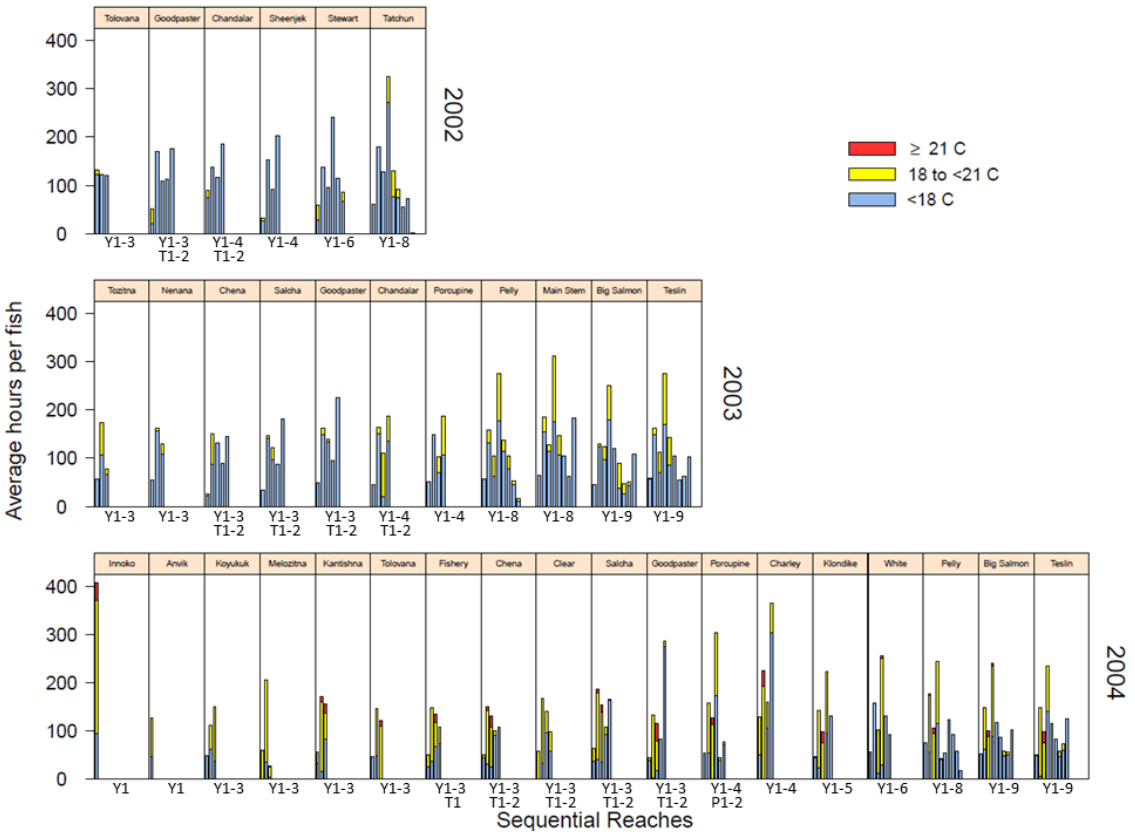


Figure 9. -- Average exposure (h) to temperature ranges by year, stock, and reach for radio-archival tagged Chinook salmon during the spawning migration in the Yukon River basin. Reaches are shown in Figure 1.

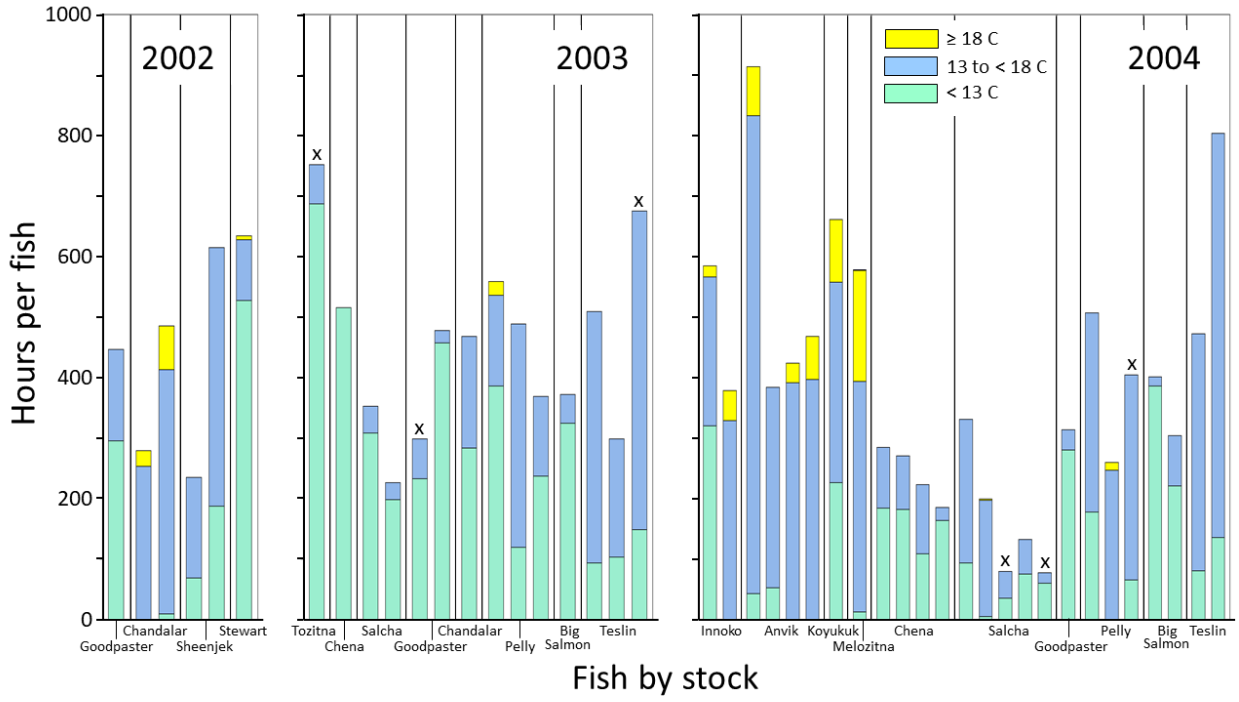


Figure 10. -- Exposure (h) to temperature ranges in terminal spawning tributaries by year and stock for individual radio-archival tagged Chinook salmon in the Yukon River basin. An “x” indicates fish that were captured alive (i.e., time of death from natural causes not determined).

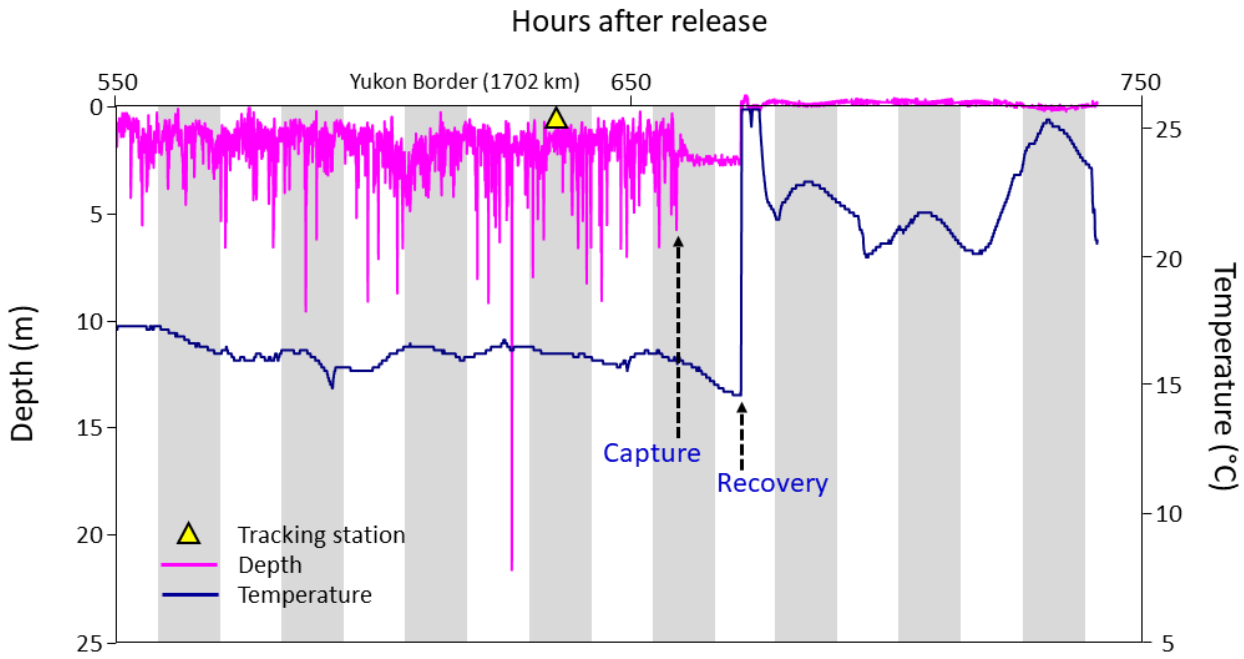


Figure 11. -- Swimming depth and water temperatures encountered by a radio-archival tagged Chinook salmon caught in the Yukon River fishery. Hours after release at the tagging site, and the time of capture and recovery are shown. The last tracking station passed and the distance from the initial tracking station at Paimiut are indicated. Gray shading represents the time between 1800 and 0600 hours.

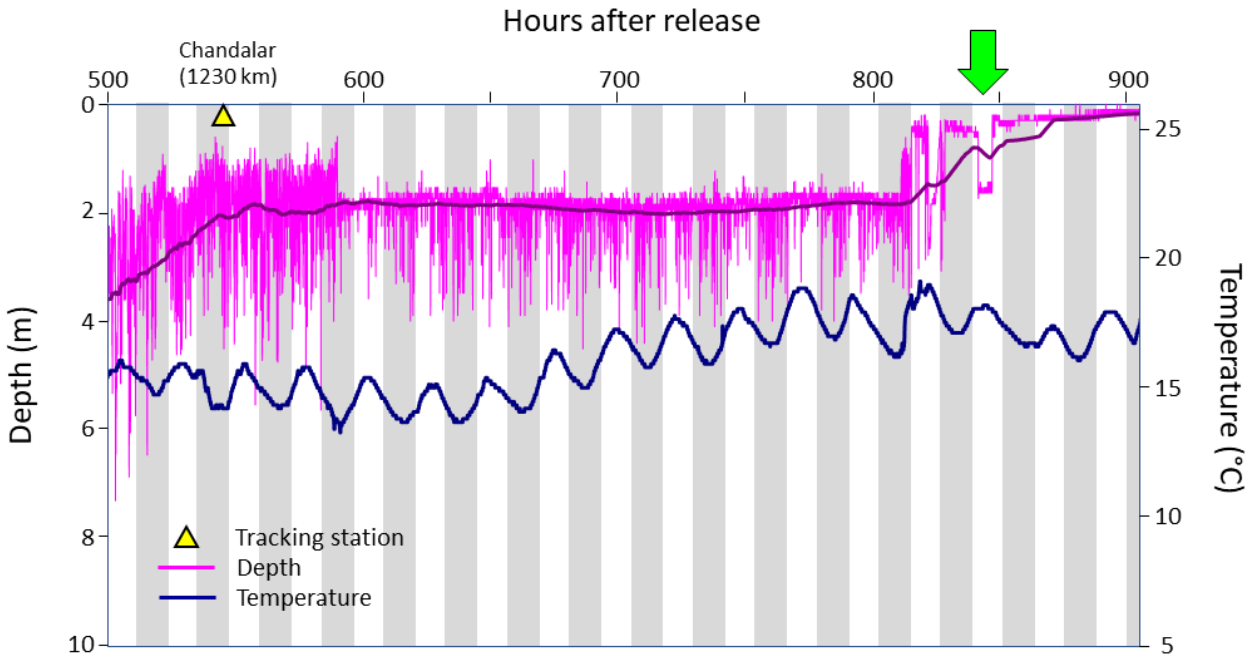


Figure 12. -- Swimming depth and water temperatures encountered by a radio-archival tagged Chinook salmon recovered on the spawning grounds in the Chandalar River. Hours after release at the tagging site, and the estimated time of death (green arrow) are shown. The last tracking station passed and the distance from the initial tracking station at Paimiut are indicated. Gray shading represents the time between 1800 and 0600 hours.

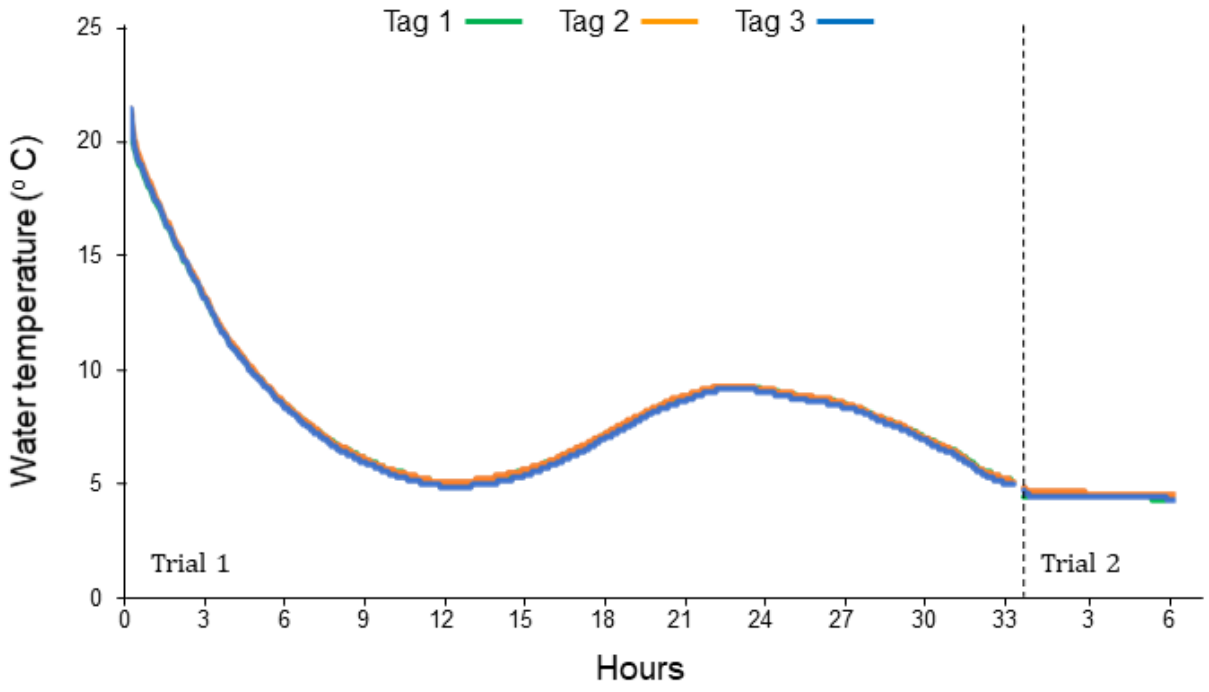


Figure 13. -- Temperatures recorded by radio-archival tags placed in a tank with varying water temperature (Trial 1). During the second trial, Tag 1 was submerged in river water flowing through a fish wheel live box. Adult salmon were tagged with Tags 2 and 3 (placed in the stomach of the fish) and released into the live box.

APPENDICES

Appendix 1. -- Description of the summary information for swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon tagged with radio-archival tags in 2002-2004.

Appendices 2-9 contain a series of figures describing the swimming depths and water temperatures encountered by Chinook salmon tagged with radio-archival tags during the spawning migration in 2002-2004. The information is organized by region, ranging from the lower river to the upper headwaters (Fig. 1), and includes data for each of the spawning stocks within the region and the individual fish within that stock. Individual fish are designated by year and tag number (e.g., Fish 2004_3038). Links have been inserted in the List of Appendices to facilitate accessing these data.

A complete complement of figures is provided for most of the stocks. Figures displaying data for multiple fish have been omitted for stocks represented by only one individual. In the case of the Middle Yukon, data for the Melozitna and Tozitna stocks (both represented by a single individual) are presented together. Notable differences were observed in the temperatures encountered during the three years of the study, and several of the temperature-related figures show the data by year (rather than individual fish) to make it easier to see these patterns.

Stock-related figures include:

- Swimming depth (recorded every 3 minutes) by distance traveled after release. Individual fish and tracking-station sites (triangles) are shown, with the first station (Paimiut) designated as Km 0. Information from the terminal spawning tributary is not included due to the lack of stations in the upper reaches (i.e., unable to estimate distance traveled over time).

- Swimming depth (12-hours centered moving average) by distance traveled after release. Individual fish and tracking station sites (triangles) are shown, with the first station (Paimiut) designated as Km 0. Information from the terminal spawning tributary is not included due to the lack of stations in the upper reaches (i.e., unable to estimate distance traveled over time).

- Swimming depth (12-hours centered moving average) by hours traveled after release, including information from the terminal spawning tributary. Individual fish are shown.

- Box plots showing swimming depth by reach.

- Box plots showing swimming depth by reach and individual fish.

- Density plots showing swimming depth by reach and individual fish.

- Water temperature (recorded every 3 minutes) by distance traveled after release. The year individual fish were tagged and tracking station sites (yellow triangles) are shown, with the first station (Paimiut) designated as Km 0. Green triangles indicate atypical movements (temporary diversion from the route usually traveled by the stock). Information from the terminal spawning tributary is not included due to the lack of stations in the upper reaches (i.e., unable to estimate distance traveled over time). Red line signifies the temperature threshold associated with heat stress in Pacific salmon.

- Water temperature (recorded every 3 minutes) by hours traveled after release, including information in terminal spawning tributaries. The year individual fish were tagged is shown. Red line signifies the temperature threshold associated with heat stress in Pacific salmon.

- Box plots showing water temperature by reach and the year fish were tagged. Red line signifies the temperature threshold associated with heat stress in Pacific salmon.

- Box plots showing water temperature by reach and the year individual fish were tagged. Red line signifies the temperature threshold associated with heat stress in Pacific salmon.

- Density plots showing water temperature by reach and individual fish. Red line signifies the temperature threshold associated with heat stress in Pacific salmon.

- Proportion of time fish exposed to water temperature levels by reach and the year individual fish were tagged. Red line signifies the temperature threshold associated with heat stress in Pacific salmon.

- Proportion of time fish exposed to water temperatures over 18°C by reach and year individual fish were tagged.

Figures related to individual fish within a stock include:

- Swimming depth (recorded every 3 minutes) by distance traveled after release. The 12-hours centered moving average (dark line) and tracking station sites (triangles) are shown, with the first station (Paimiut) designated as Km 0. Information from the terminal spawning tributary is not included due to the lack of stations in the upper reaches (i.e., unable to estimate distance traveled over time).

- Swimming depth (recorded every 3 minutes) by hours traveled after release, including information from the terminal spawning tributary. The 12-hours centered moving average (dark line) and tracking station sites (triangles) are shown, with the first station (Paimiut) designated as Km 0.

- Box plots showing swimming depth by reach.

- Density plots showing swimming depth by reach and individual fish.

- Water temperature (recorded every 3 minutes) by distance traveled after release. Tracking station sites (triangles) are shown, with the first station (Paimiut) designated as Km 0. Information from the terminal spawning tributary is not included due to the lack of stations in the upper reaches (i.e., unable to estimate distance traveled over time). Red line signifies the temperature threshold associated with heat stress in Pacific salmon.

- Water temperature (recorded every 3 minutes) by hours traveled after release, including information from the terminal spawning tributary. Tracking station site (triangles) are shown, with the first station (Paimiut) designated as Km 0. Red line signifies the temperature threshold associated with heat stress in Pacific salmon.

- Box plots showing water temperature by reach. Red line signifies the temperature threshold associated with heat stress in Pacific salmon.

- Density plots showing water temperature by reach. Red line signifies the temperature threshold associated with heat stress in Pacific salmon.

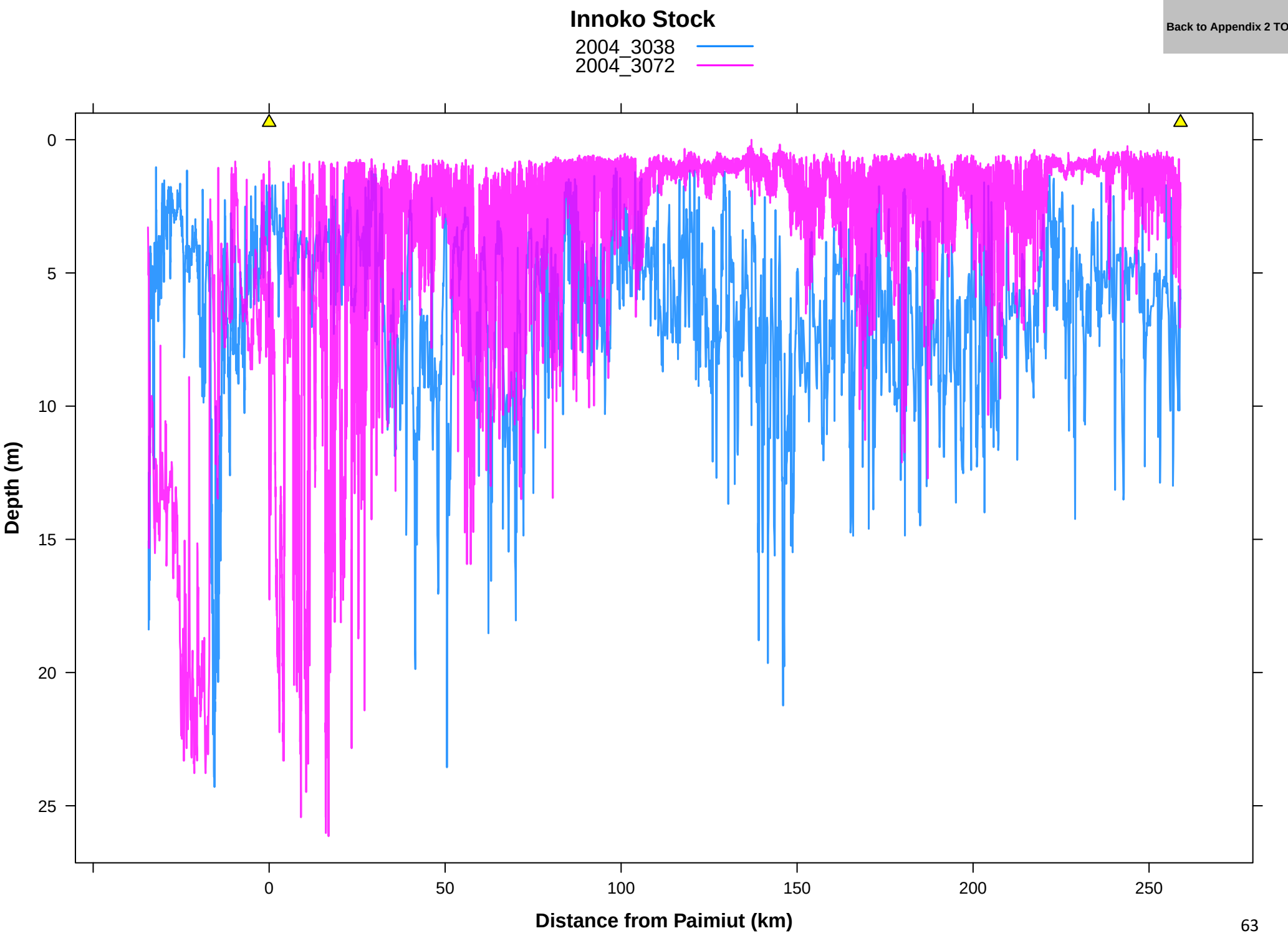
- Comparison of swimming depth and water temperature by reach.

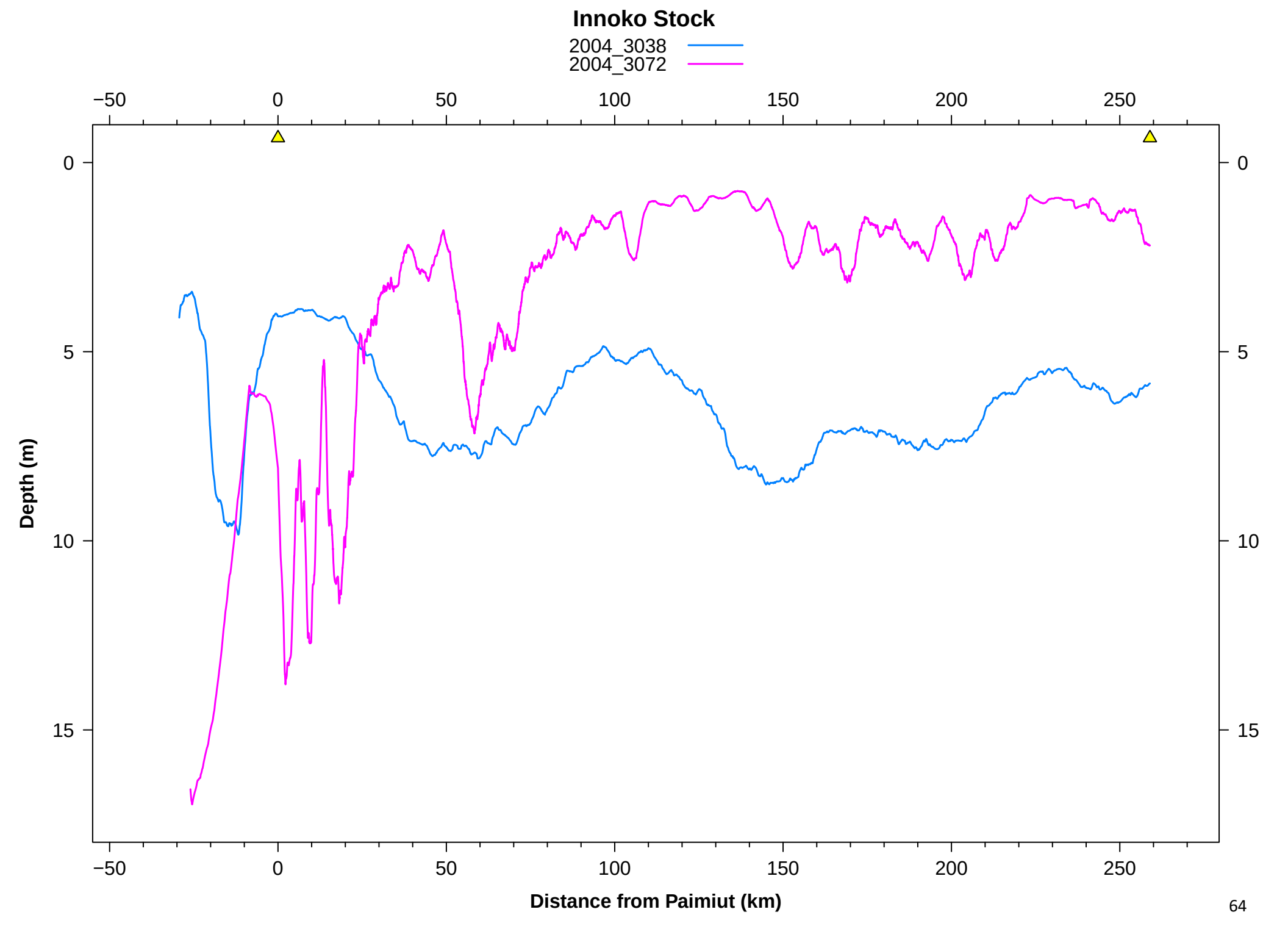
Appendix 2. -- Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Lower Yukon in 2002-2004.

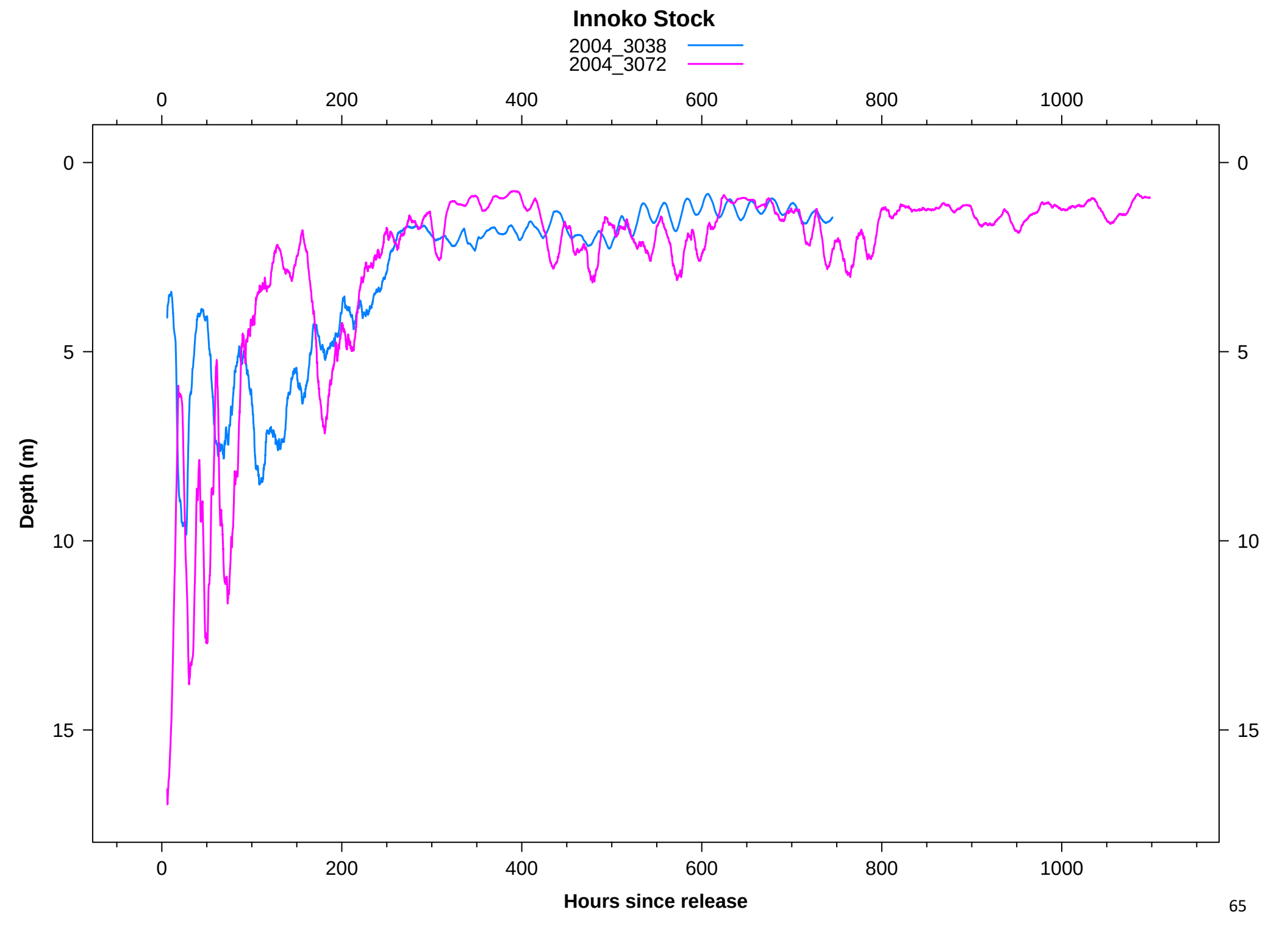
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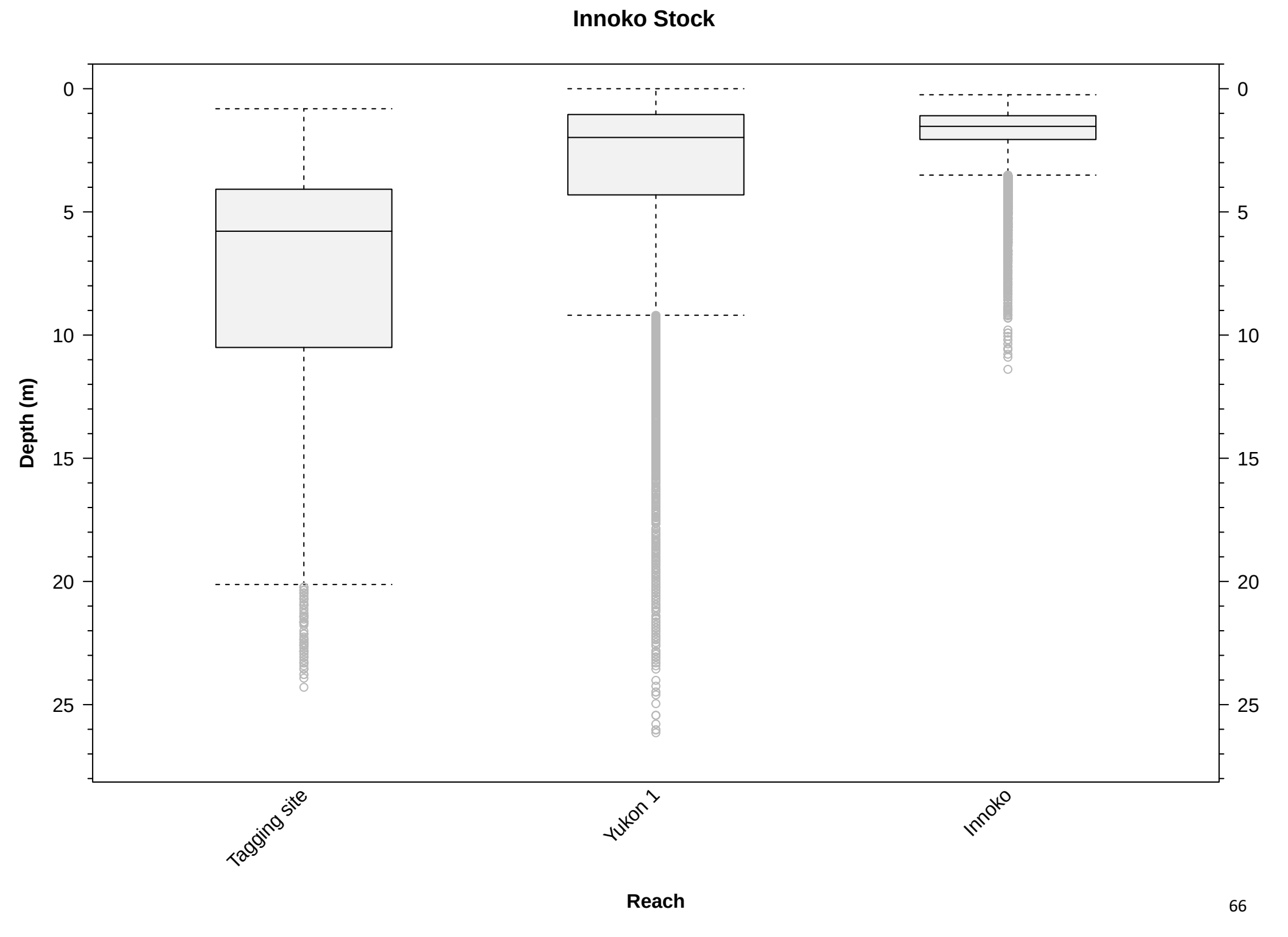
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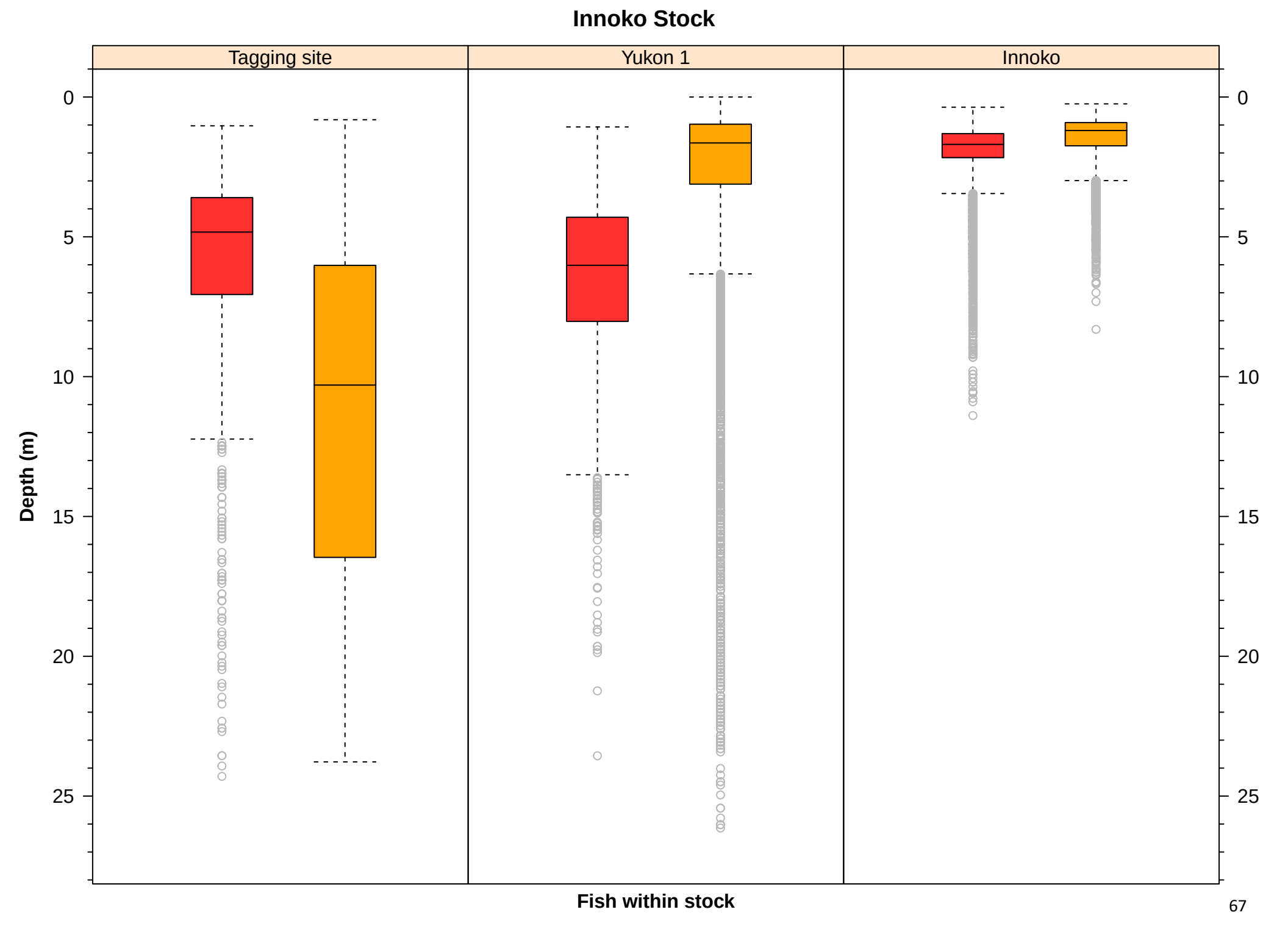
Back to Appendix 2 TOC

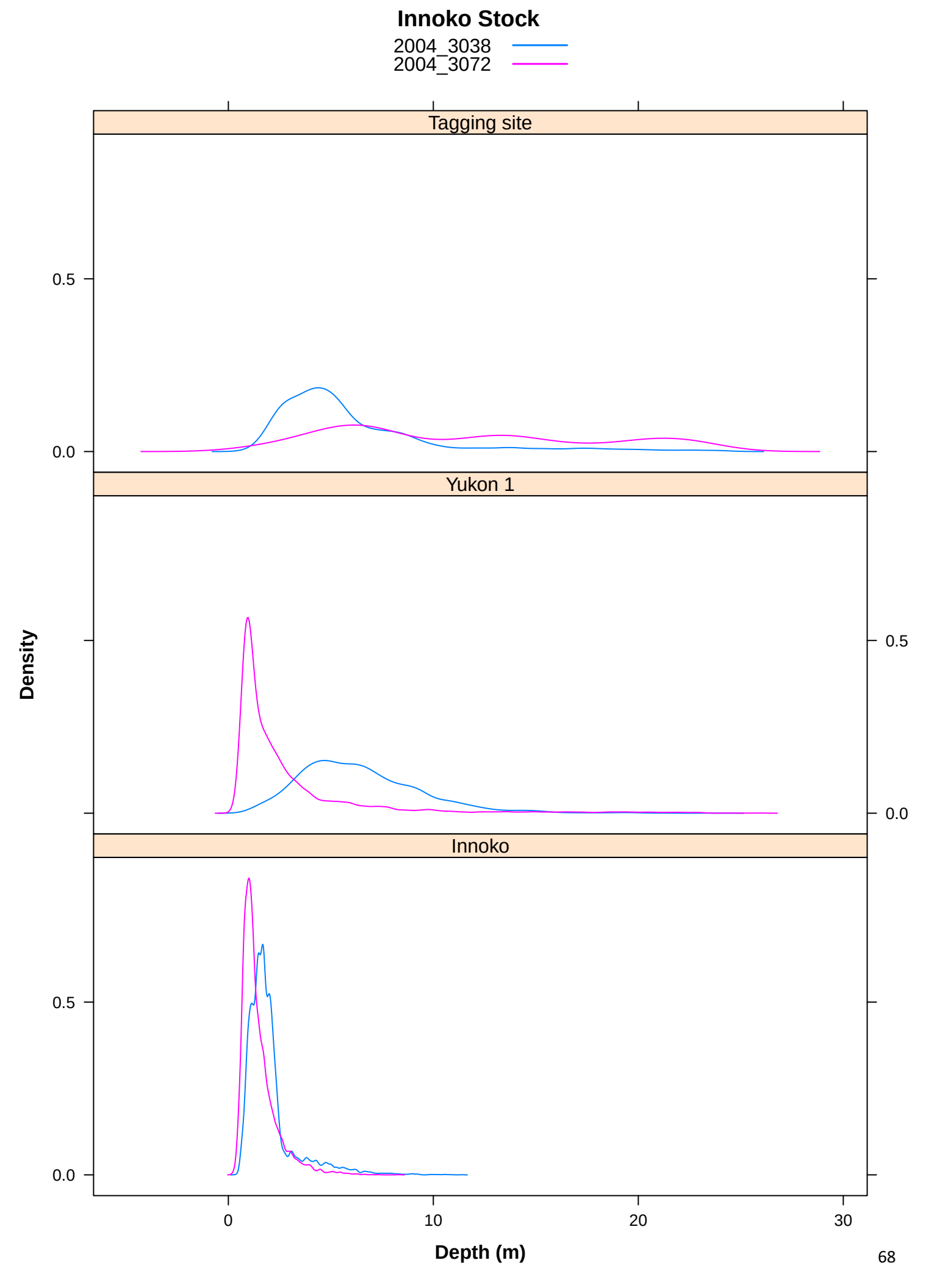


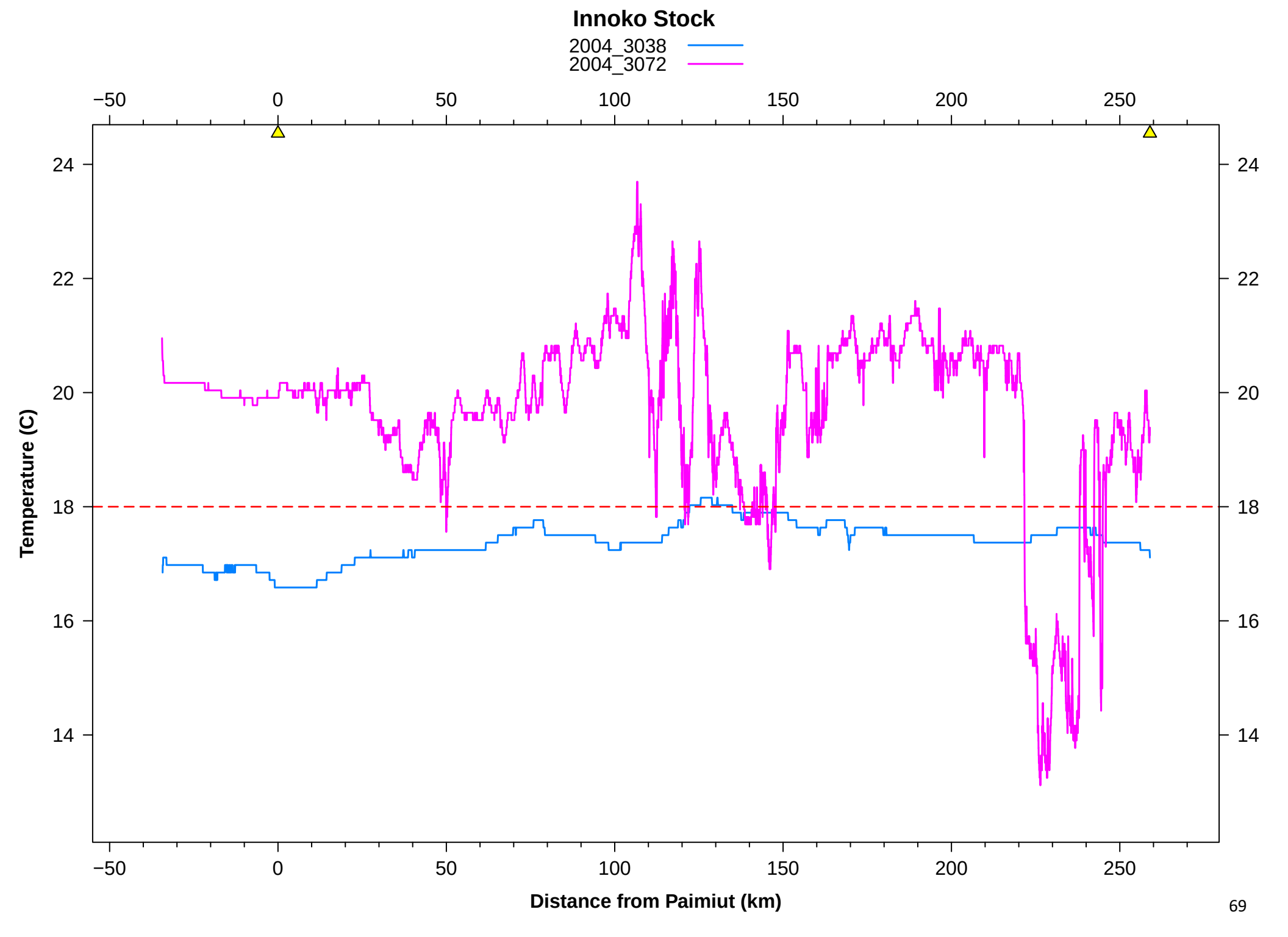

Innoko Stock
2004_3038
2004_3072
−50
0
50
100
150
200
250
0
5
10
15
Depth (m)
Distance from Paimiut (km)

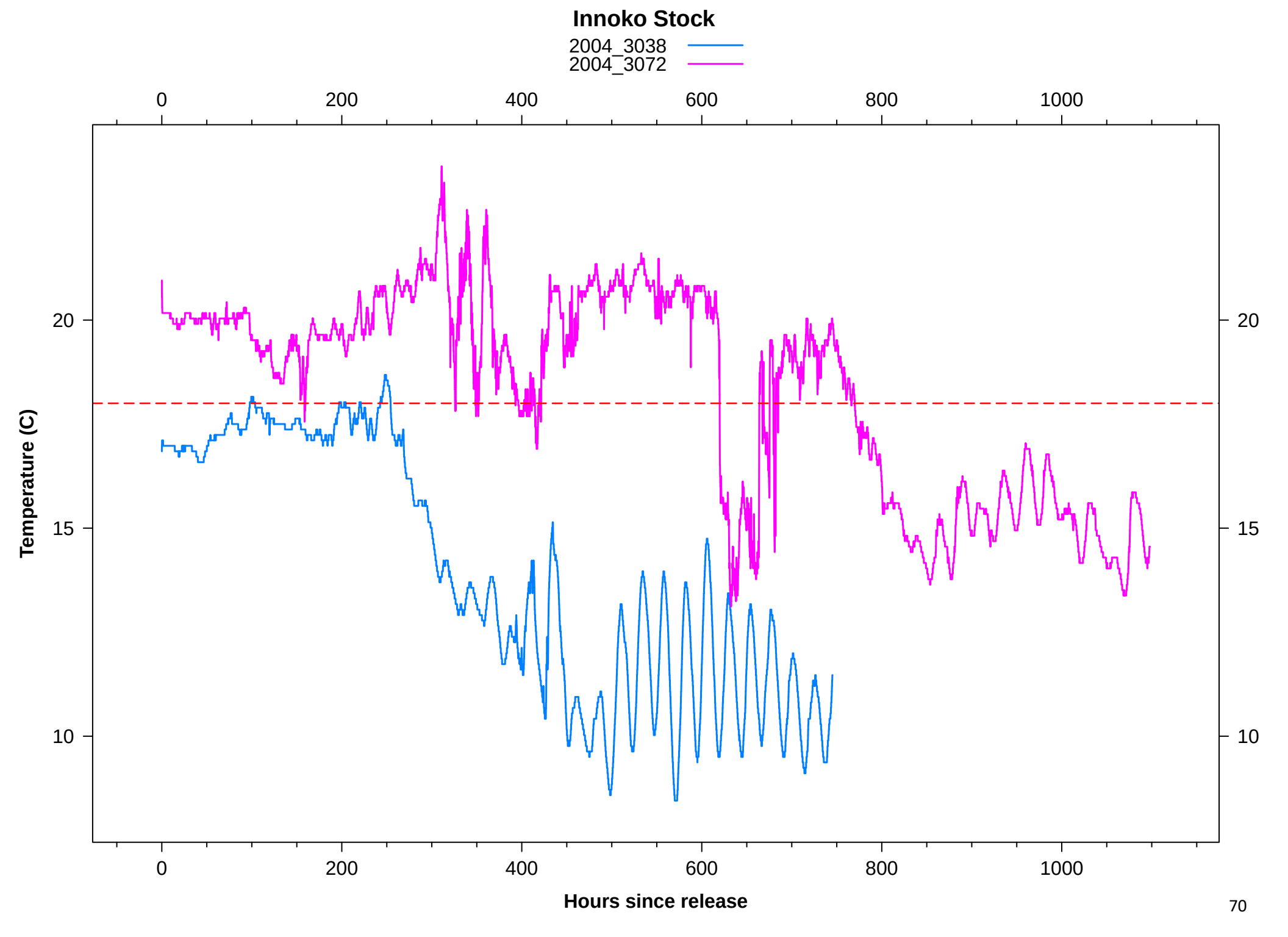

Innoko Stock
2004_3038
2004_3072
0
200
400
600
800
1000
0
5
10
15
Depth (m)
Hours since release

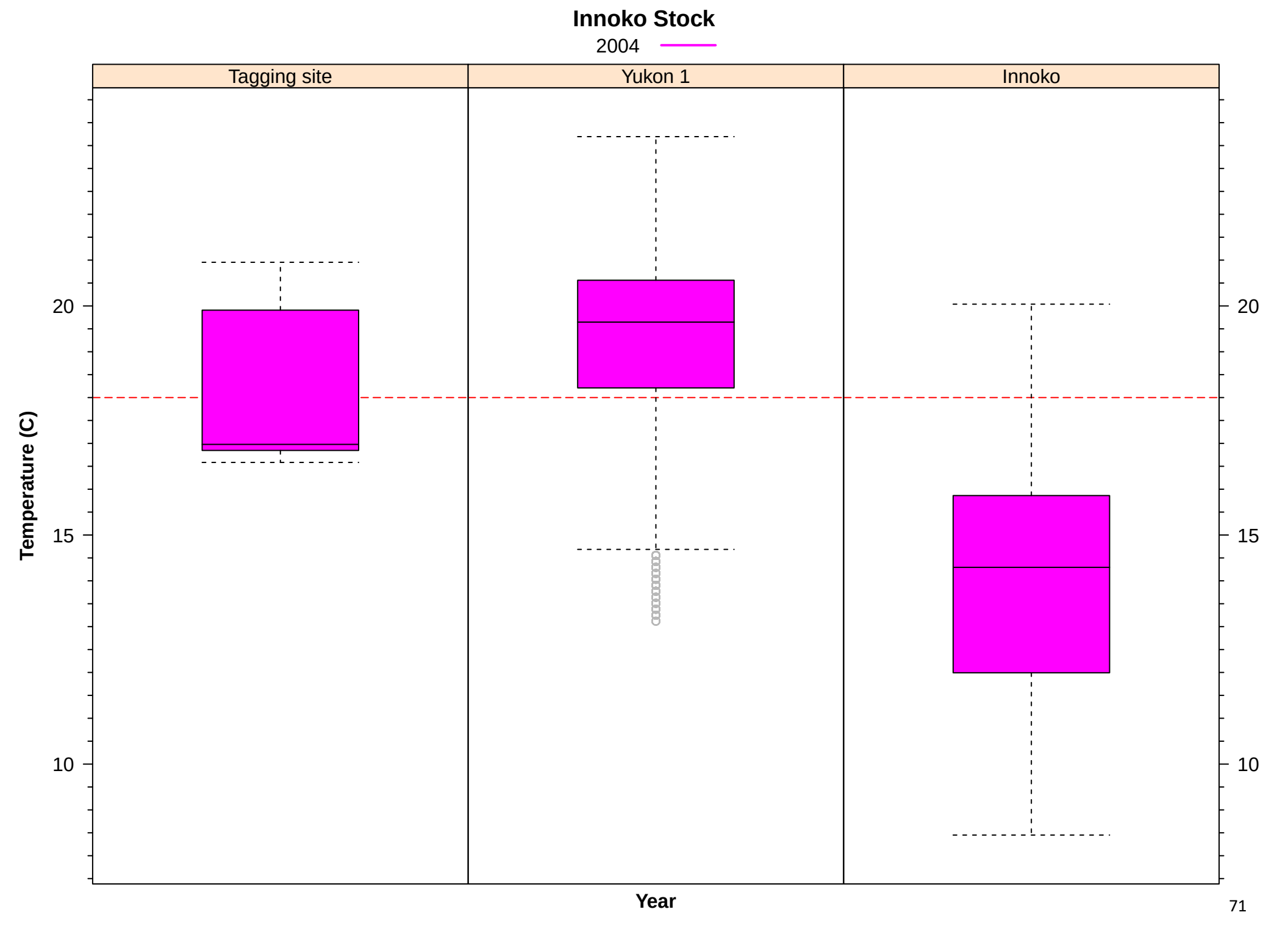

Innoko Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Innoko
Reach

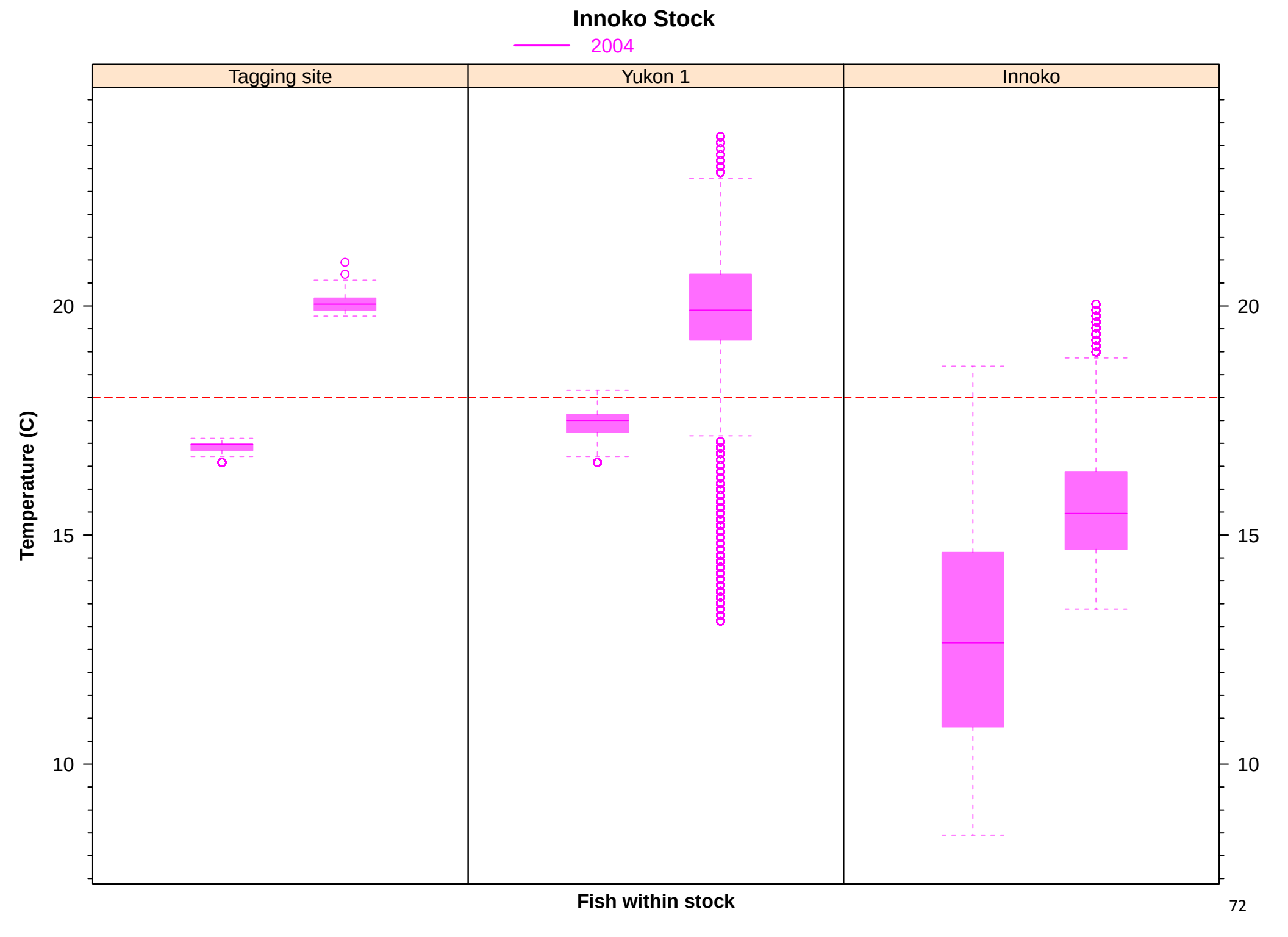

Innoko Stock
Tagging site
Yukon 1
Innoko
Depth (m)
0
5
10
15
20
25
Fish within stock

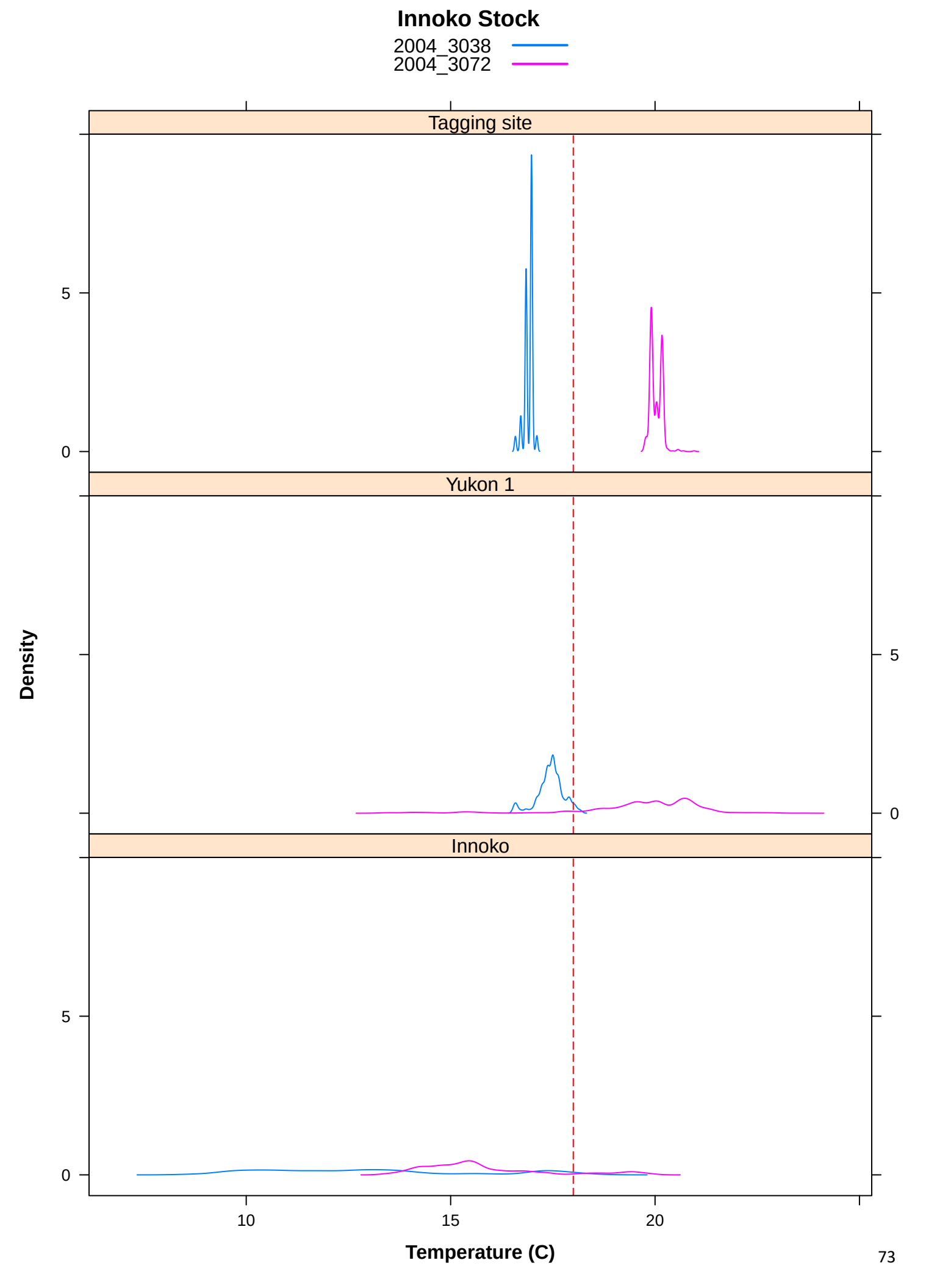

Innoko Stock
2004_3038
2004_3072
Tagging site
Yukon 1
Innoko
Density
0.5
0.0
0
10
20
30
Depth (m)

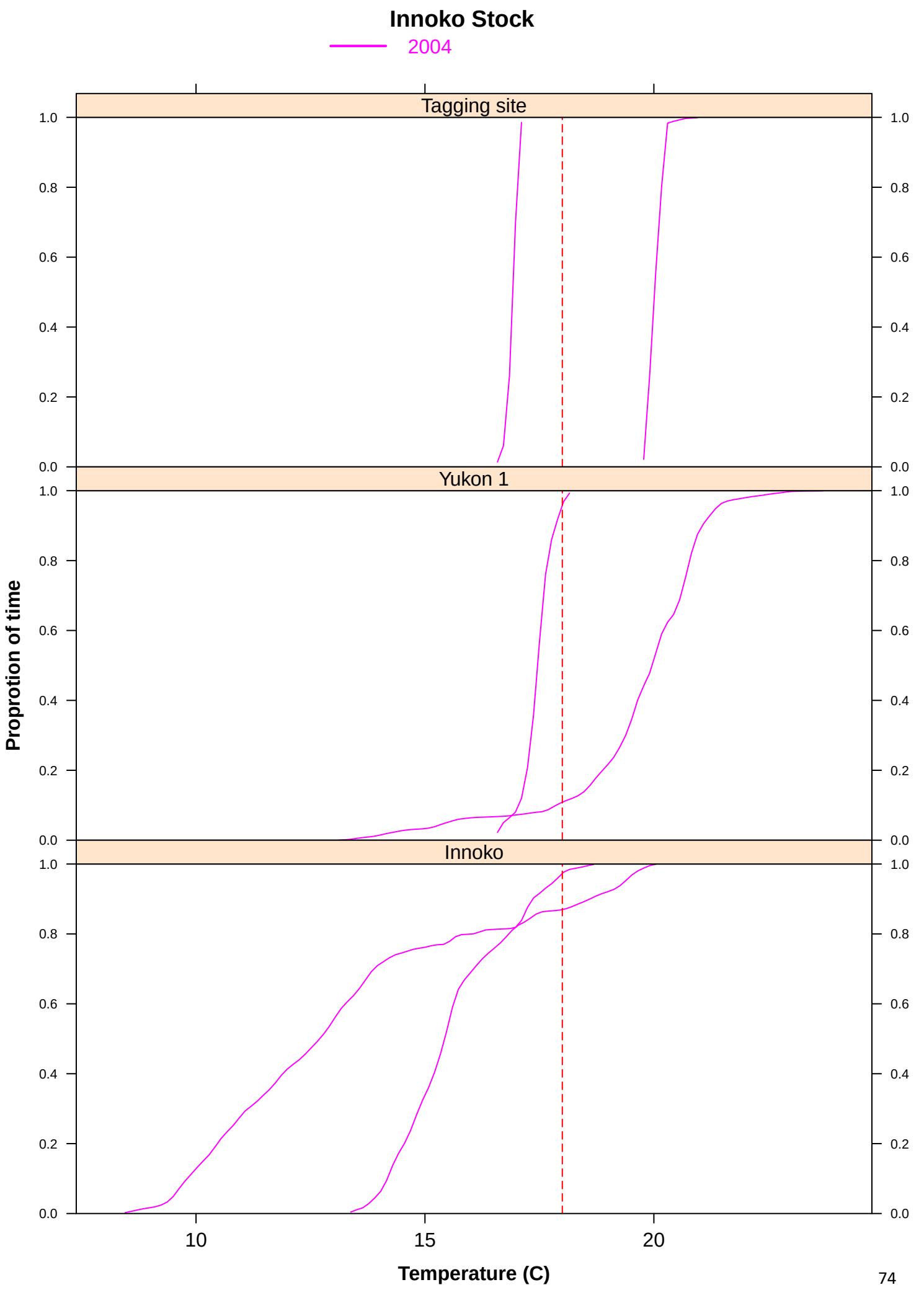

Innoko Stock
2004_3038
2004_3072
−50
0
50
100
150
200
250
24
22
20
18
16
14
Temperature (C)
Distance from Paimiut (km)

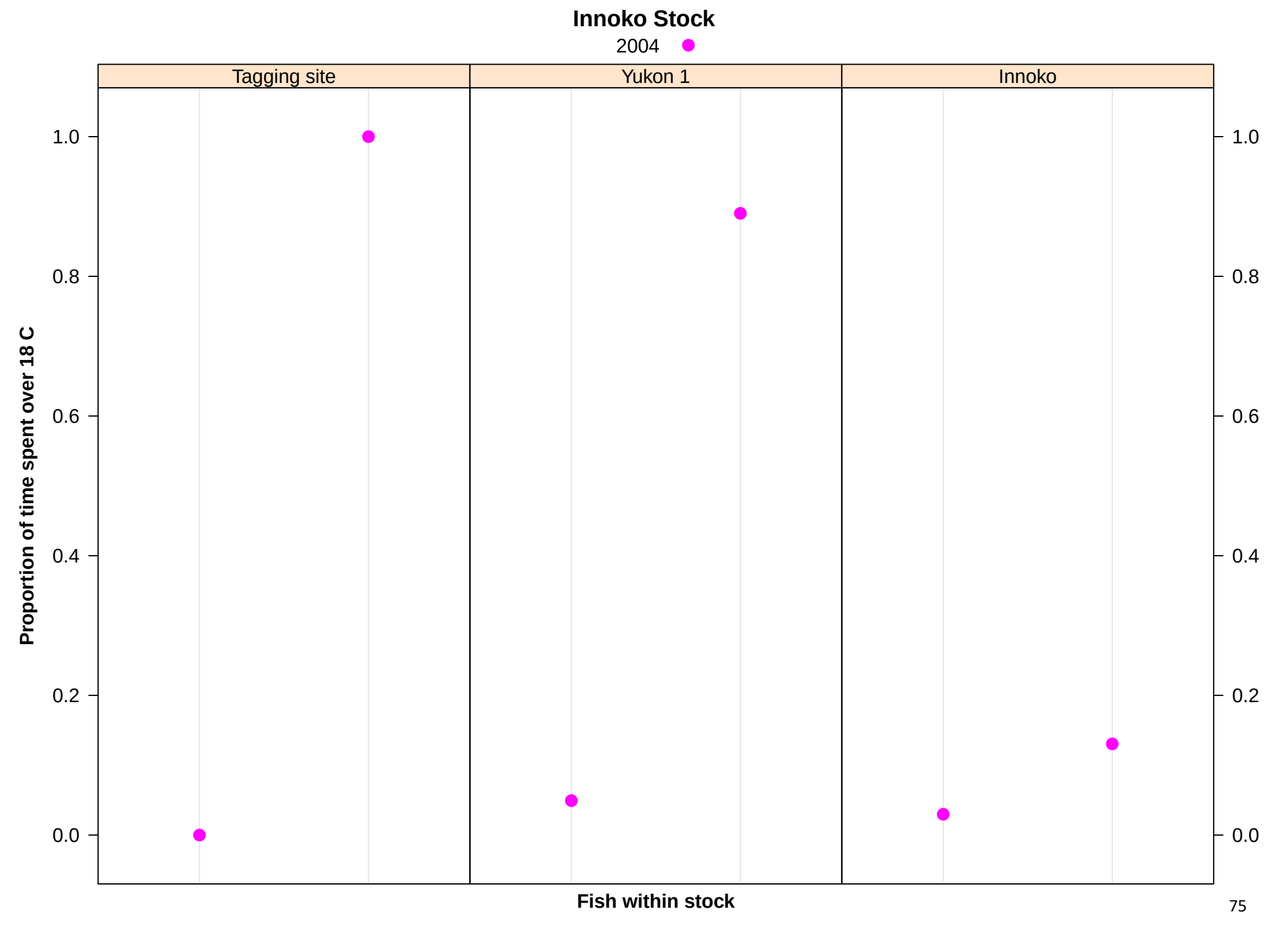

Innoko Stock
2004_3038
2004_3072
0
200
400
600
800
1000
20
15
10
Temperature (C)
Hours since release

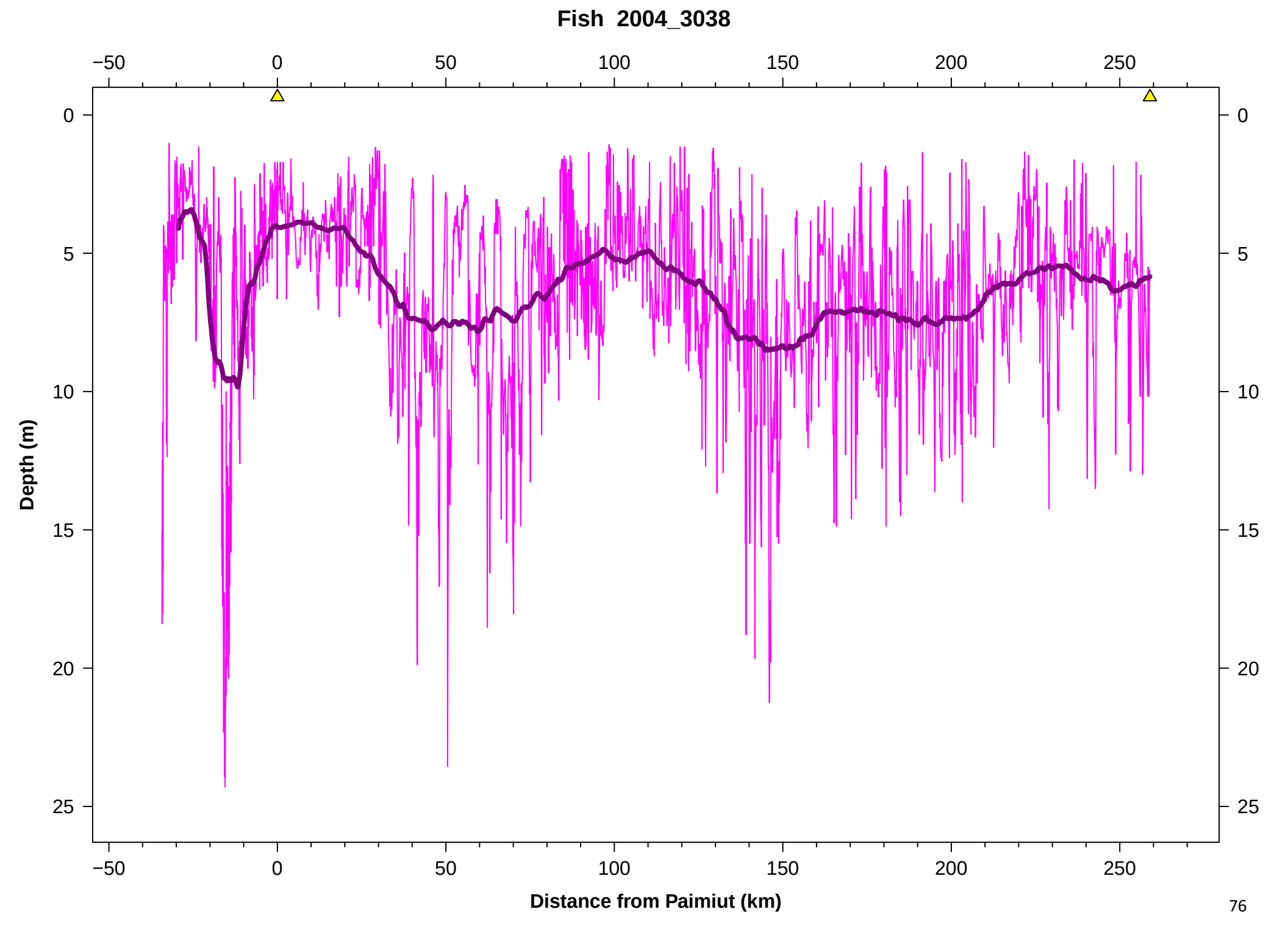

Innoko Stock
2004
Tagging site
Yukon 1
Innoko
Temperature (C)
20
15
10
Year

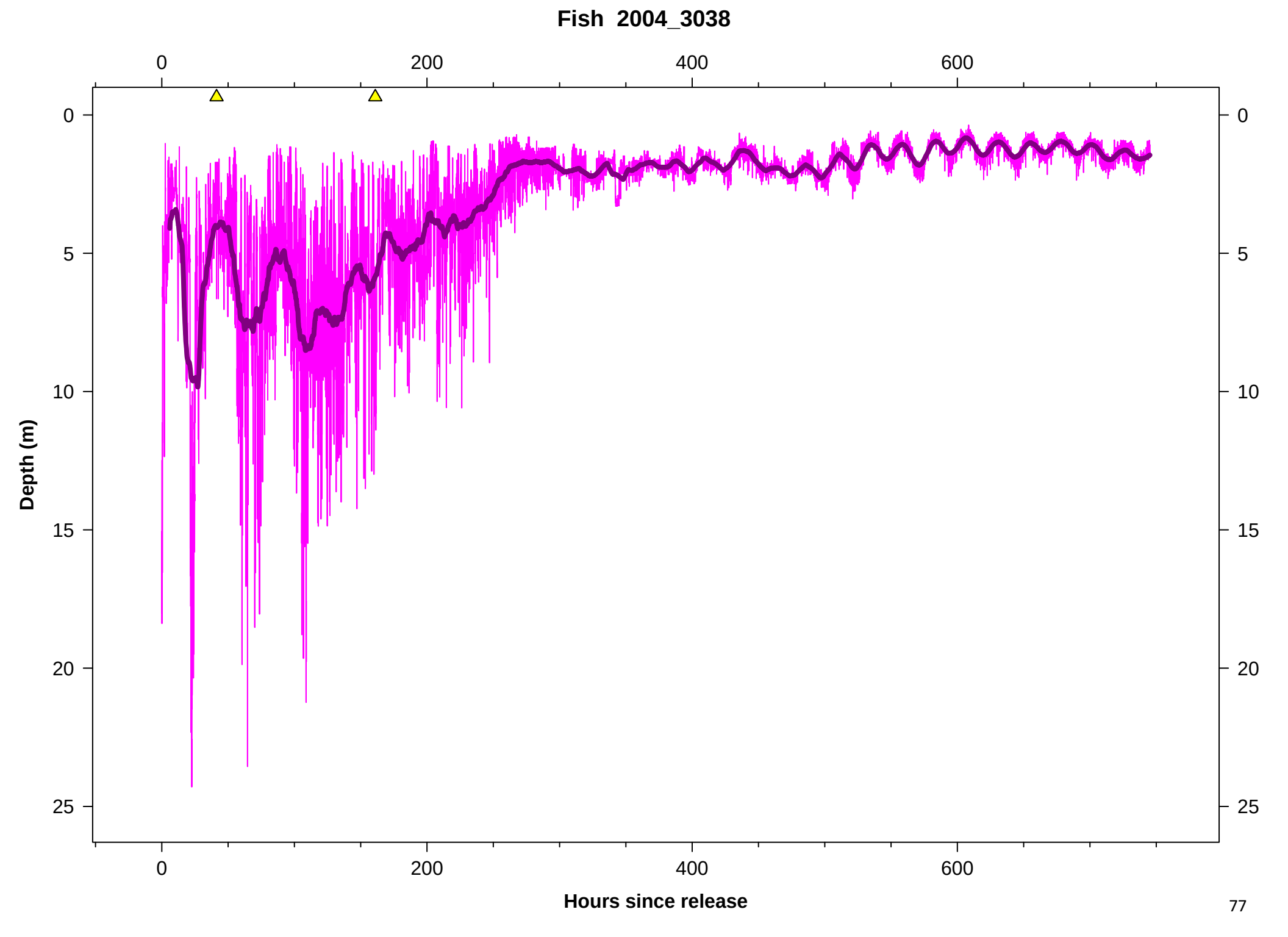

Innoko Stock
2004
Tagging site
Yukon 1
Innoko
Temperature (C)
20
15
10
Fish within stock

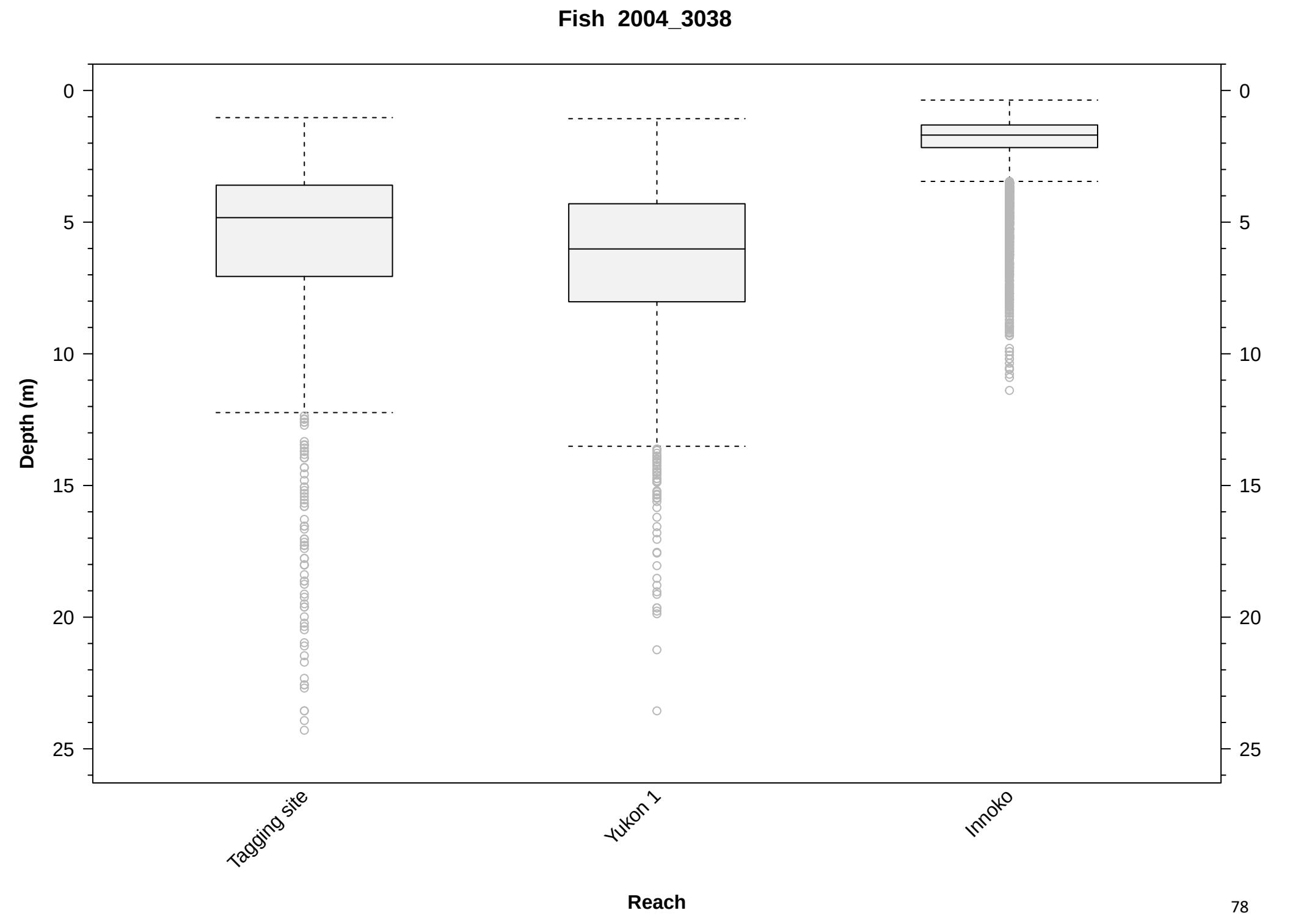

Innoko Stock
2004_3038
2004_3072
Tagging site
Yukon 1
Innoko
Density
Temperature (C)
0
5
10
15
20

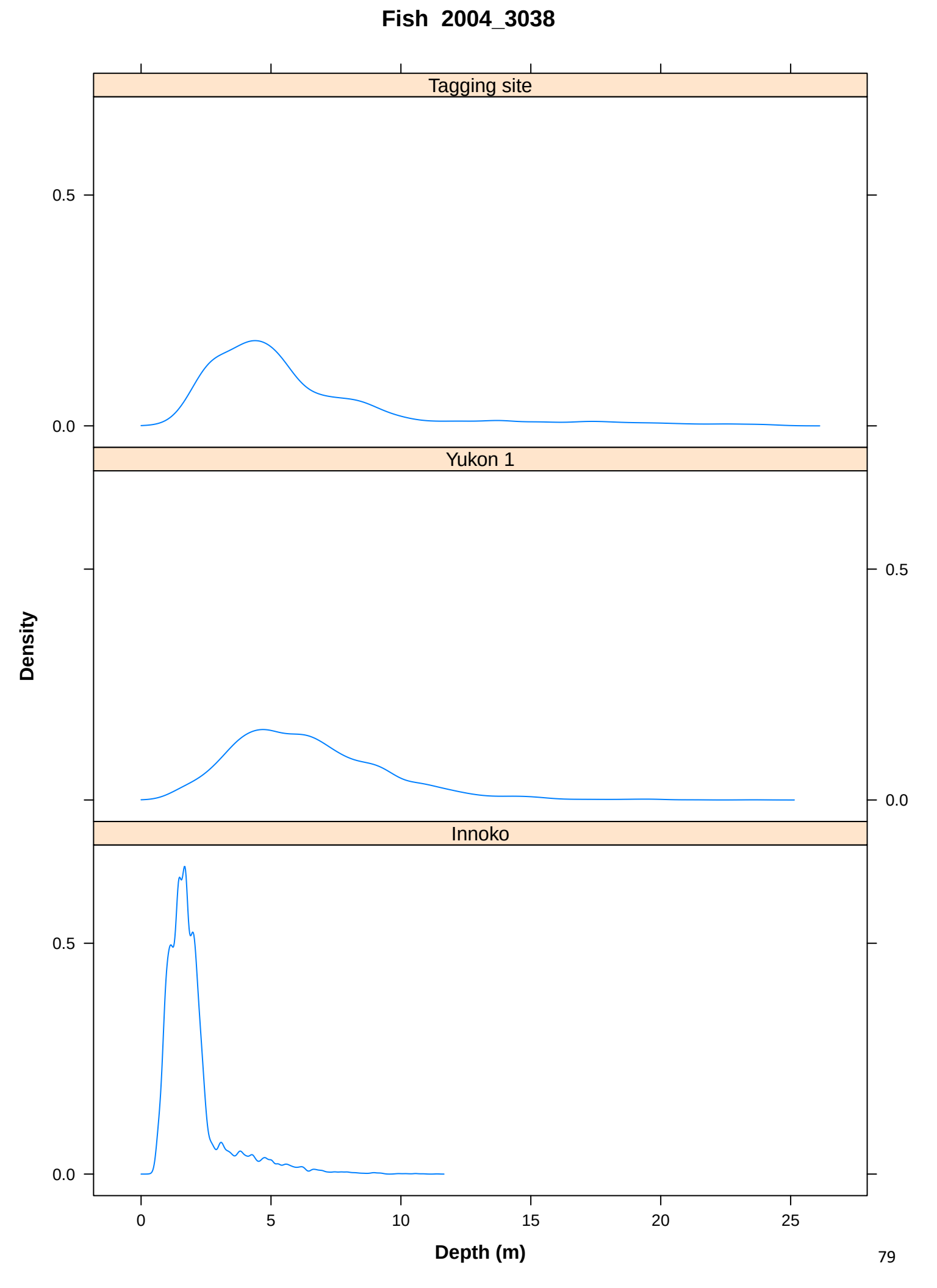

Innoko Stock
2004
Tagging site
Yukon 1
Innoko
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
10
15
20

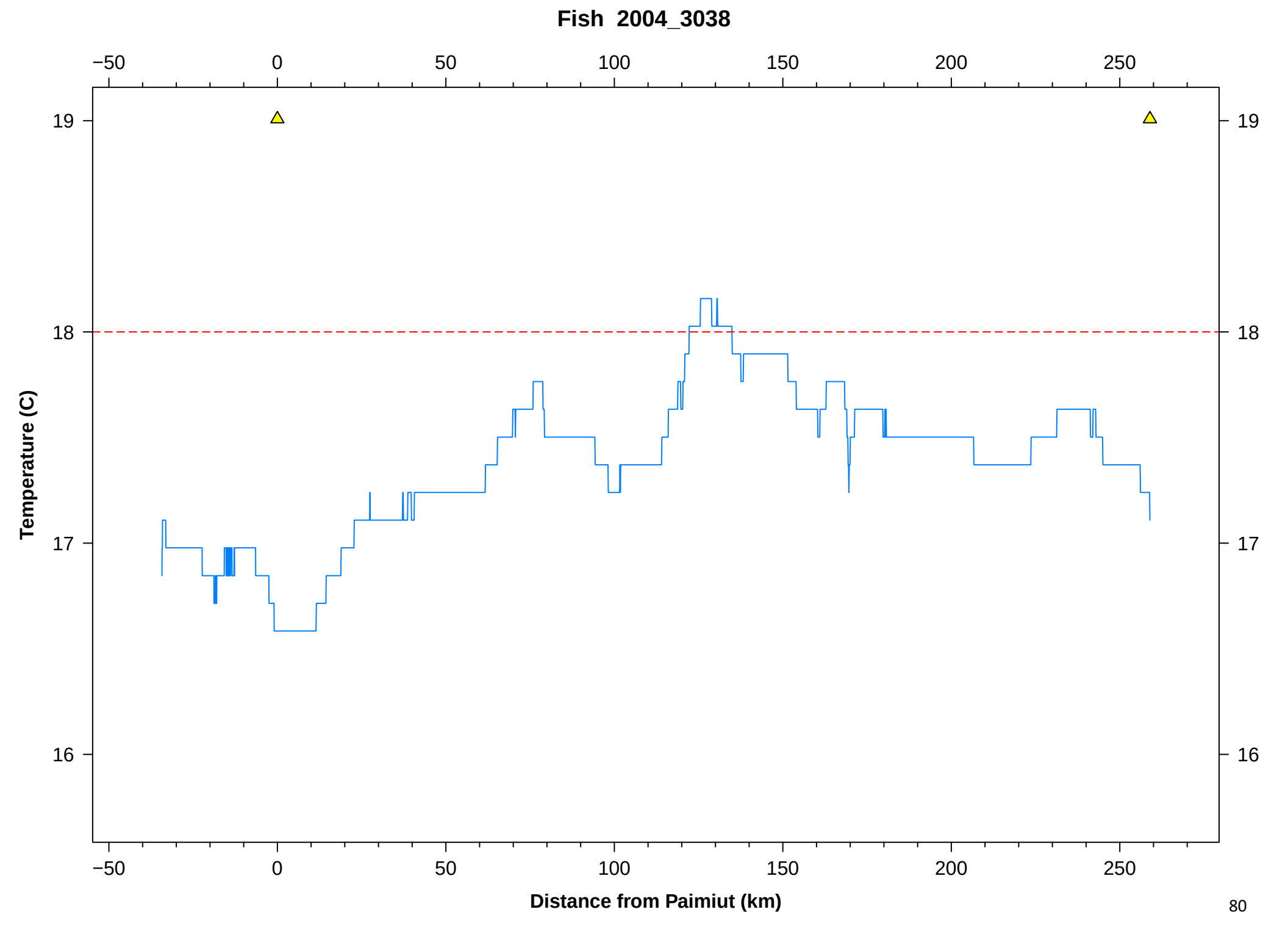

Innoko Stock
2004
Tagging site
Yukon 1
Innoko
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock

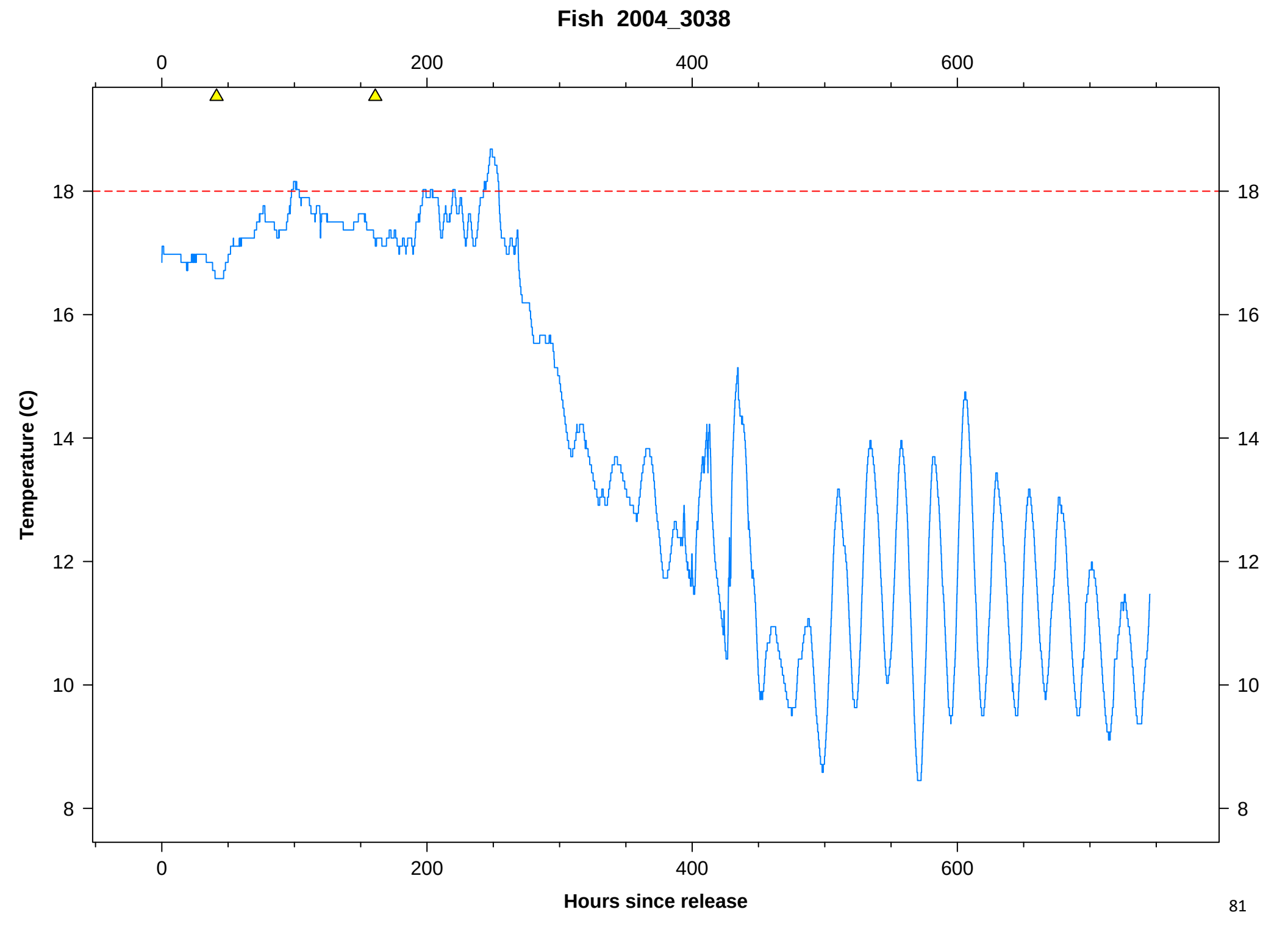

Fish 2004_3038
−50
0
50
100
150
200
250
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

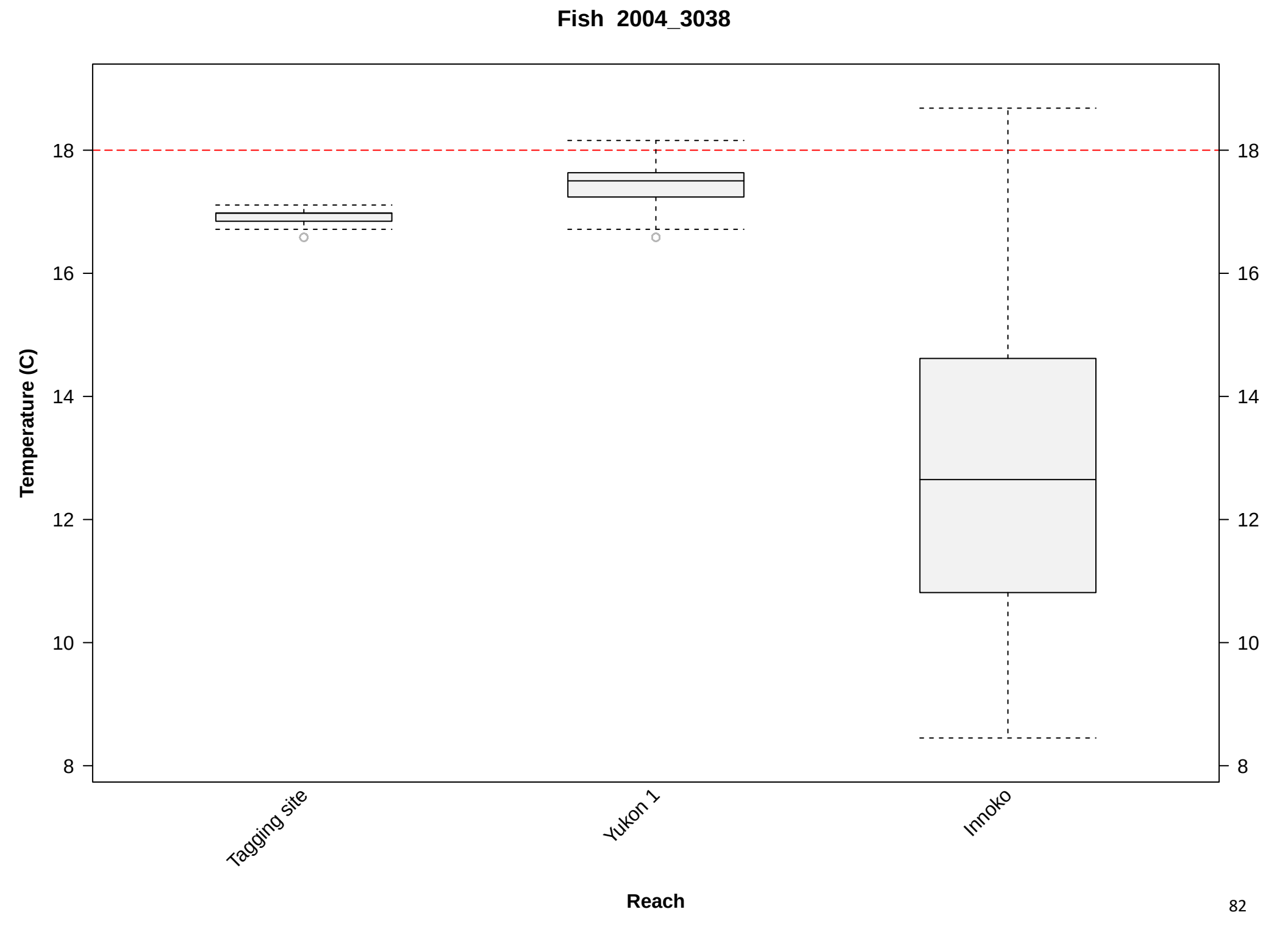

Fish 2004_3038
0
200
400
600
0
5
10
15
20
25
Depth (m)
Hours since release

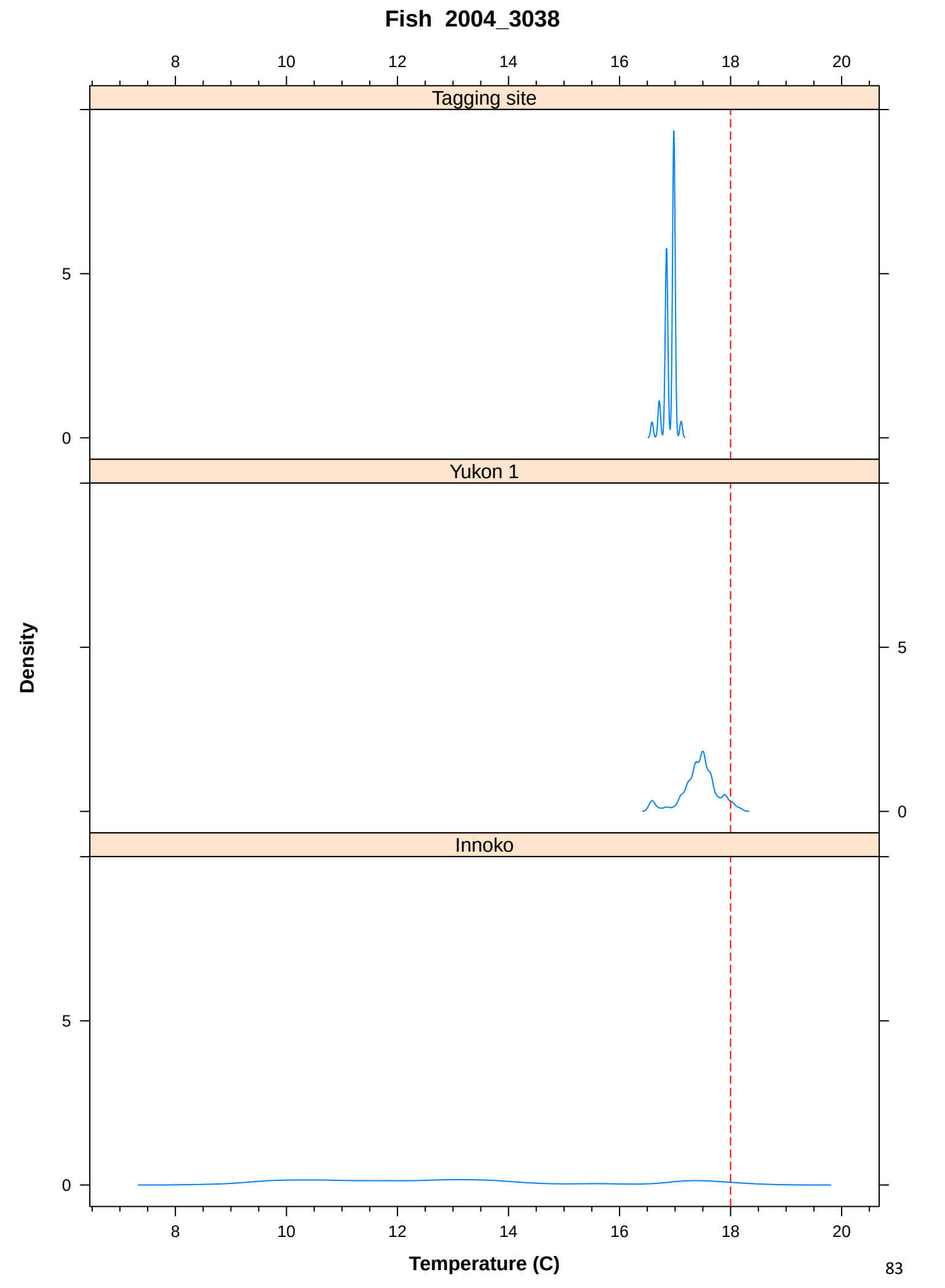

Fish 2004_3038
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Innoko
Reach

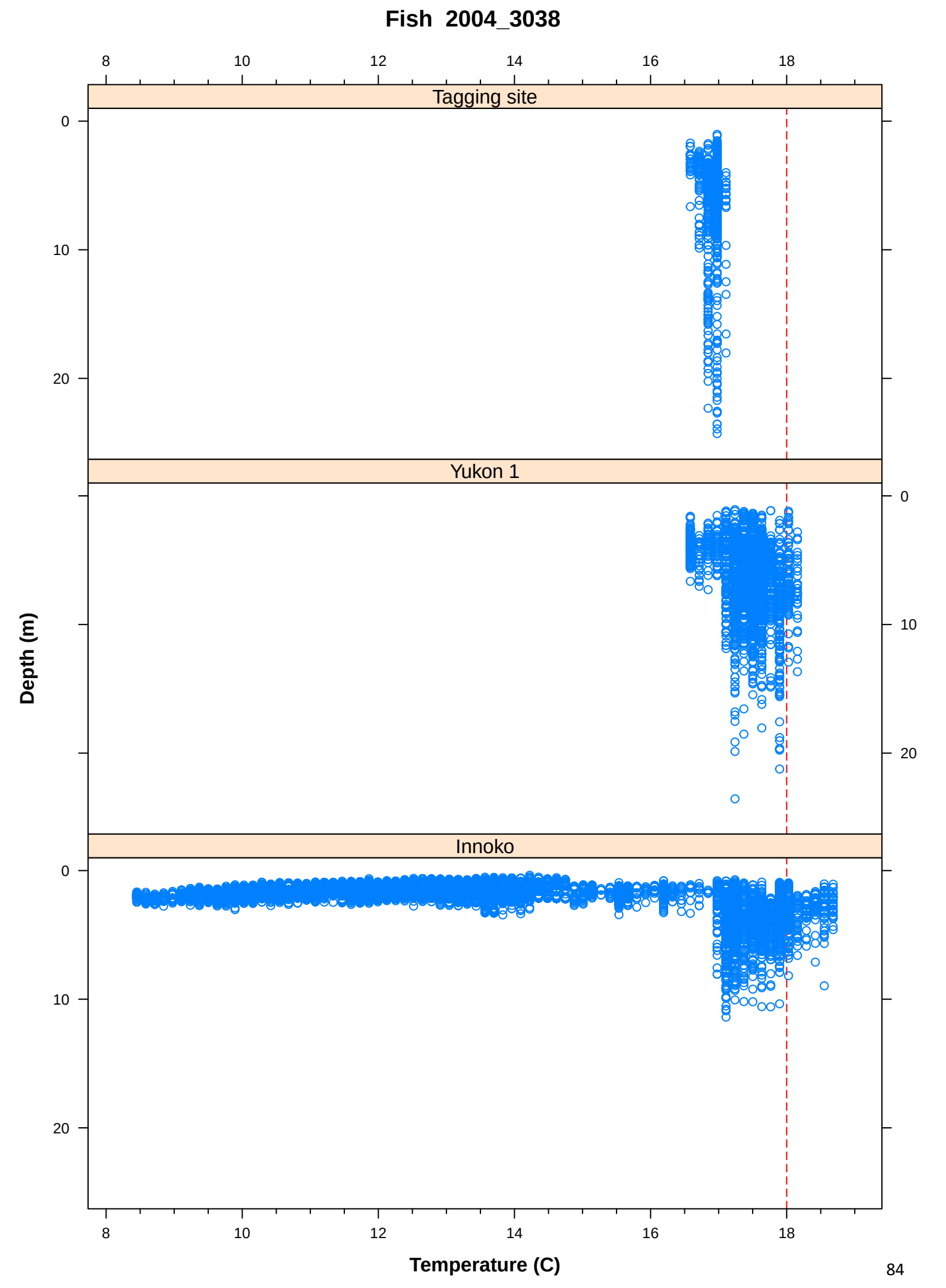

Fish 2004_3038
Tagging site
Yukon 1
Innoko
Density
0.5
0.0
0
5
10
15
20
25
Depth (m)

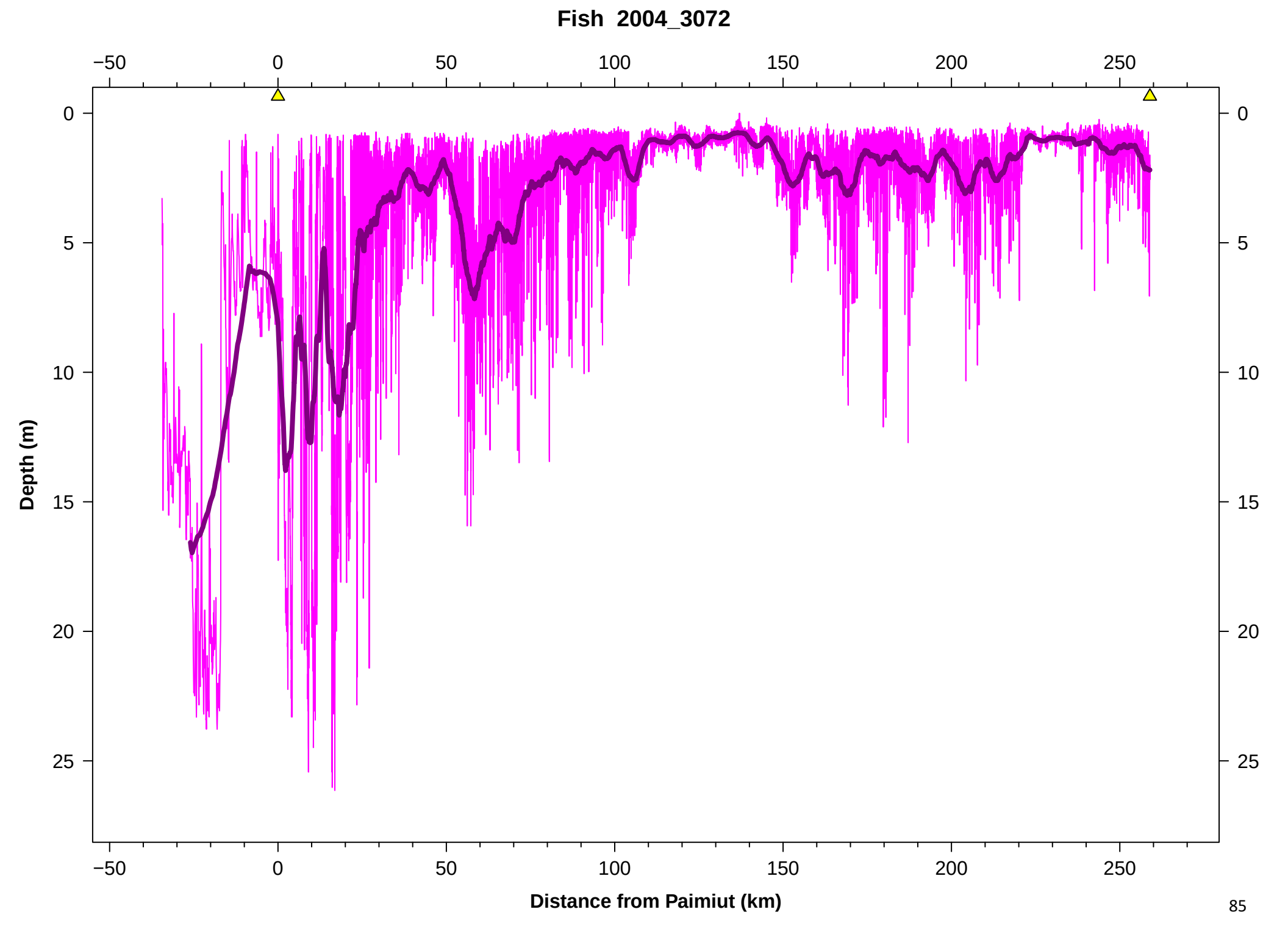

Fish 2004_3038
−50
0
50
100
150
200
250
19
18
17
16
Temperature (C)
Distance from Paimiut (km)


Fish 2004_3038
0
200
400
600
18
16
14
12
10
8
Temperature (C)
Hours since release


Fish 2004_3038
Temperature (C)
18
16
14
12
10
8
Tagging site
Yukon 1
Innoko
Reach

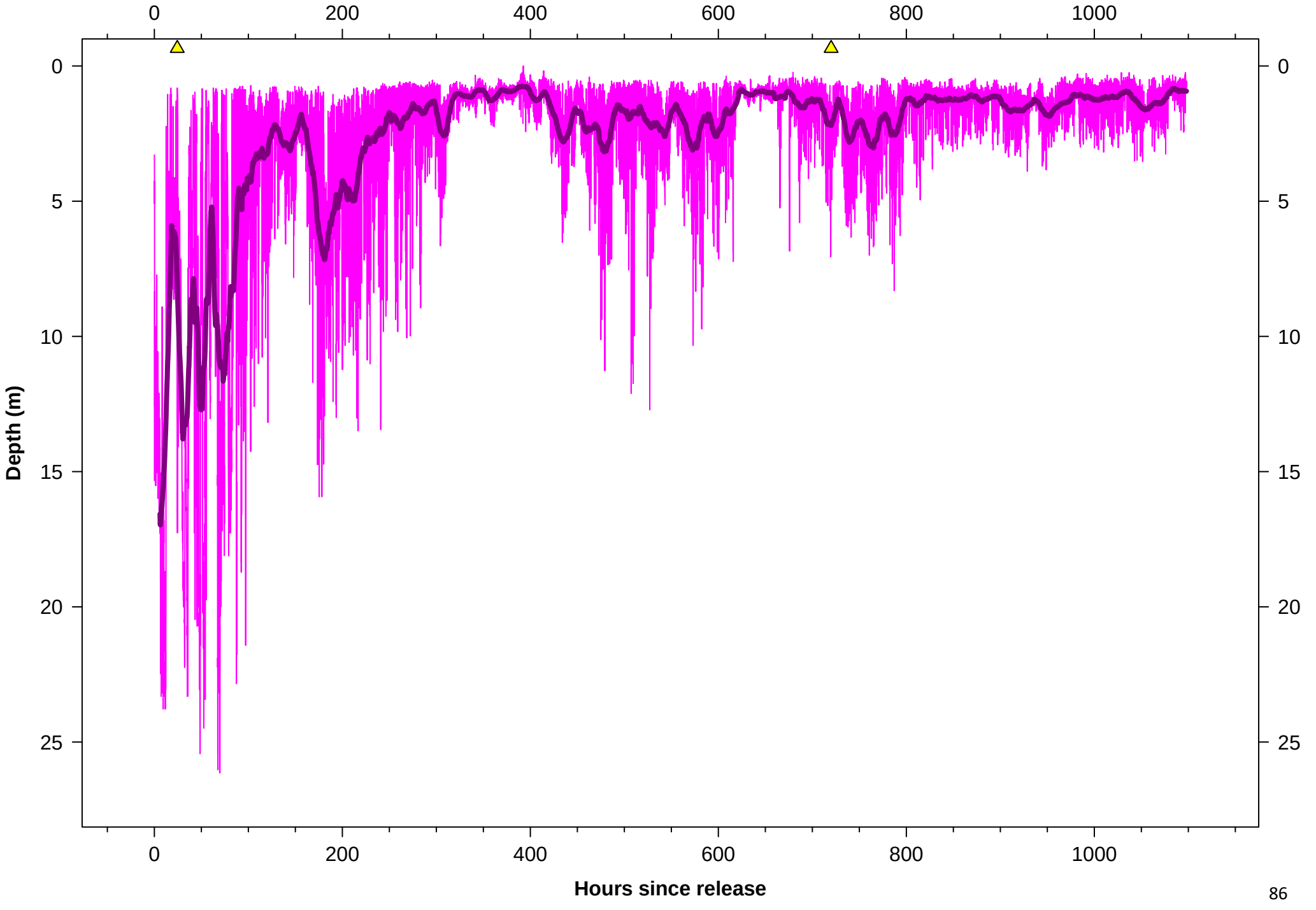

Fish 2004_3038
8
10
12
14
16
18
20
Tagging site
Yukon 1
Innoko
5
0
Density
Temperature (C)

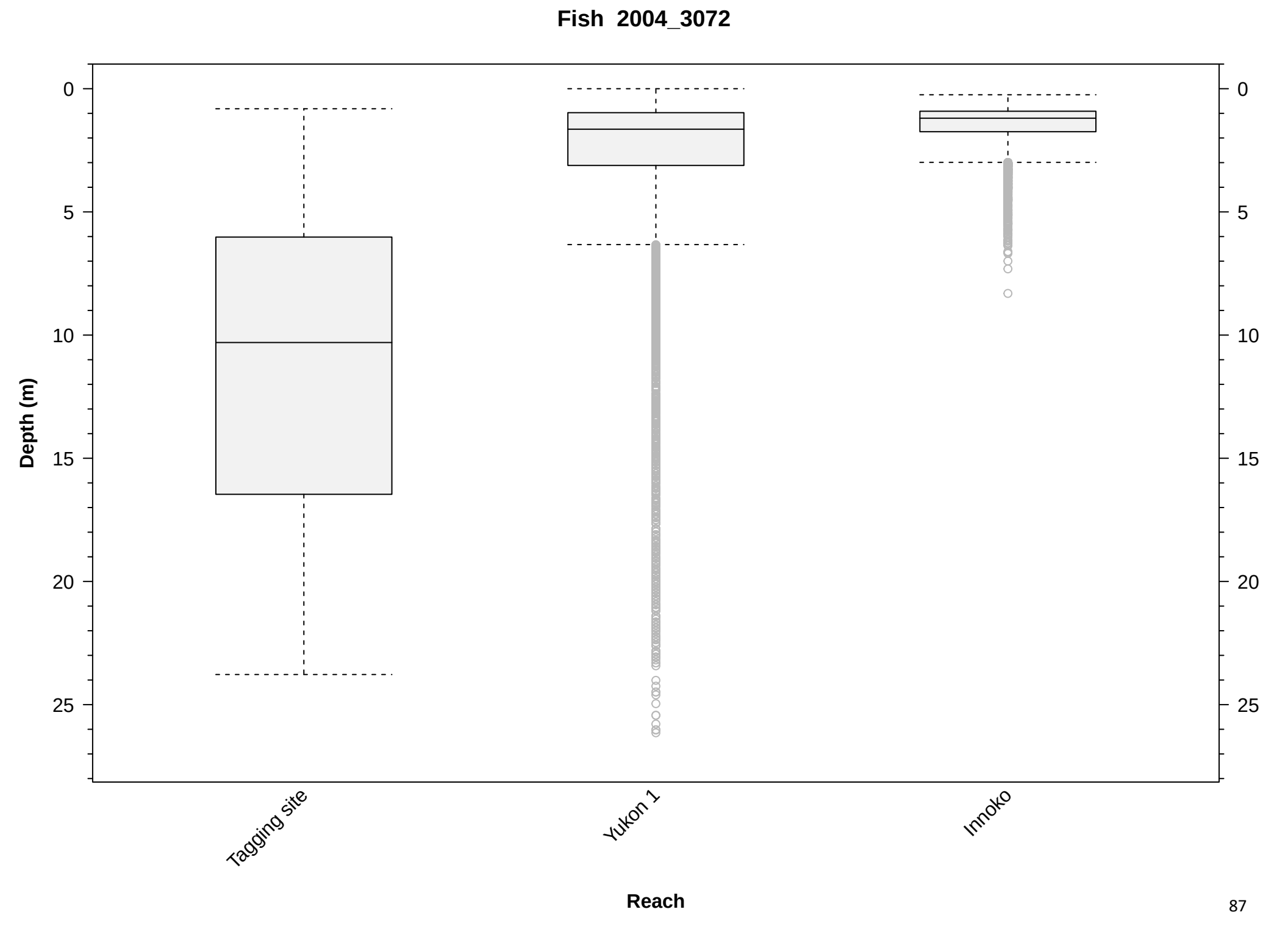

Fish 2004_3038
Tagging site
Yukon 1
Innoko
Depth (m)
Temperature (C)
8
10
12
14
16
18
0
10
20

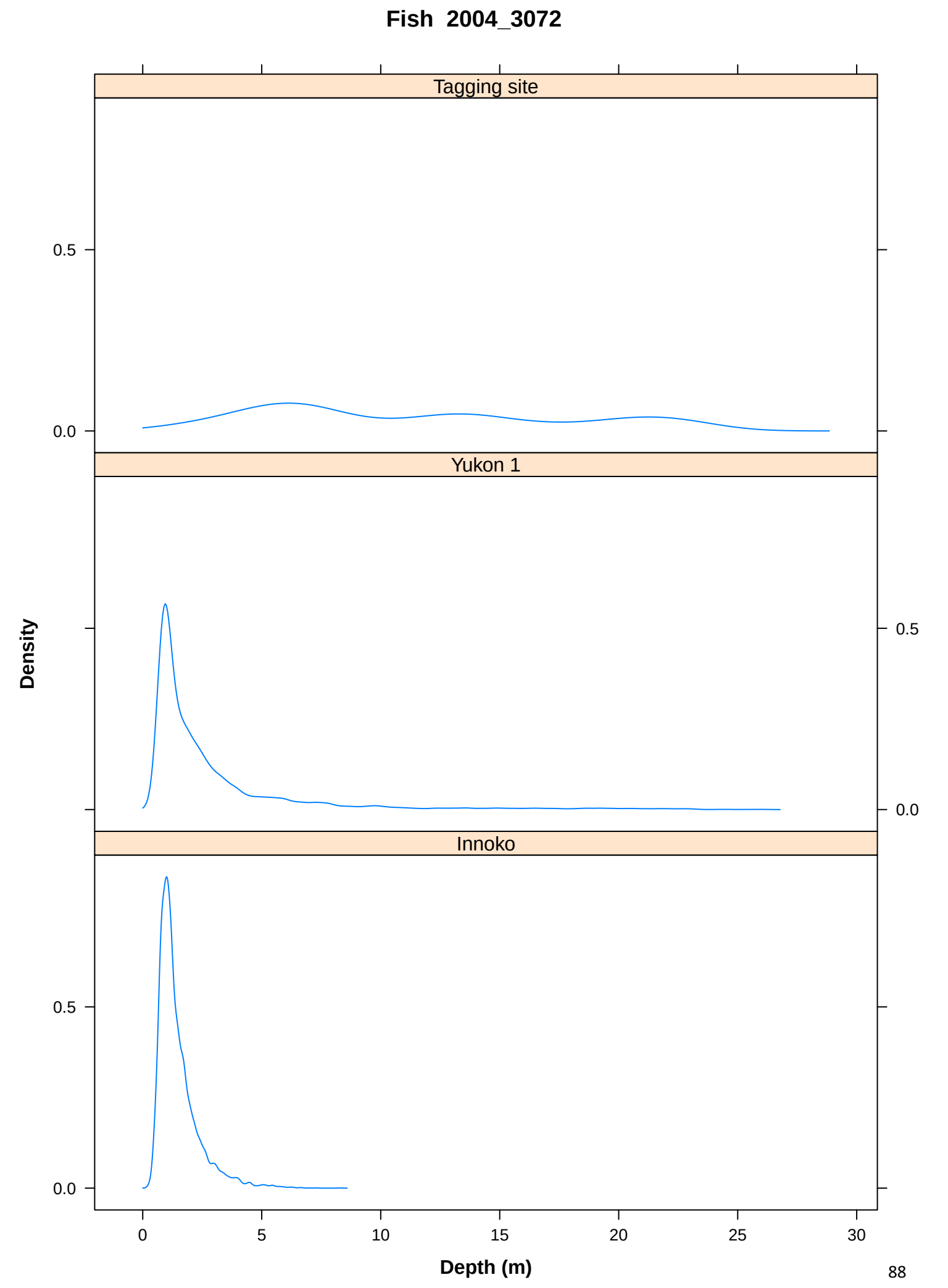

Fish 2004_3072
−50
0
50
100
150
200
250
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

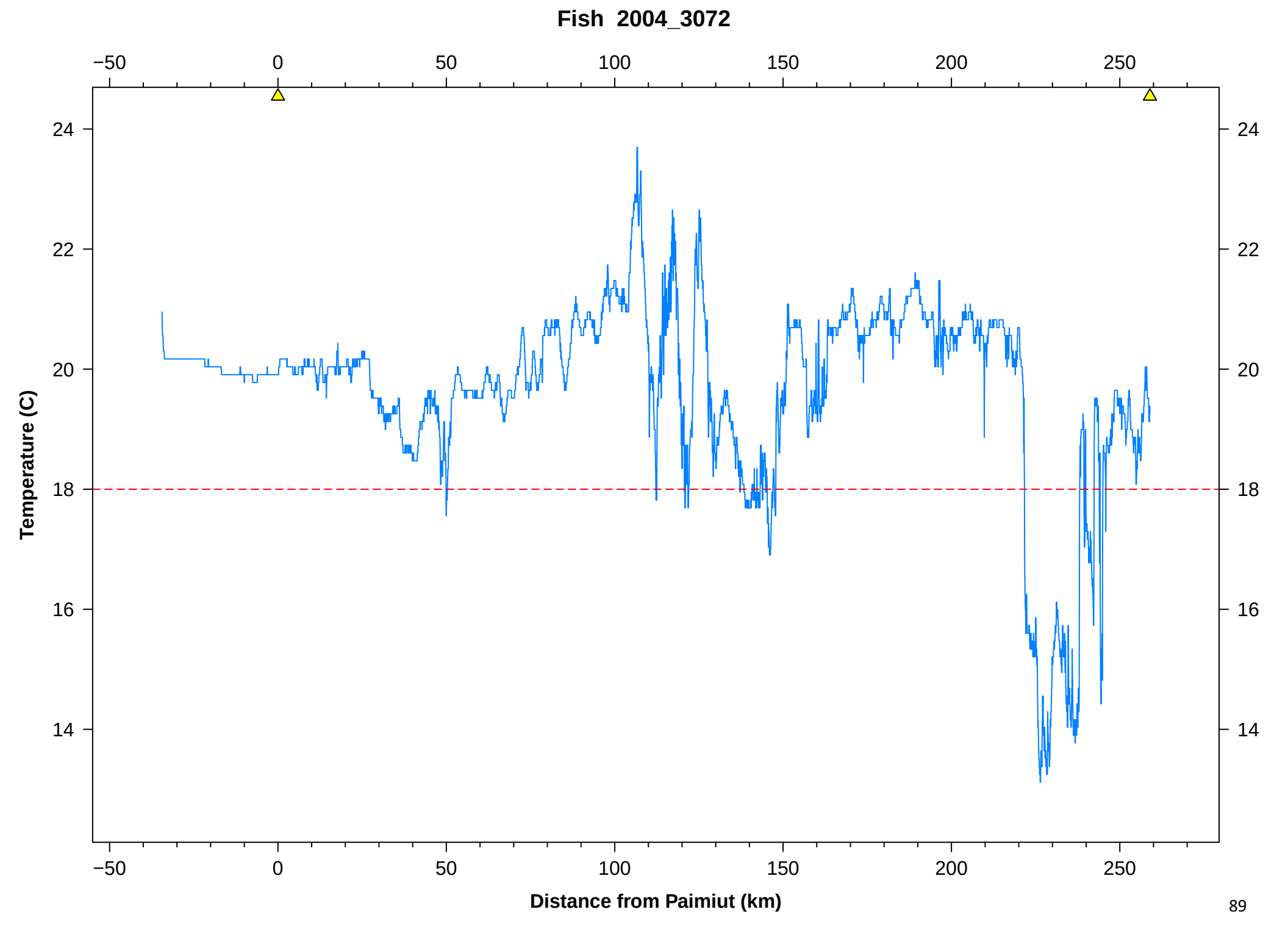
Fish 2004_3072

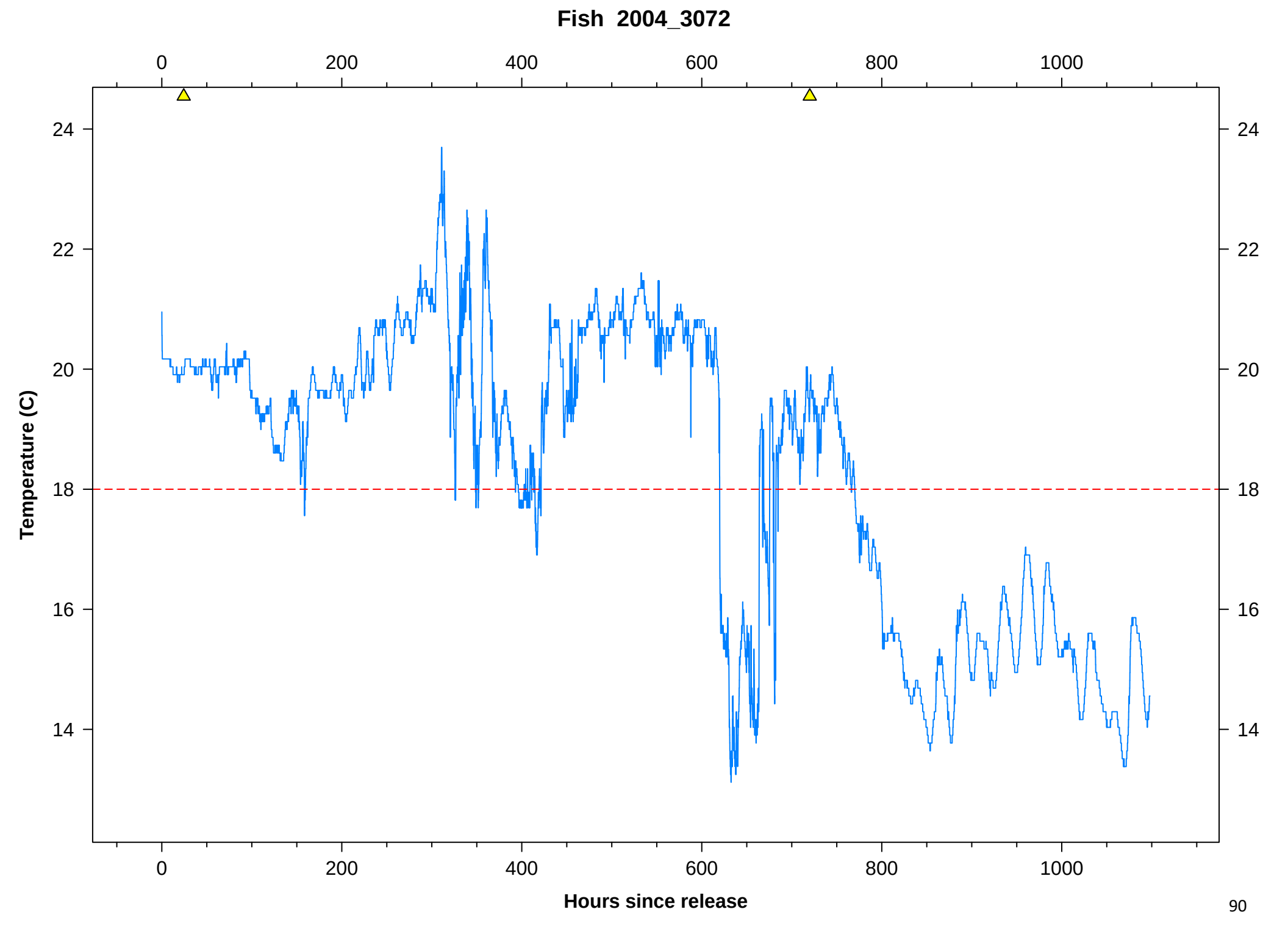
Back to Appendix 2 TOC

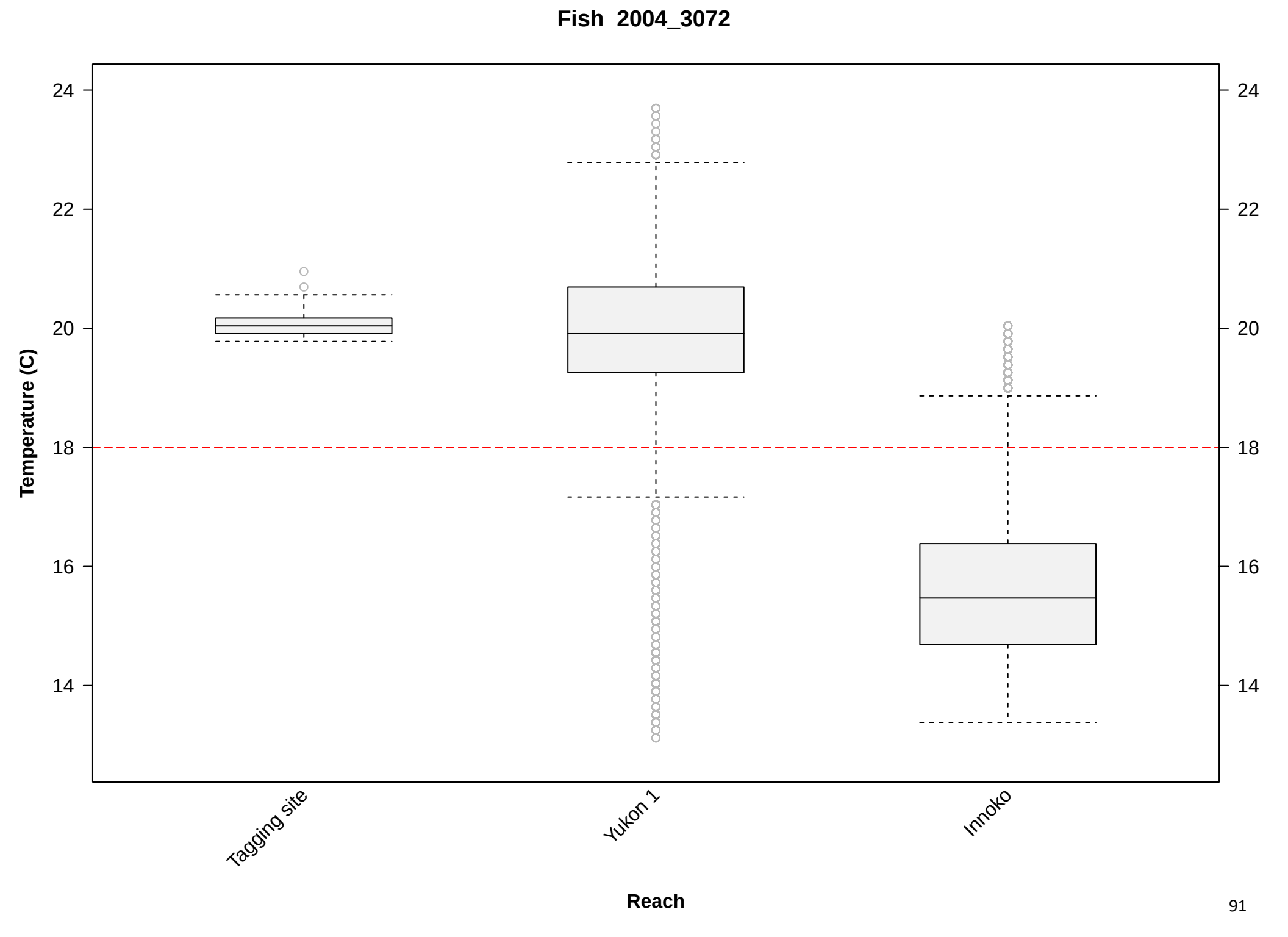


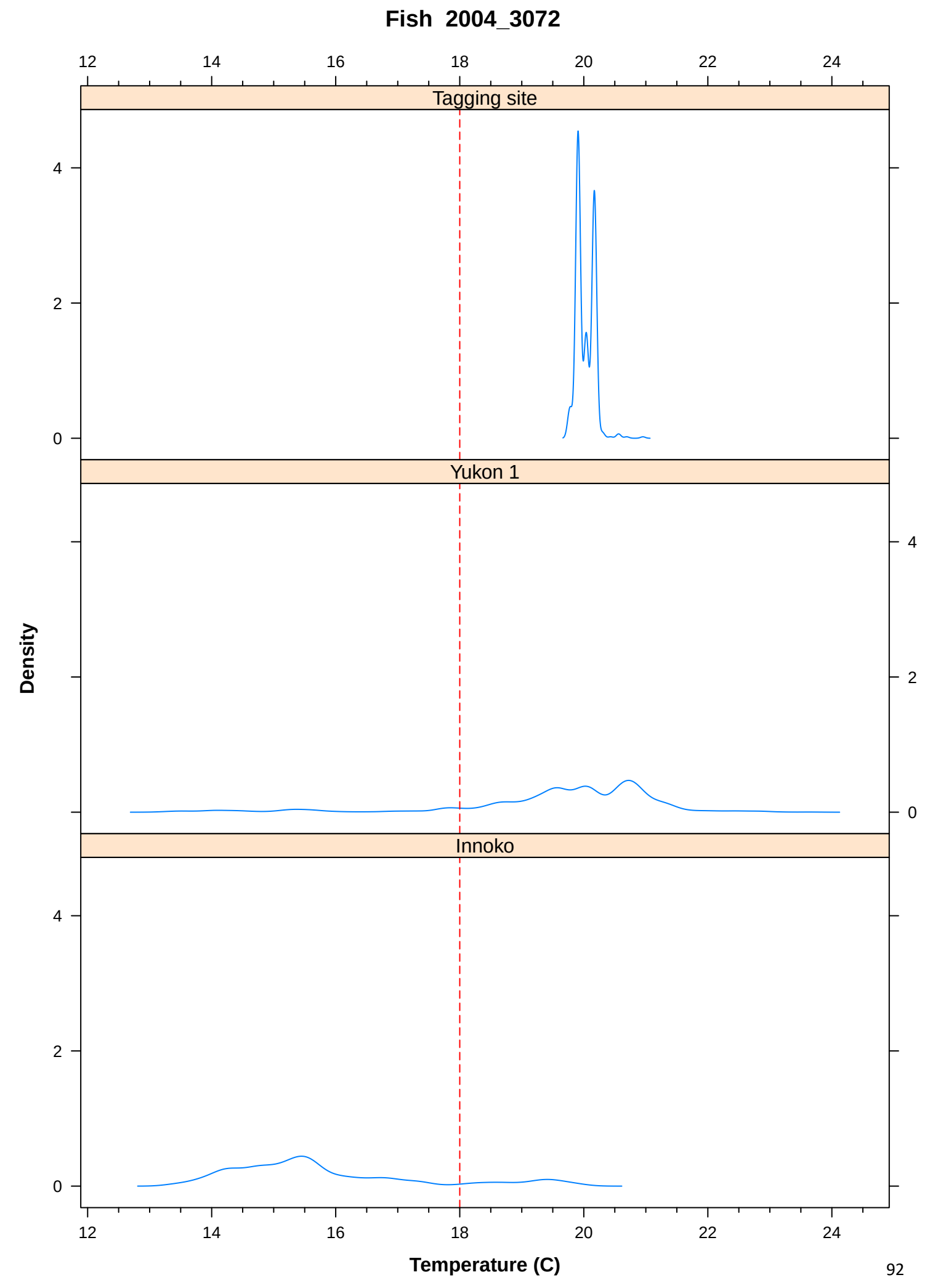

Fish 2004_3072
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Innoko
Reach

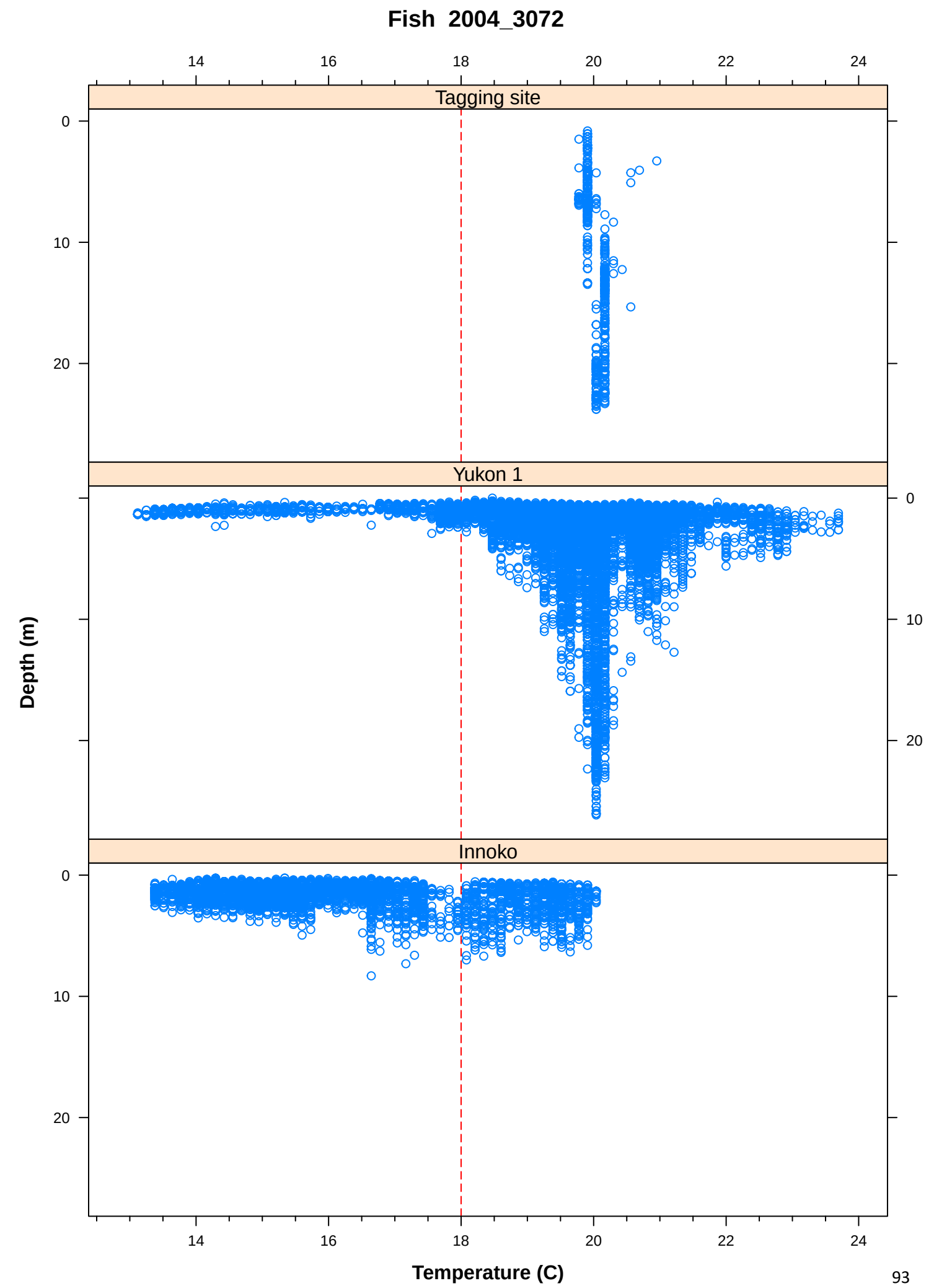

Fish 2004_3072
Tagging site
Yukon 1
Innoko
Density
0.5
0.0
0
5
10
15
20
25
30
Depth (m)


Fish 2004_3072
−50
0
50
100
150
200
250
24
22
20
18
16
14
Temperature (C)
Distance from Paimiut (km)

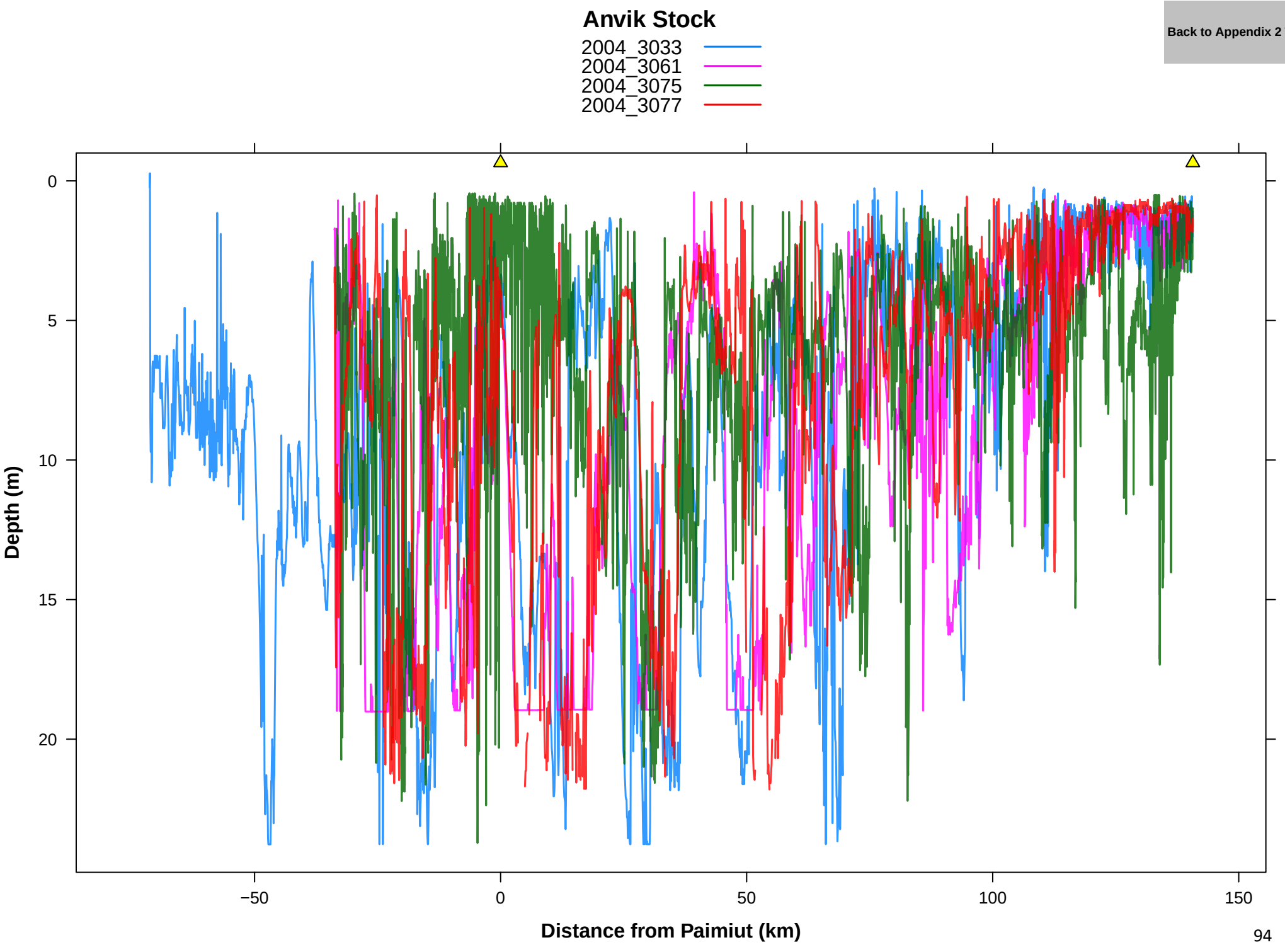

Fish 2004_3072
0
200
400
600
800
1000
24
22
20
18
16
14
Temperature (C)
Hours since release

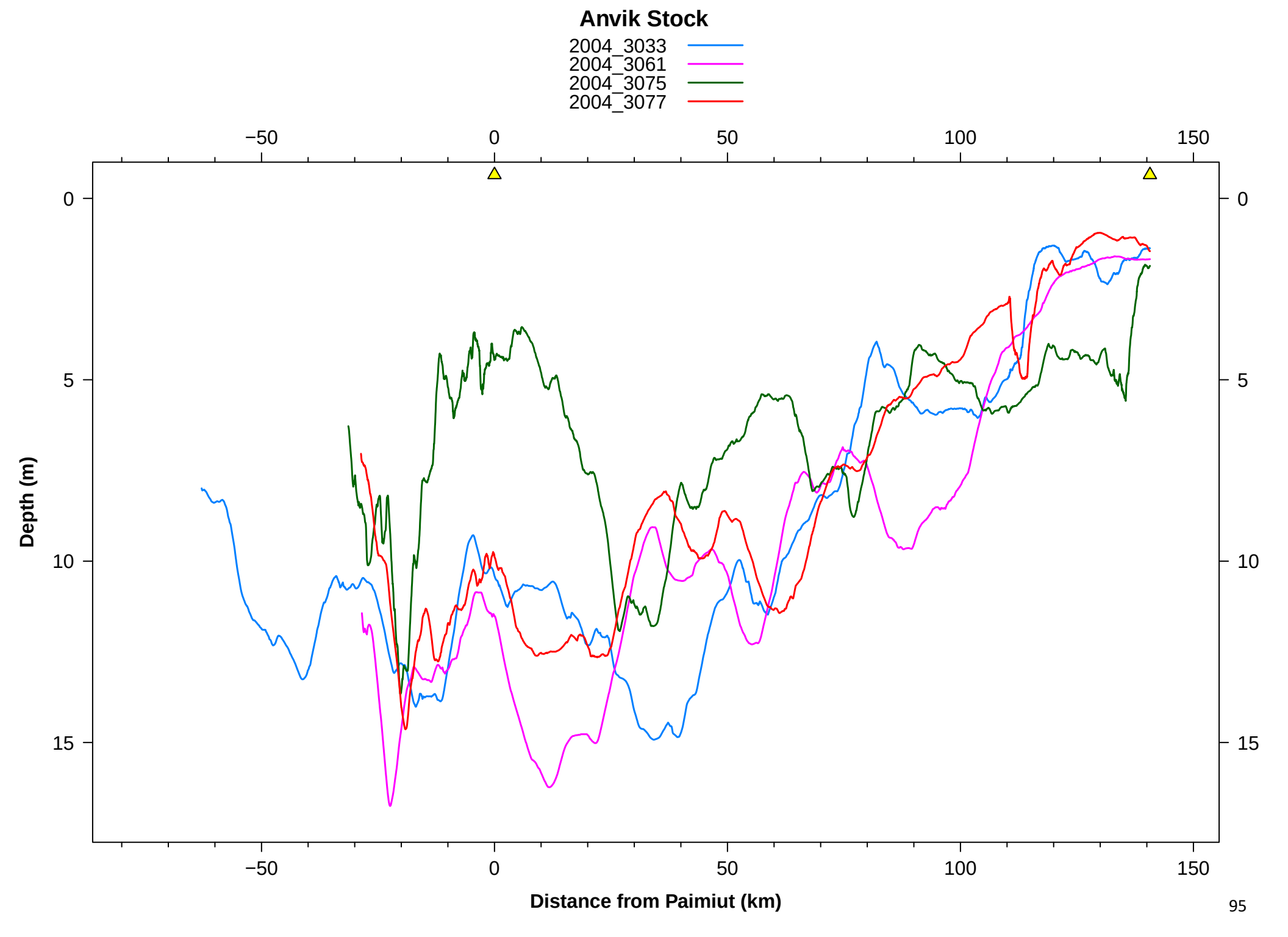

Fish 2004_3072
Temperature (C)
24
22
20
18
16
14
Tagging site
Yukon 1
Innoko
Reach

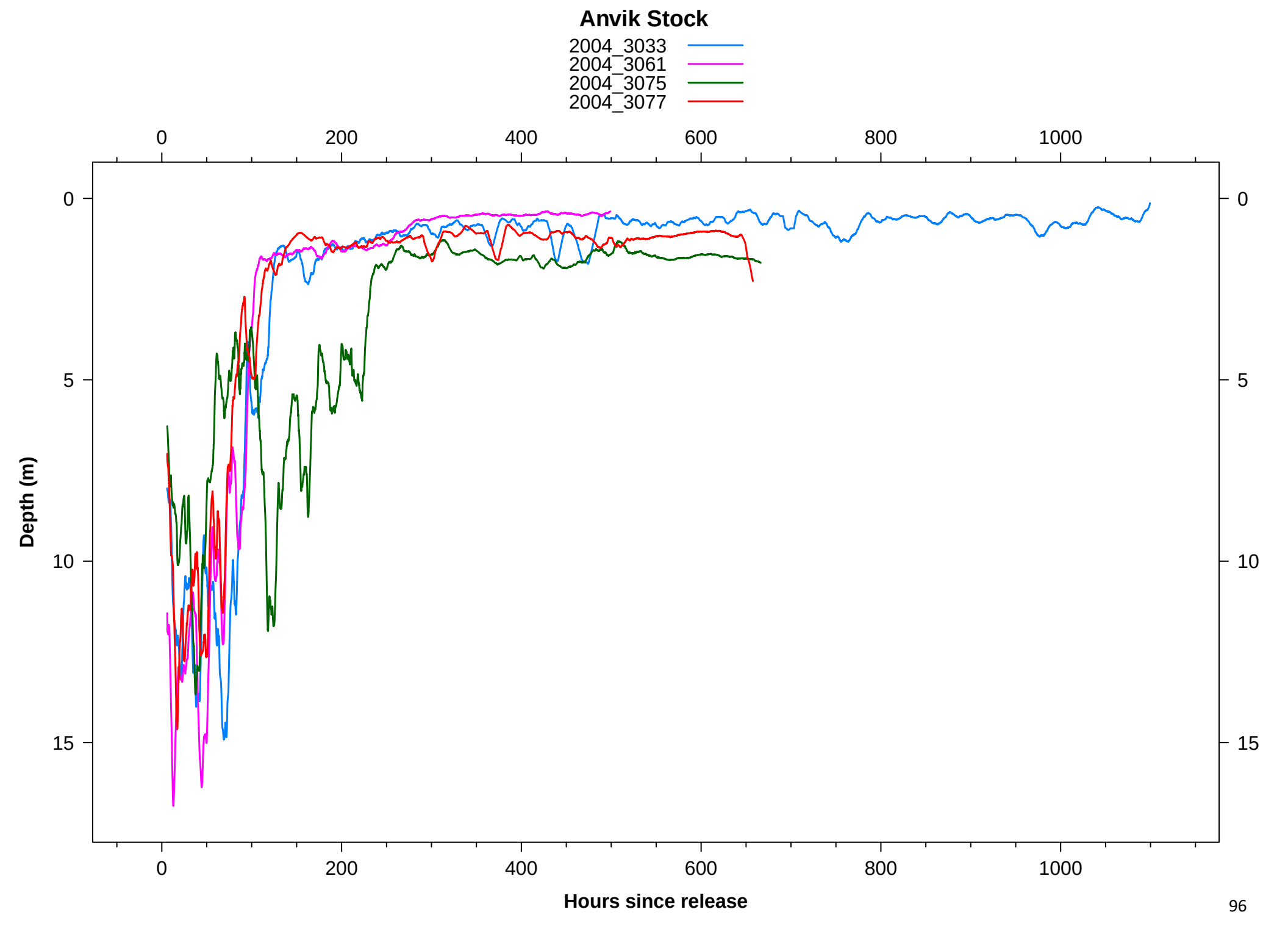

Fish 2004_3072
Tagging site
Yukon 1
Innoko
Density
Temperature (C)
12
14
16
18
20
22
24
0
2
4

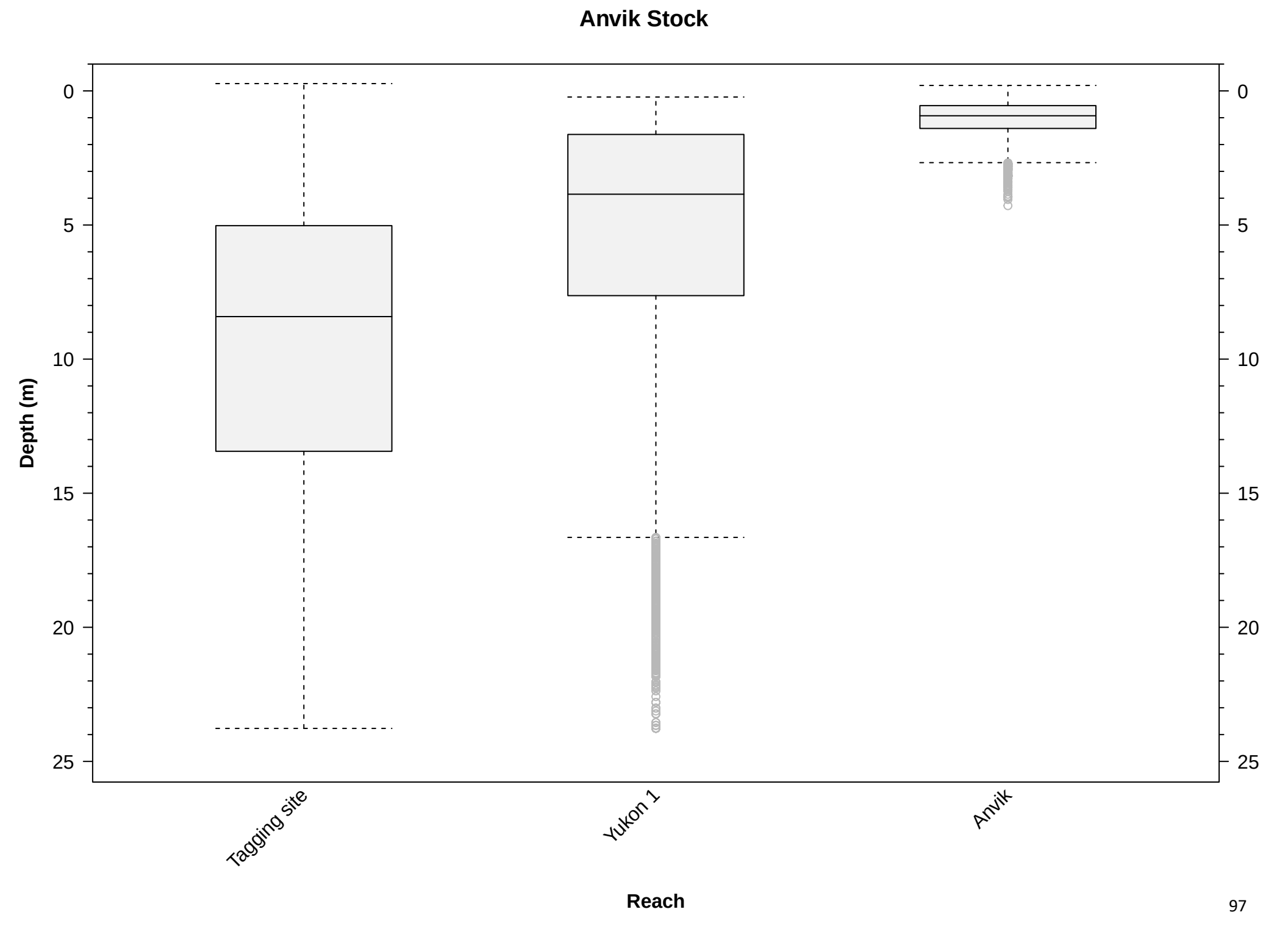

Fish 2004_3072
Tagging site
Yukon 1
Innoko
Depth (m)
Temperature (C)
14
16
18
20
22
24
0
10
20

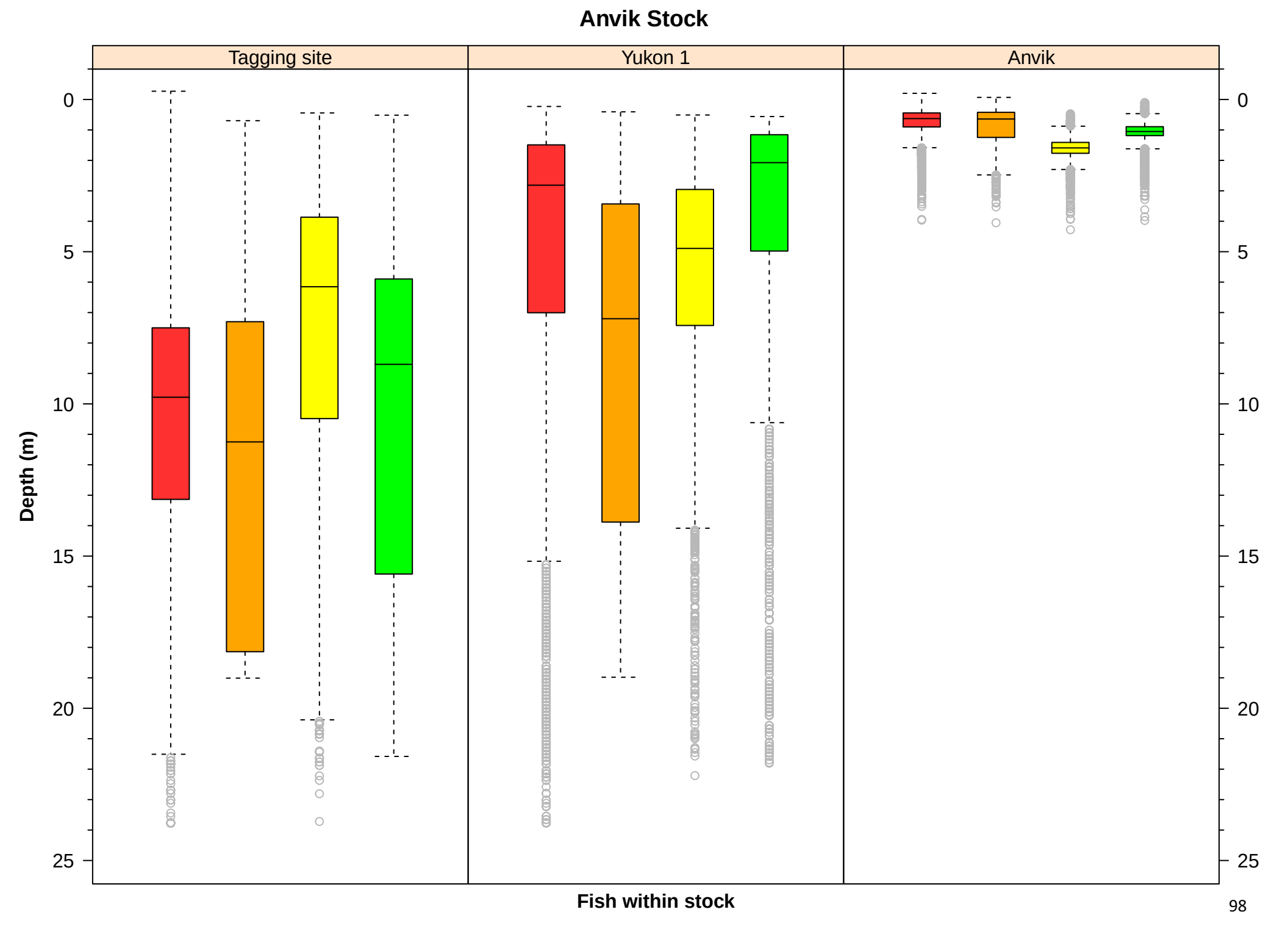
Back to Appendix 2 TOC

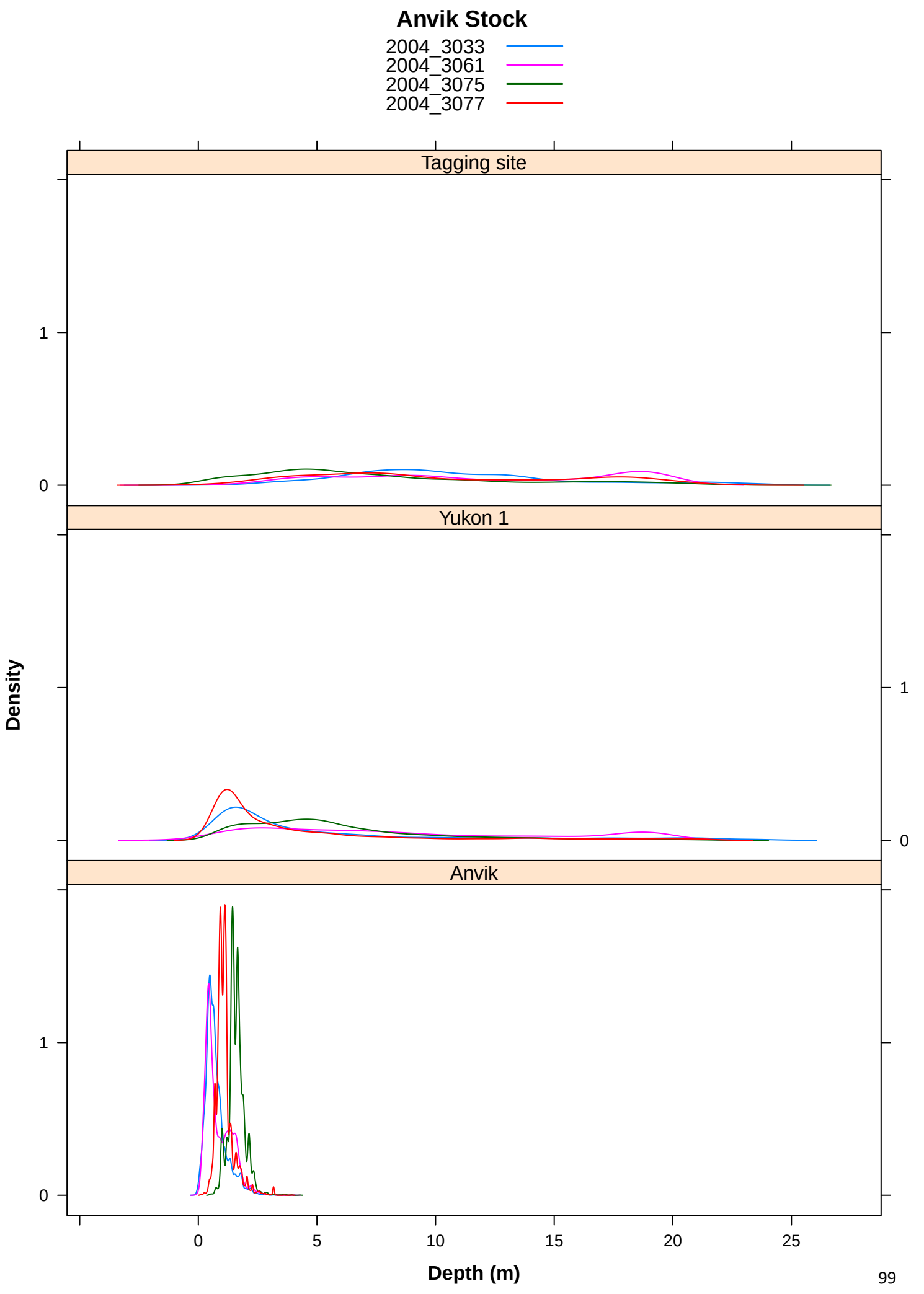


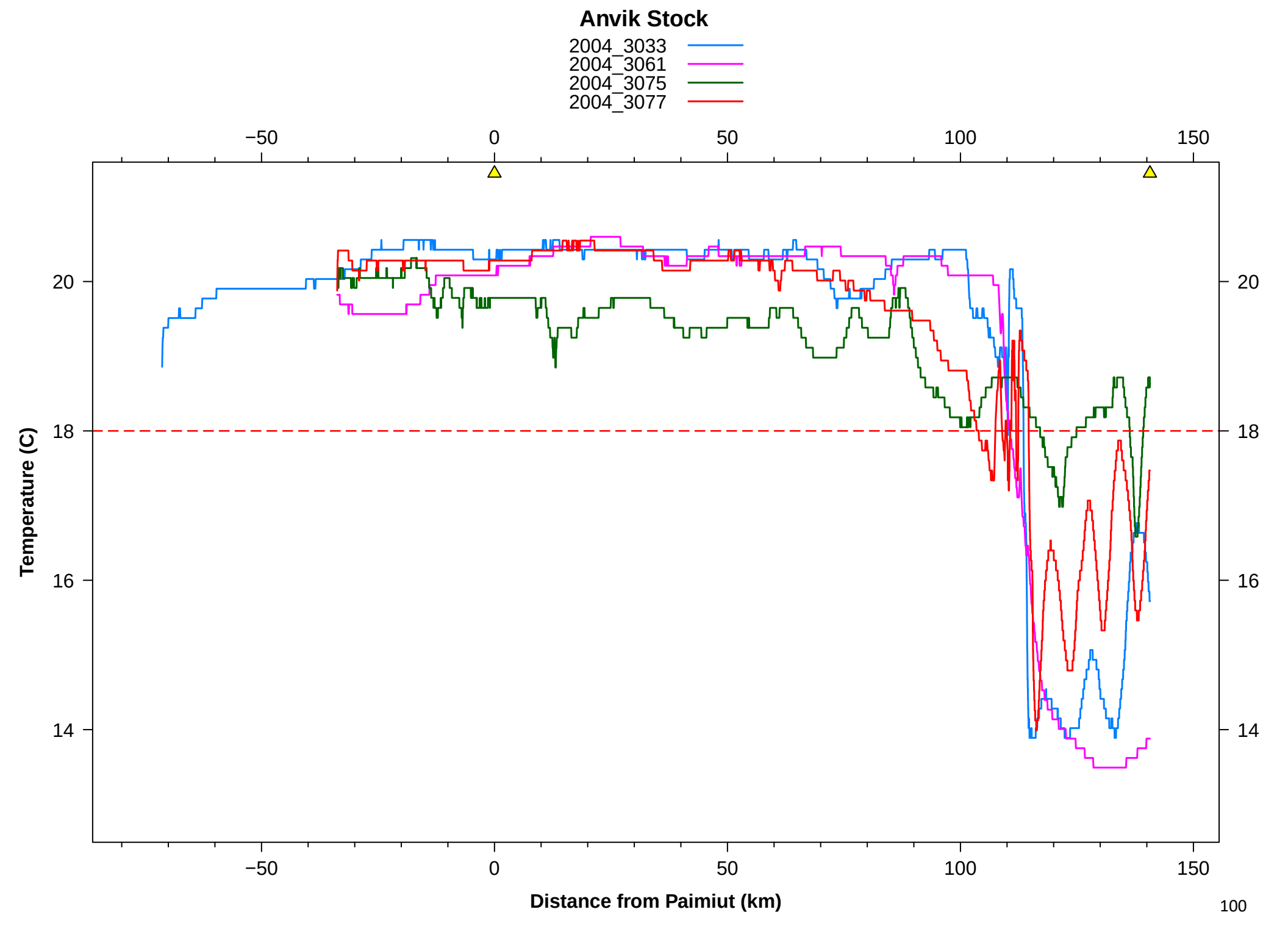

Anvik Stock
2004_3033
2004_3061
2004_3075
2004_3077
−50
0
50
100
150
0
5
10
15
Depth (m)
Distance from Paimiut (km)

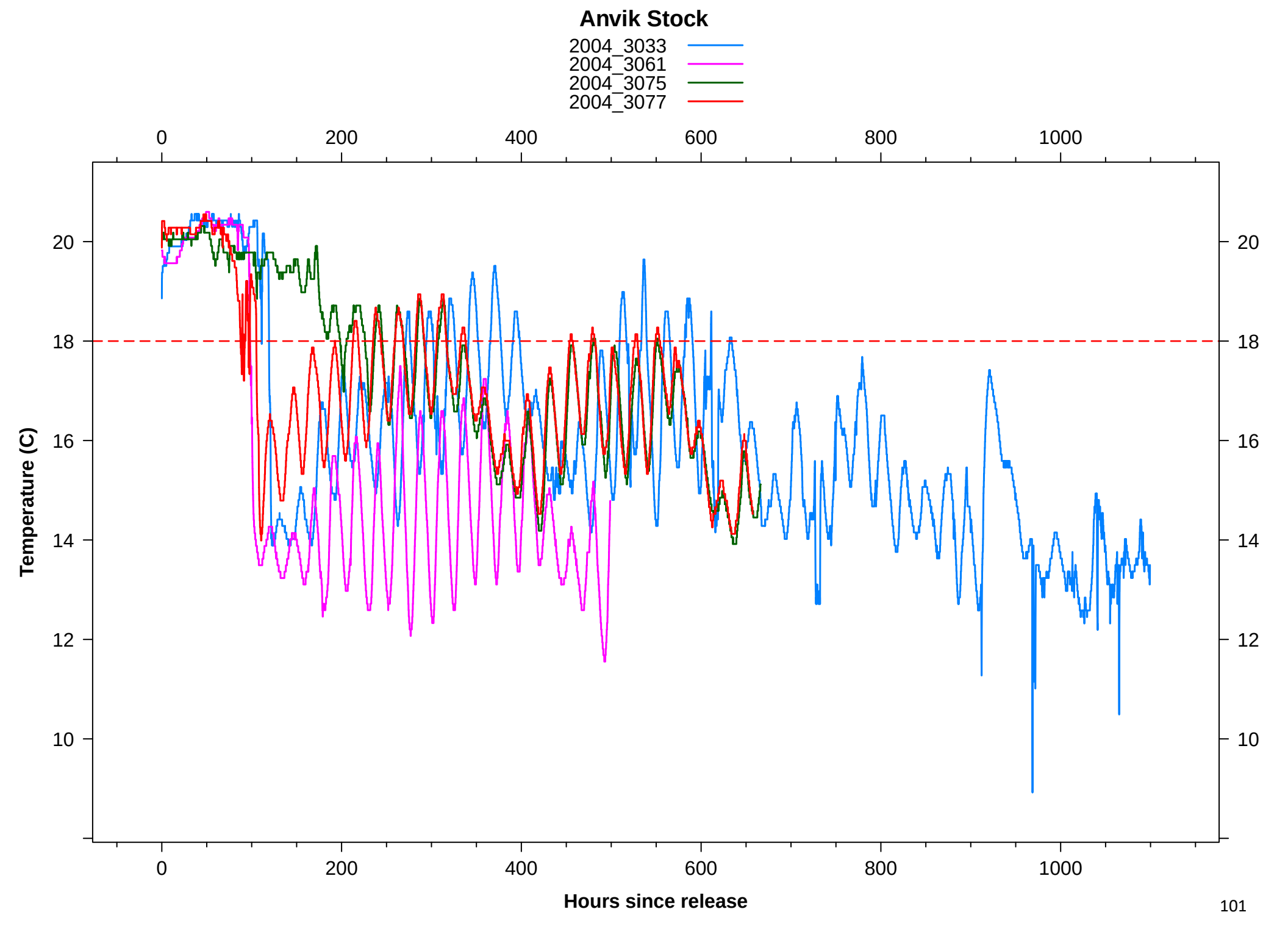

Anvik Stock
2004_3033
2004_3061
2004_3075
2004_3077
0
200
400
600
800
1000
0
5
10
15
Depth (m)
Hours since release

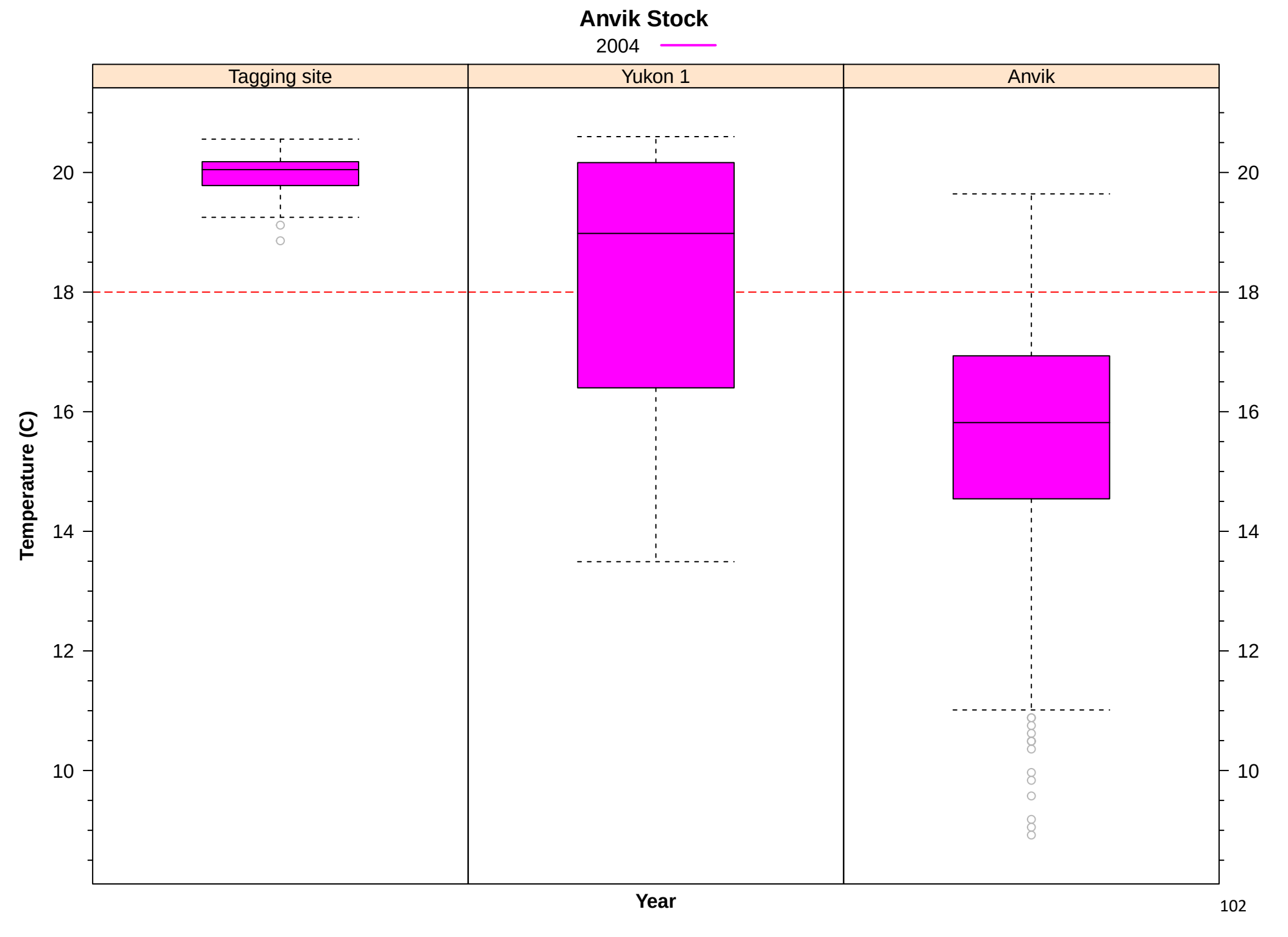

Anvik Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Anvik
Reach

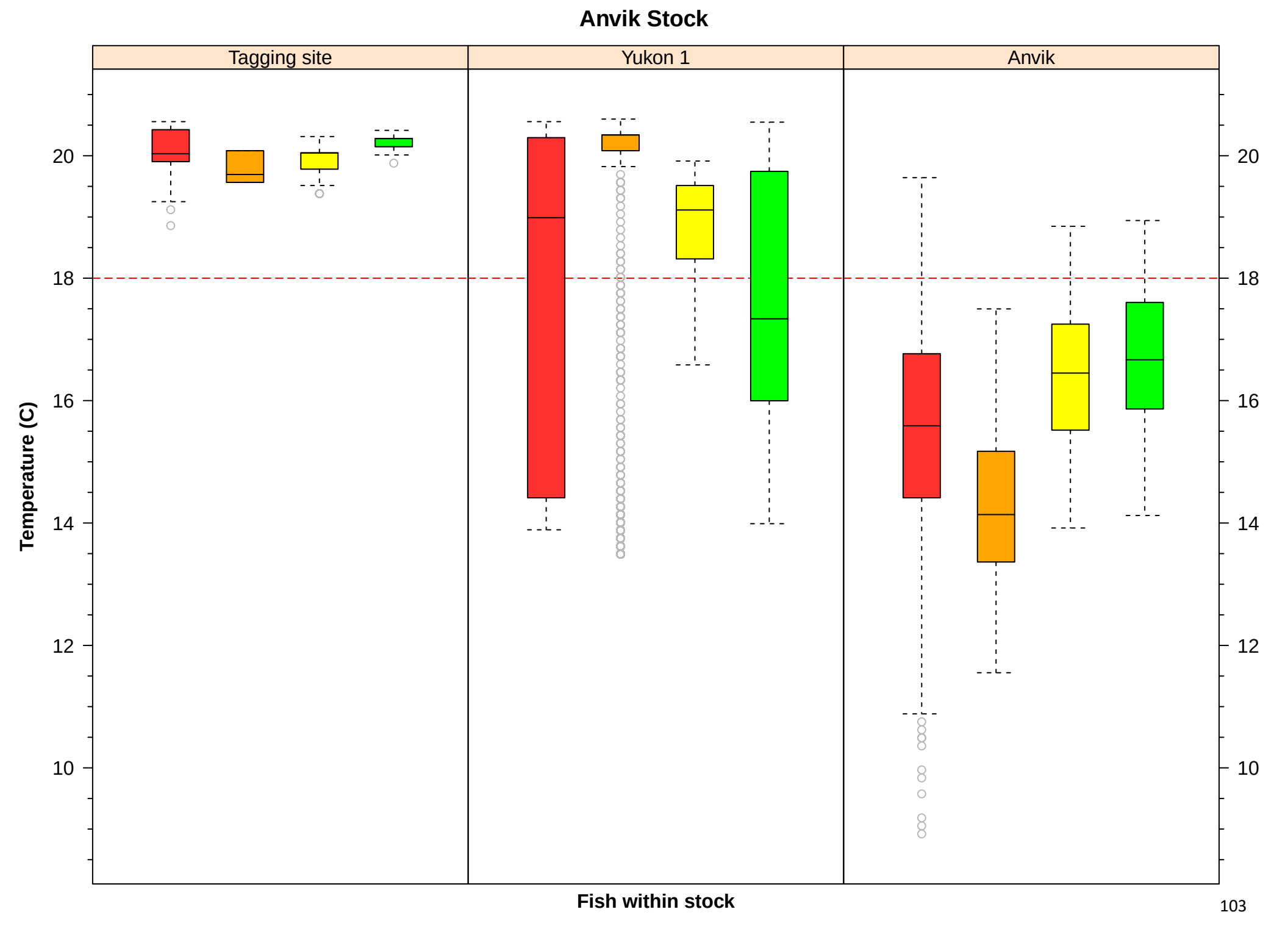

Anvik Stock
Tagging site
Yukon 1
Anvik
Depth (m)
0
5
10
15
20
25
Fish within stock

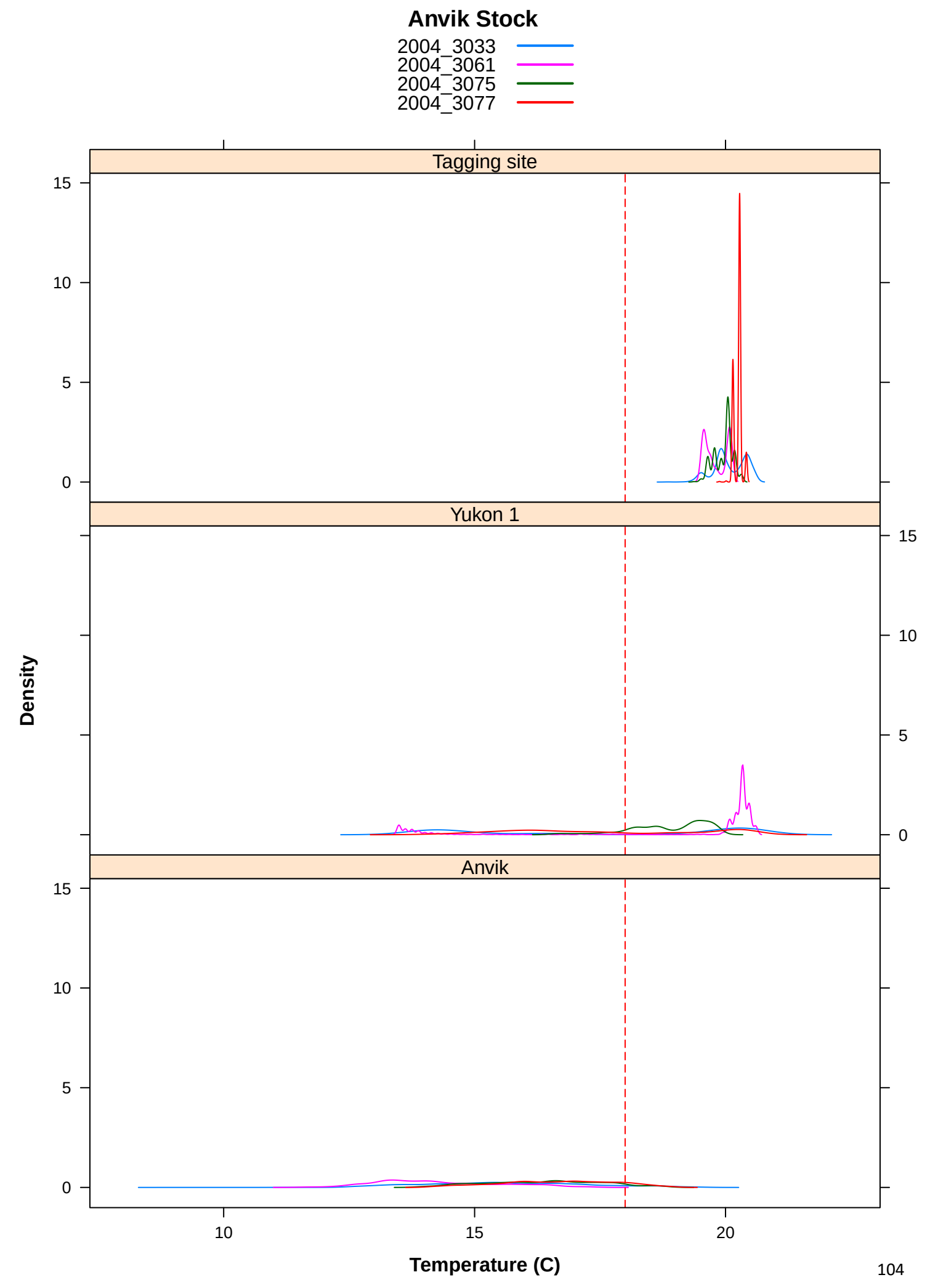

Anvik Stock
2004_3033
2004_3061
2004_3075
2004_3077
Tagging site
Yukon 1
Anvik
Density
Depth (m)
0
1
5
10
15
20
25

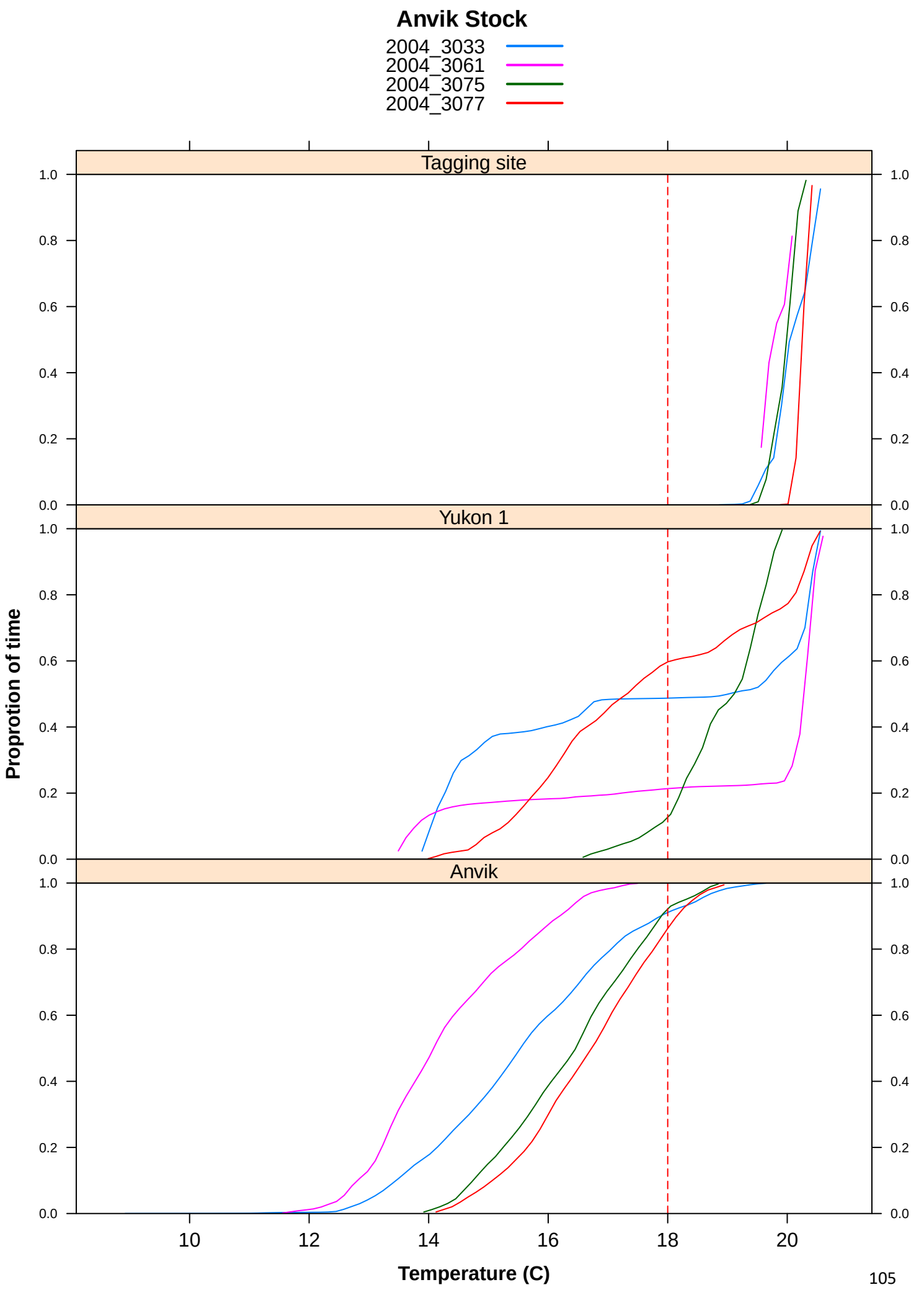

Anvik Stock
2004_3033
2004_3061
2004_3075
2004_3077
−50
0
50
100
150
20
18
16
14
Temperature (C)
Distance from Paimiut (km)
100

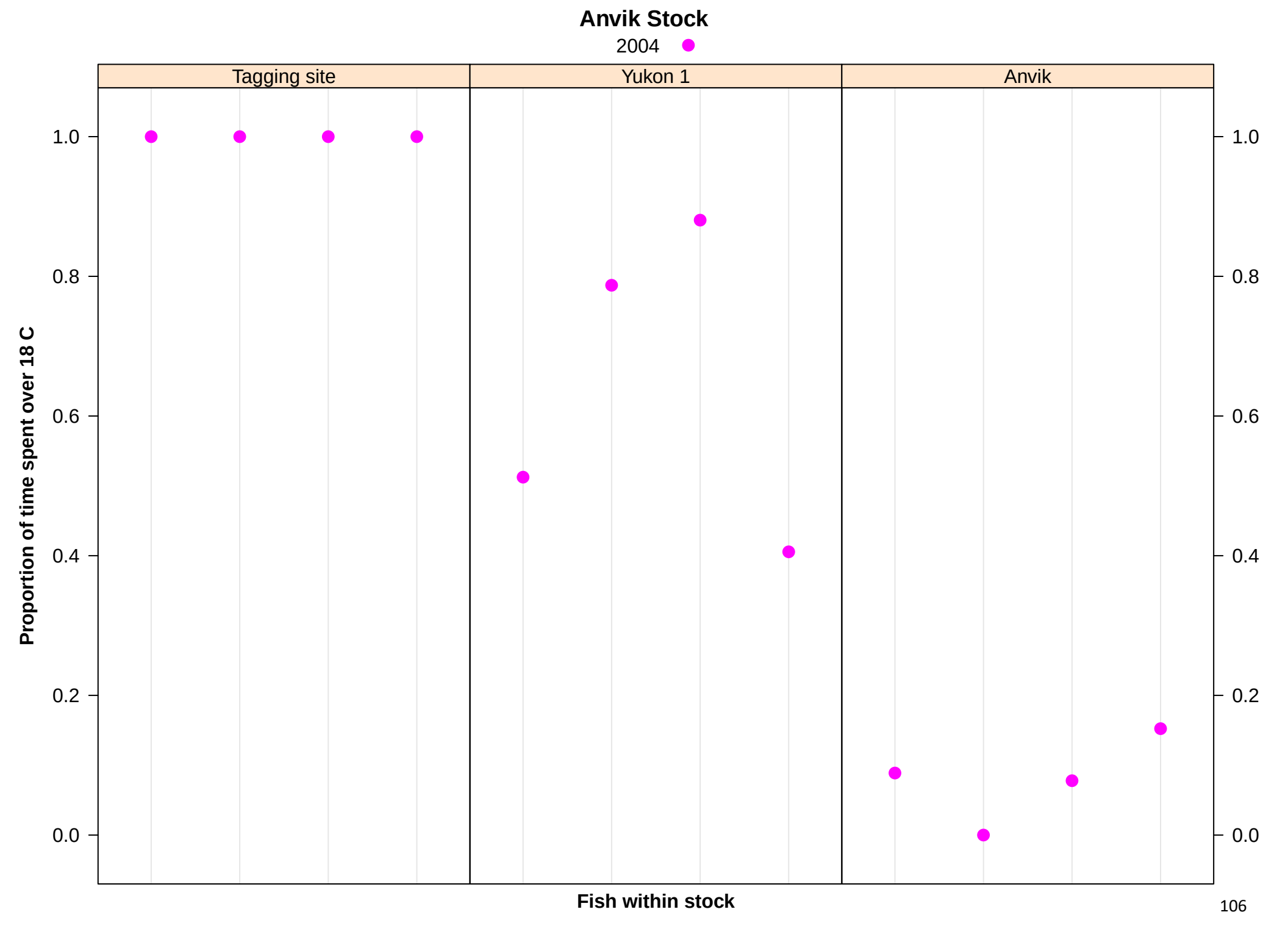

Anvik Stock
2004_3033
2004_3061
2004_3075
2004_3077
0
200
400
600
800
1000
20
18
16
14
12
10
Temperature (C)
Hours since release

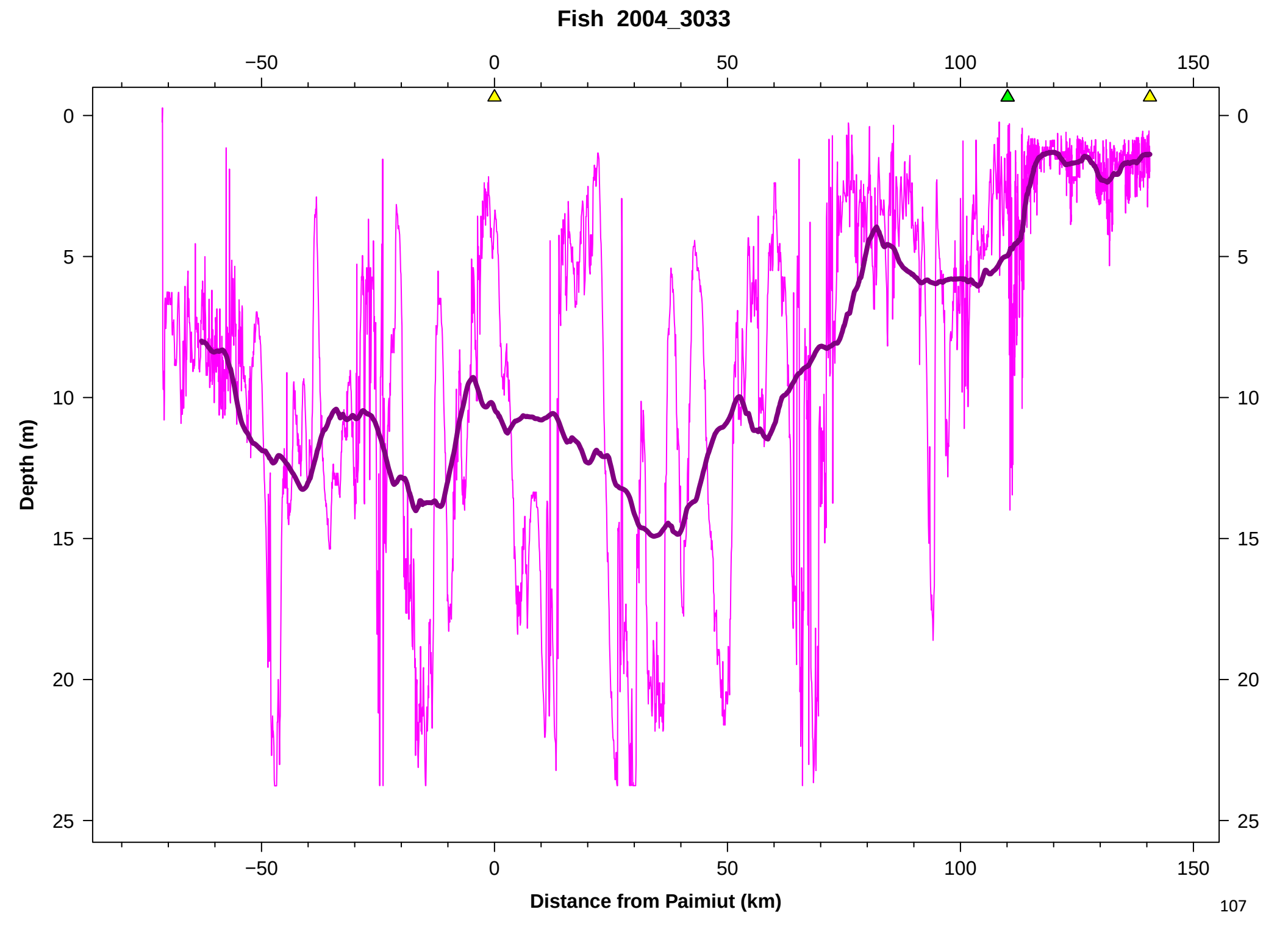

Anvik Stock
2004
Tagging site
Yukon 1
Anvik
Temperature (C)
Year
10
12
14
16
18
20

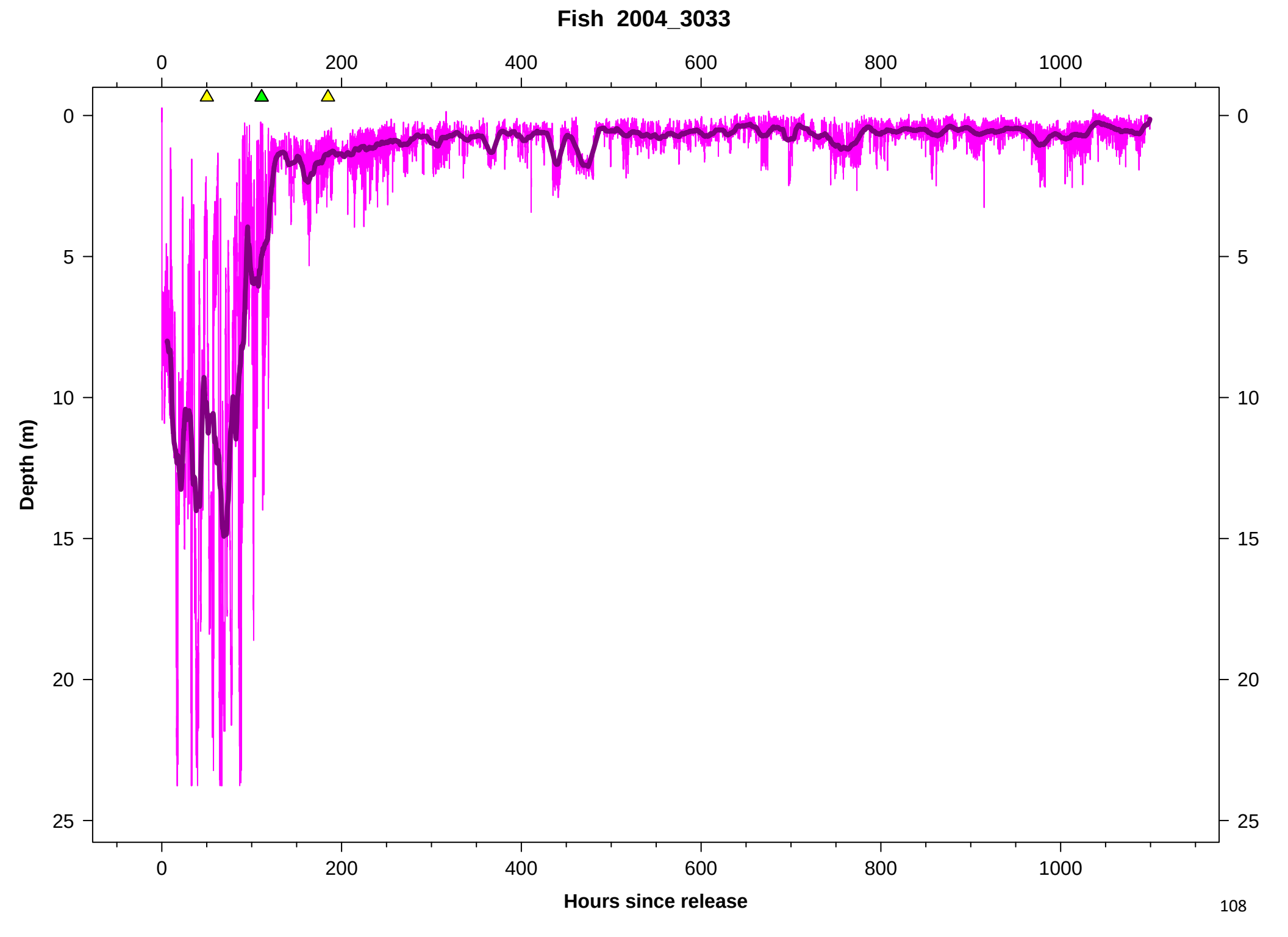

Anvik Stock
Tagging site
Yukon 1
Anvik
Temperature (C)
20
18
16
14
12
10
Fish within stock

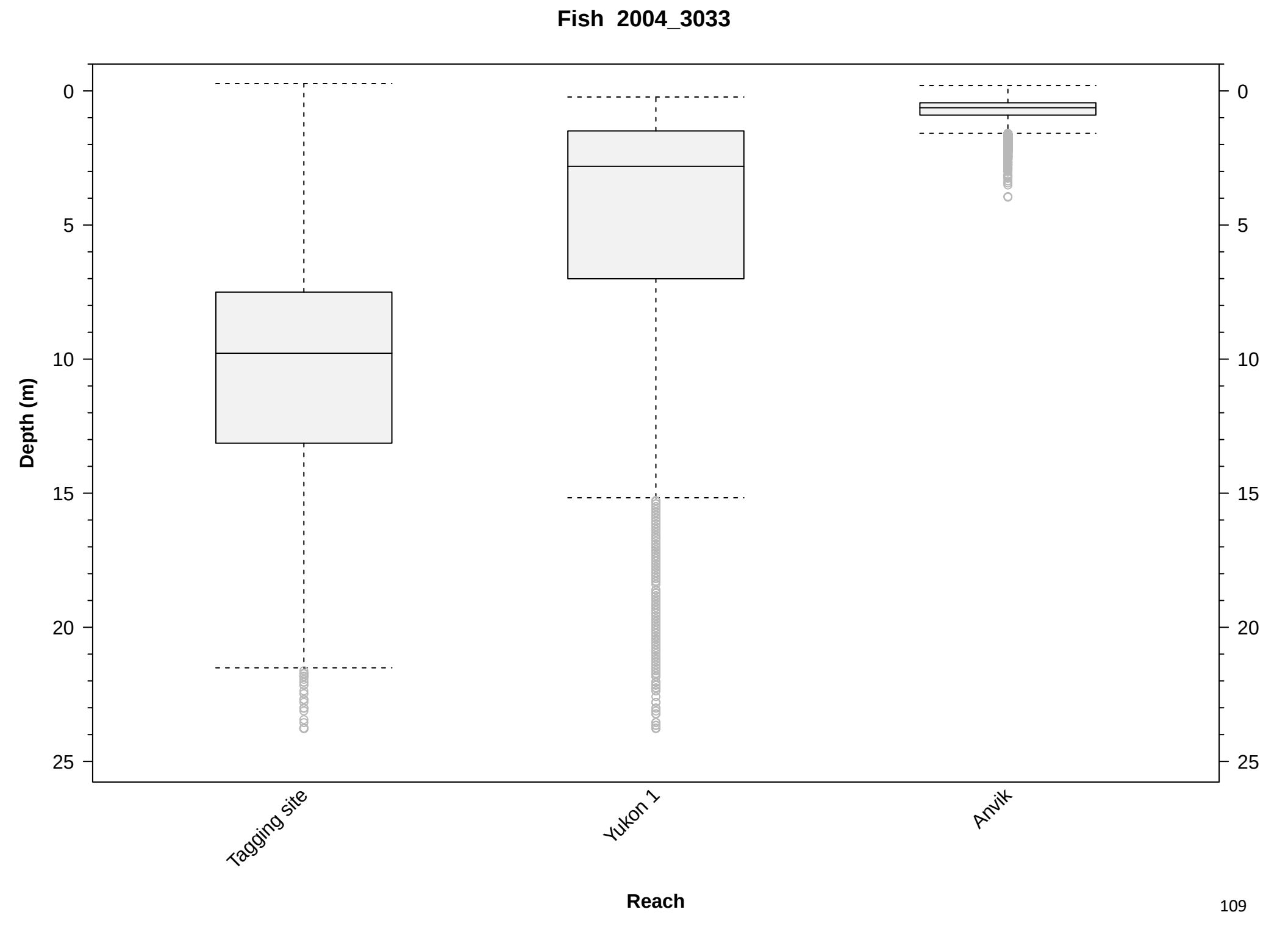

Anvik Stock
2004_3033
2004_3061
2004_3075
2004_3077
Tagging site
Yukon 1
Anvik
Density
Temperature (C)
0
5
10
15
20

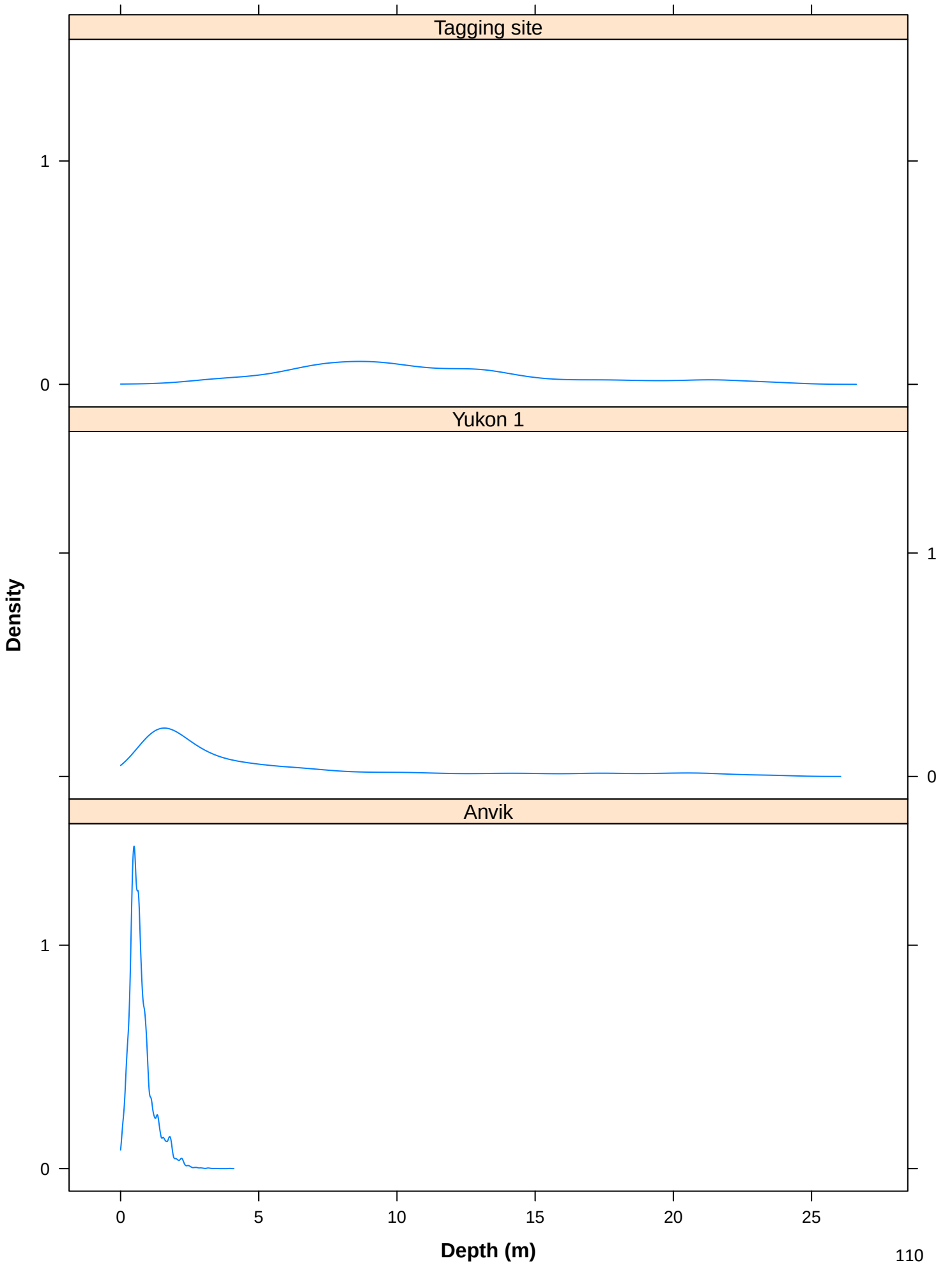

Anvik Stock
2004_3033
2004_3061
2004_3075
2004_3077
Tagging site
Yukon 1
Anvik
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
10
12
14
16
18
20

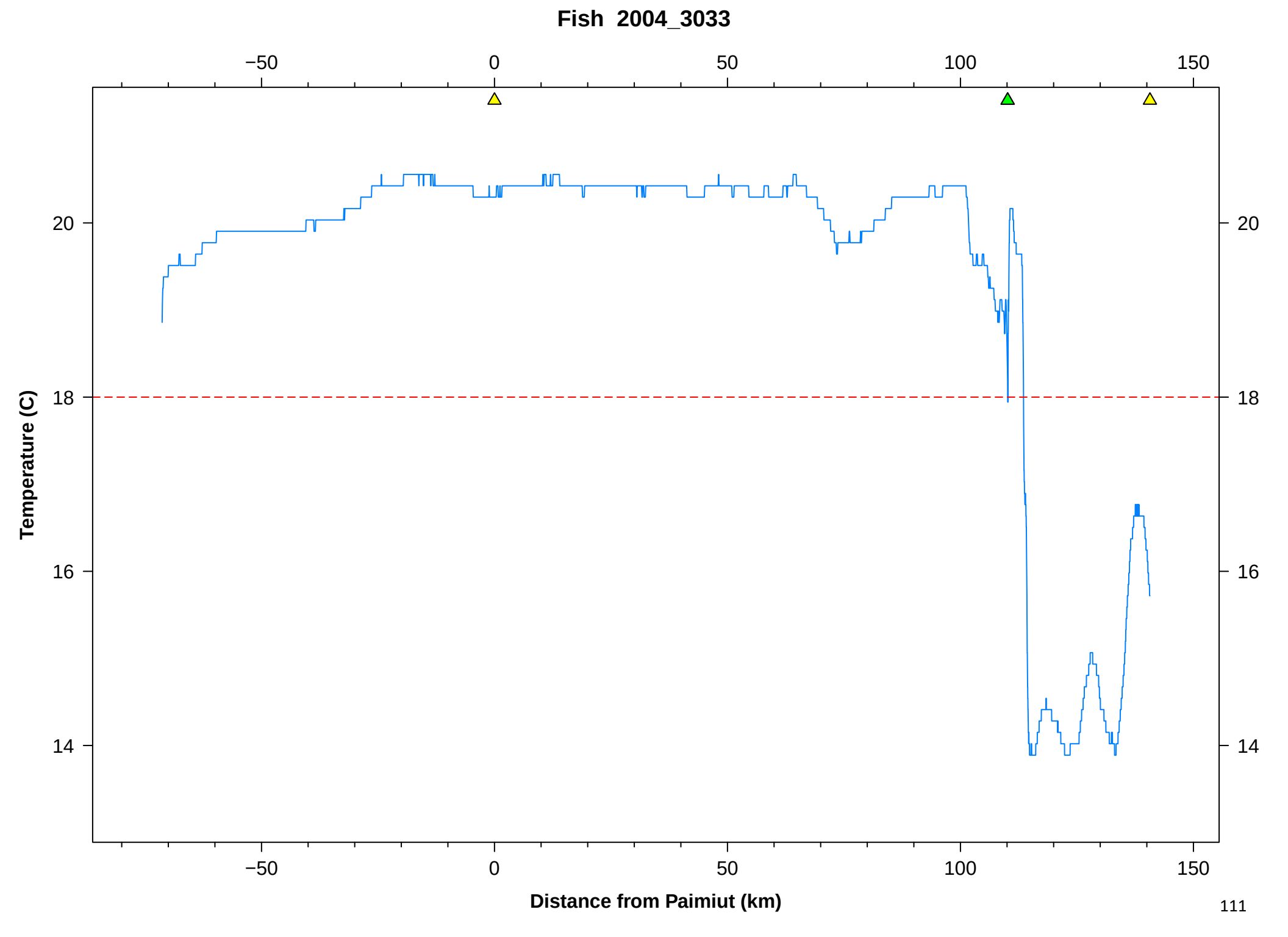

Anvik Stock
2004
Tagging site
Yukon 1
Anvik
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock

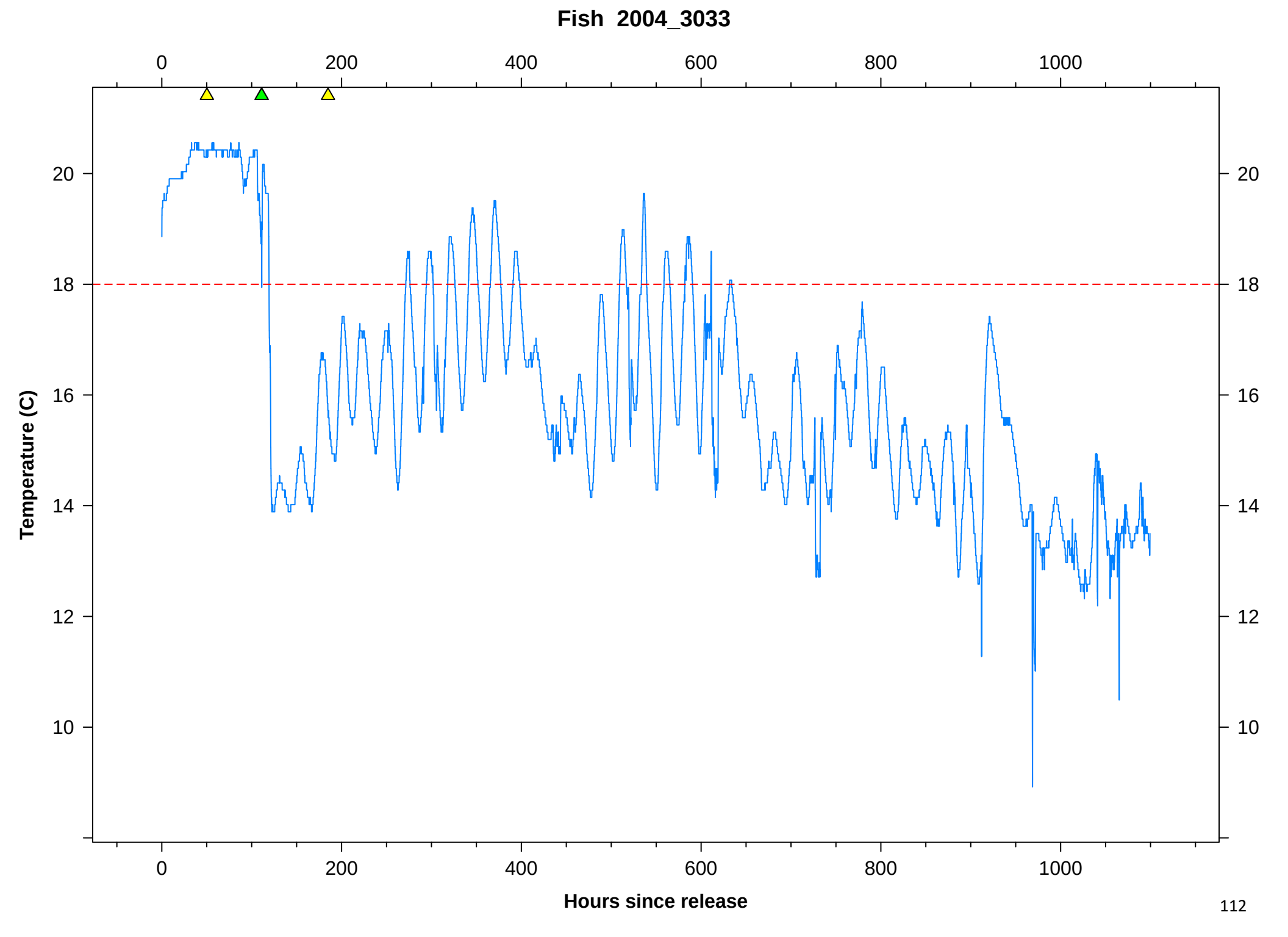

Fish 2004_3033
−50
0
50
100
150
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

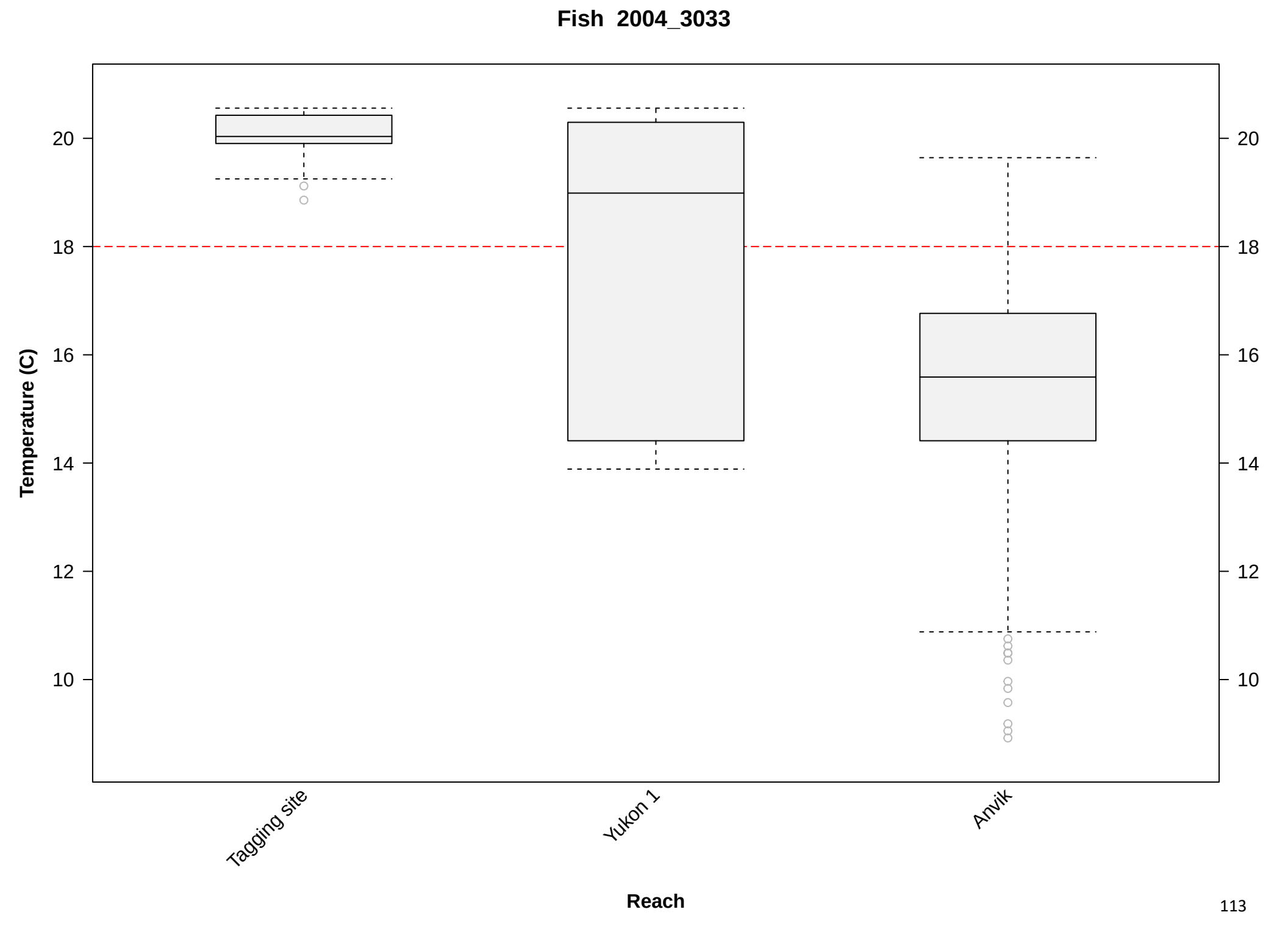

Fish 2004_3033
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release

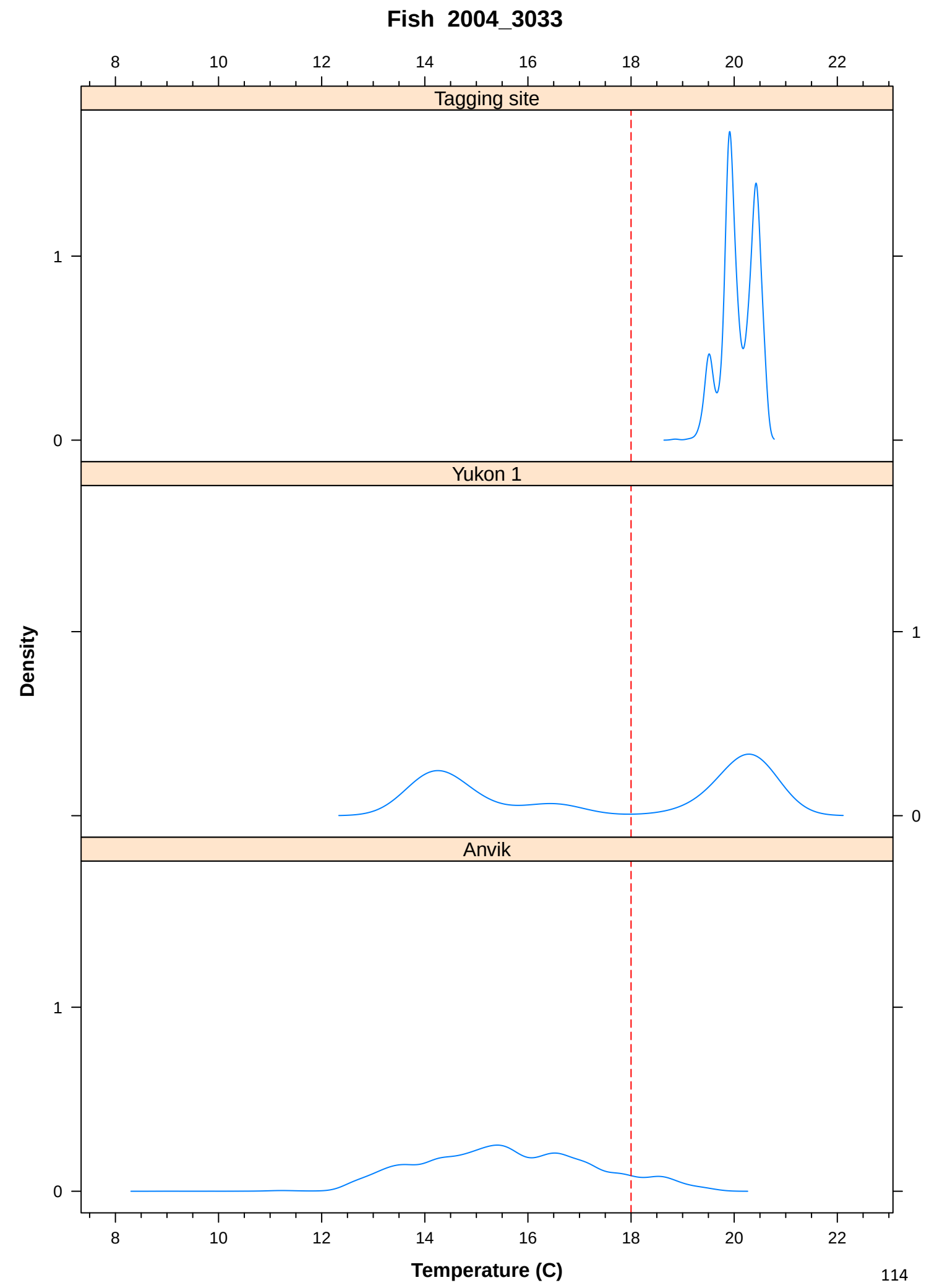

Fish 2004_3033
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Anvik
Reach

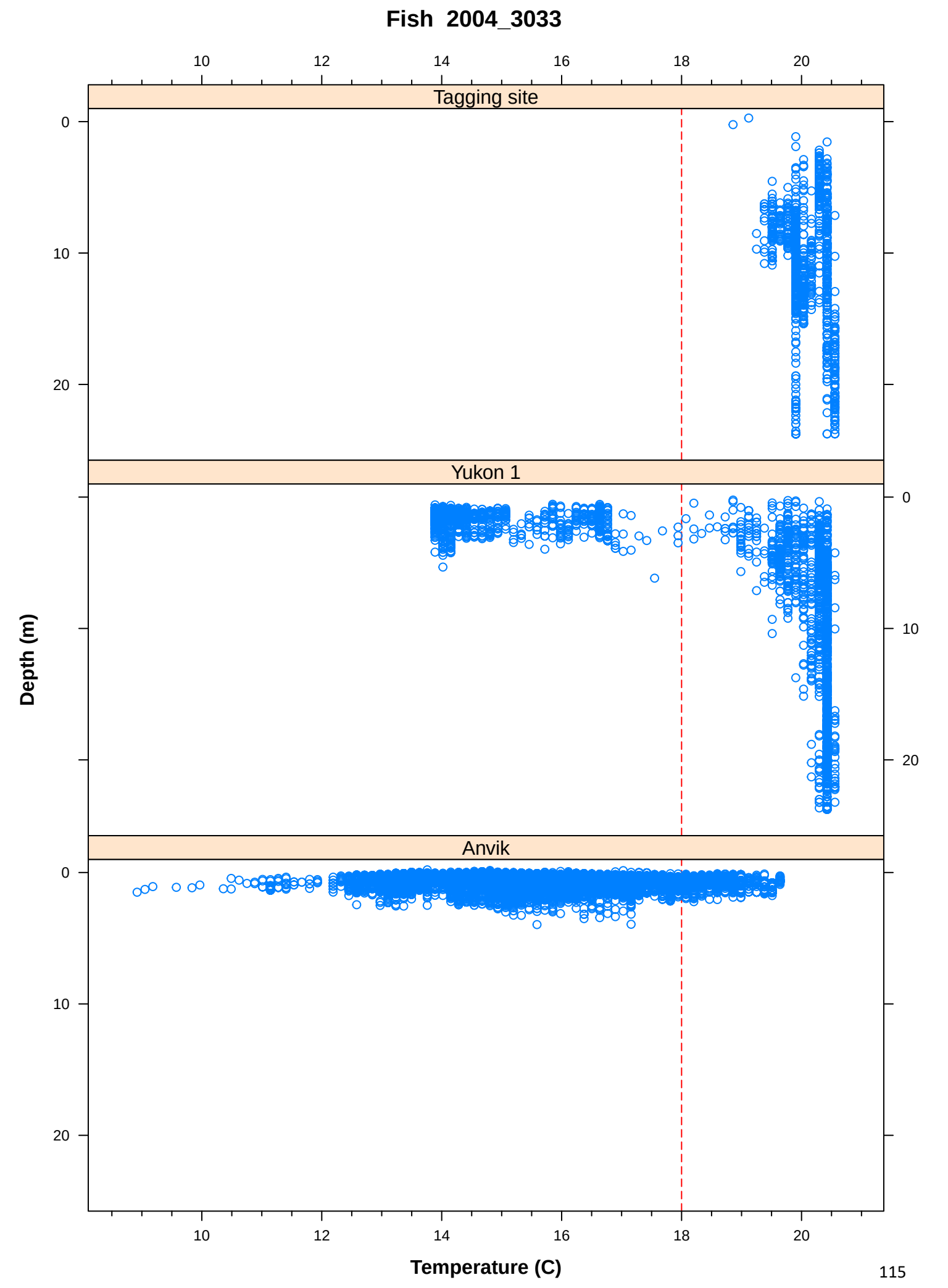

Fish 2004_3033
Tagging site
Yukon 1
Anvik
Density
1
0
1
0
1
0
0
5
10
15
20
25
Depth (m)

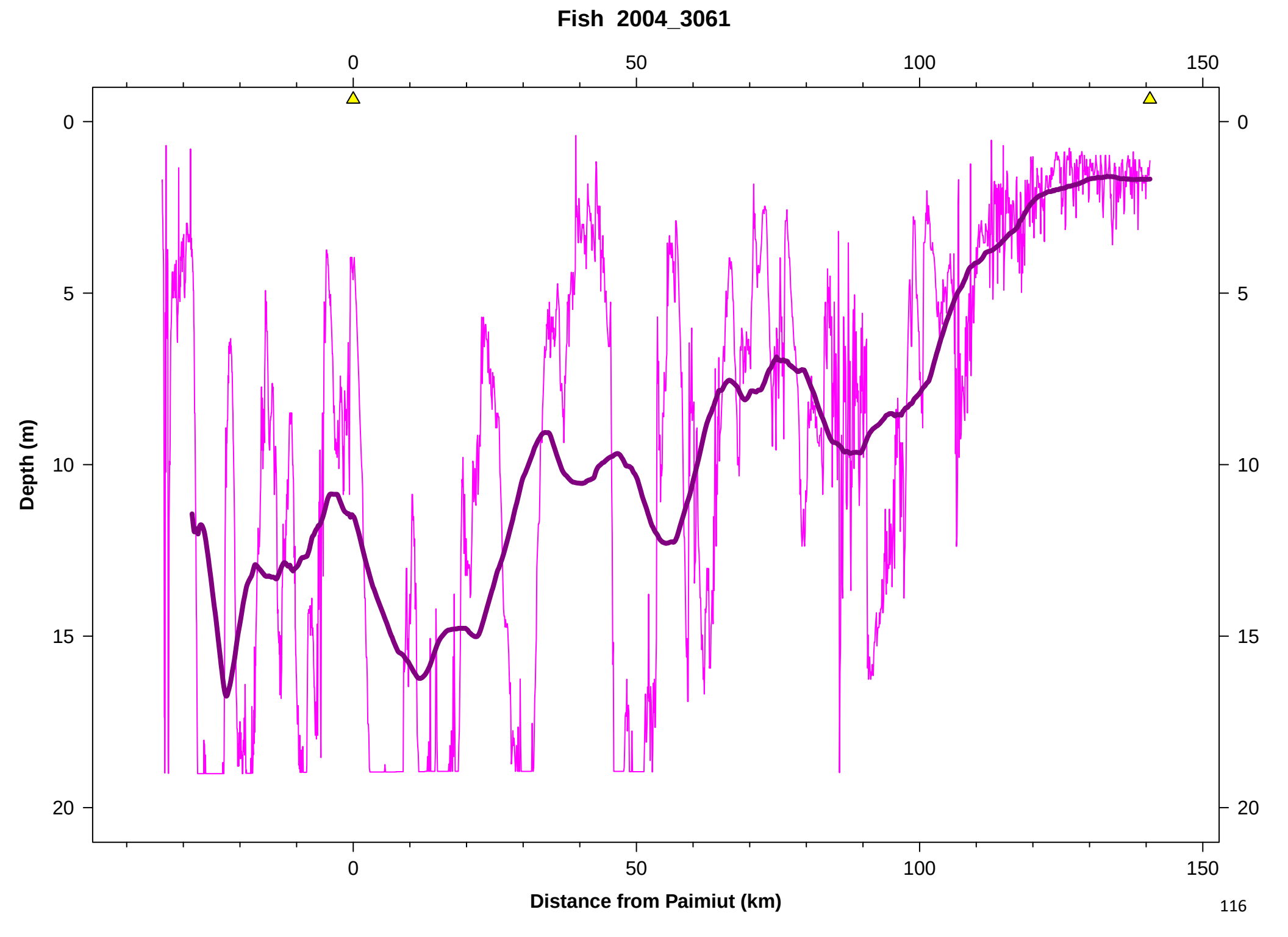

Fish 2004_3033
−50
0
50
100
150
20
18
16
14
Temperature (C)
Distance from Paimiut (km)

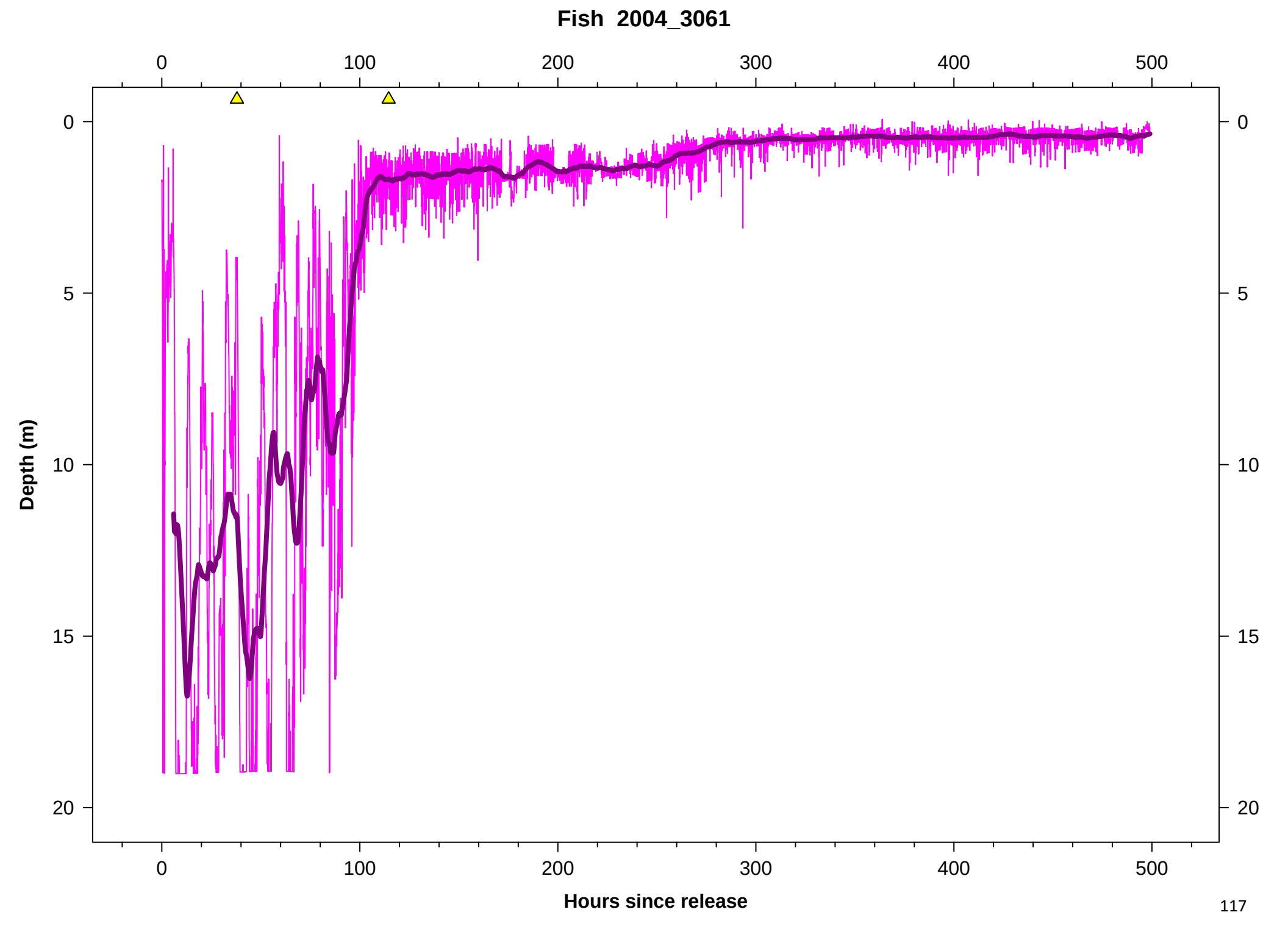

Fish 2004_3033
0
200
400
600
800
1000
20
18
16
14
12
10
Temperature (C)
Hours since release

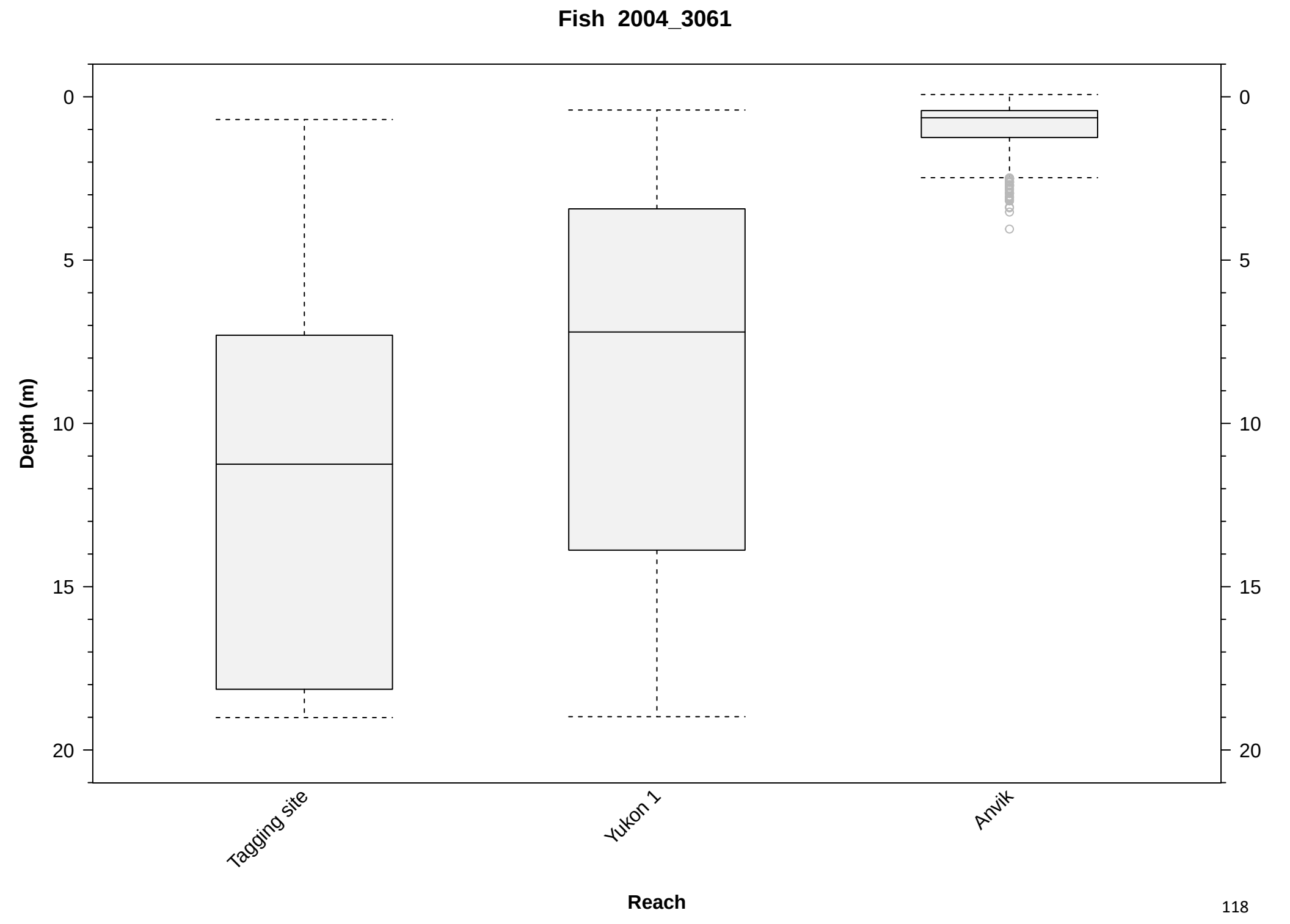

Fish 2004_3033
Temperature (C)
20
18
16
14
12
10
Tagging site
Yukon 1
Anvik
Reach

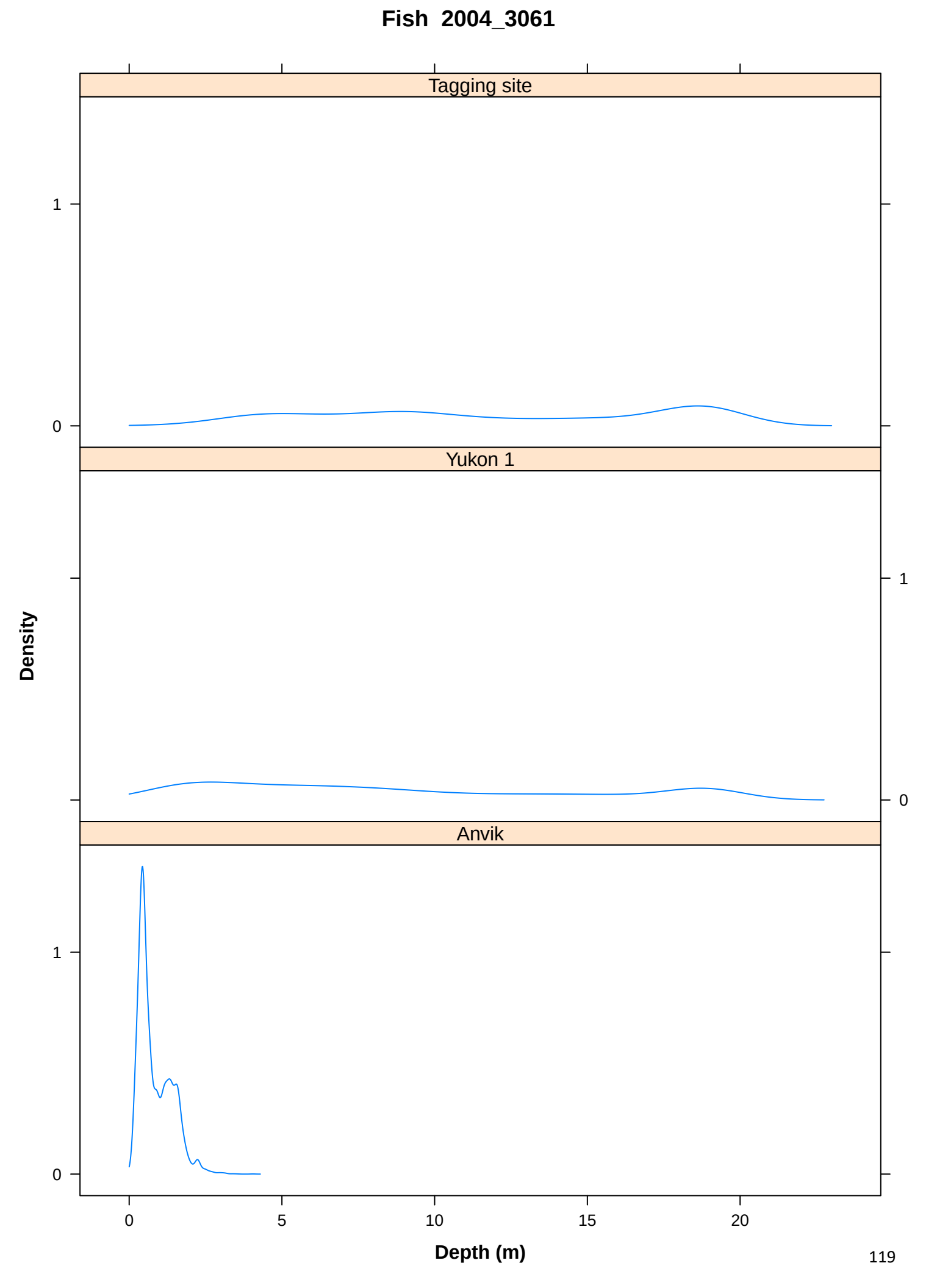

Fish 2004_3033
Tagging site
Yukon 1
Anvik
Density
Temperature (C)
8
10
12
14
16
18
20
22
0
1

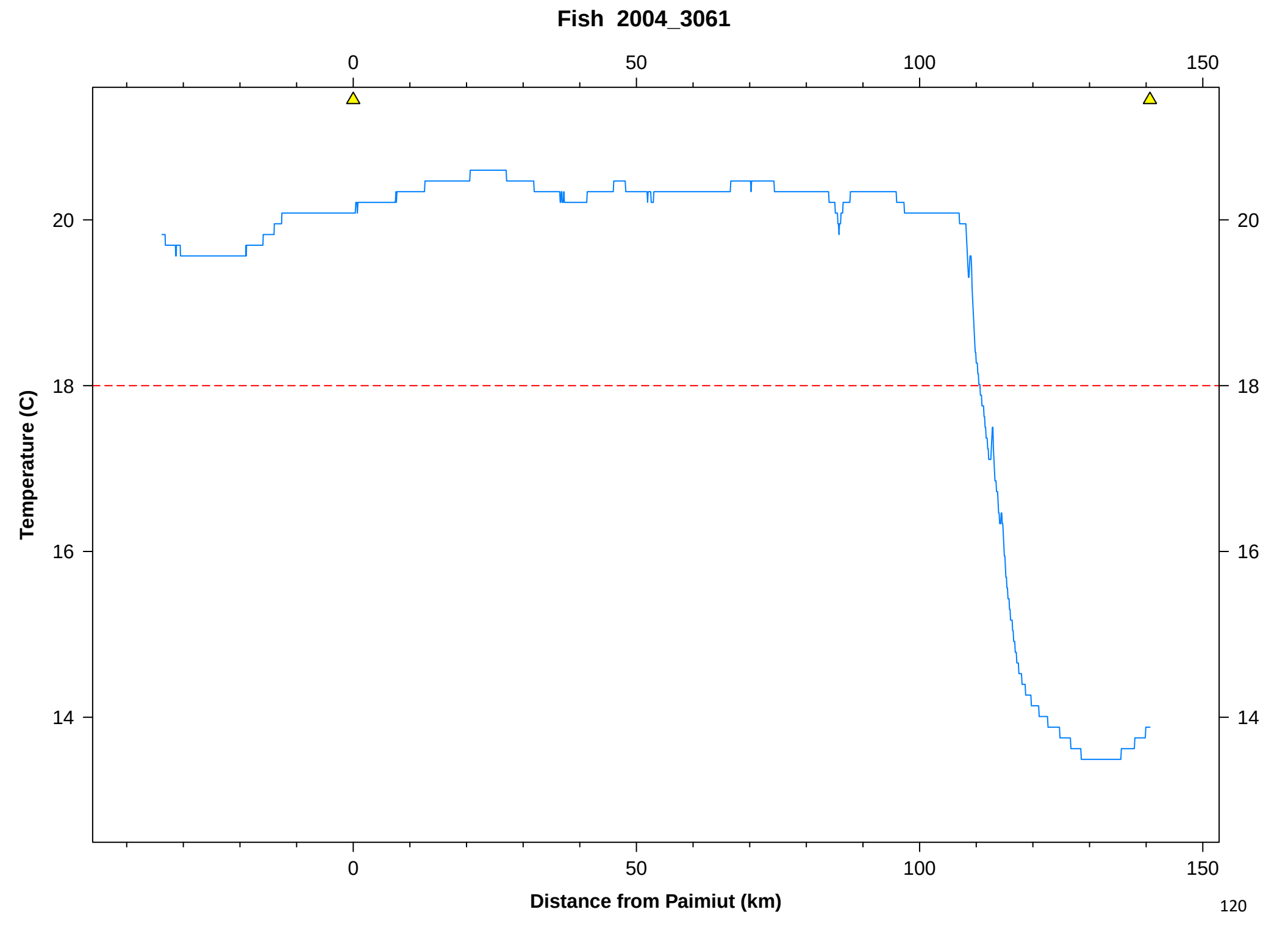

Fish 2004_3033
Tagging site
Yukon 1
Anvik
Depth (m)
Temperature (C)
10
12
14
16
18
20
0
10
20

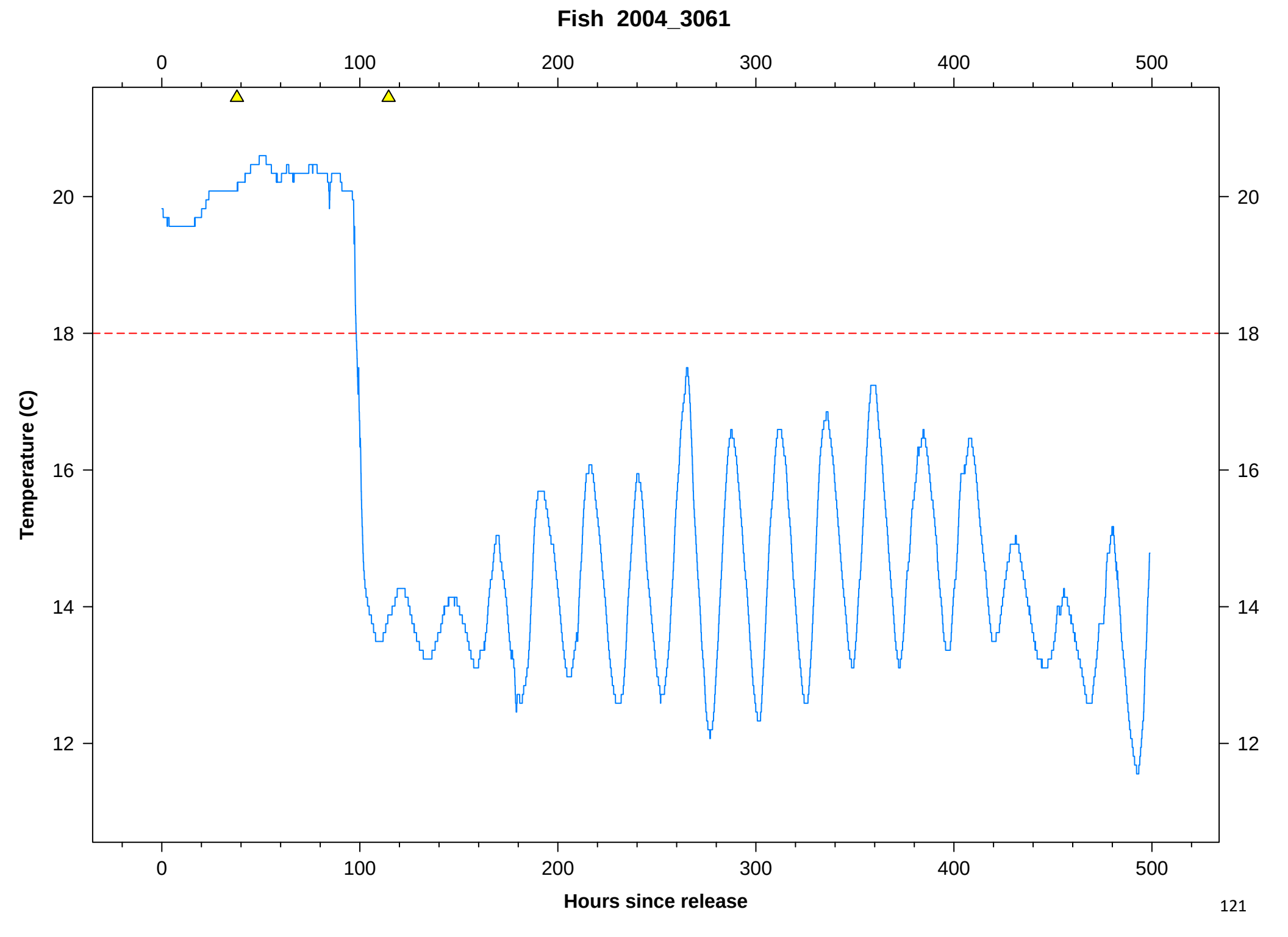

Fish 2004_3061
0
50
100
150
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

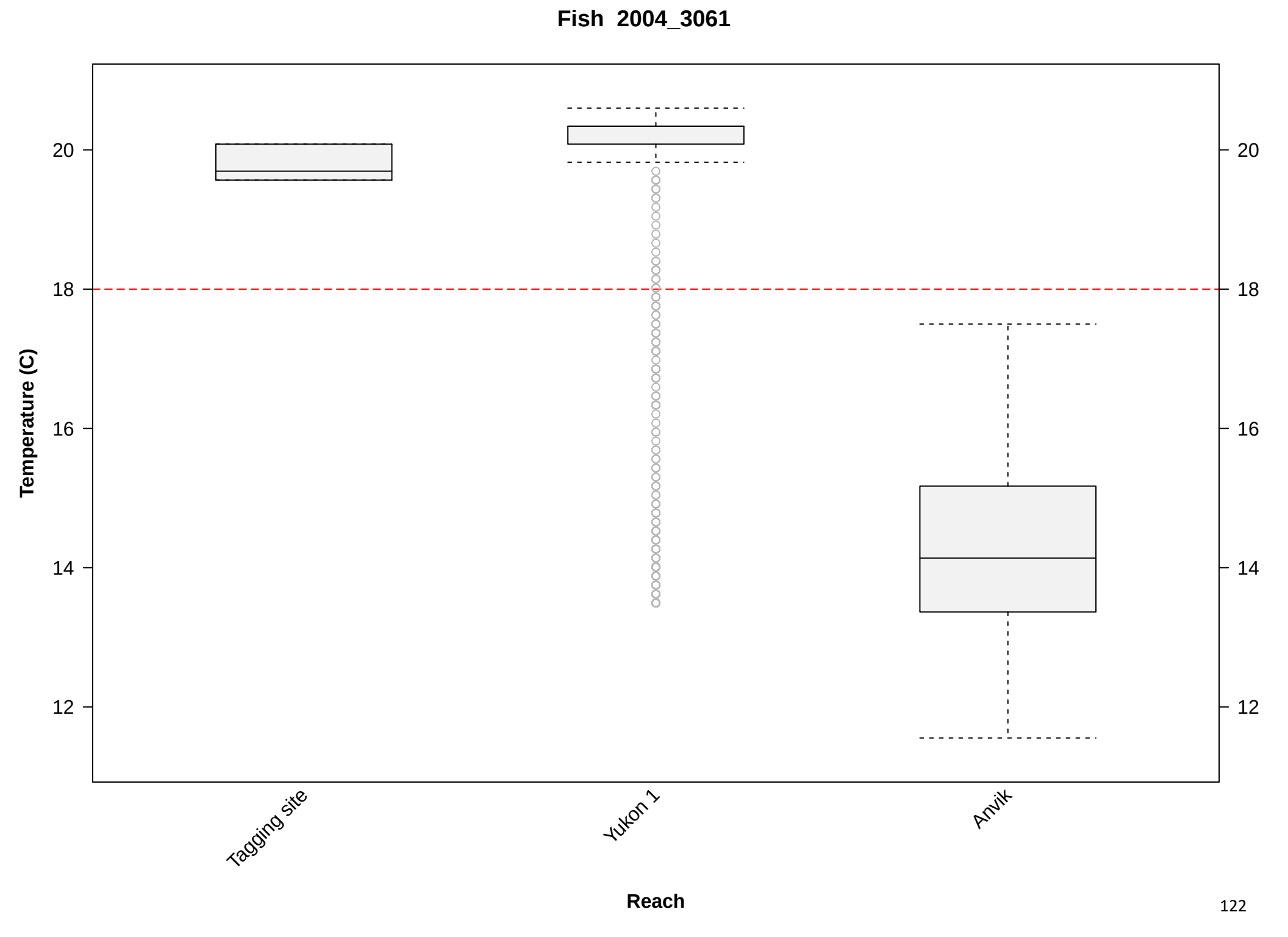

Fish 2004_3061
0
100
200
300
400
500
0
5
10
15
20
Depth (m)
Hours since release

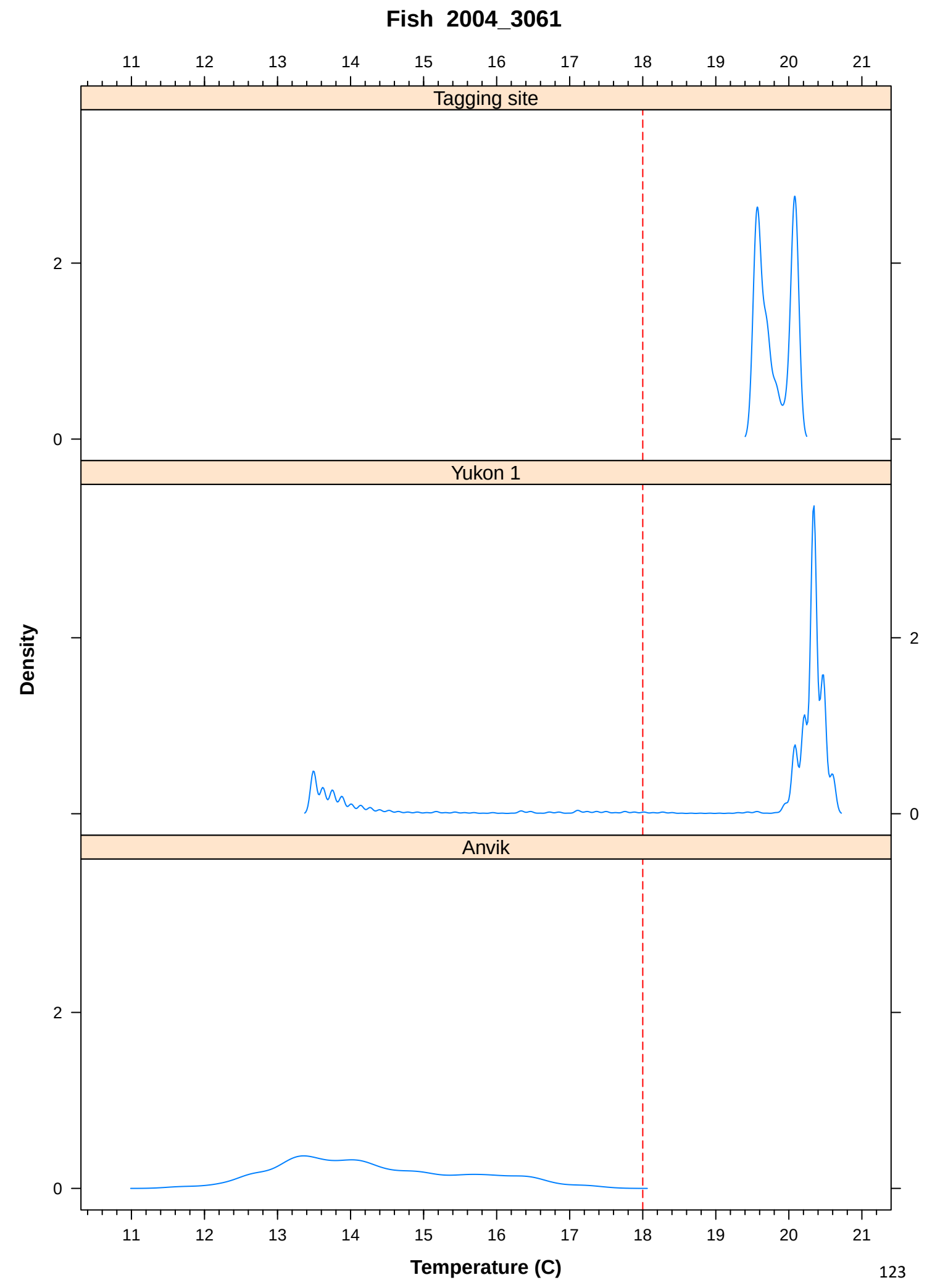

Fish 2004_3061
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Anvik
Reach

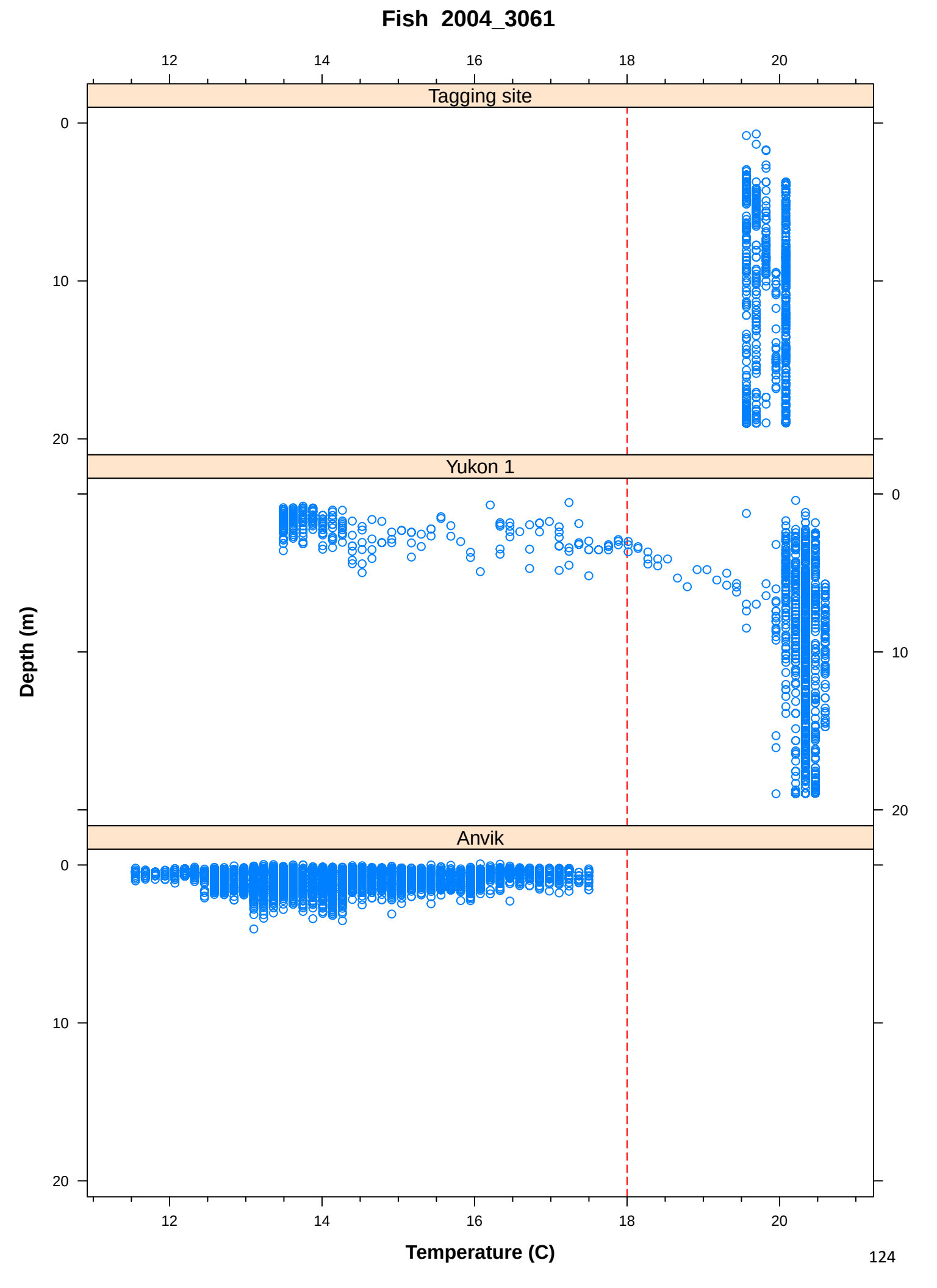

Fish 2004_3061
Tagging site
Yukon 1
Anvik
Density
1
0
1
0
1
0
0
5
10
15
20
Depth (m)

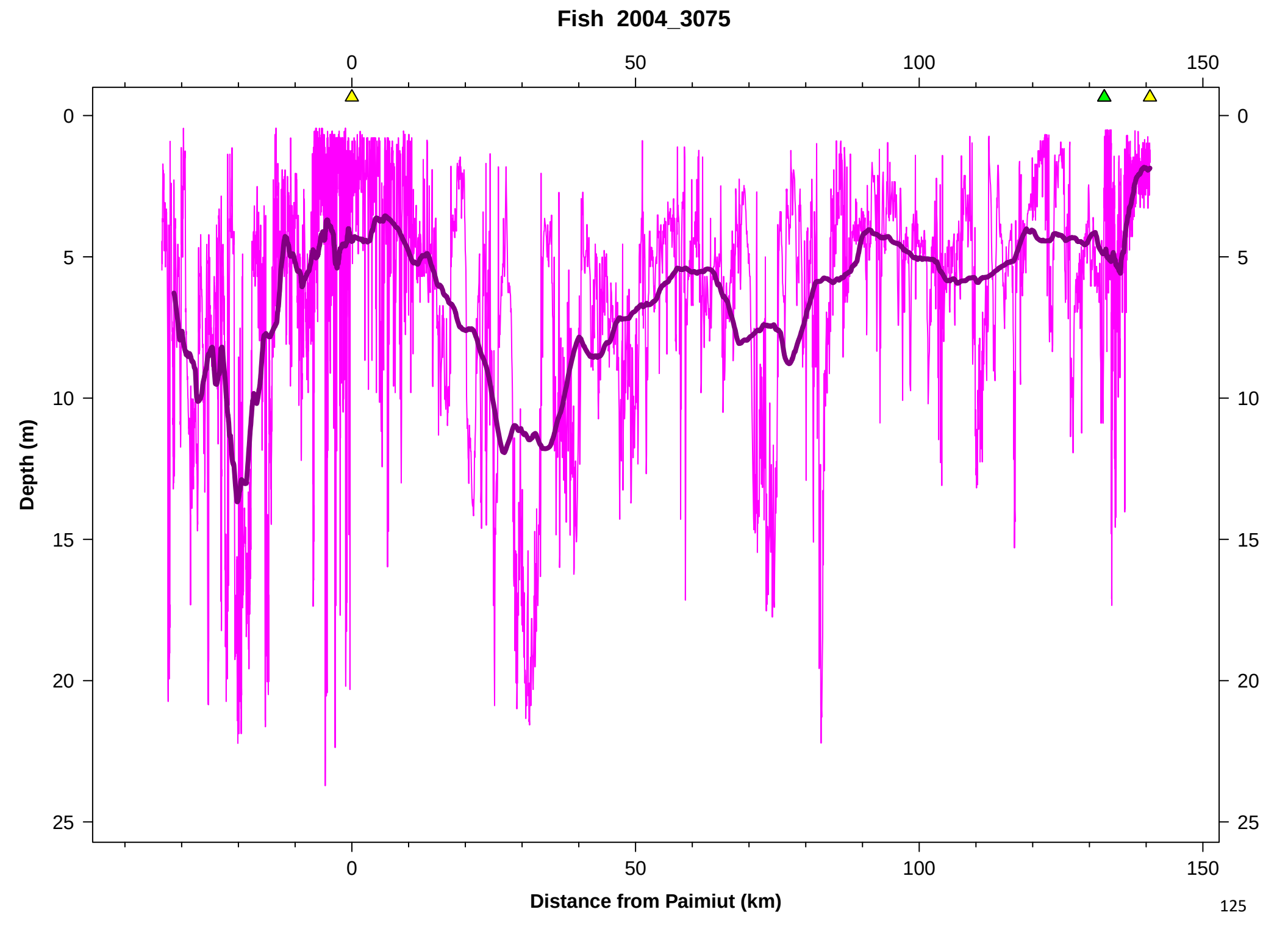

Fish 2004_3061
0
50
100
150
20
18
16
14
Temperature (C)
Distance from Paimiut (km)

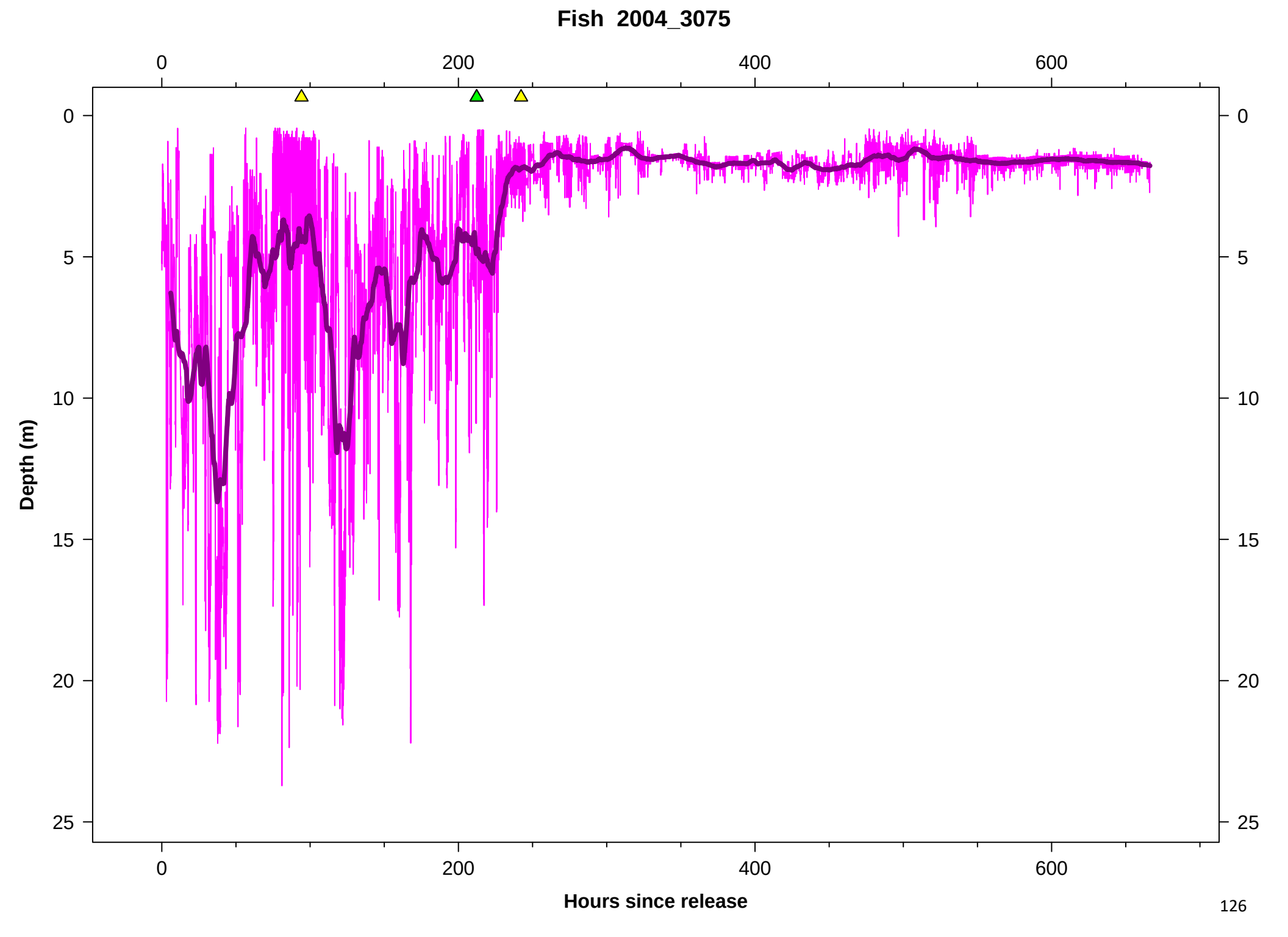

Fish 2004_3061
0
100
200
300
400
500
20
18
16
14
12
Temperature (C)
Hours since release

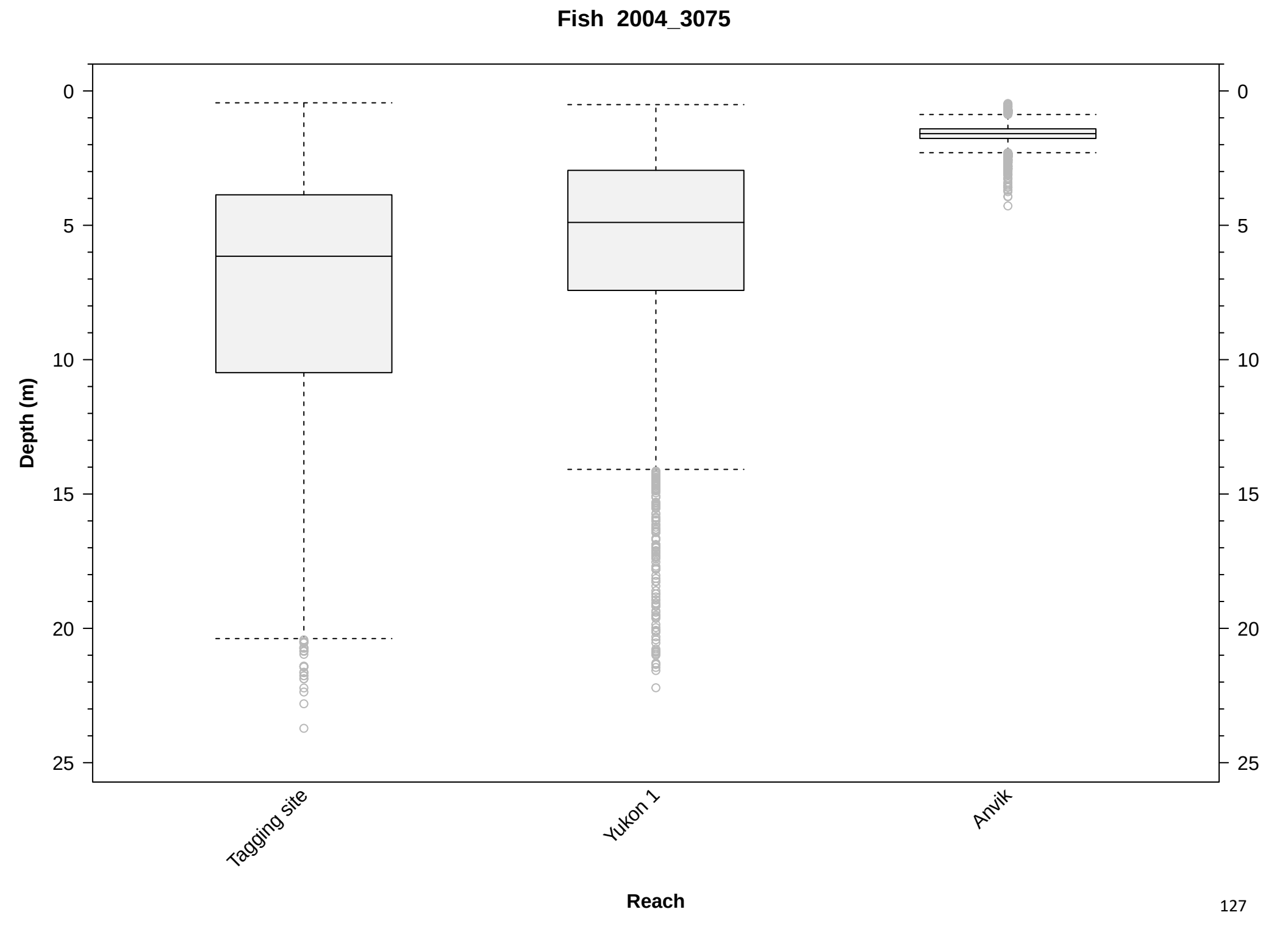

Fish 2004_3061
Temperature (C)
20
18
16
14
12
Tagging site
Yukon 1
Anvik
Reach

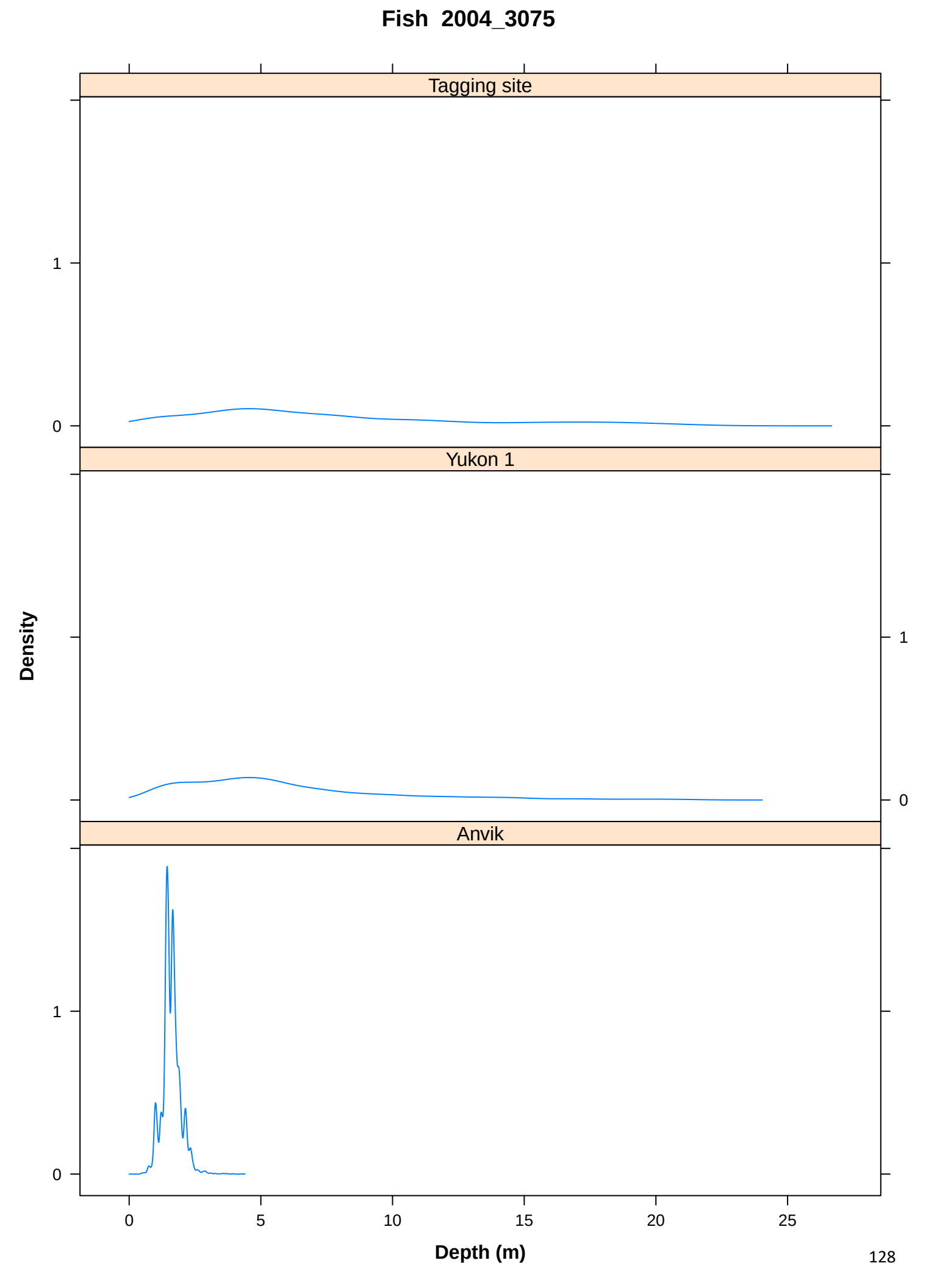

Fish 2004_3061
Tagging site
Yukon 1
Anvik
Density
Temperature (C)
11
12
13
14
15
16
17
18
19
20
21
0
2

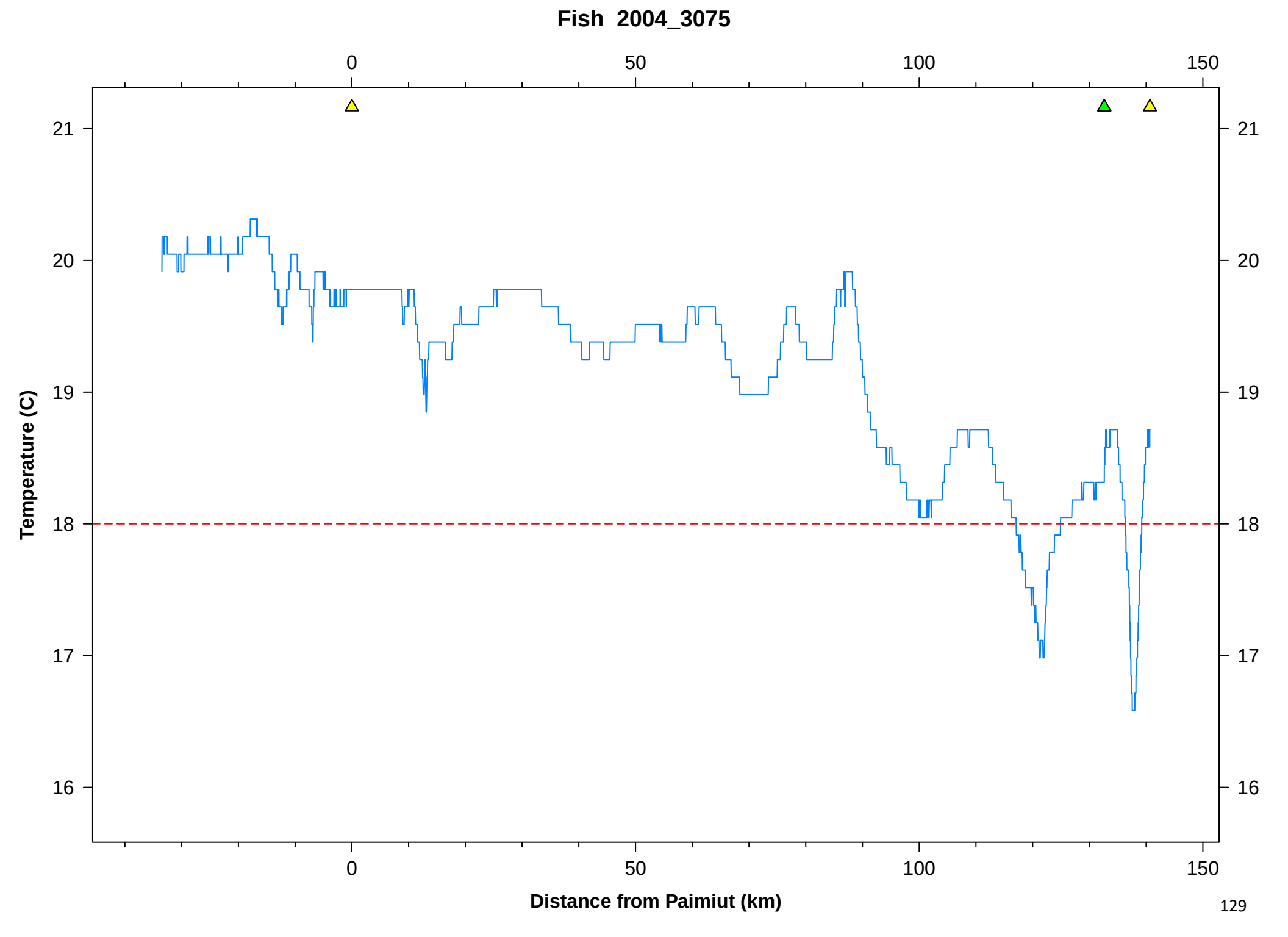

Fish 2004_3061
Tagging site
Yukon 1
Anvik
Depth (m)
Temperature (C)
12
14
16
18
20
0
10
20

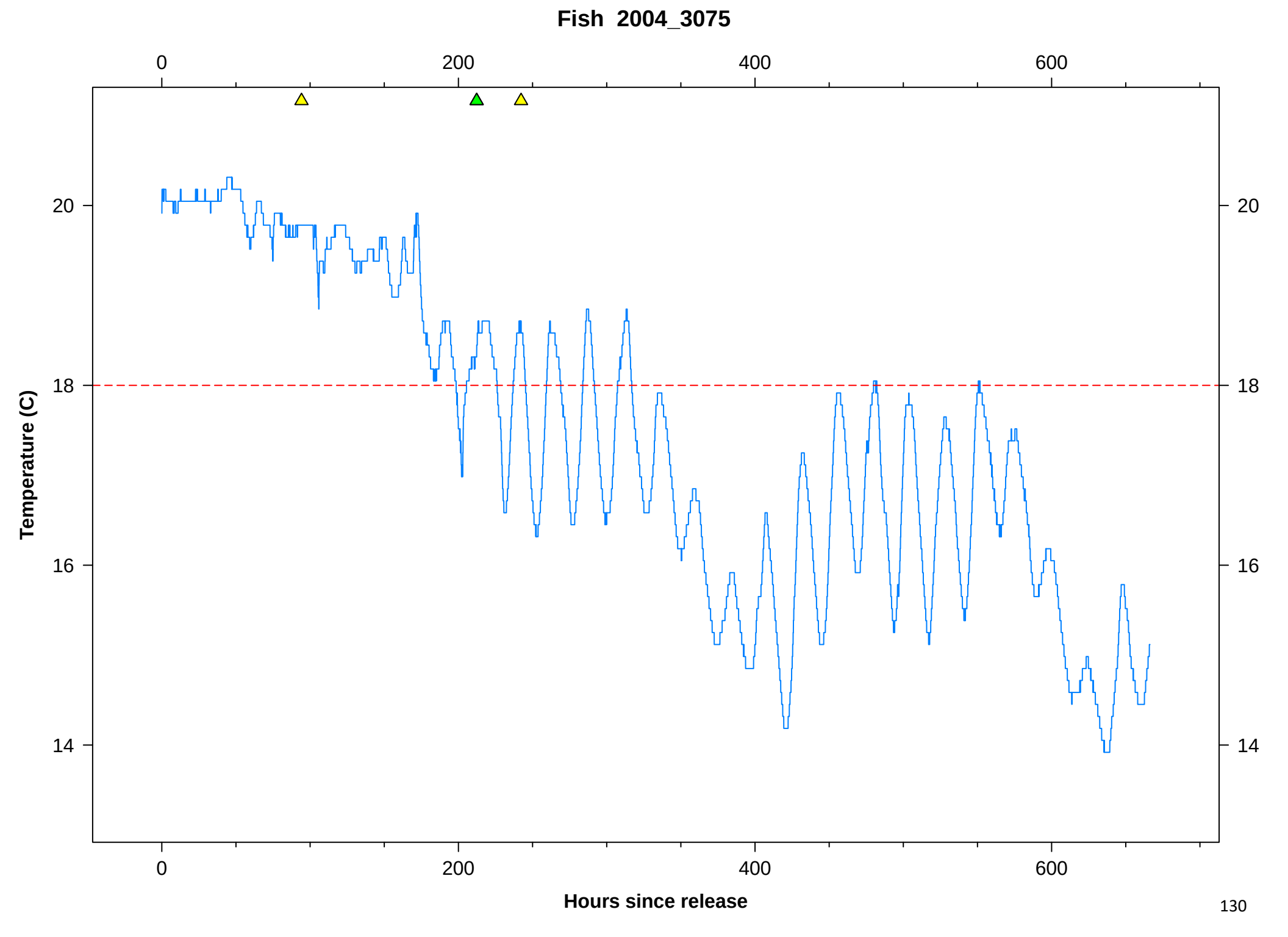

Fish 2004_3075
0
50
100
150
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

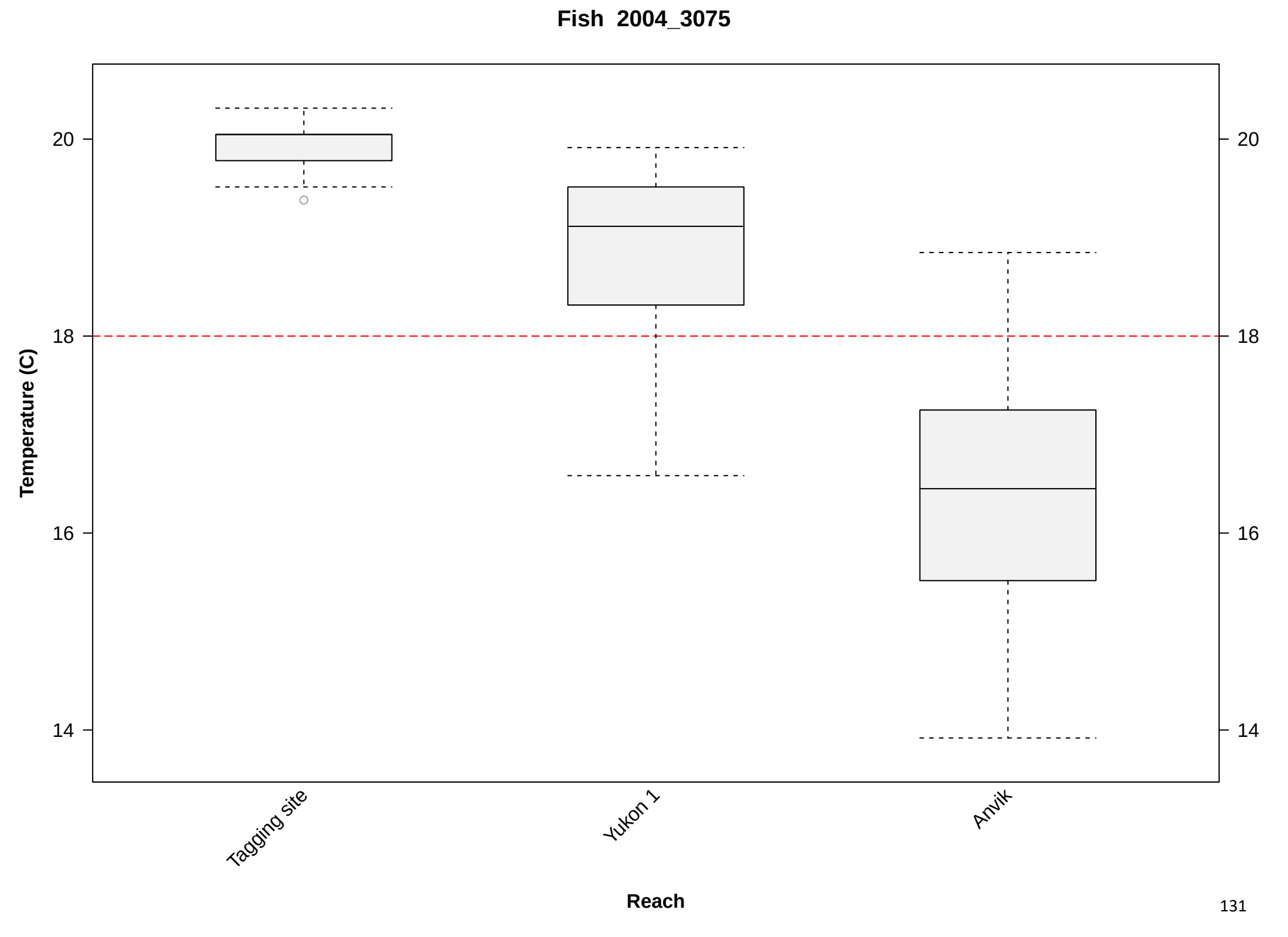

Fish 2004_3075
0
200
400
600
0
5
10
15
20
25
Depth (m)
Hours since release

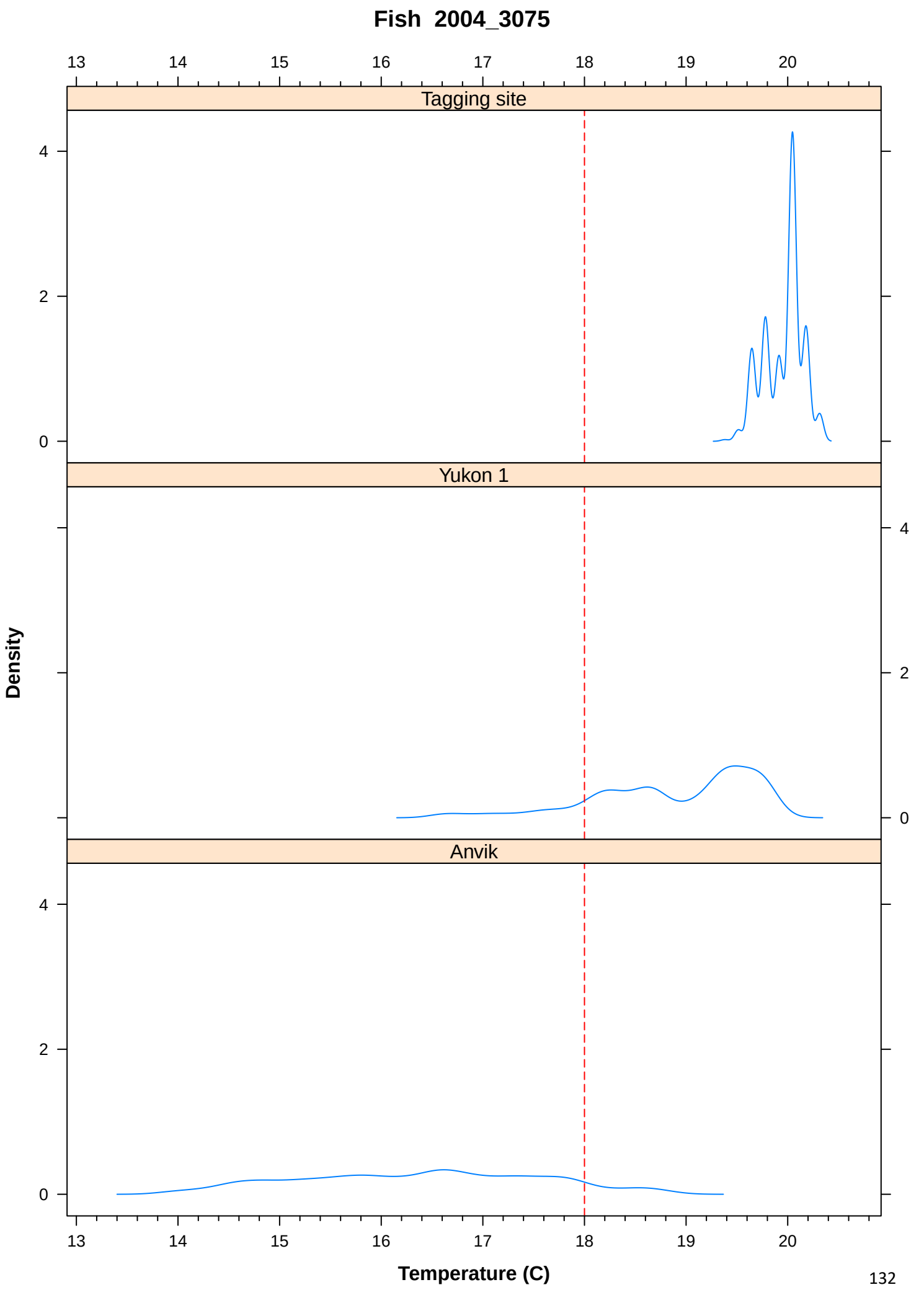

Fish 2004_3075
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Anvik
Reach

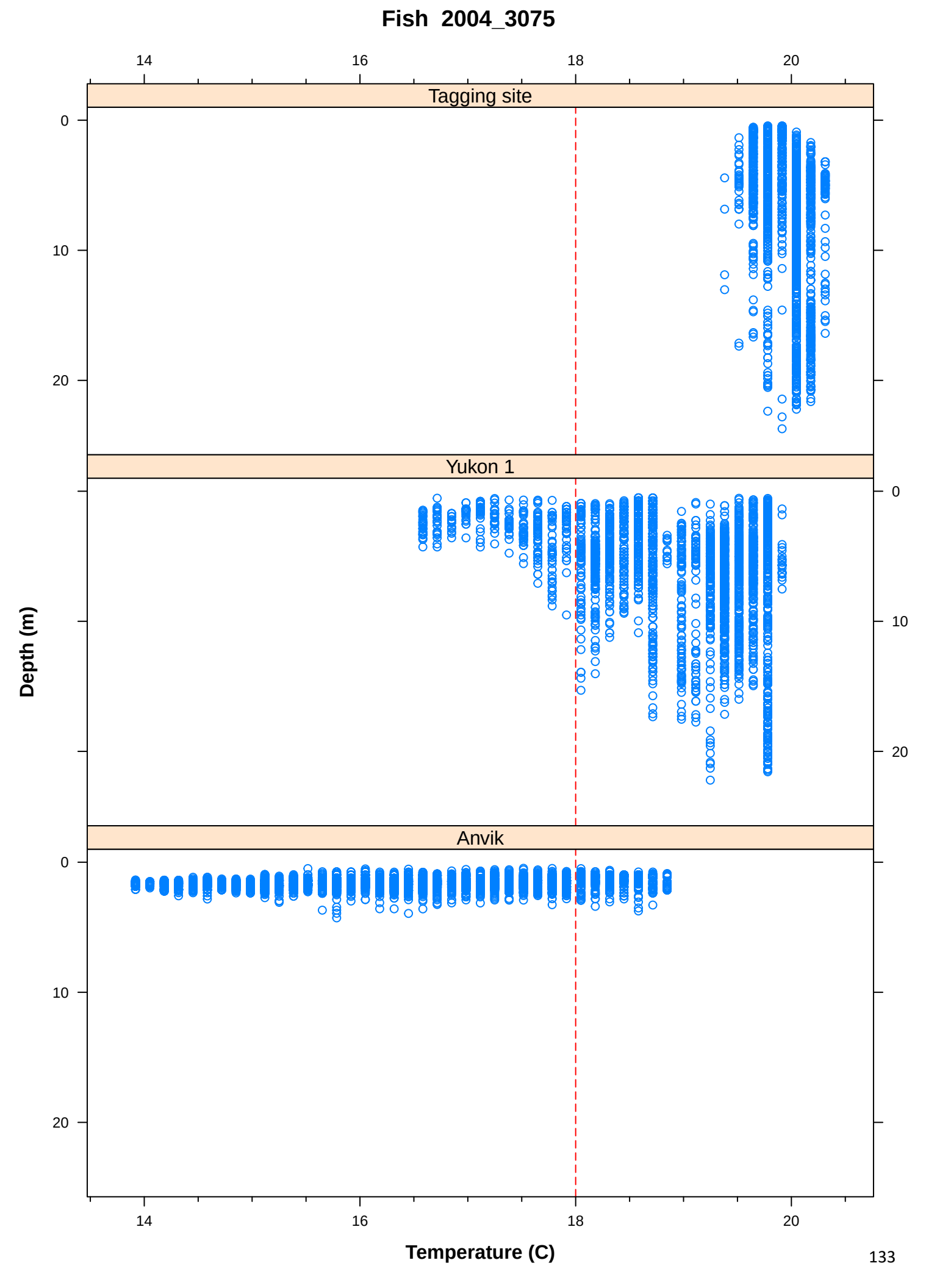

Fish 2004_3075
Tagging site
Yukon 1
Anvik
Density
Depth (m)
0
1
5
10
15
20
25

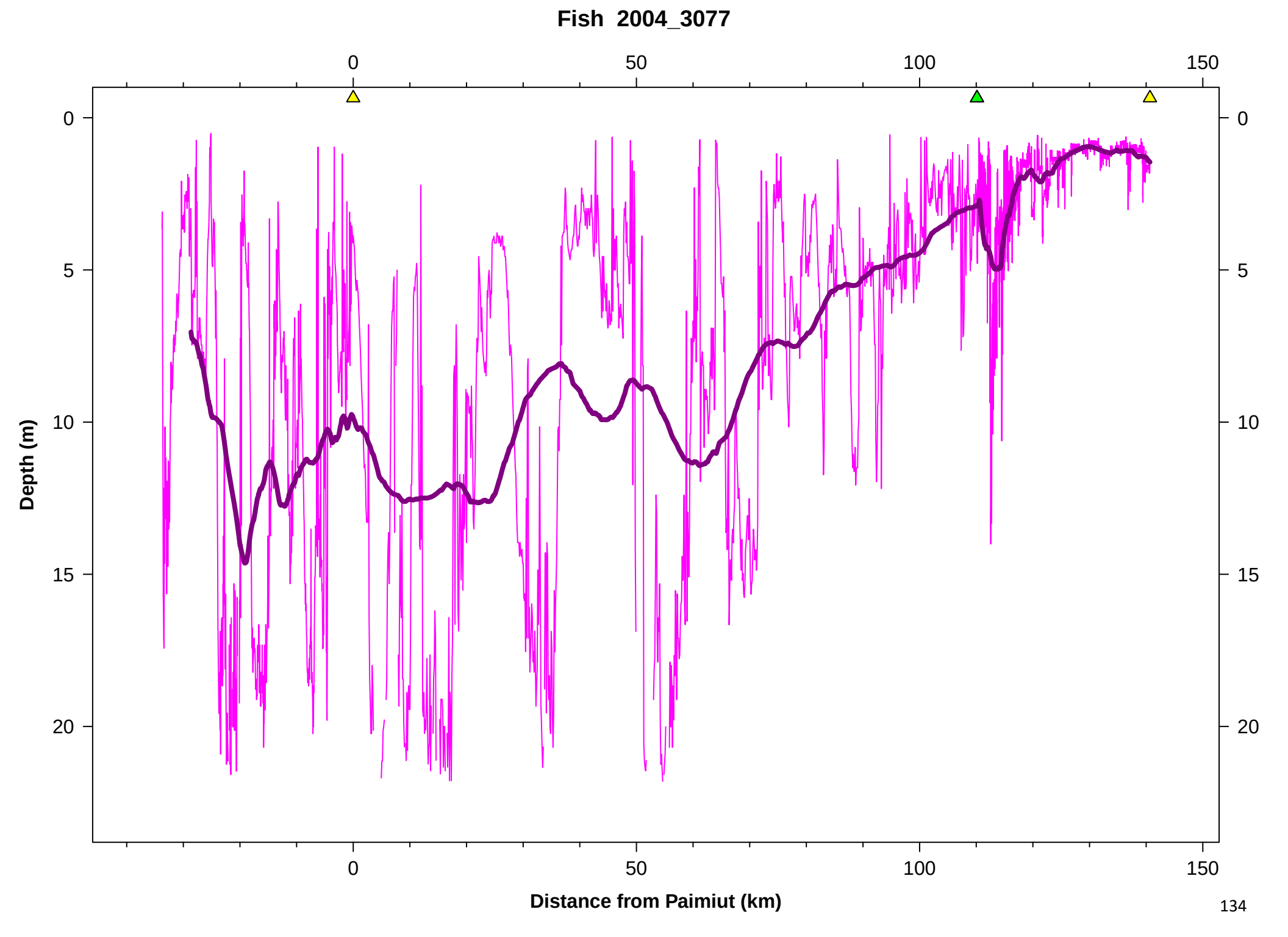

Fish 2004_3075
0
50
100
150
21
20
19
18
17
16
Temperature (C)
Distance from Paimiut (km)

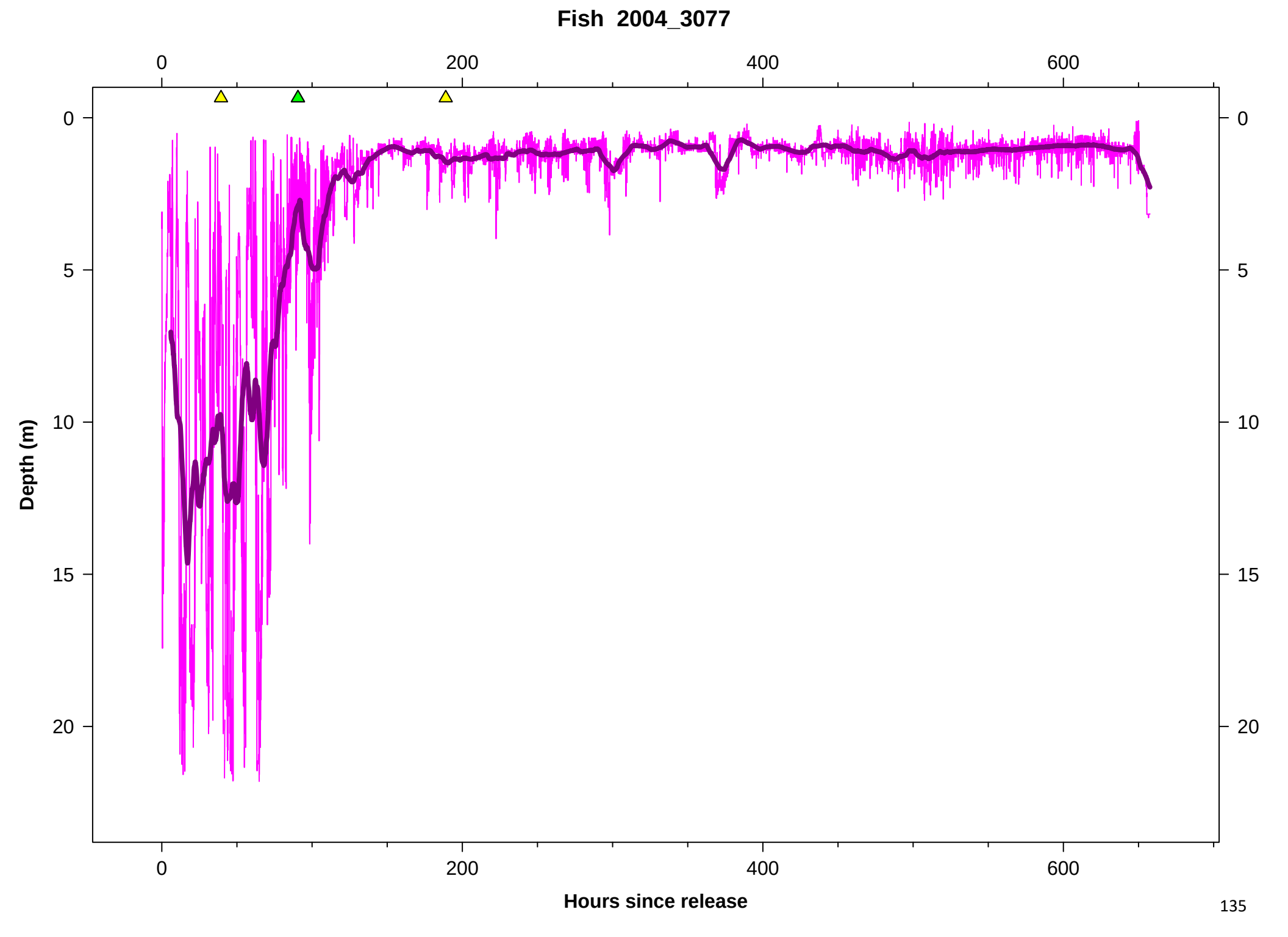

Fish 2004_3075
0
200
400
600
20
18
16
14
Temperature (C)
Hours since release

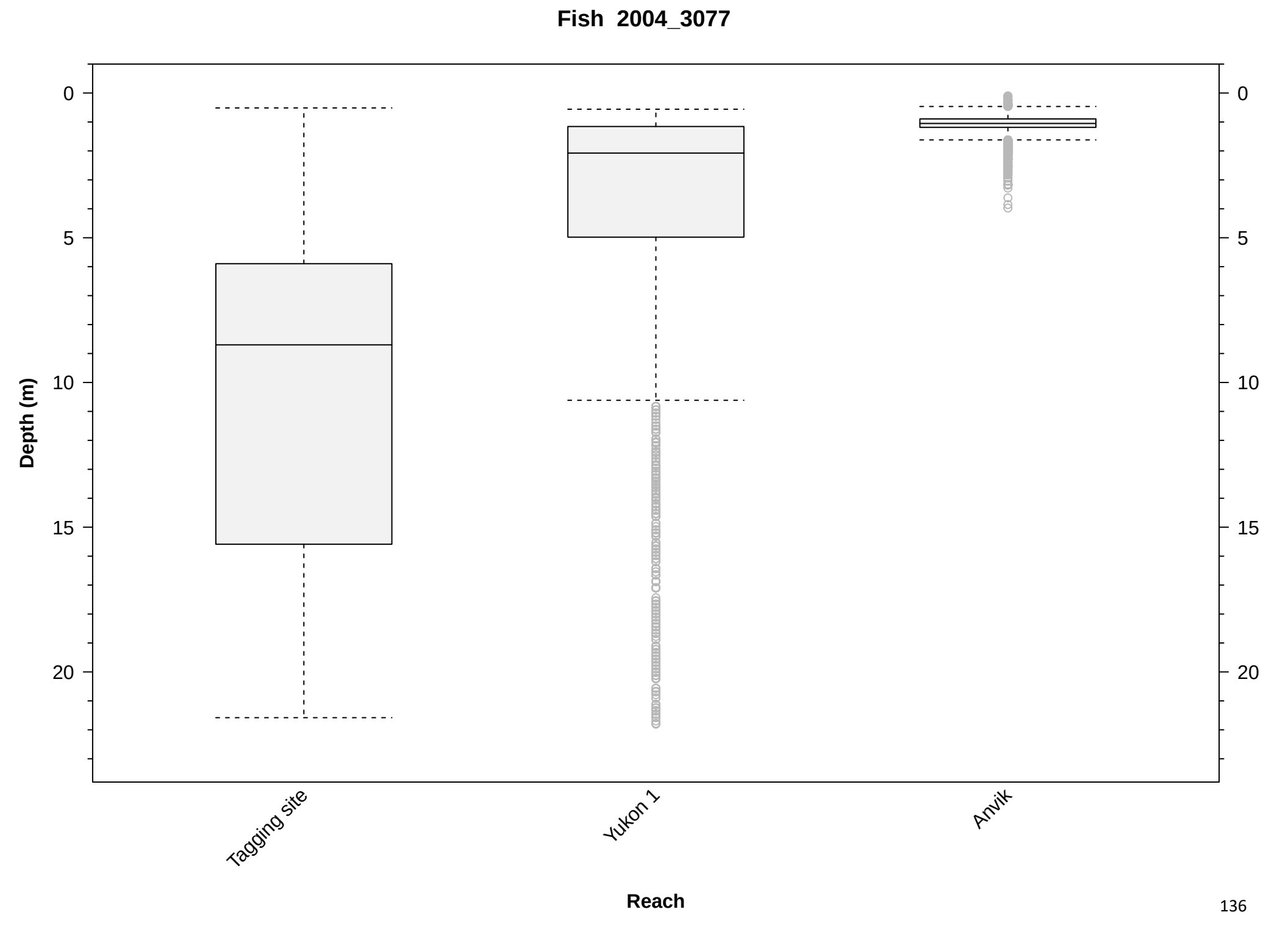

Fish 2004_3075
Temperature (C)
20
18
16
14
Tagging site
Yukon 1
Anvik
Reach

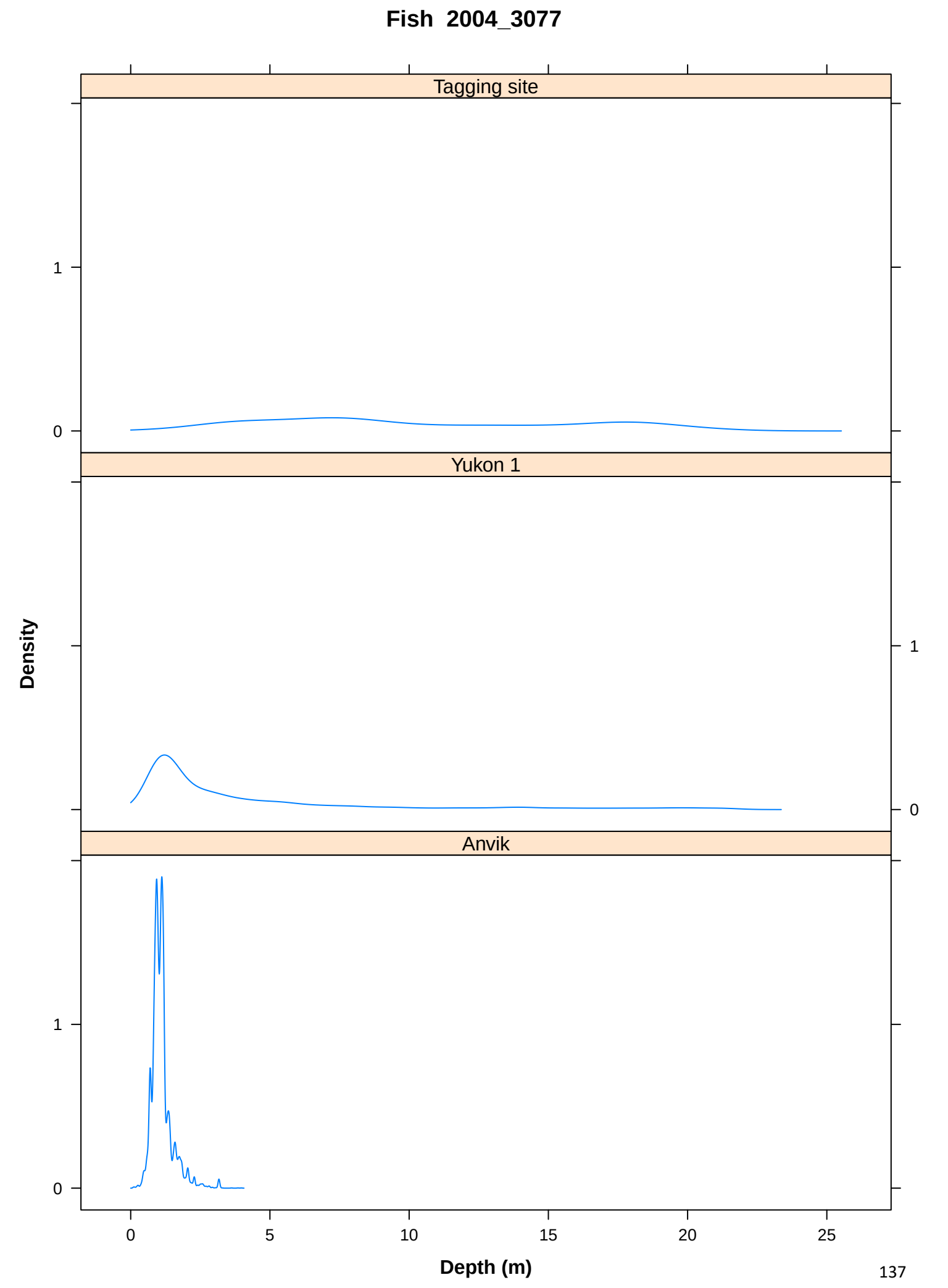

Fish 2004_3075
Tagging site
Yukon 1
Anvik
Density
Temperature (C)
13
14
15
16
17
18
19
20
0
2
4

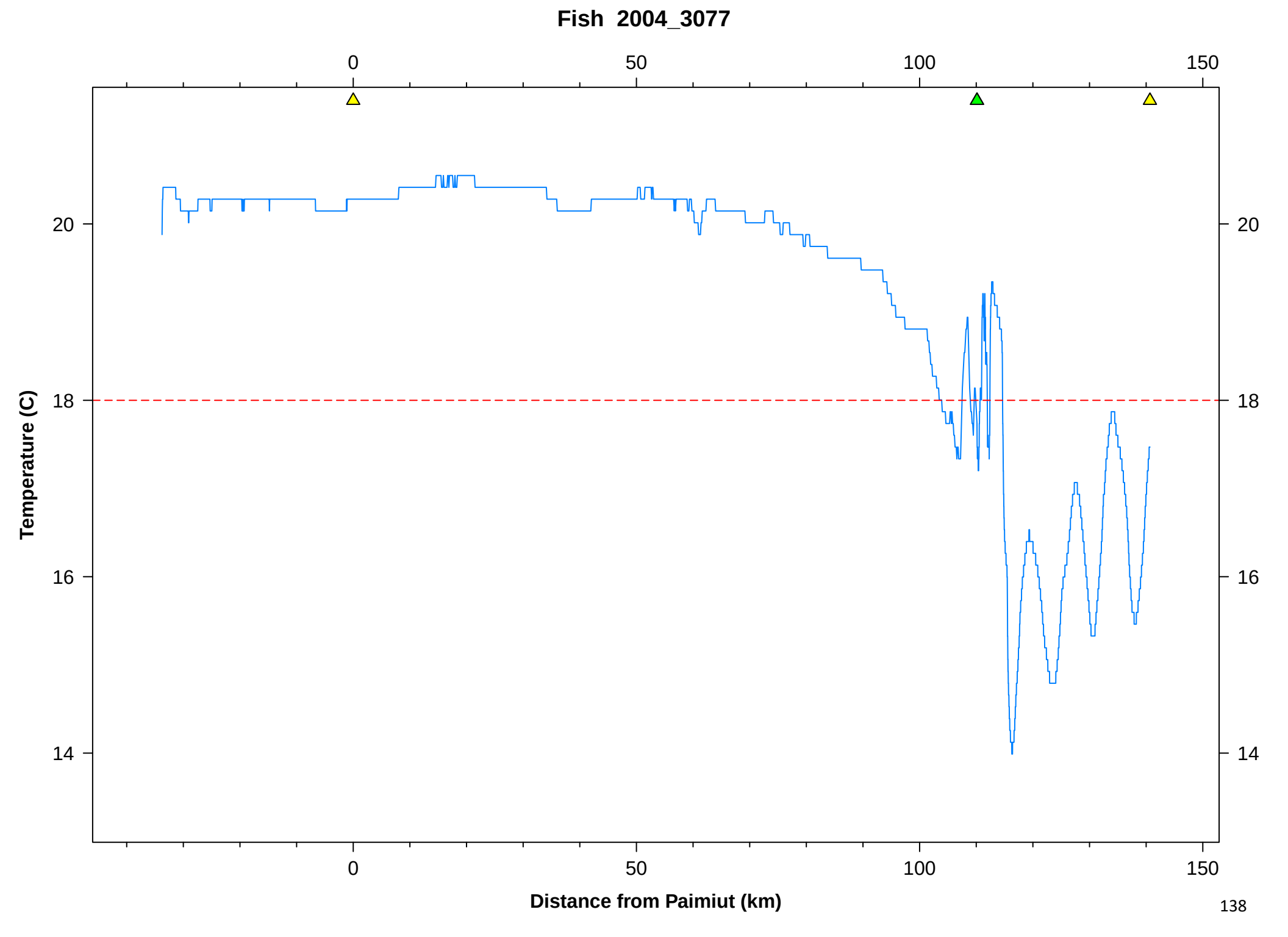

Fish 2004_3075
Tagging site
Yukon 1
Anvik
Depth (m)
Temperature (C)
14
16
18
20
0
10
20

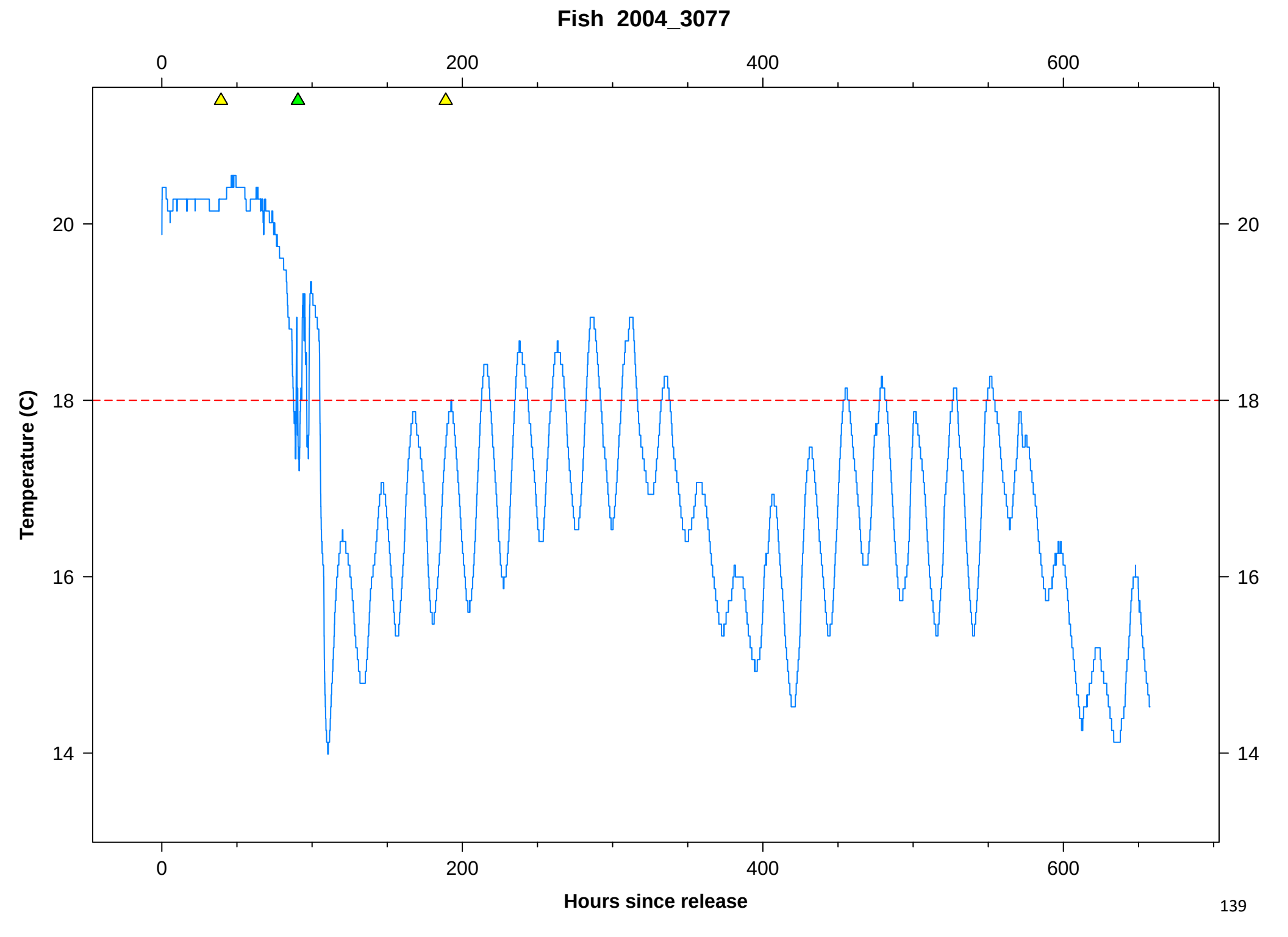

Fish 2004_3077
0
50
100
150
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

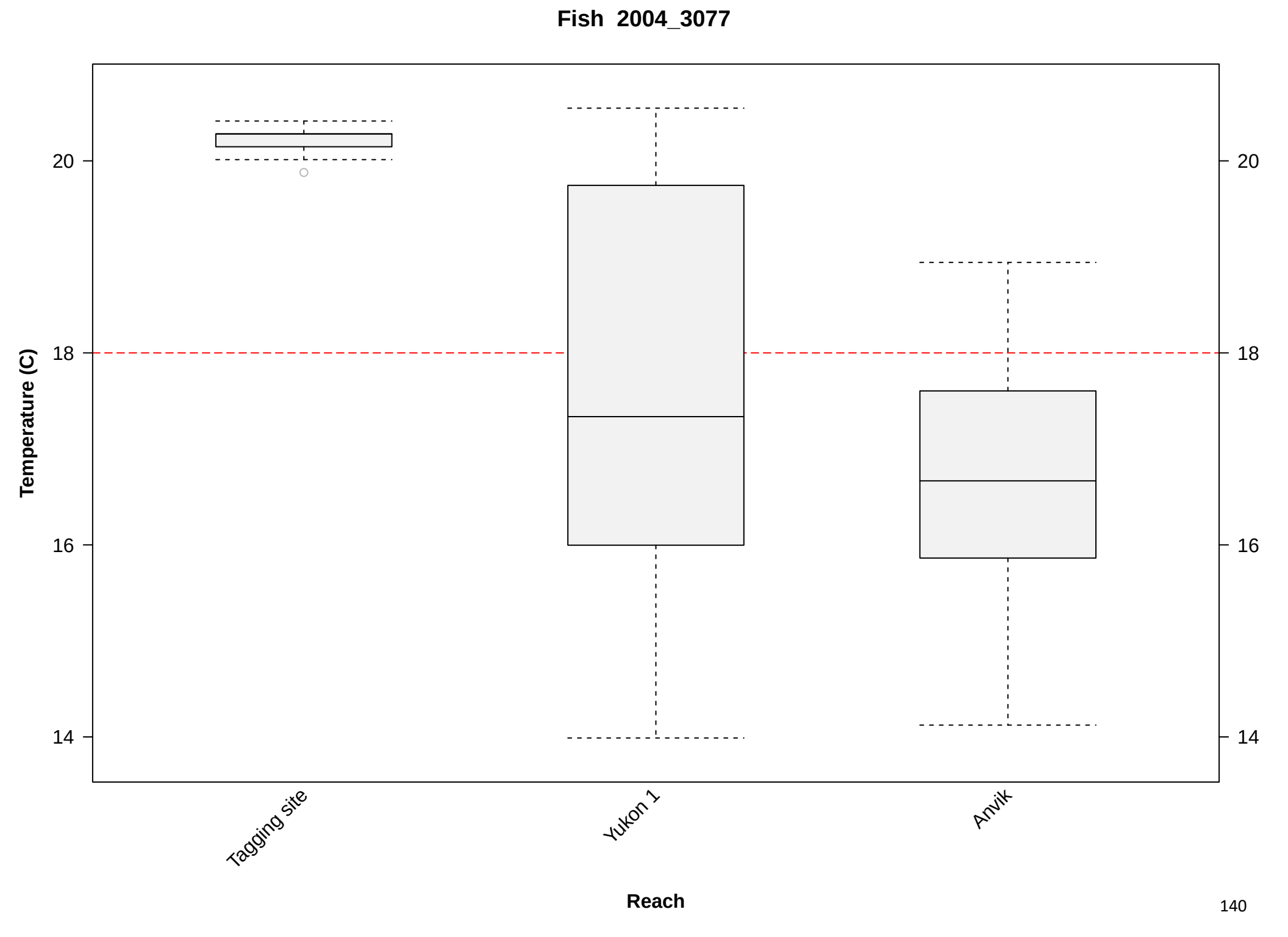

Fish 2004_3077
0
200
400
600
0
5
10
15
20
Depth (m)
Hours since release

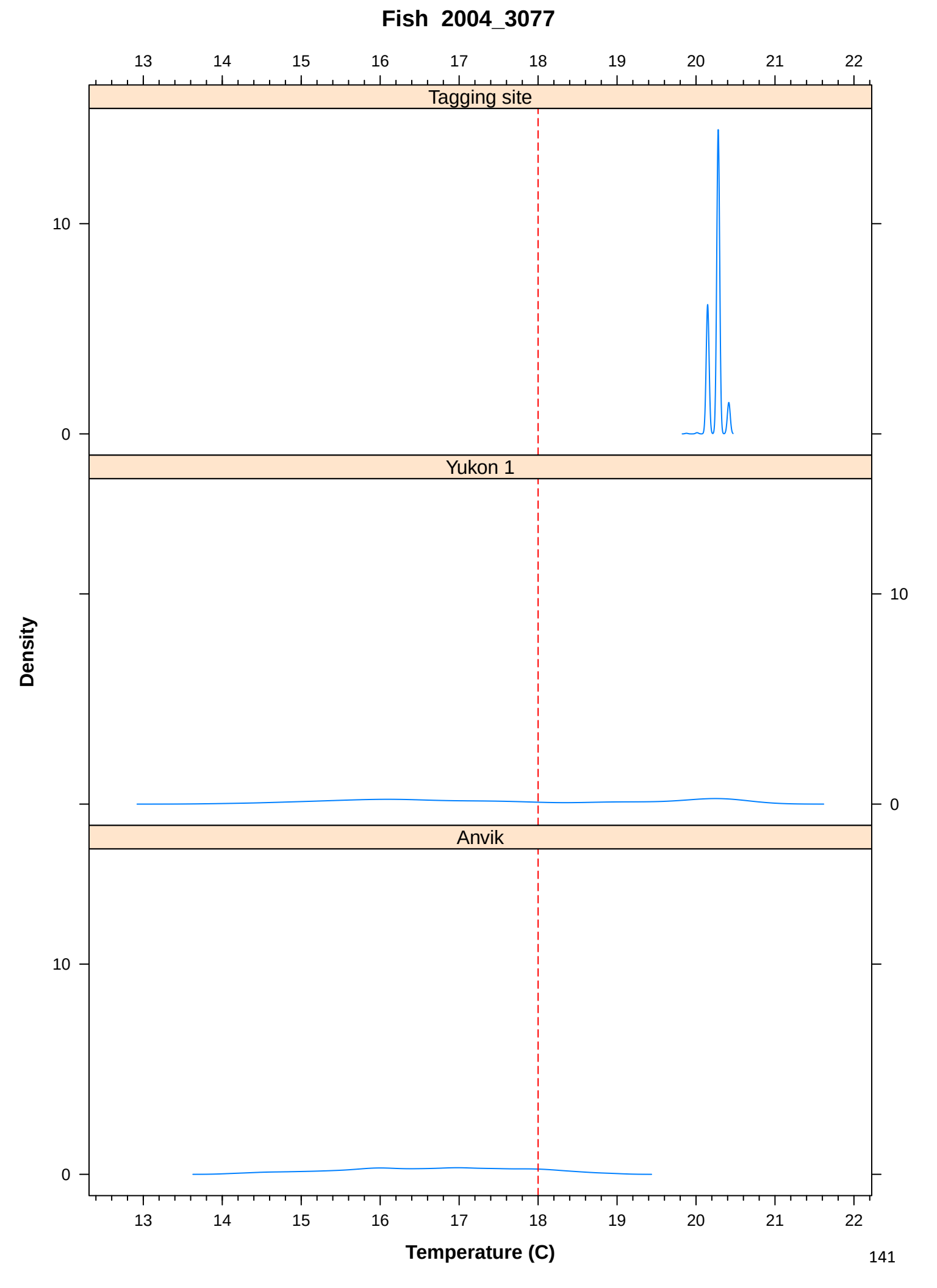

Fish 2004_3077
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Anvik
Reach

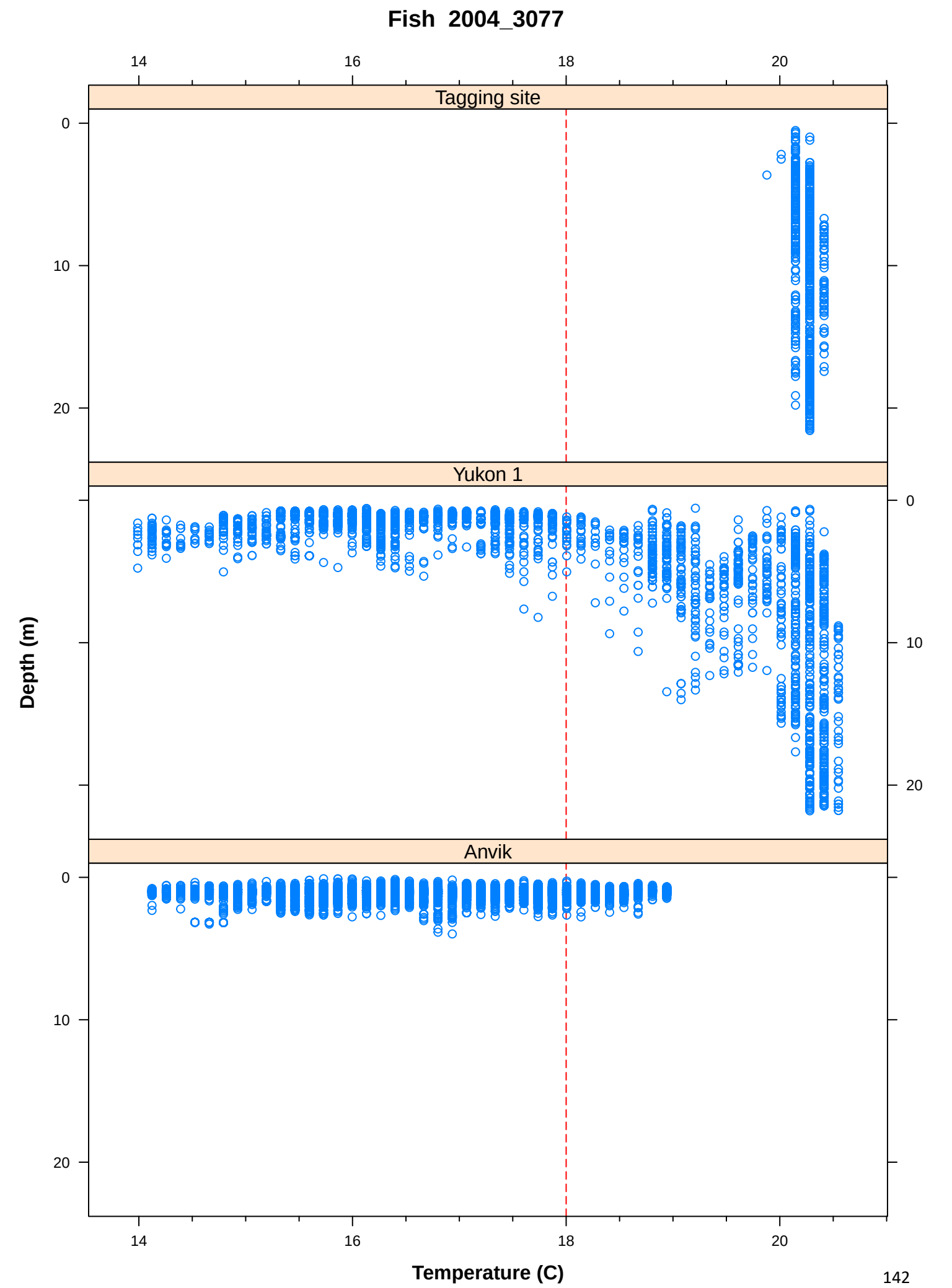

Fish 2004_3077
Tagging site
Yukon 1
Anvik
Density
Depth (m)
0
1
5
10
15
20
25


Fish 2004_3077
0
50
100
150
20
18
16
14
Temperature (C)
Distance from Paimiut (km)

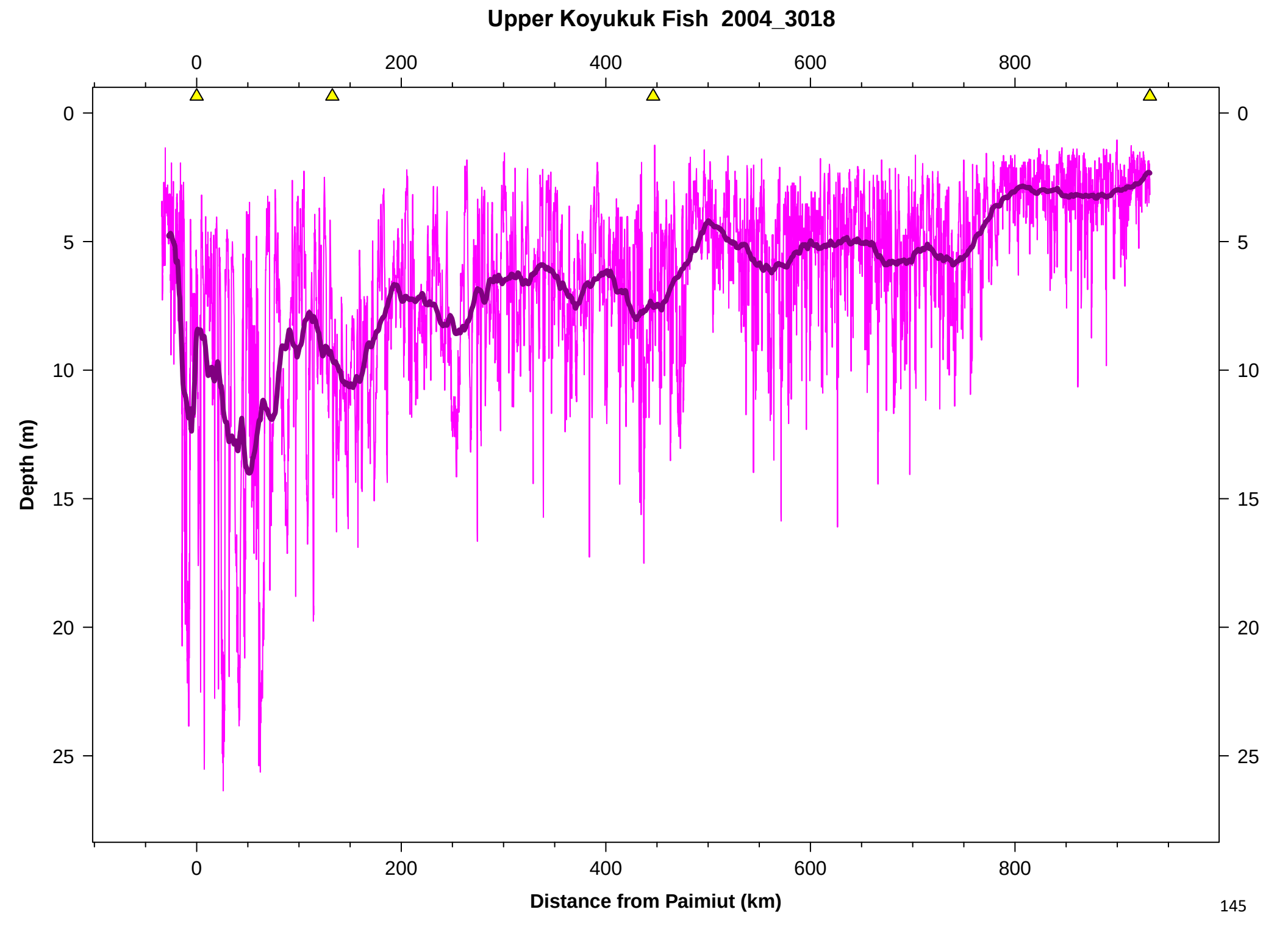

Fish 2004_3077
0
200
400
600
20
18
16
14
Temperature (C)
Hours since release

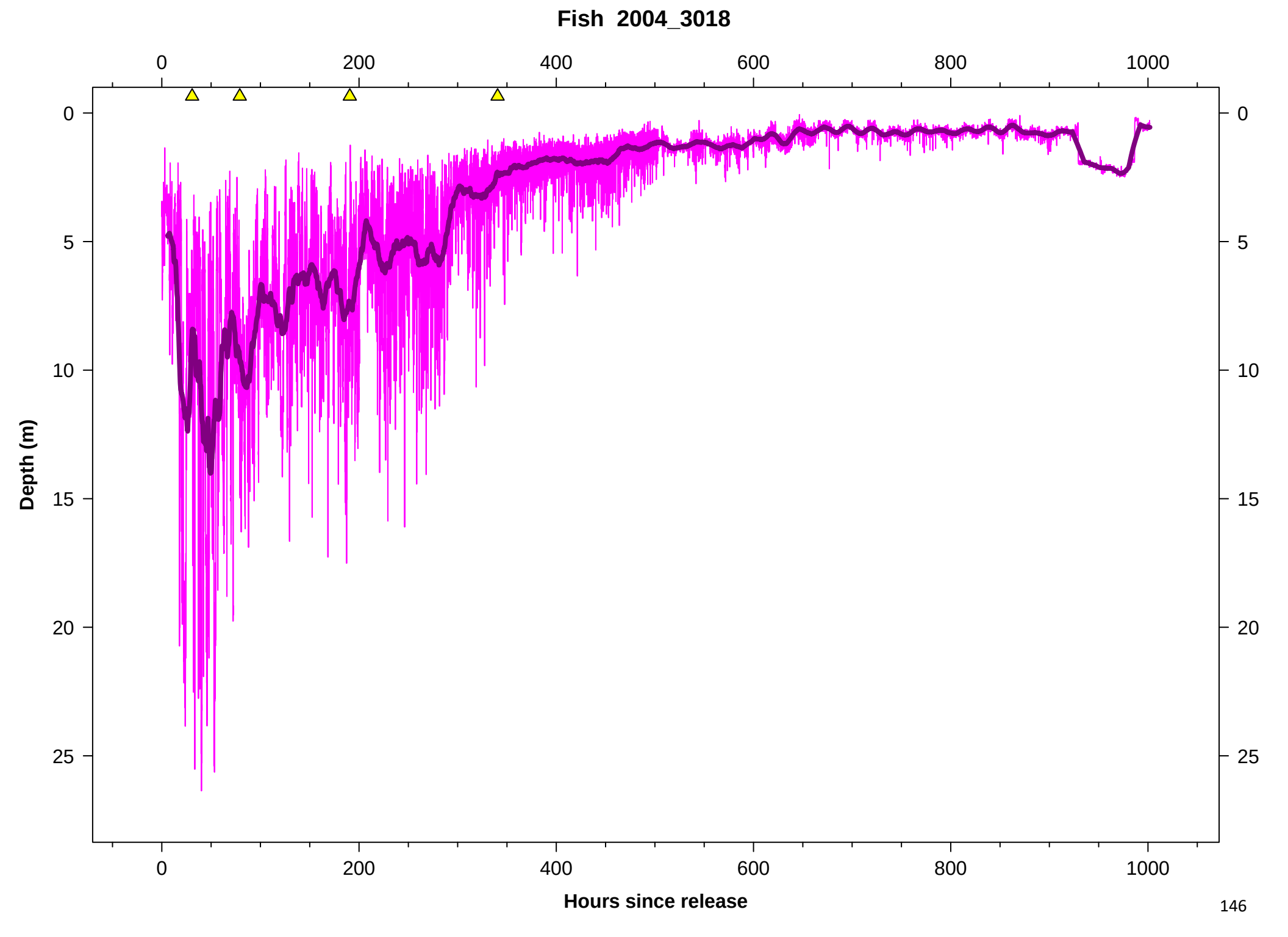

Fish 2004_3077
Temperature (C)
20
18
16
14
Tagging site
Yukon 1
Anvik
Reach

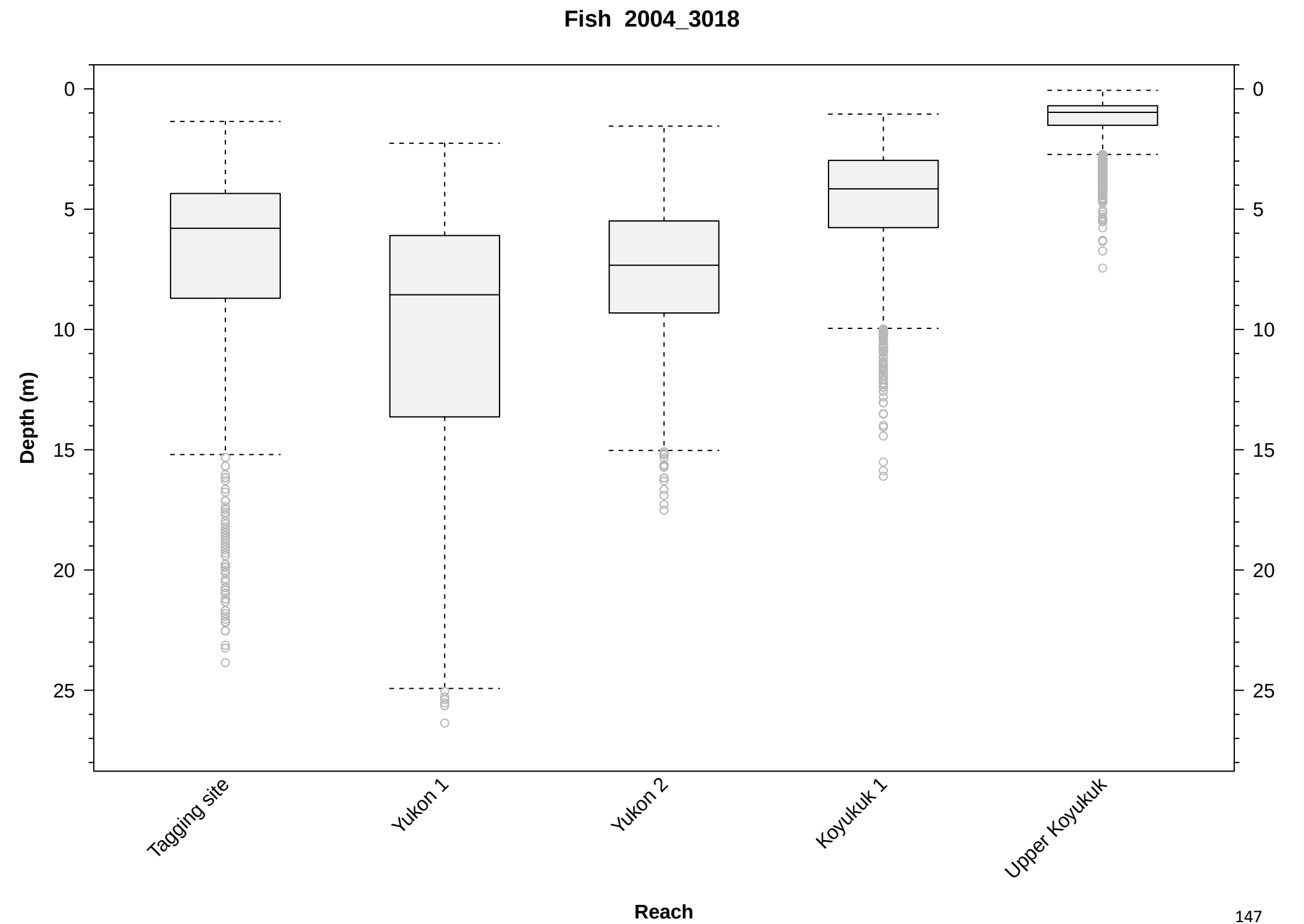

Fish 2004_3077
13
14
15
16
17
18
19
20
21
22
Tagging site
10
0
Yukon 1
10
0
Anvik
10
0
Density
Temperature (C)

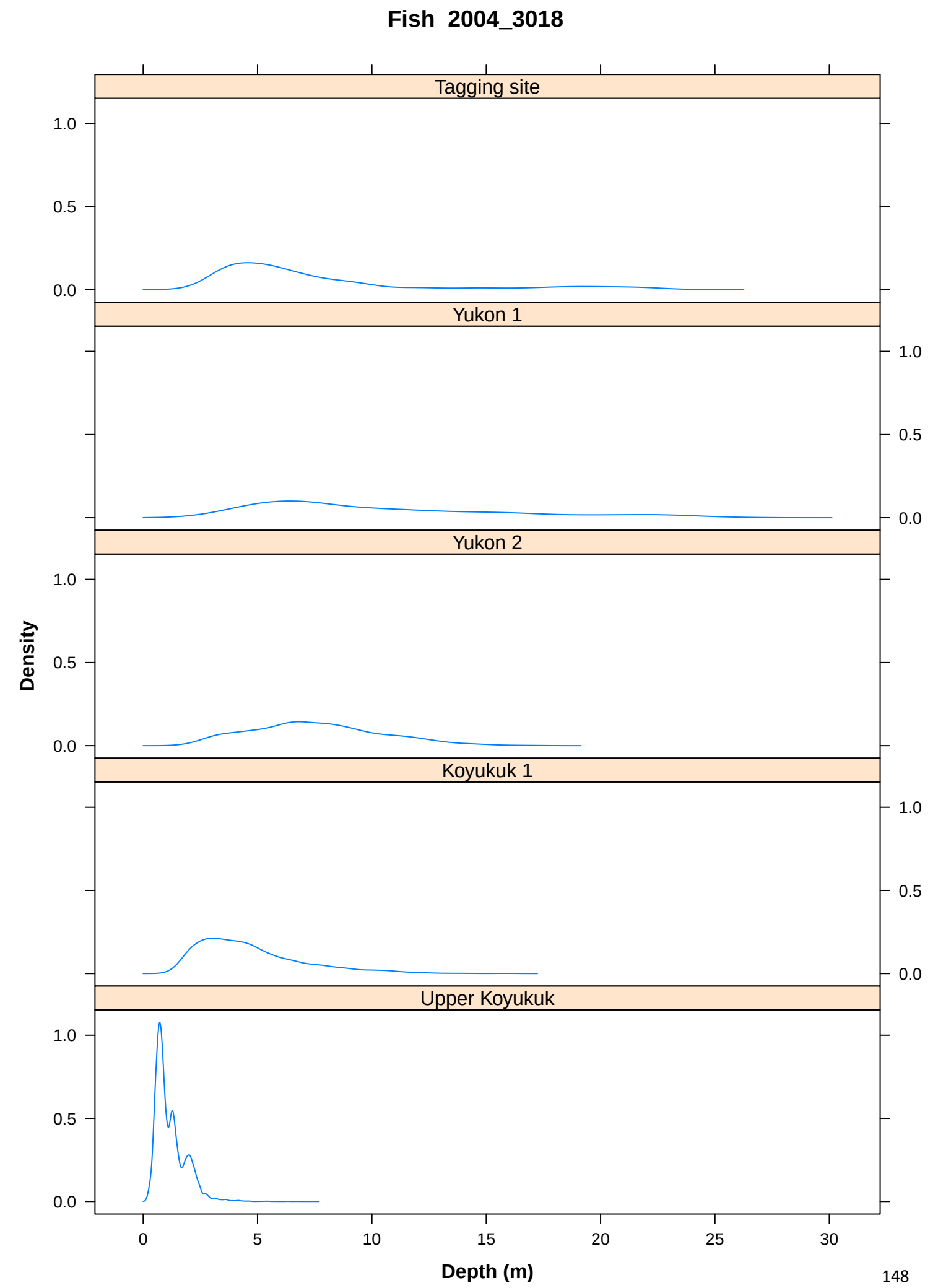

Fish 2004_3077
Tagging site
Yukon 1
Anvik
Depth (m)
Temperature (C)
14
16
18
20
0
10
20

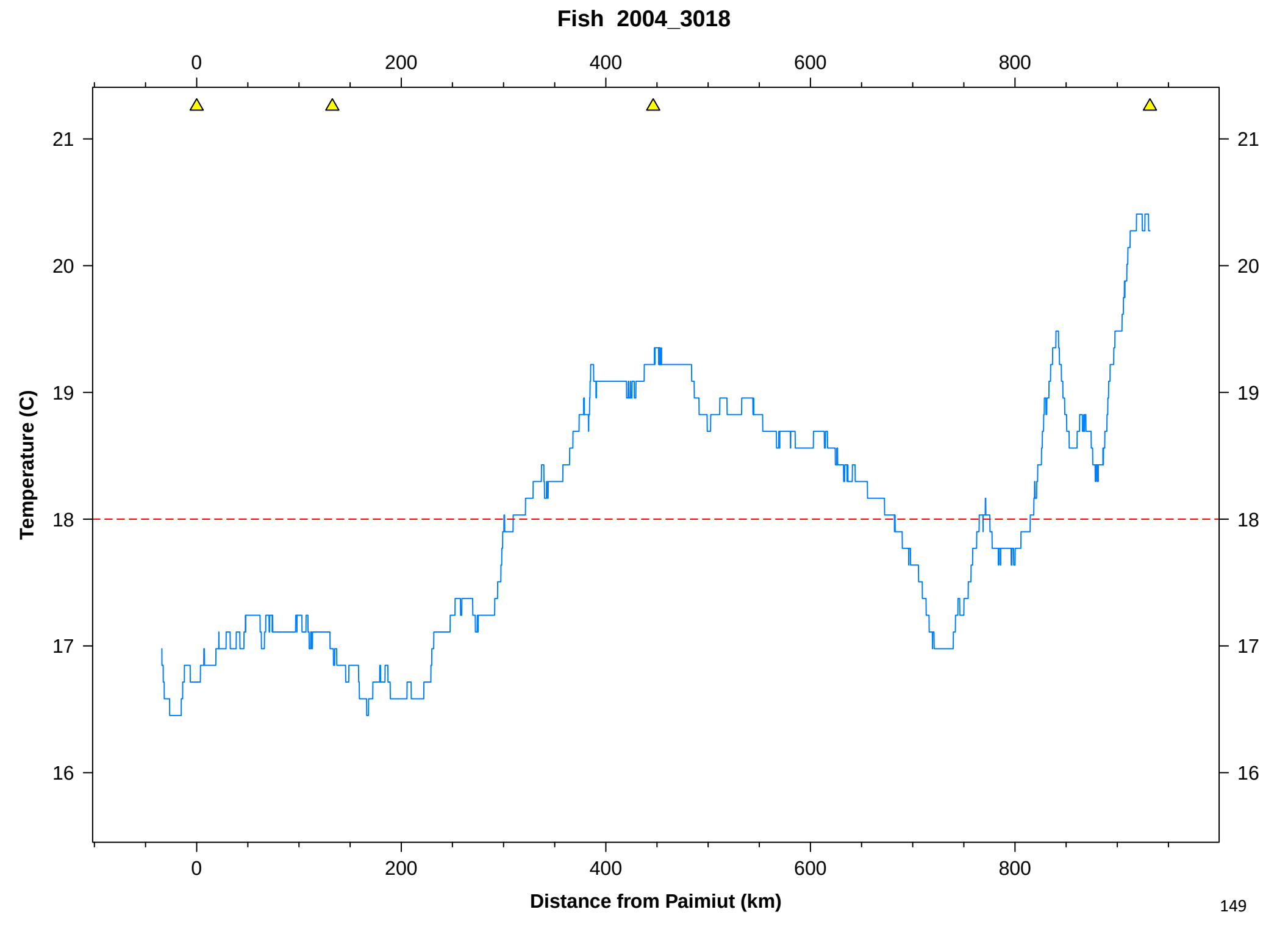
Appendix 3. -- Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Upper Koyukuk in 2002-2004 145

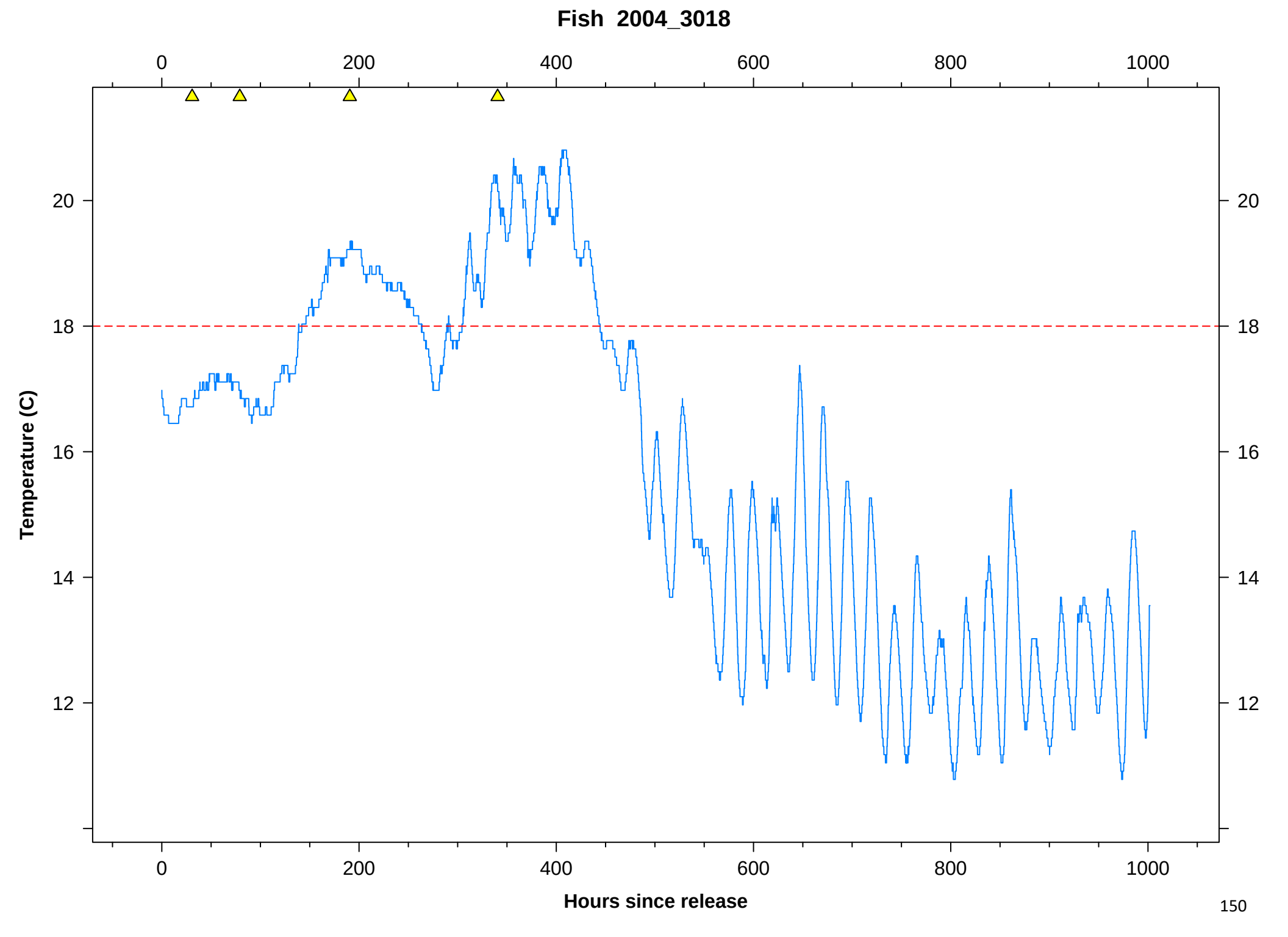

Upper Koyukuk Fish 2004_3018
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

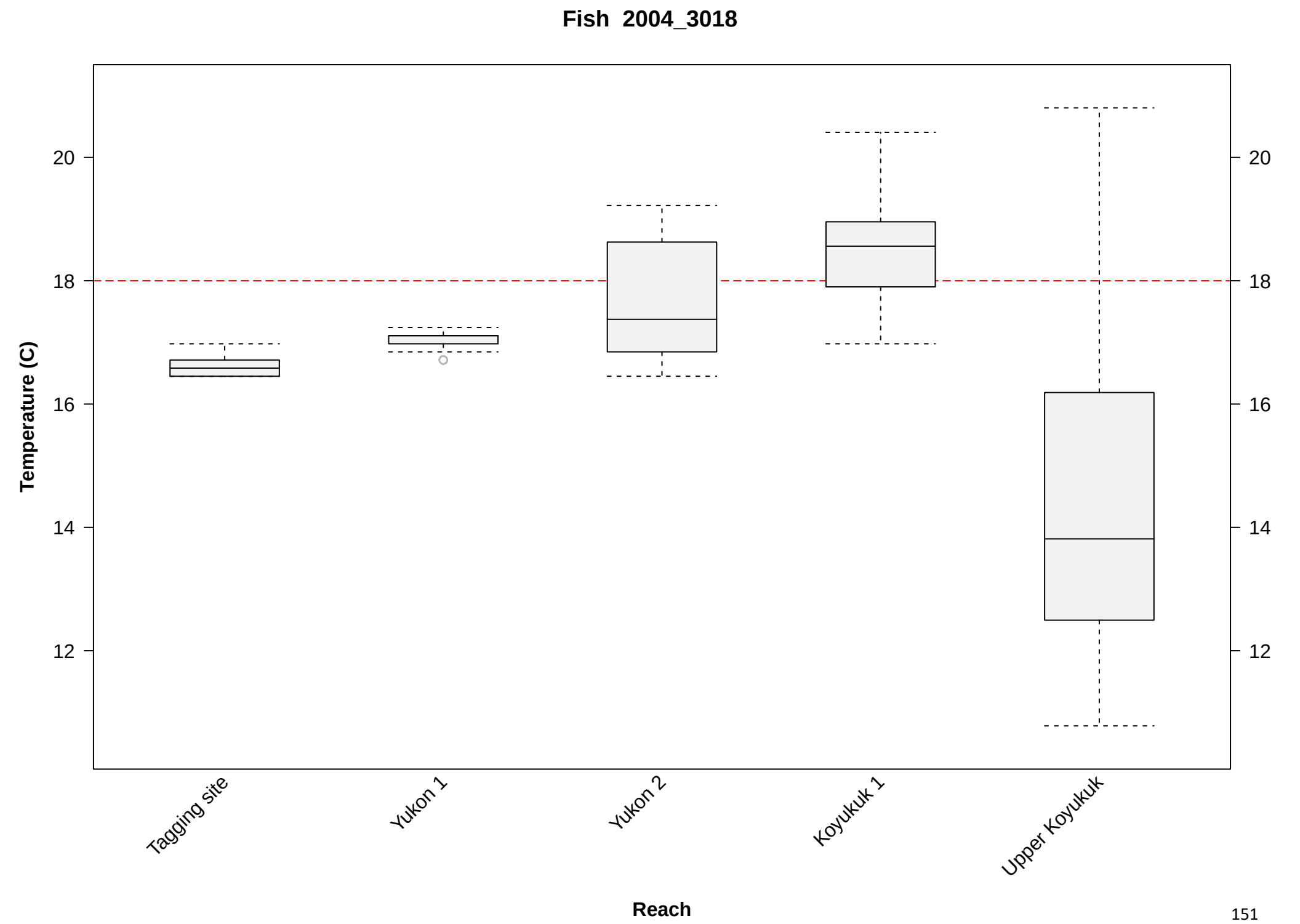

Fish 2004_3018
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release

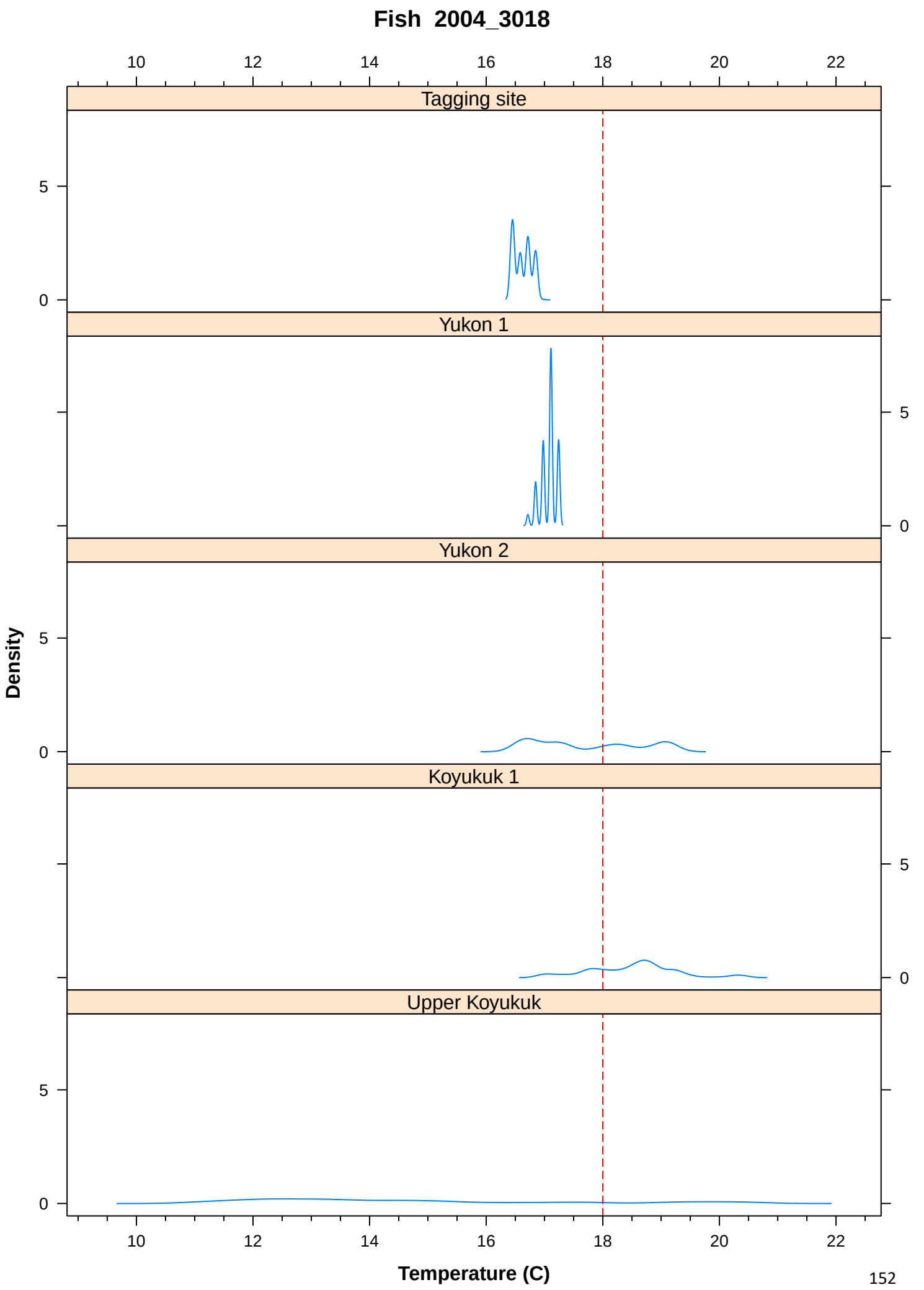

Fish 2004_3018
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Koyukuk 1
Upper Koyukuk
Reach

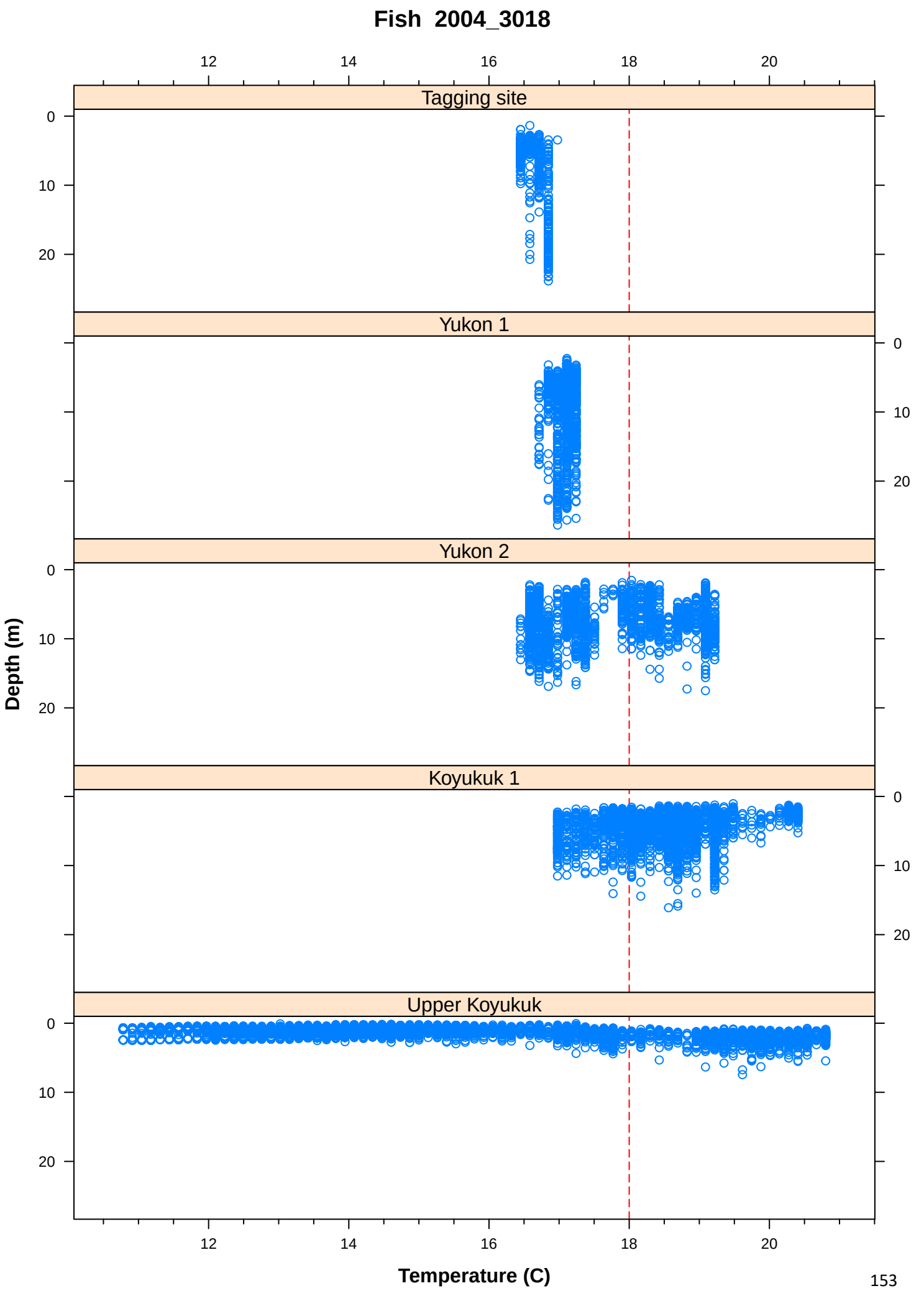

Fish 2004_3018
Tagging site
Yukon 1
Yukon 2
Koyukuk 1
Upper Koyukuk
Density
1.0
0.5
0.0
0
5
10
15
20
25
30
Depth (m)

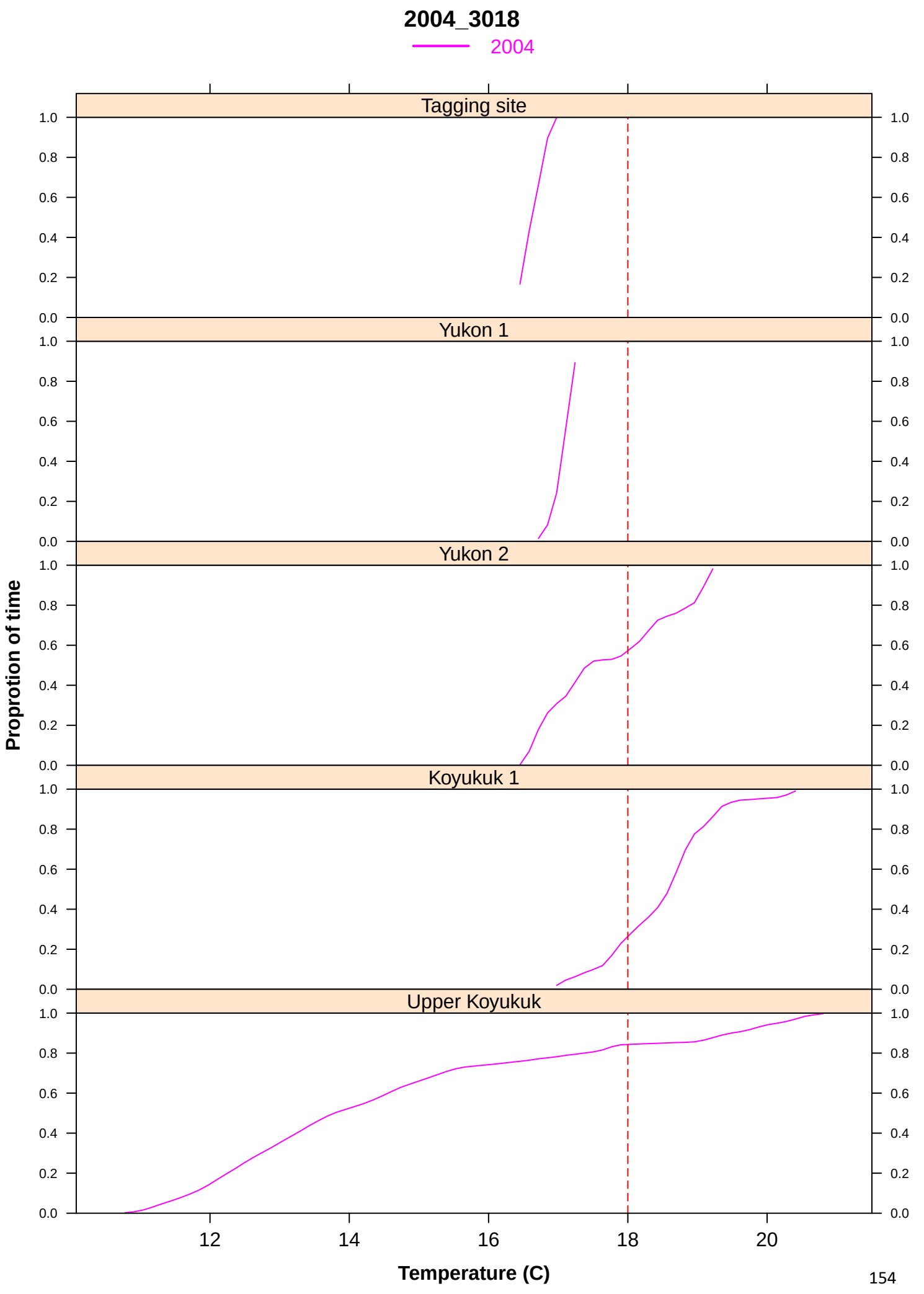

Fish 2004_3018
0
200
400
600
800
21
20
19
18
17
16
Temperature (C)
Distance from Paimiut (km)

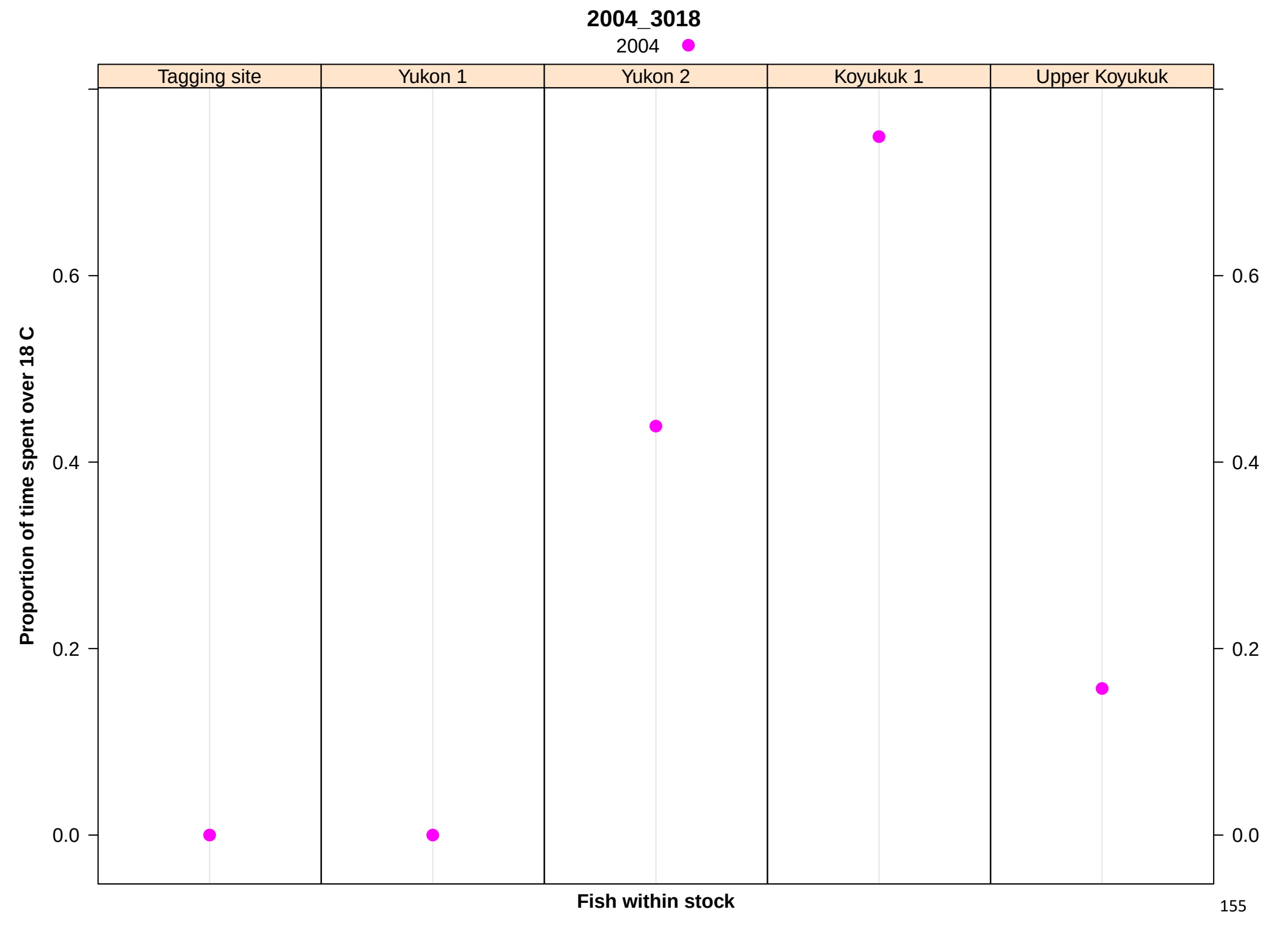

Fish 2004_3018
0
200
400
600
800
1000
20
18
16
14
12
Temperature (C)
Hours since release


Fish 2004_3018
Temperature (C)
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Koyukuk 1
Upper Koyukuk
Reach


Fish 2004_3018
Tagging site
Yukon 1
Yukon 2
Koyukuk 1
Upper Koyukuk
Density
Temperature (C)
10
12
14
16
18
20
22
0
5


Fish 2004_3018
Tagging site
Yukon 1
Yukon 2
Koyukuk 1
Upper Koyukuk
Depth (m)
Temperature (C)
12
14
16
18
20
0
10
20


2004_3018
2004
Tagging site
Yukon 1
Yukon 2
Koyukuk 1
Upper Koyukuk
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
12
14
16
18
20


2004_3018
2004
Tagging site
Yukon 1
Yukon 2
Koyukuk 1
Upper Koyukuk
Proportion of time spent over 18 C
0.0
0.2
0.4
0.6
Fish within stock

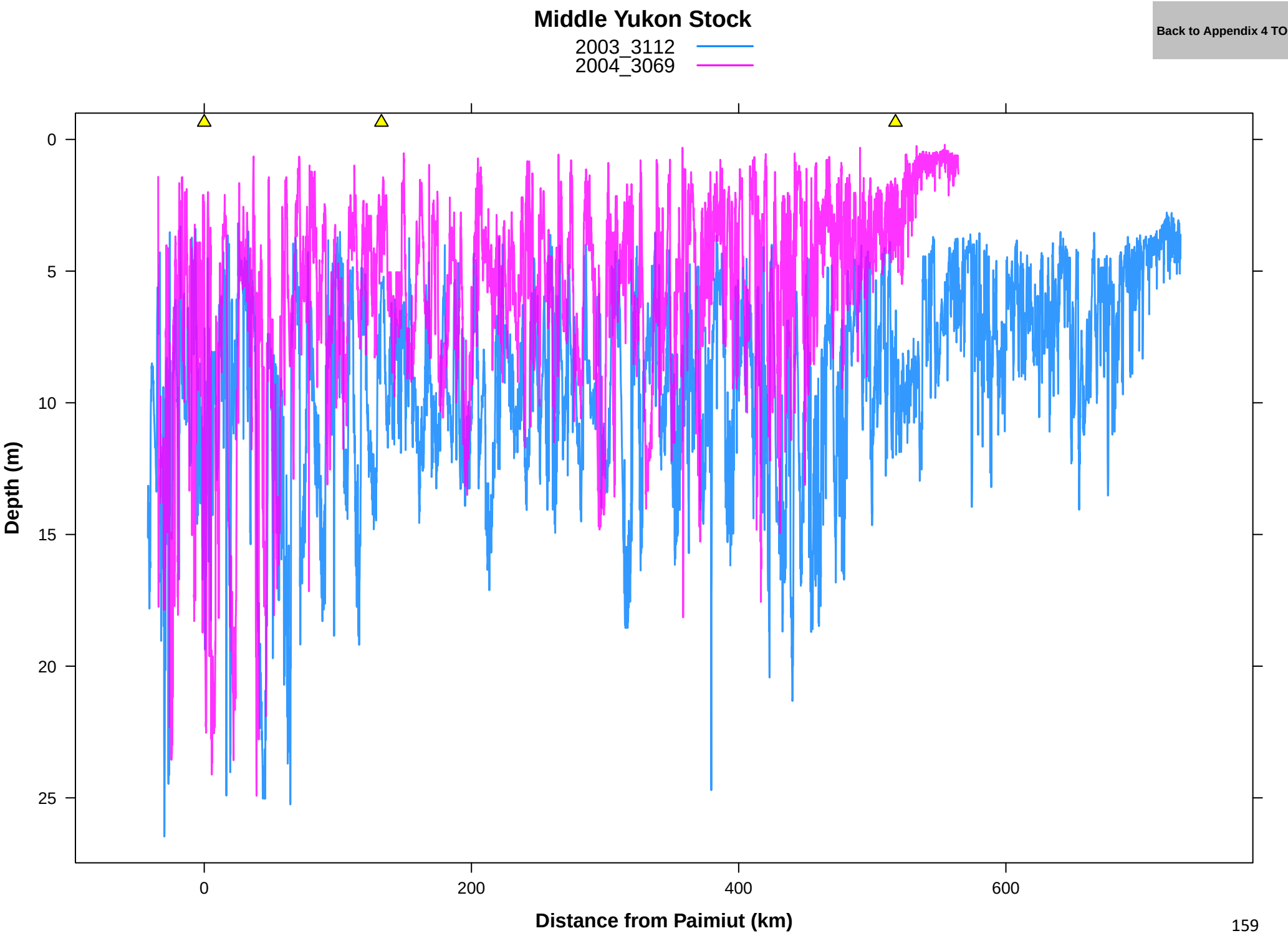
Appendix 4. -- Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Middle Yukon in 2002-2004.

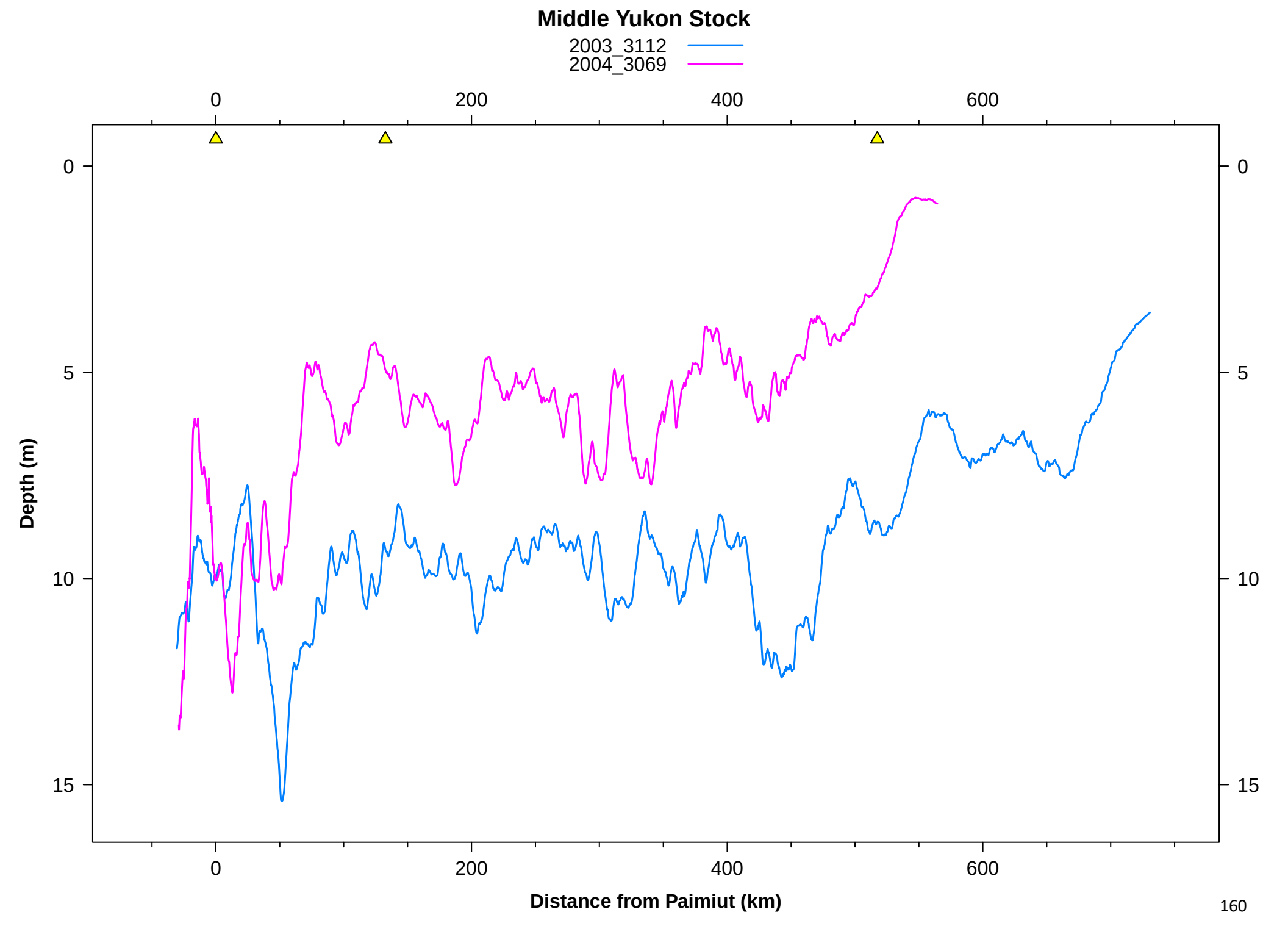
All stocks.....159

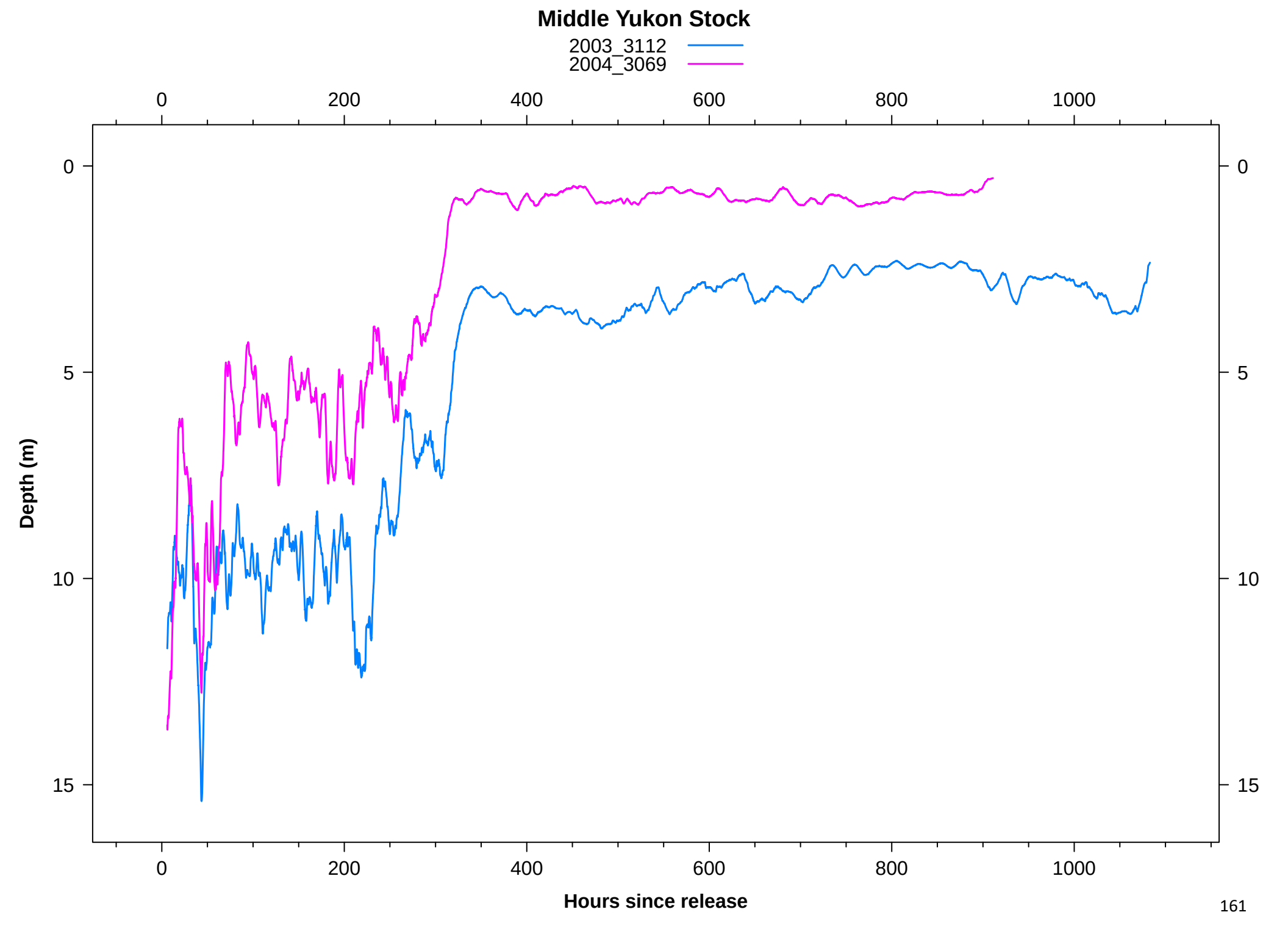
Tozitna.....172

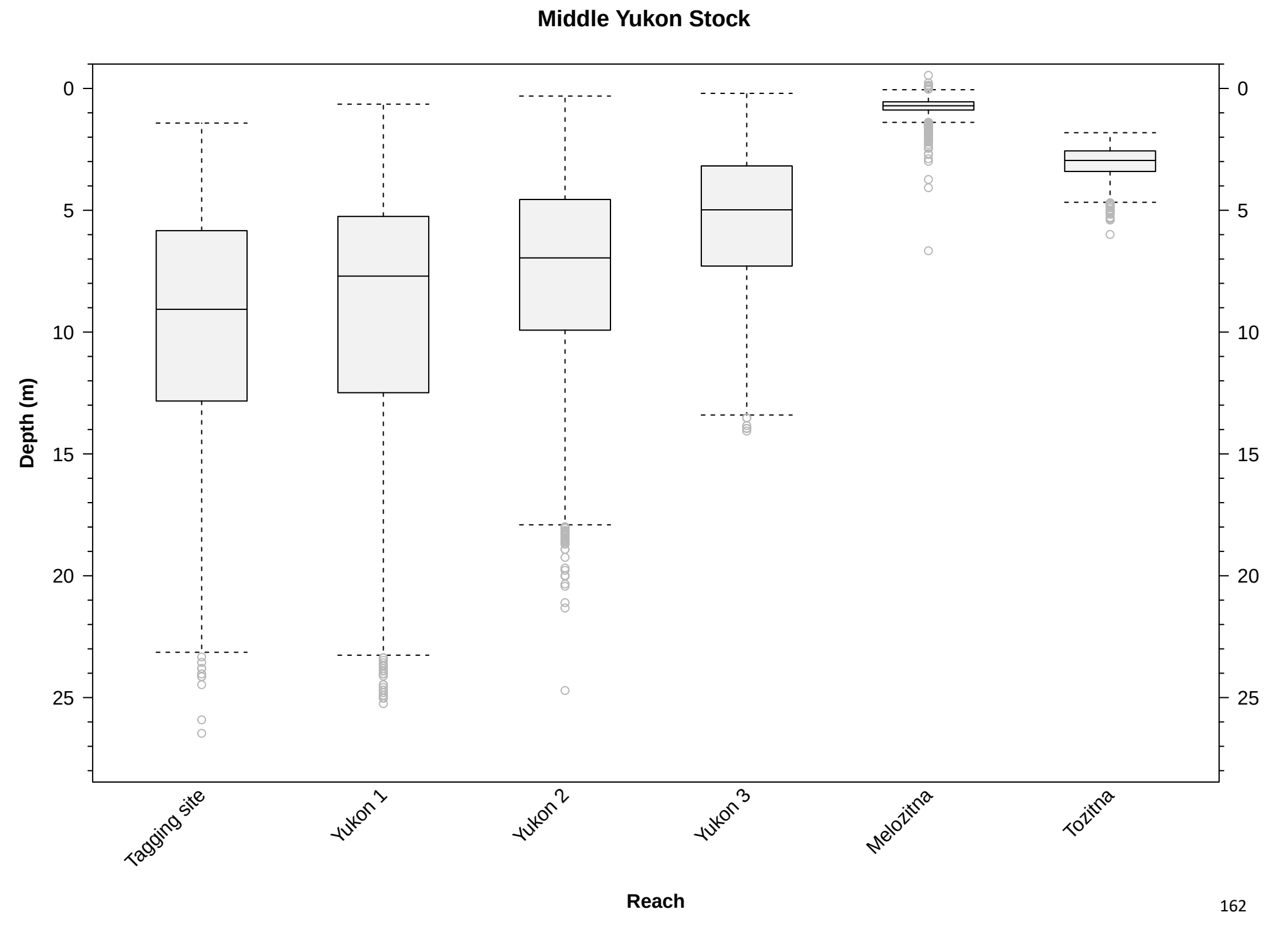
Melozitna.....181

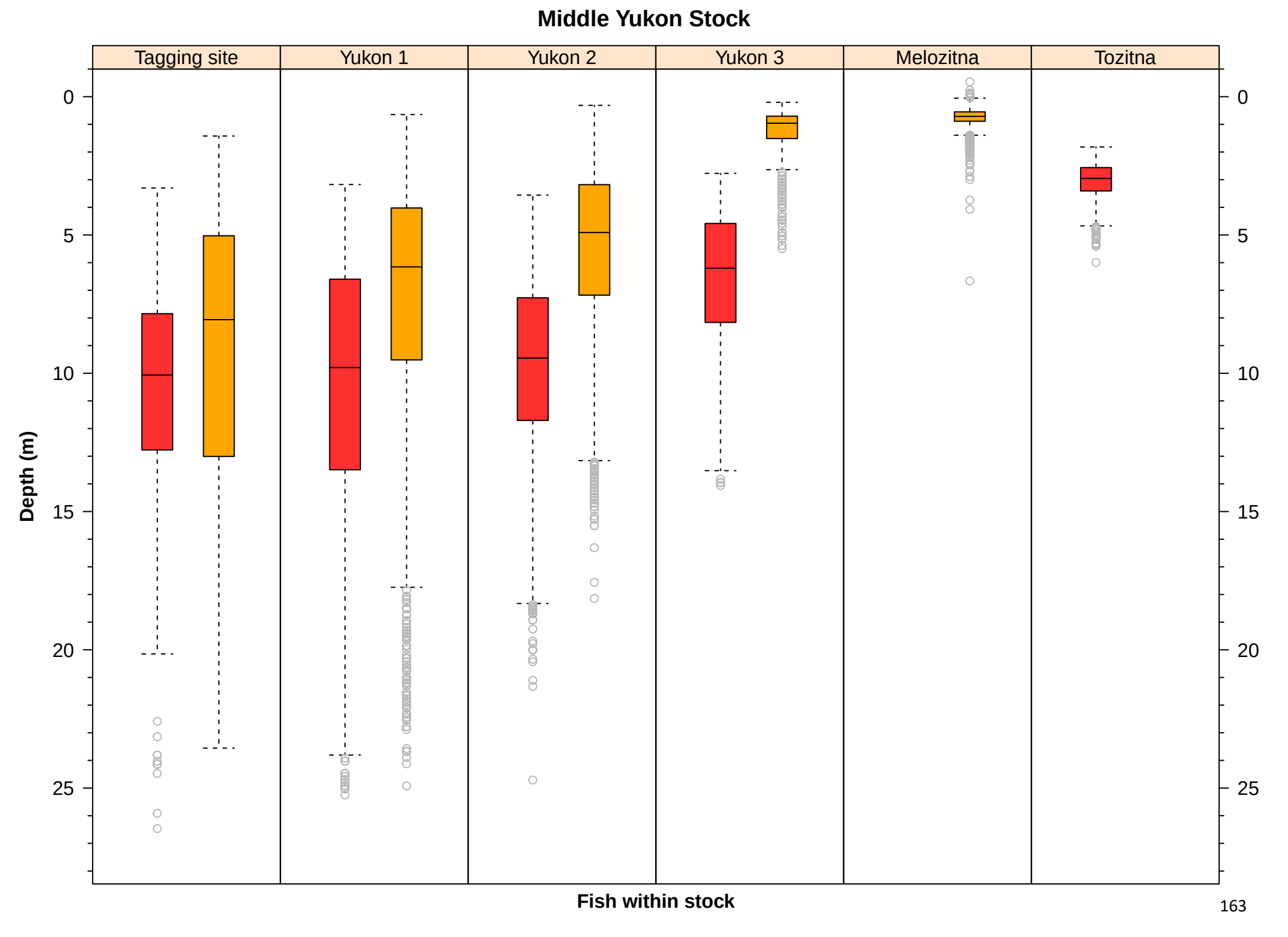
Back to Appendix 4 TOC

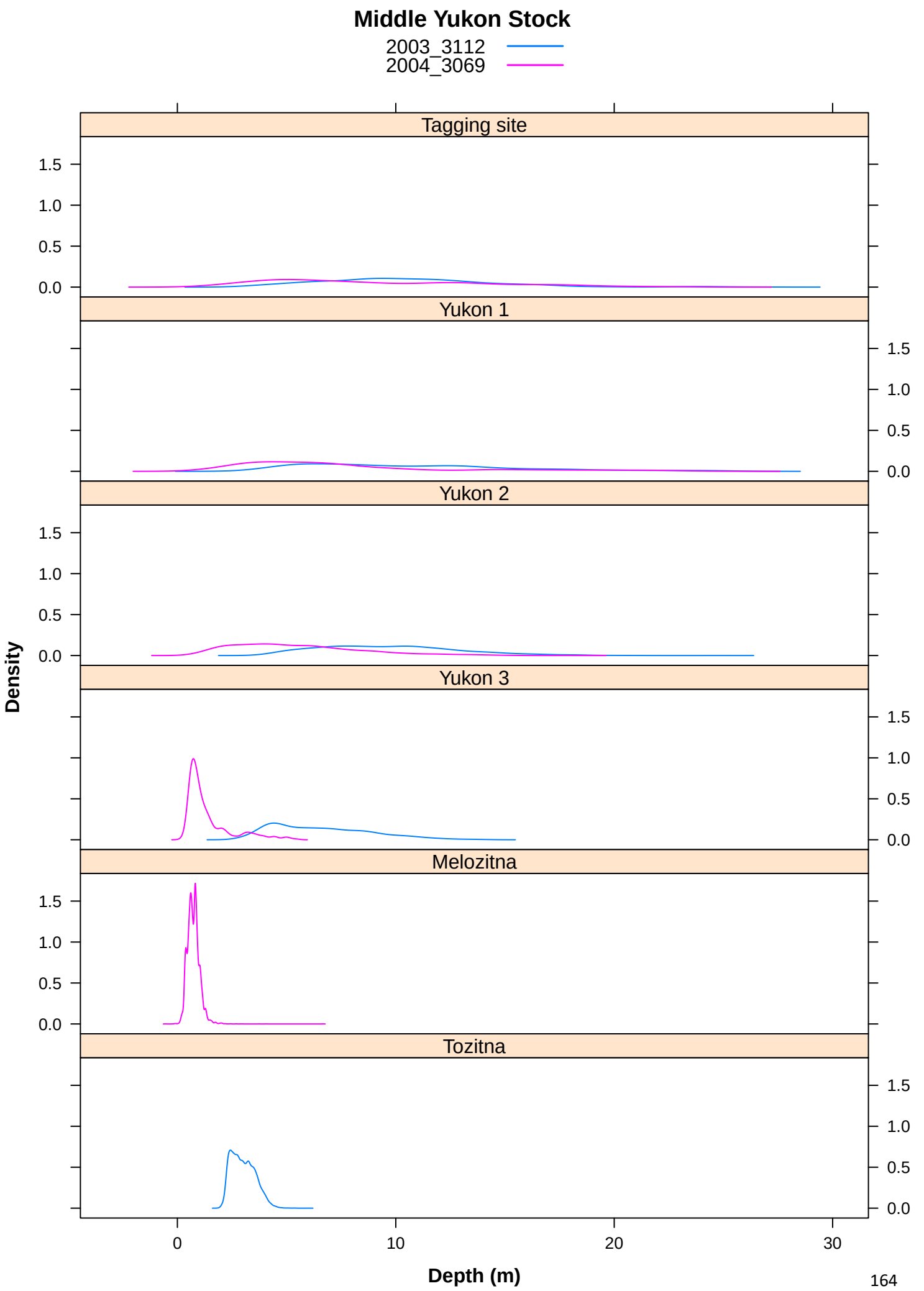


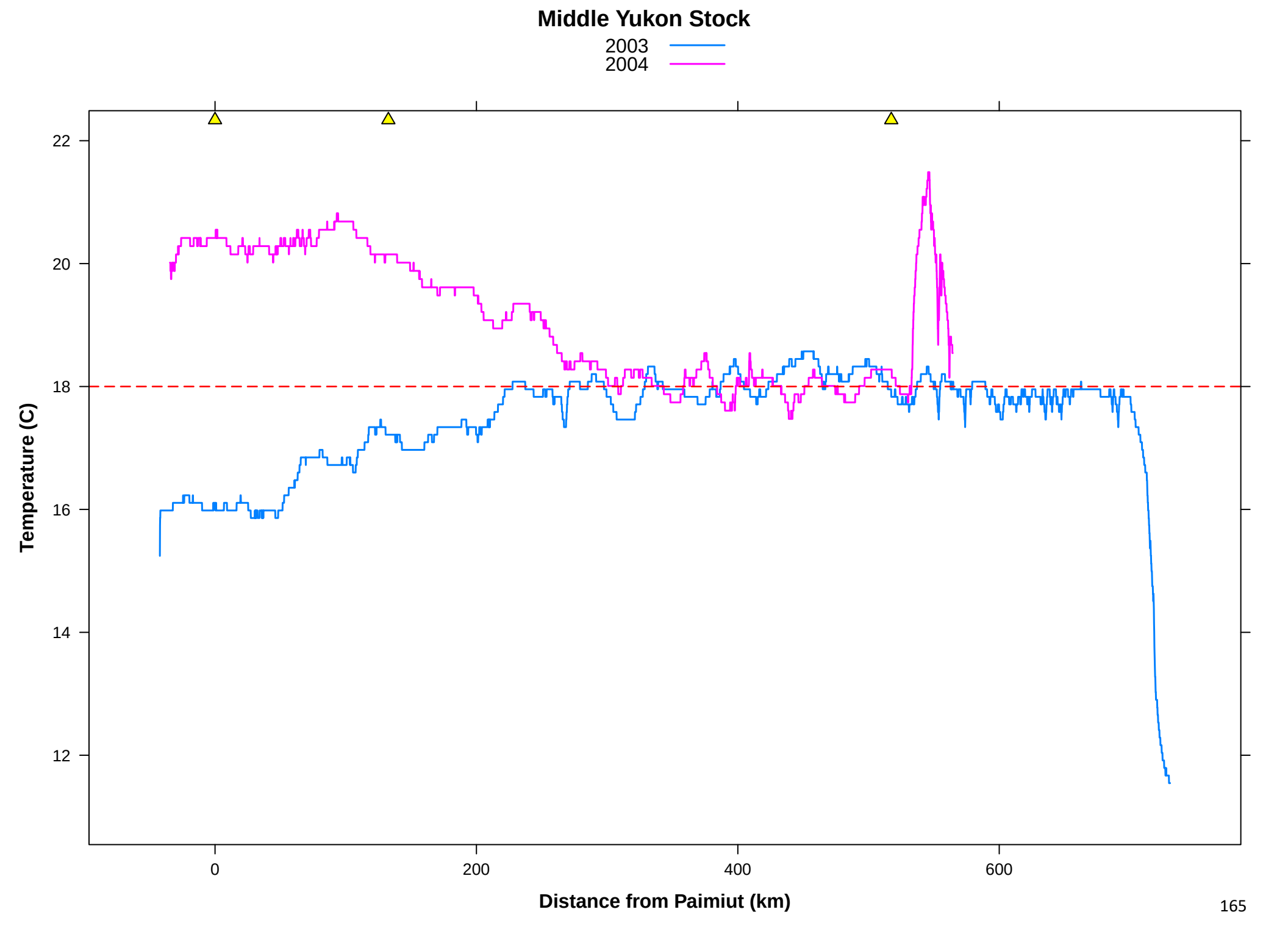

Middle Yukon Stock
2003_3112
2004_3069
0
200
400
600
0
5
10
15
Depth (m)
Distance from Paimiut (km)

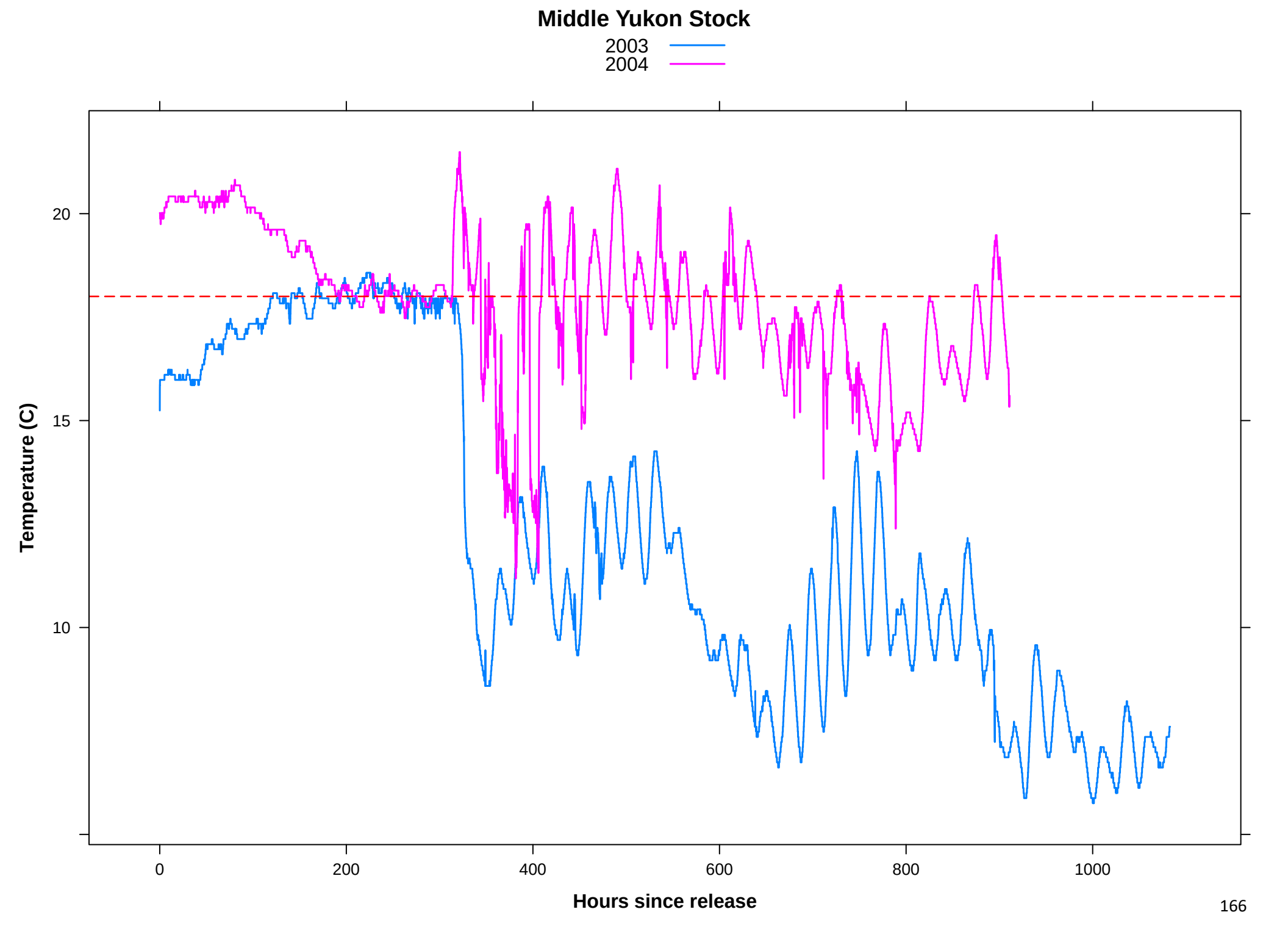

Middle Yukon Stock
2003_3112
2004_3069
0
200
400
600
800
1000
0
5
10
15
Depth (m)
Hours since release

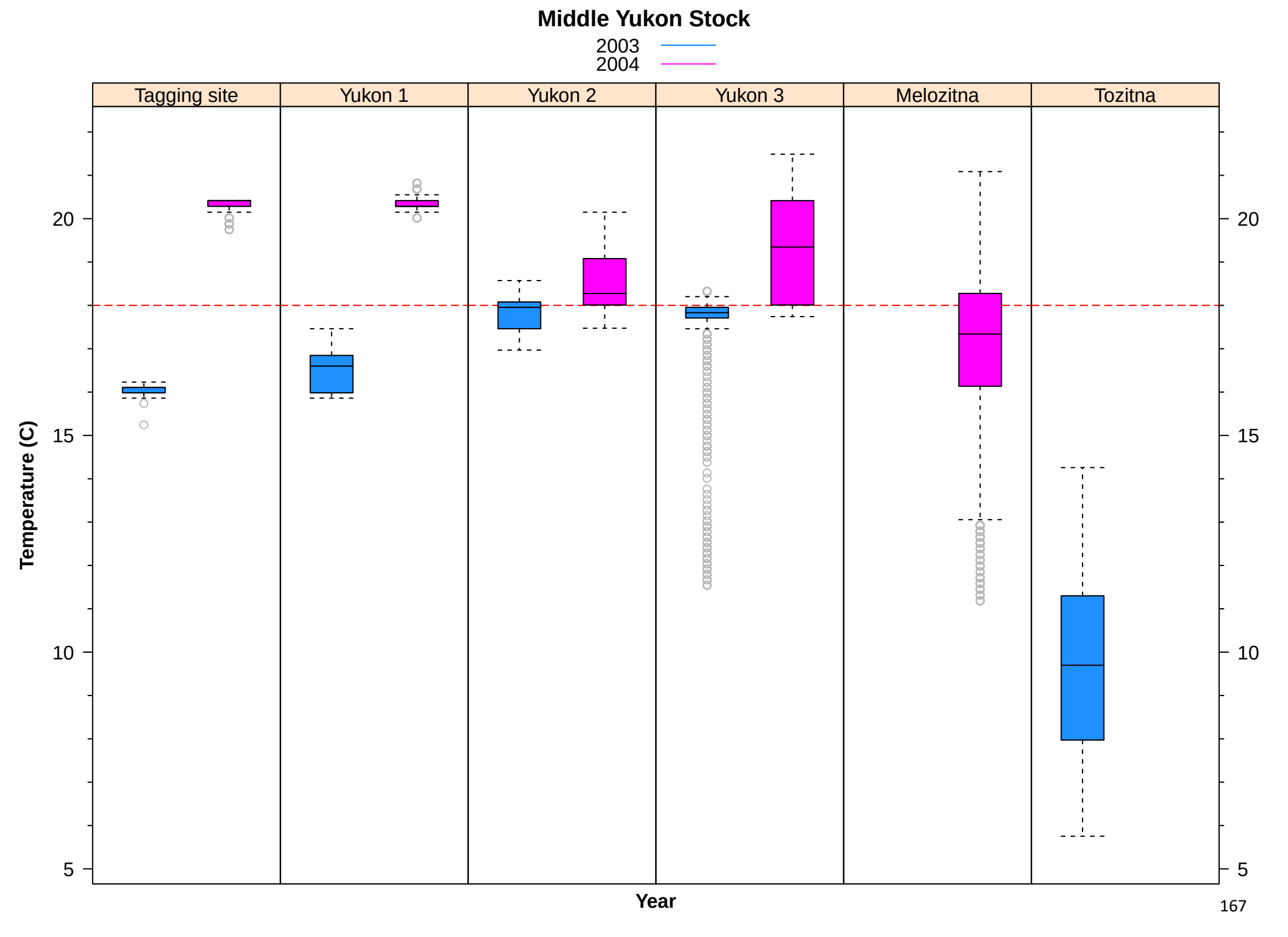

Middle Yukon Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Tozitna
Reach

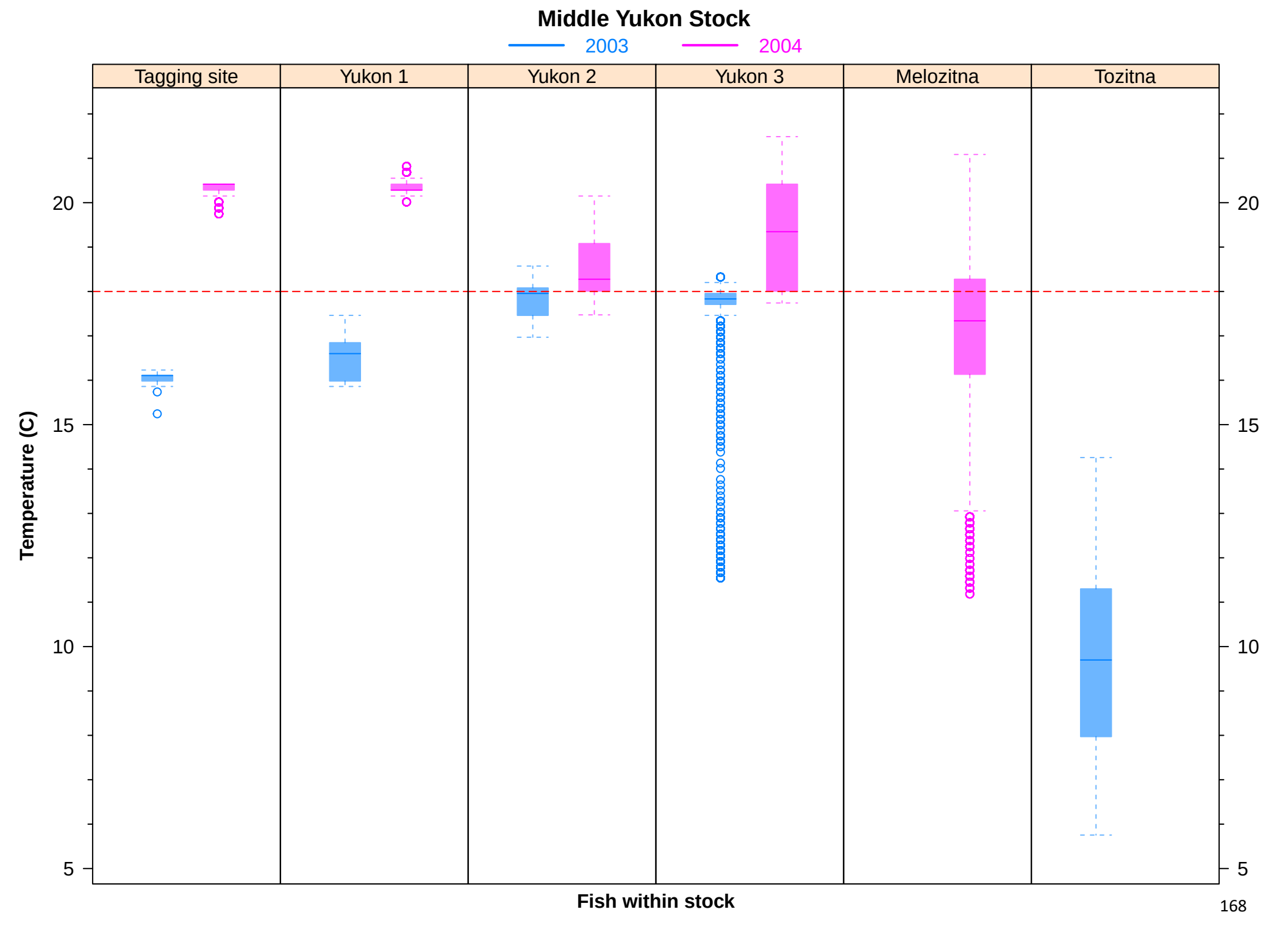

Middle Yukon Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Tozitna
Depth (m)
0
5
10
15
20
25
Fish within stock

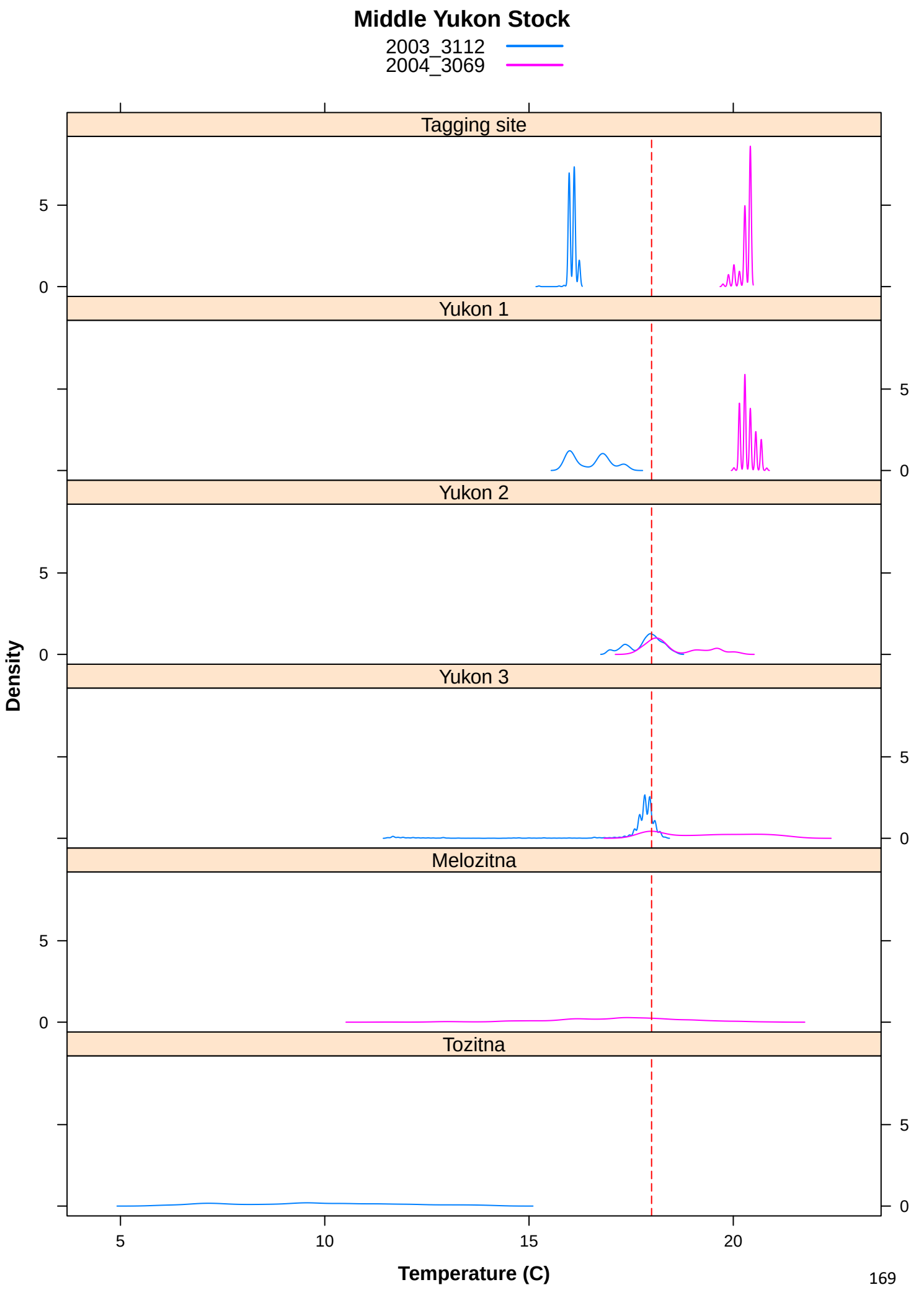

Middle Yukon Stock
2003_3112
2004_3069
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Tozitna
Density
Depth (m)
0.0
0.5
1.0
1.5
0
10
20
30

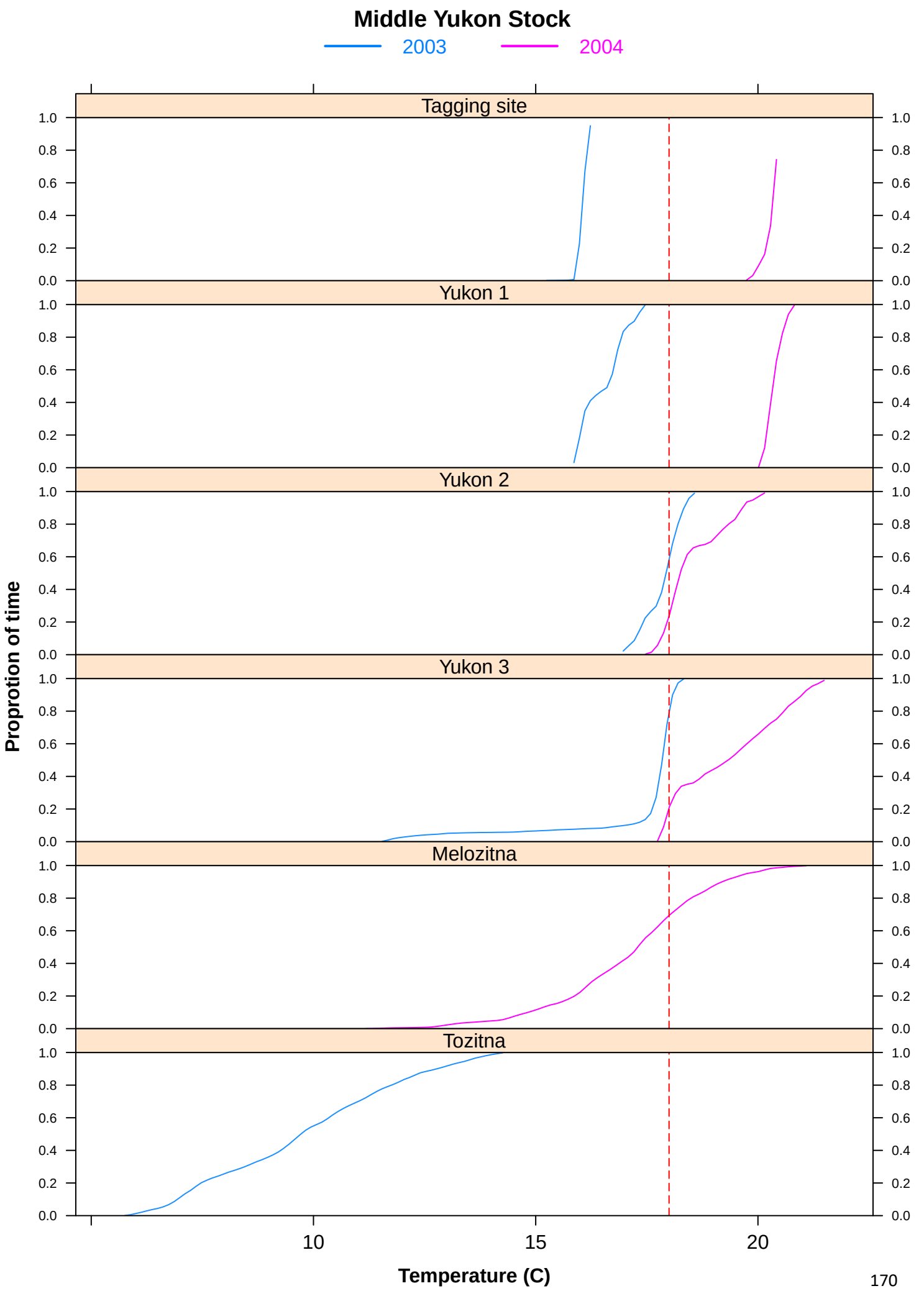

Middle Yukon Stock
2003
2004
22
20
18
16
14
12
Temperature (C)
0
200
400
600
Distance from Paimiut (km)

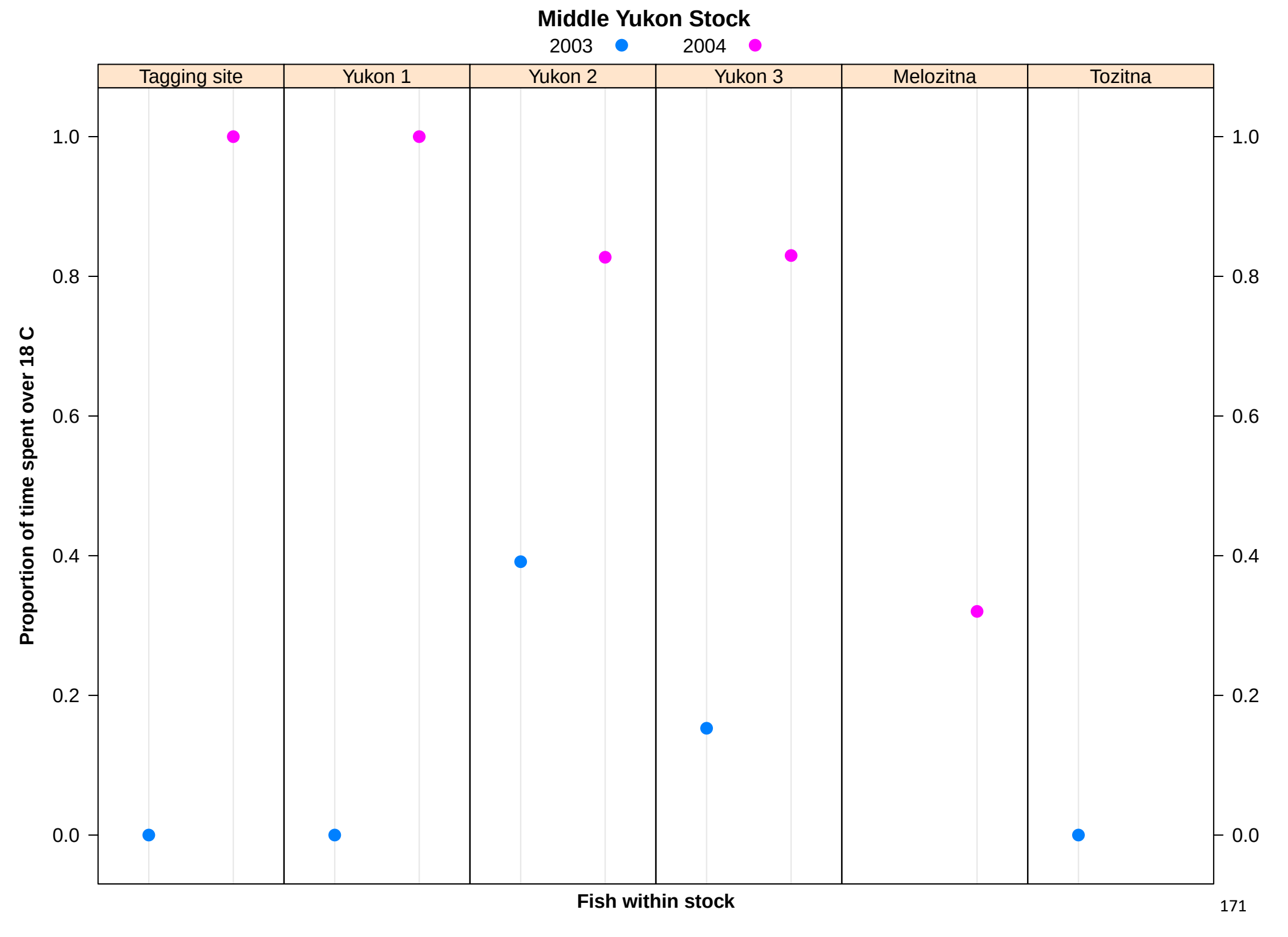

Middle Yukon Stock
2003
2004
Temperature (C)
20
15
10
0
200
400
600
800
1000
Hours since release


Middle Yukon Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Tozitna
Temperature (C)
5
10
15
20
Year

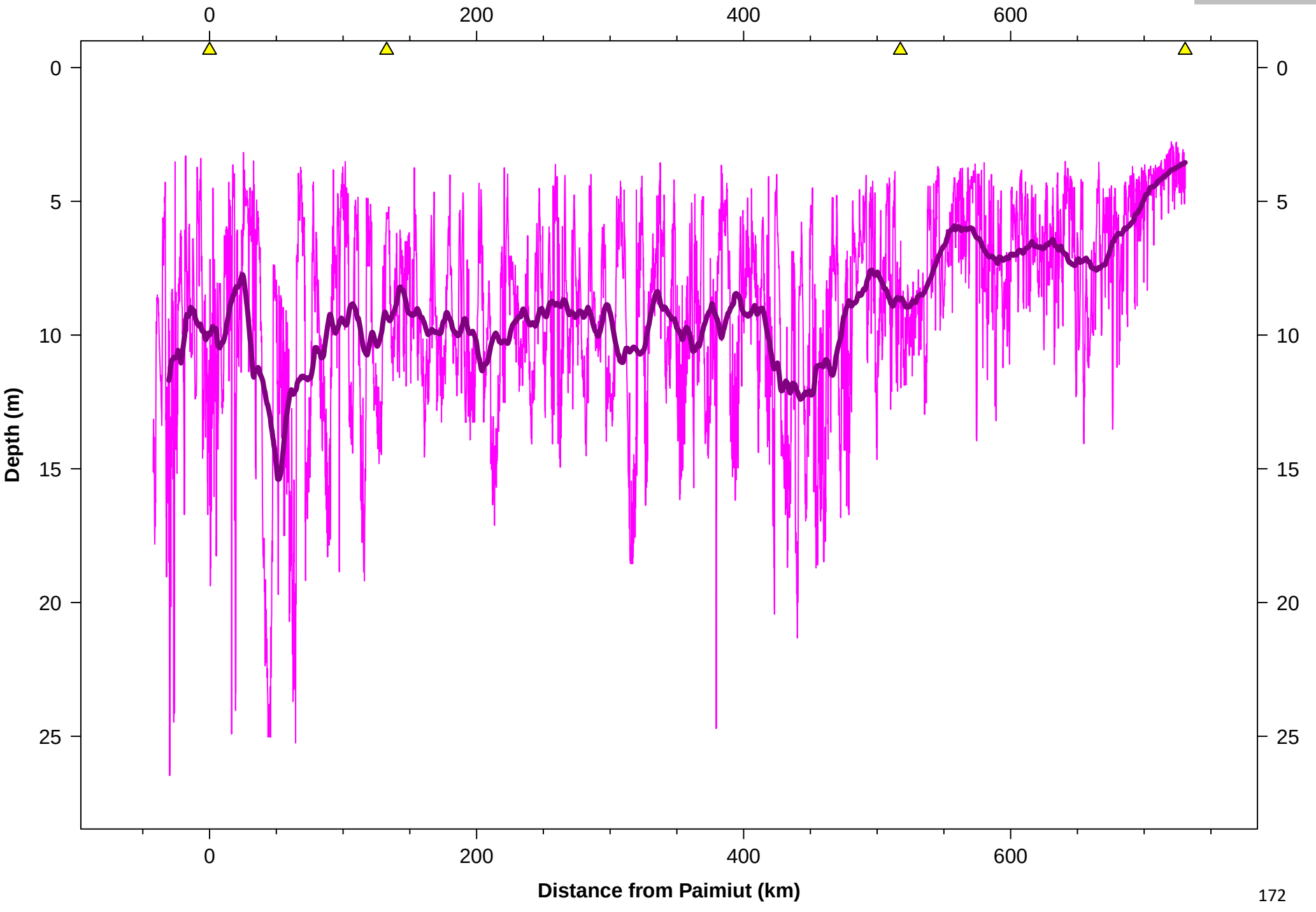

Middle Yukon Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Tozitna
Temperature (C)
20
15
10
5
Fish within stock

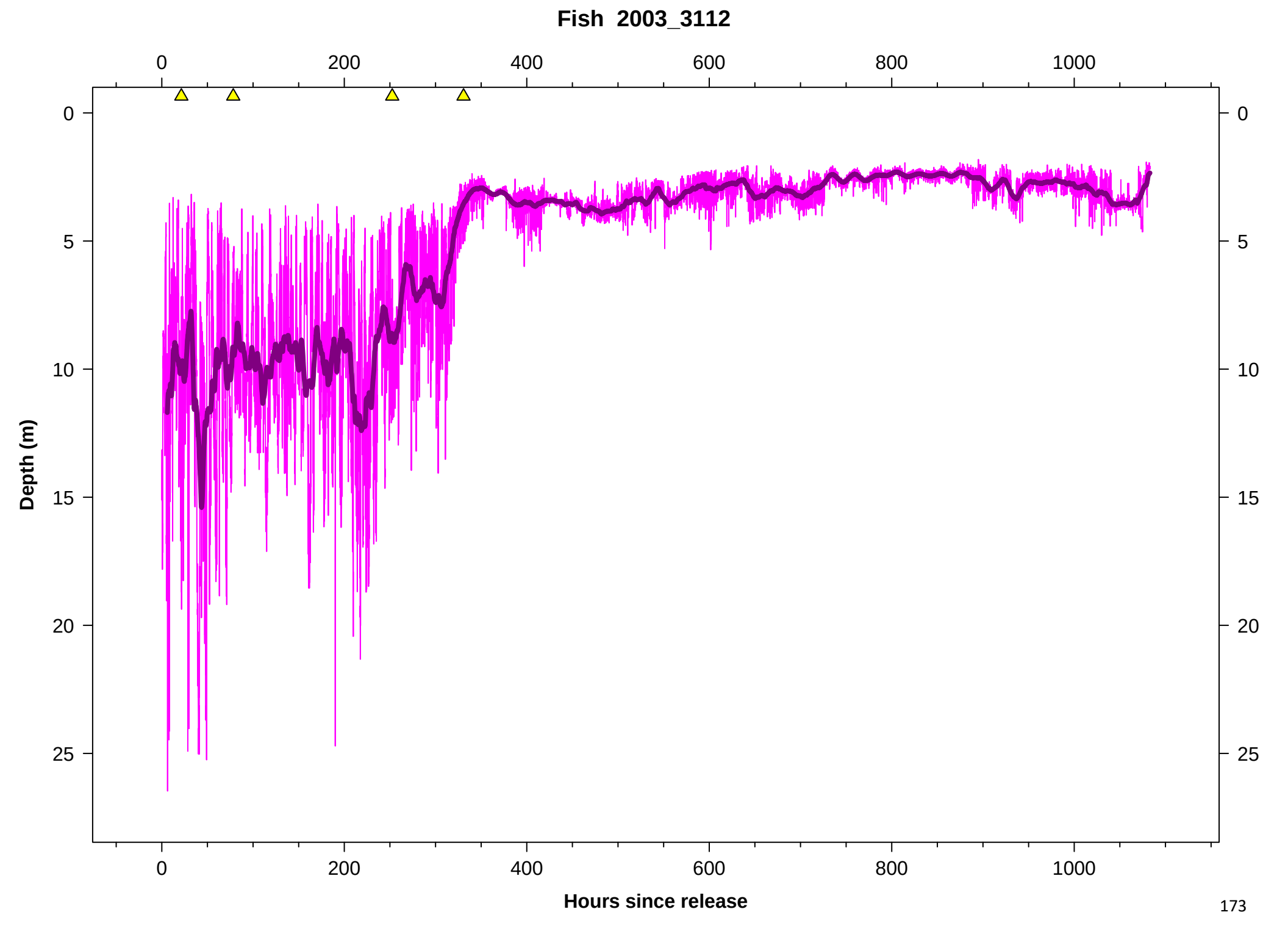

Middle Yukon Stock
2003_3112
2004_3069
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Tozitna
Density
Temperature (C)
5
10
15
20
0
5

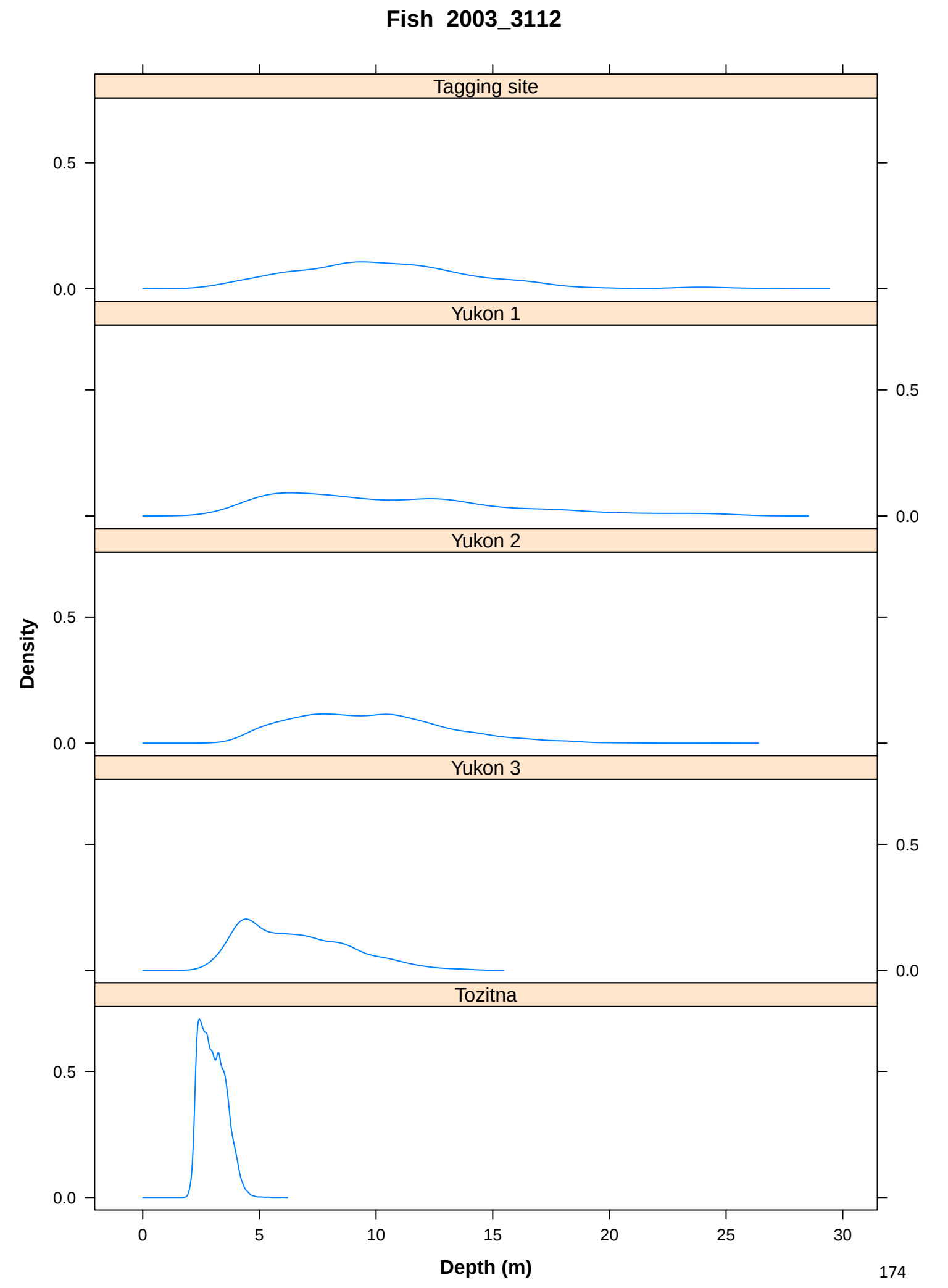

Middle Yukon Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Tozitna
Proprotion of time
0.0
0.2
0.4
0.6
0.8
1.0
10
15
20
Temperature (C)

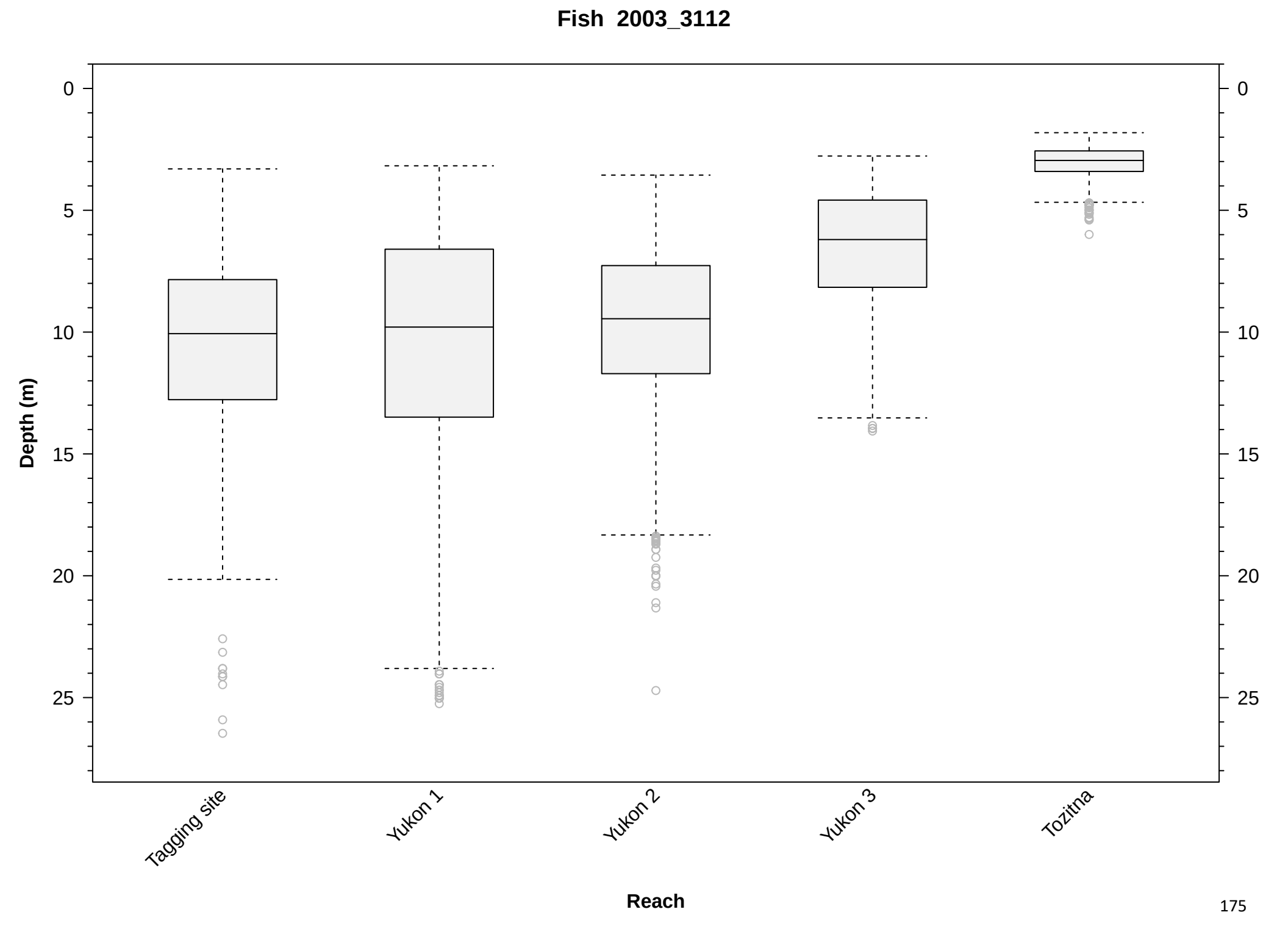

Middle Yukon Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Tozitna
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock

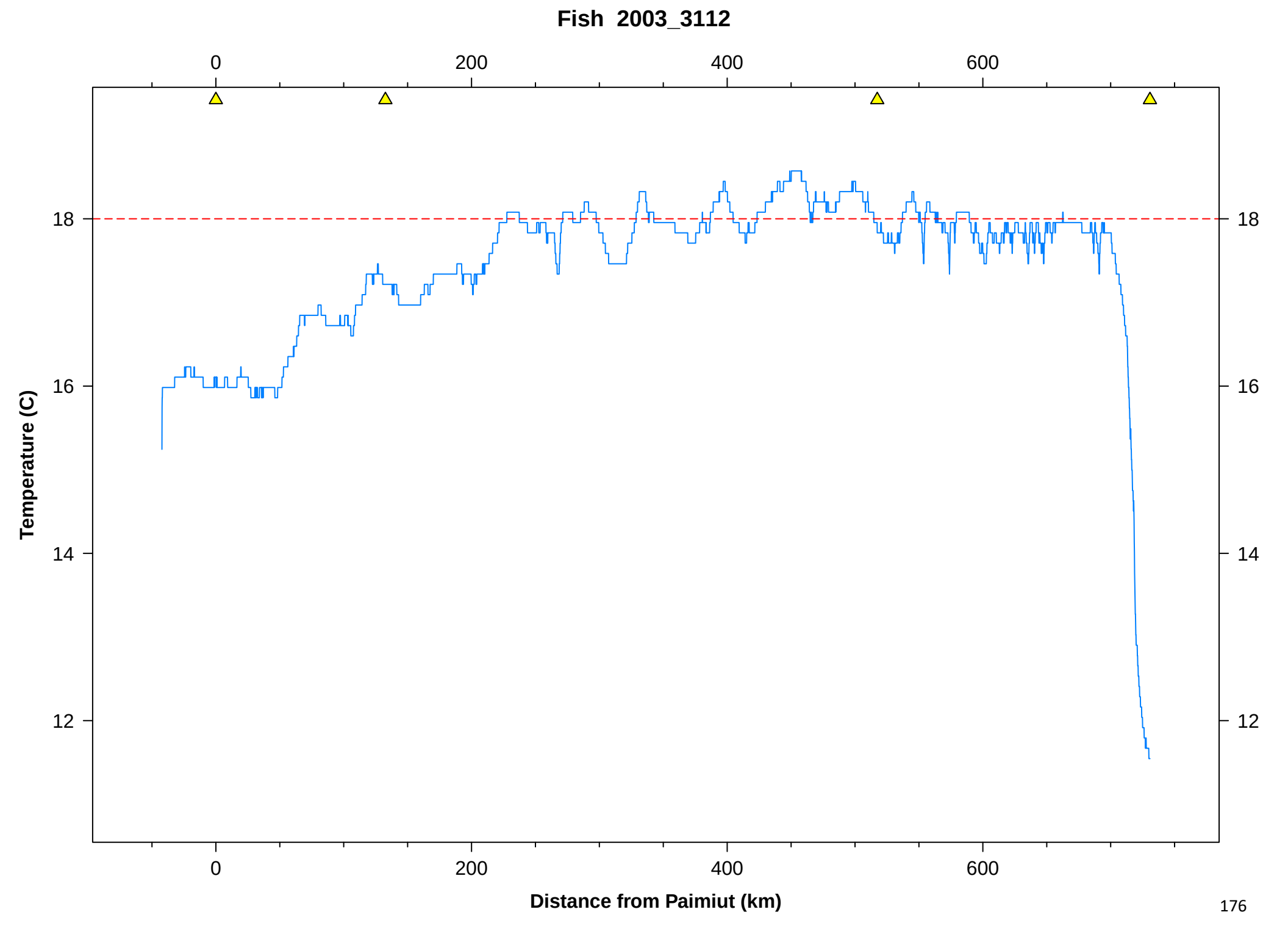
Tozitna Fish 2003_3112

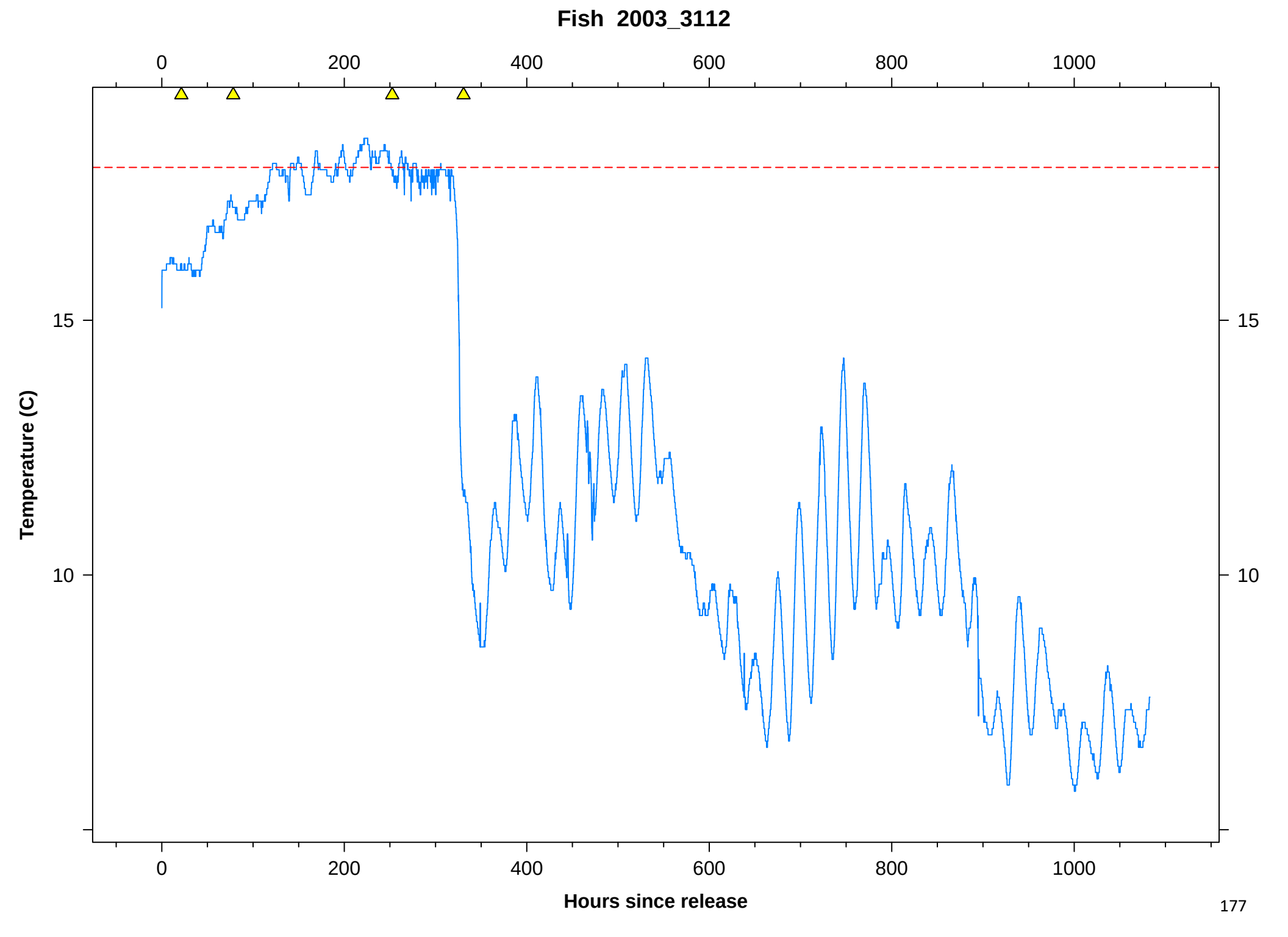


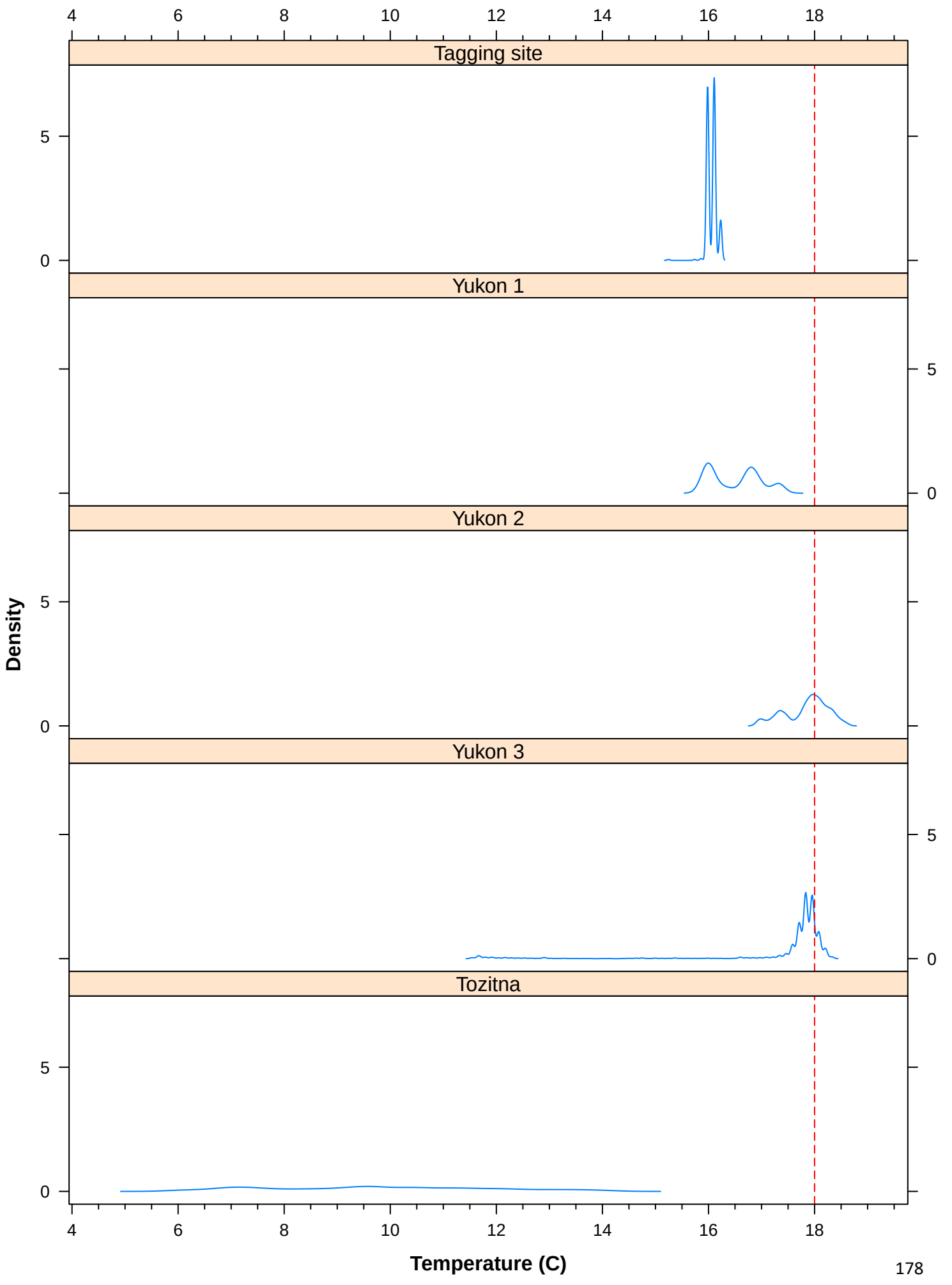

Fish 2003_3112
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release

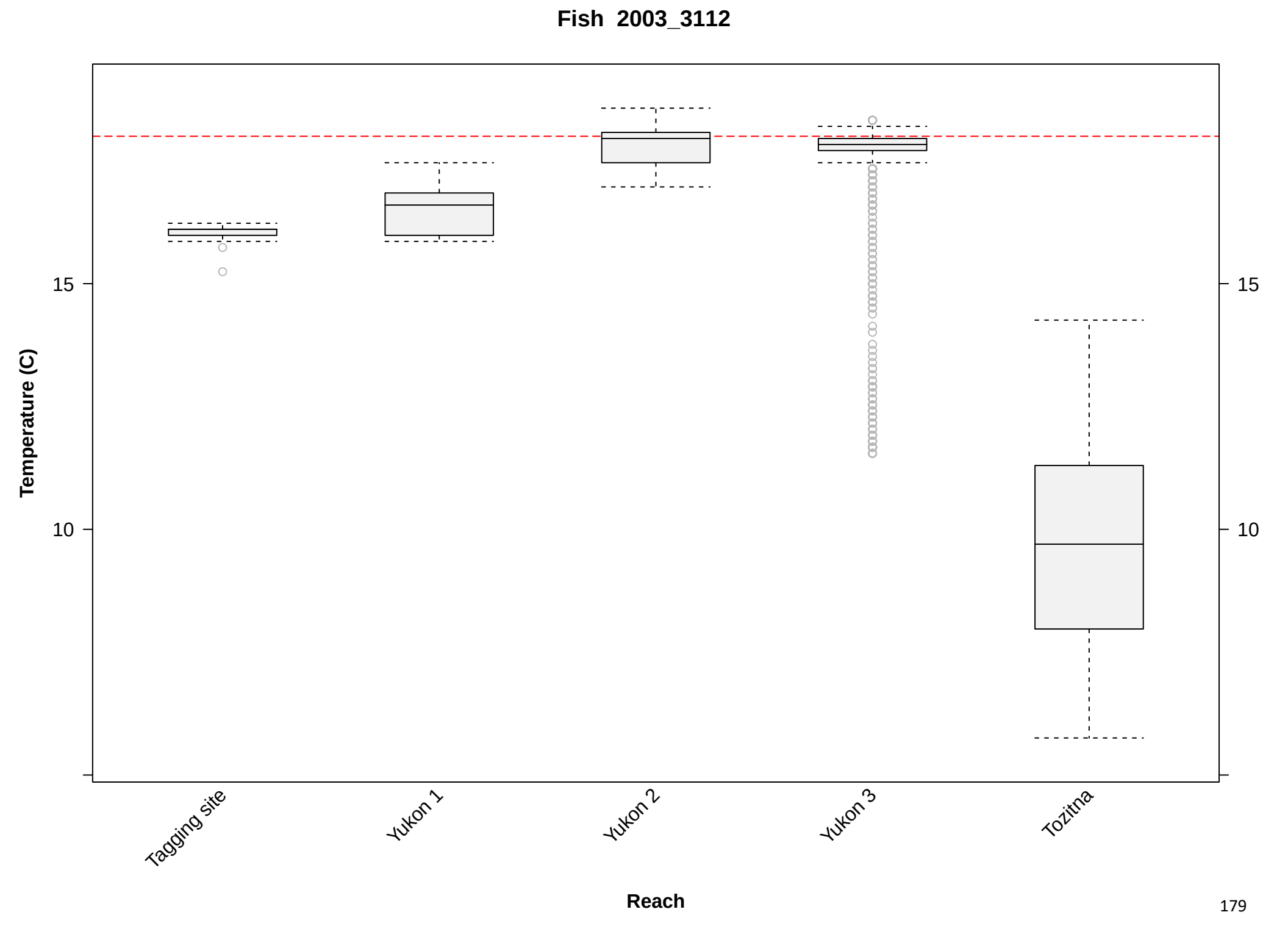

Fish 2003_3112
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tozitna
Density
0.5
0.0
0
5
10
15
20
25
30
Depth (m)

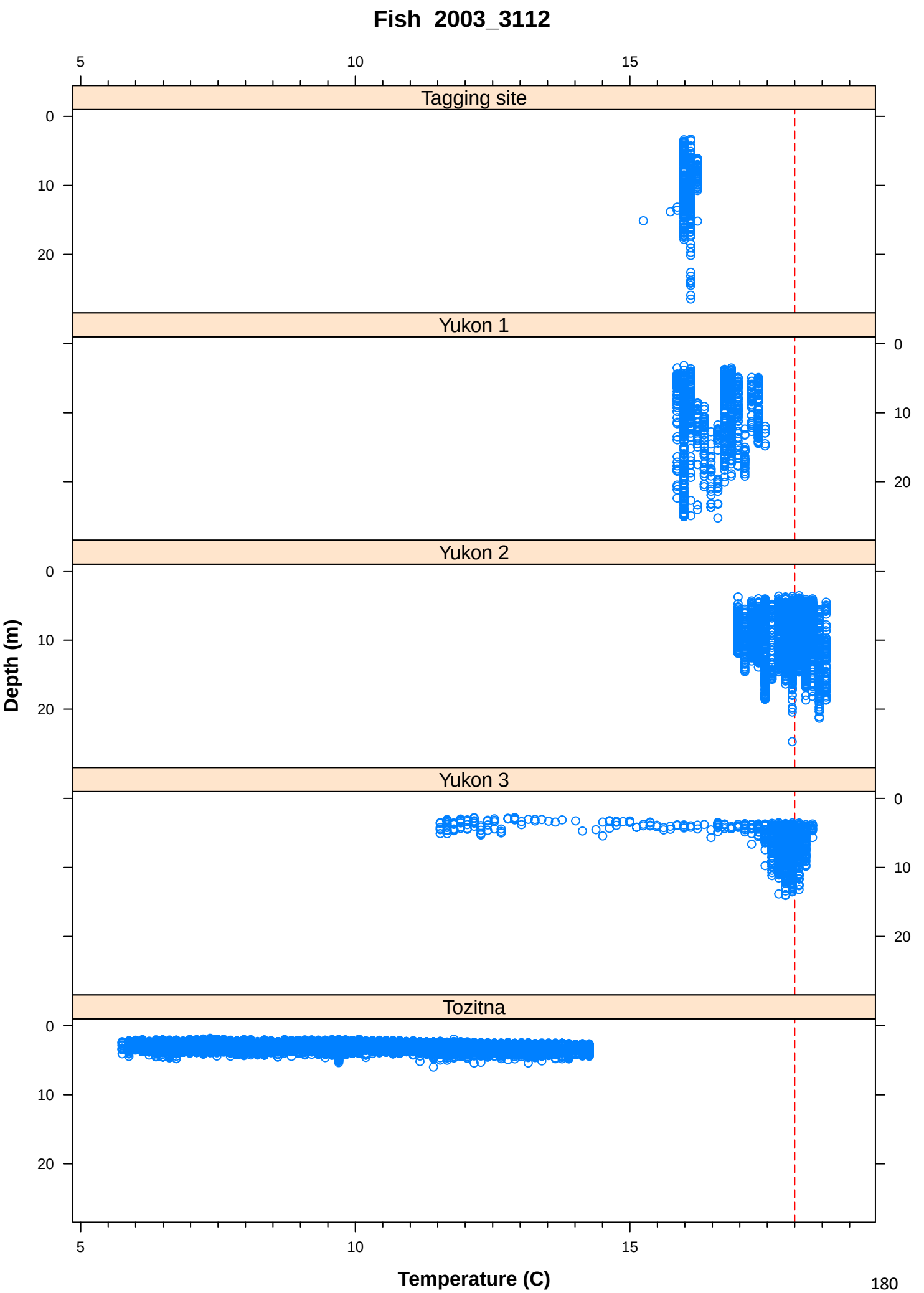

Fish 2003_3112
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tozitna
Reach


Fish 2003_3112
0
200
400
600
18
16
14
12
Temperature (C)
Distance from Paimiut (km)


Fish 2003_3112
0
200
400
600
800
1000
15
10
Temperature (C)
Hours since release

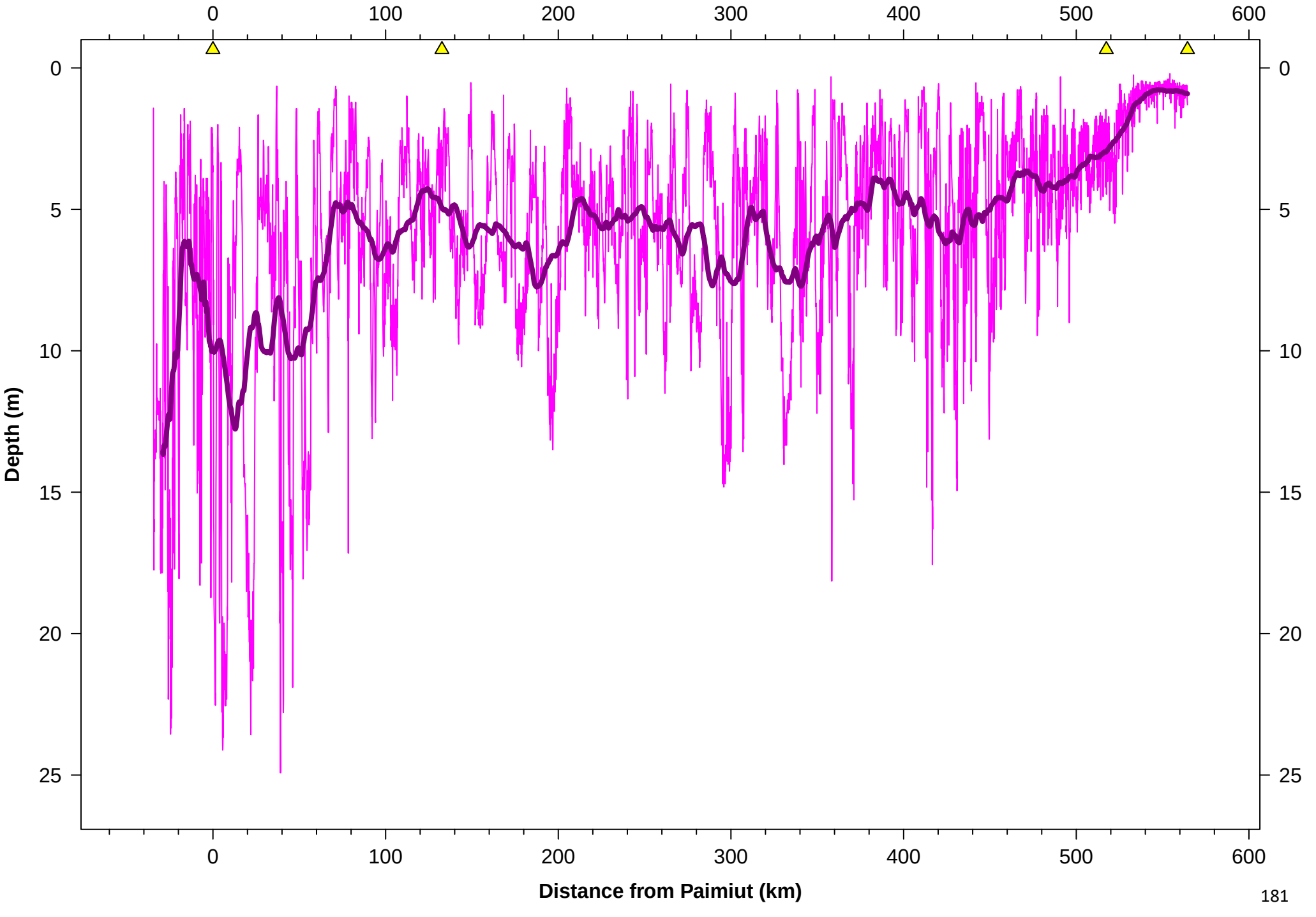

Fish 2003_3112
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tozitna
Density
Temperature (C)
4
6
8
10
12
14
16
18
0
5

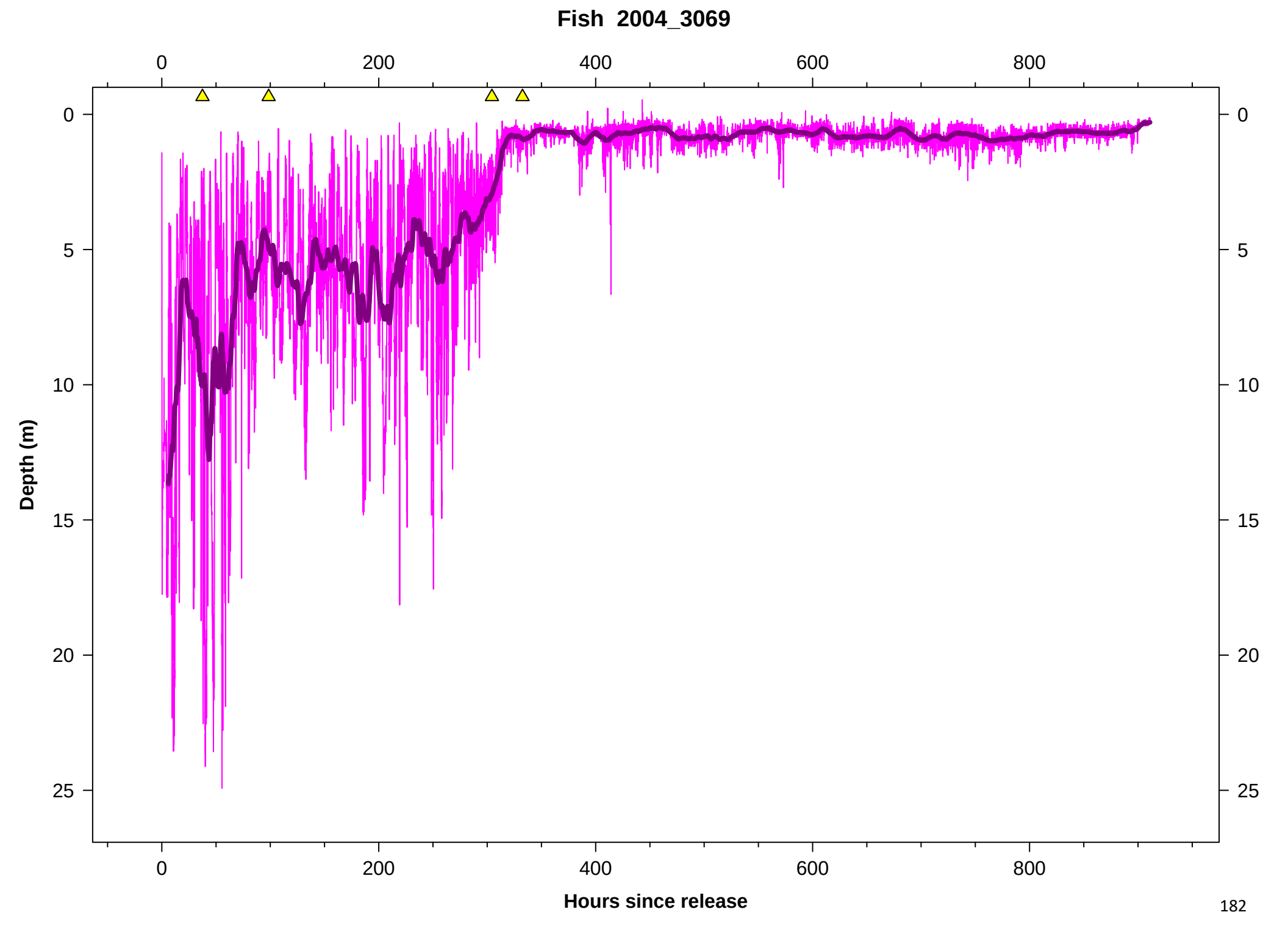

Fish 2003_3112
Temperature (C)
15
10
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tozitna
Reach

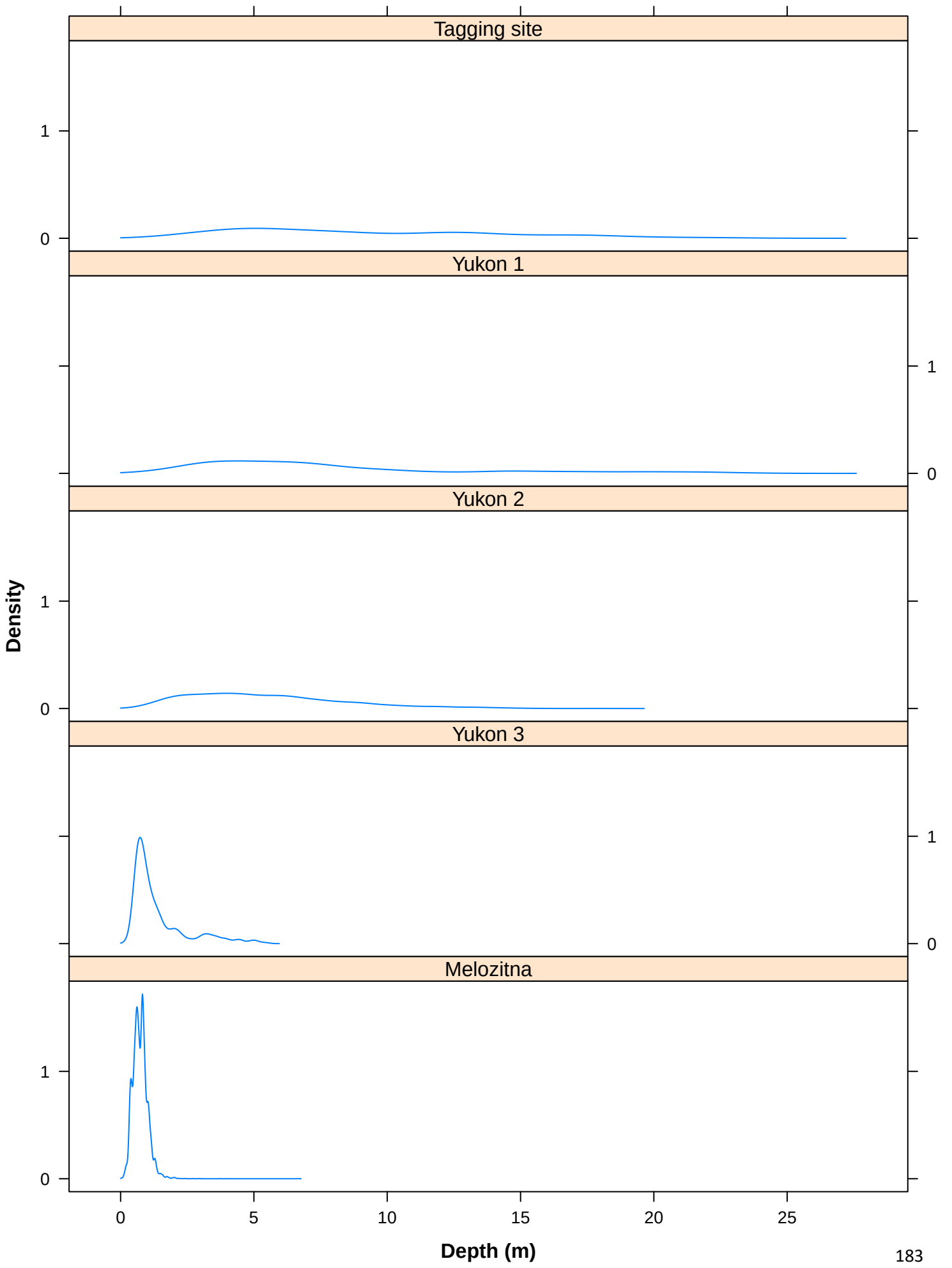

Fish 2003_3112
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tozitna
Depth (m)
Temperature (C)
5
10
15
0
10
20

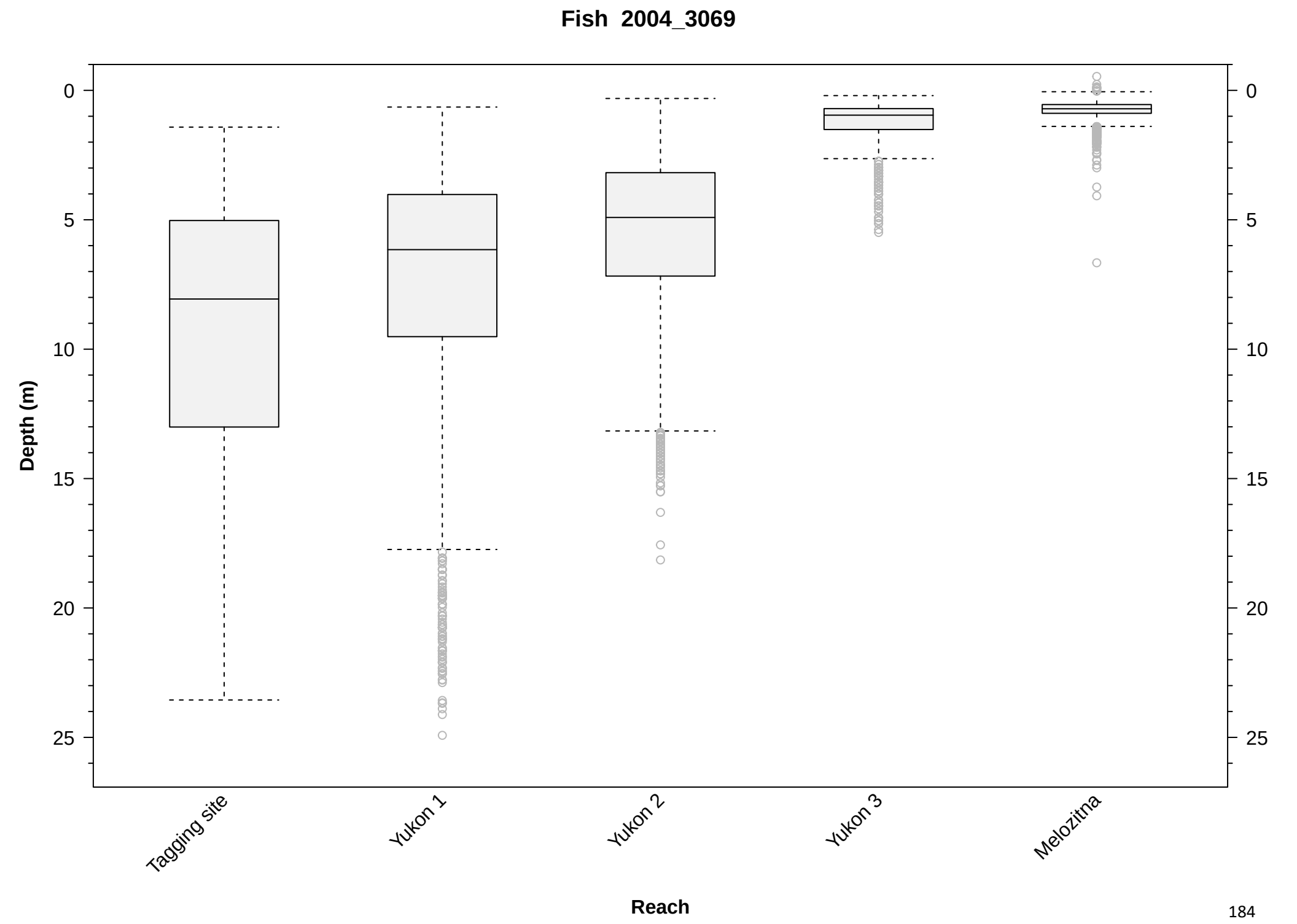
Melozitna Fish 2004_3069

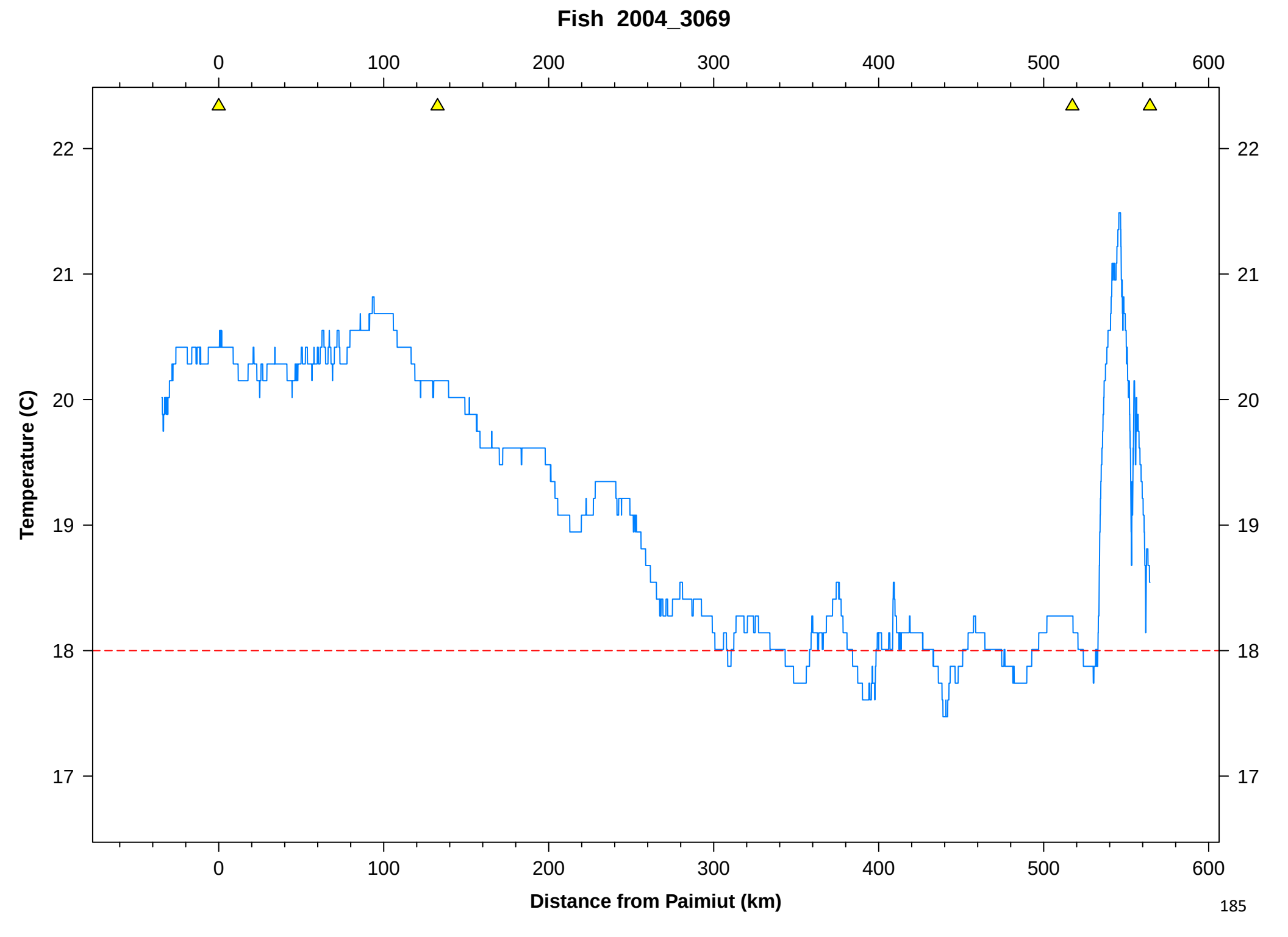
Back to Appendix 4 TOC

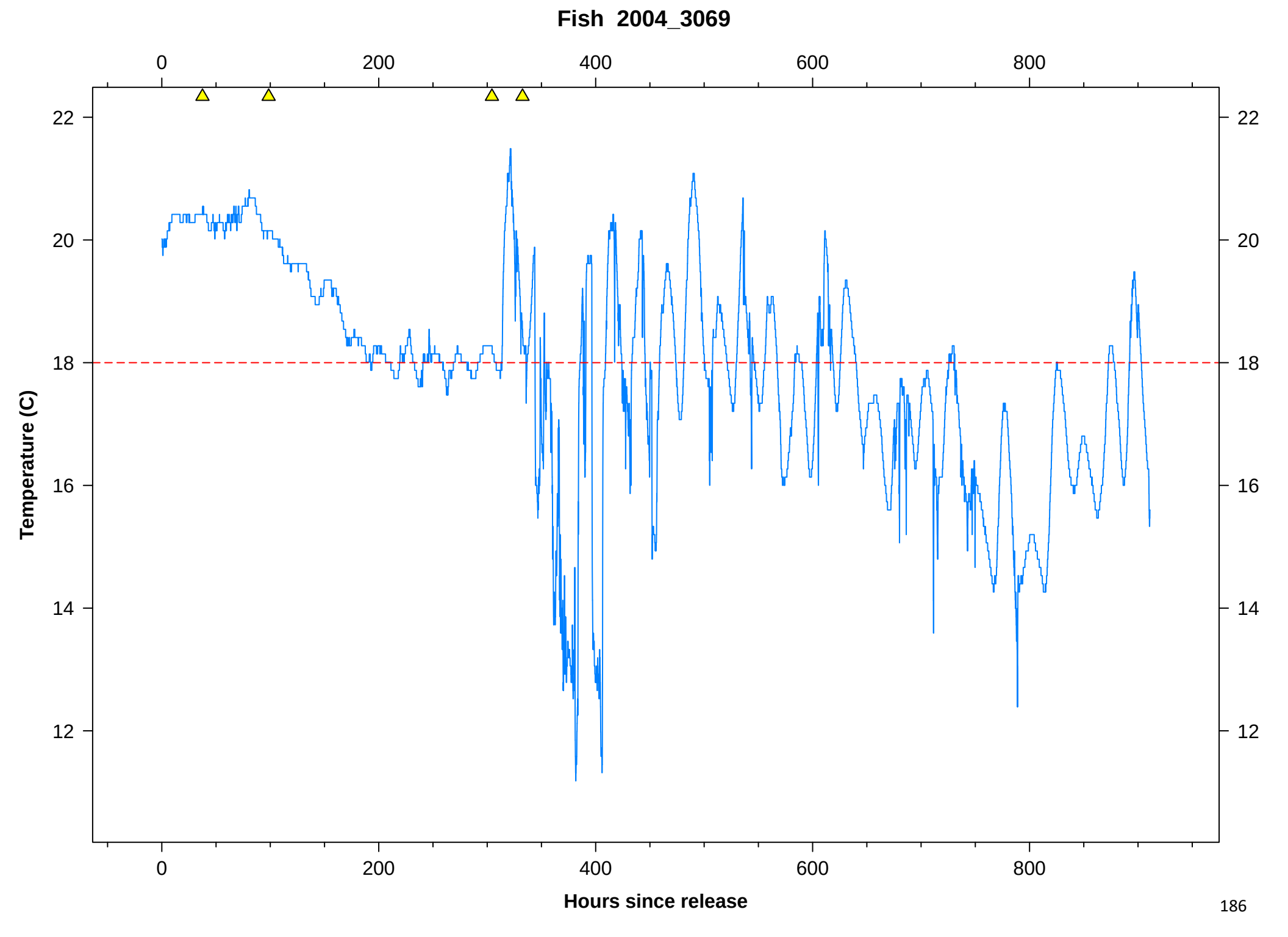


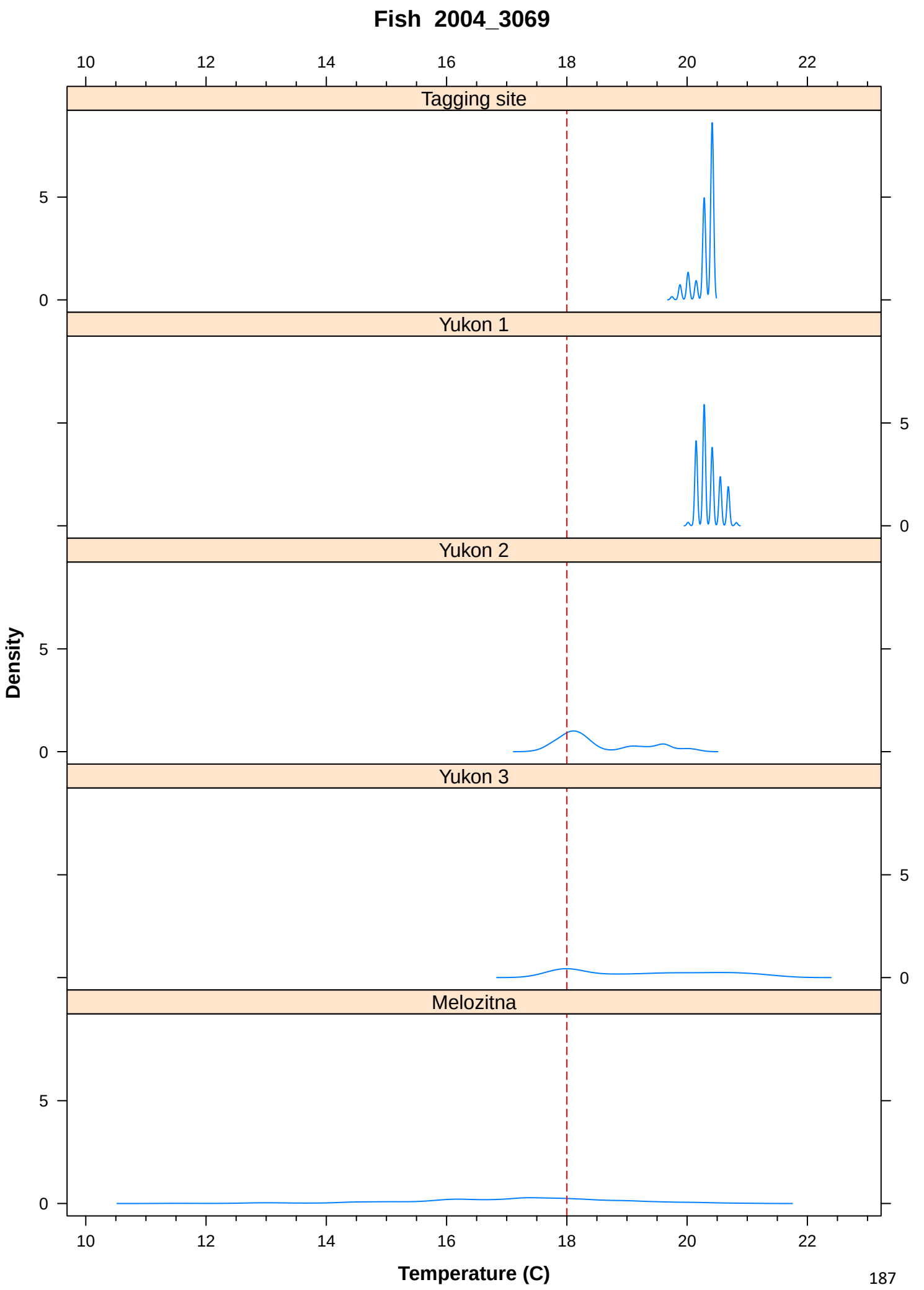

Fish 2004_3069
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Hours since release

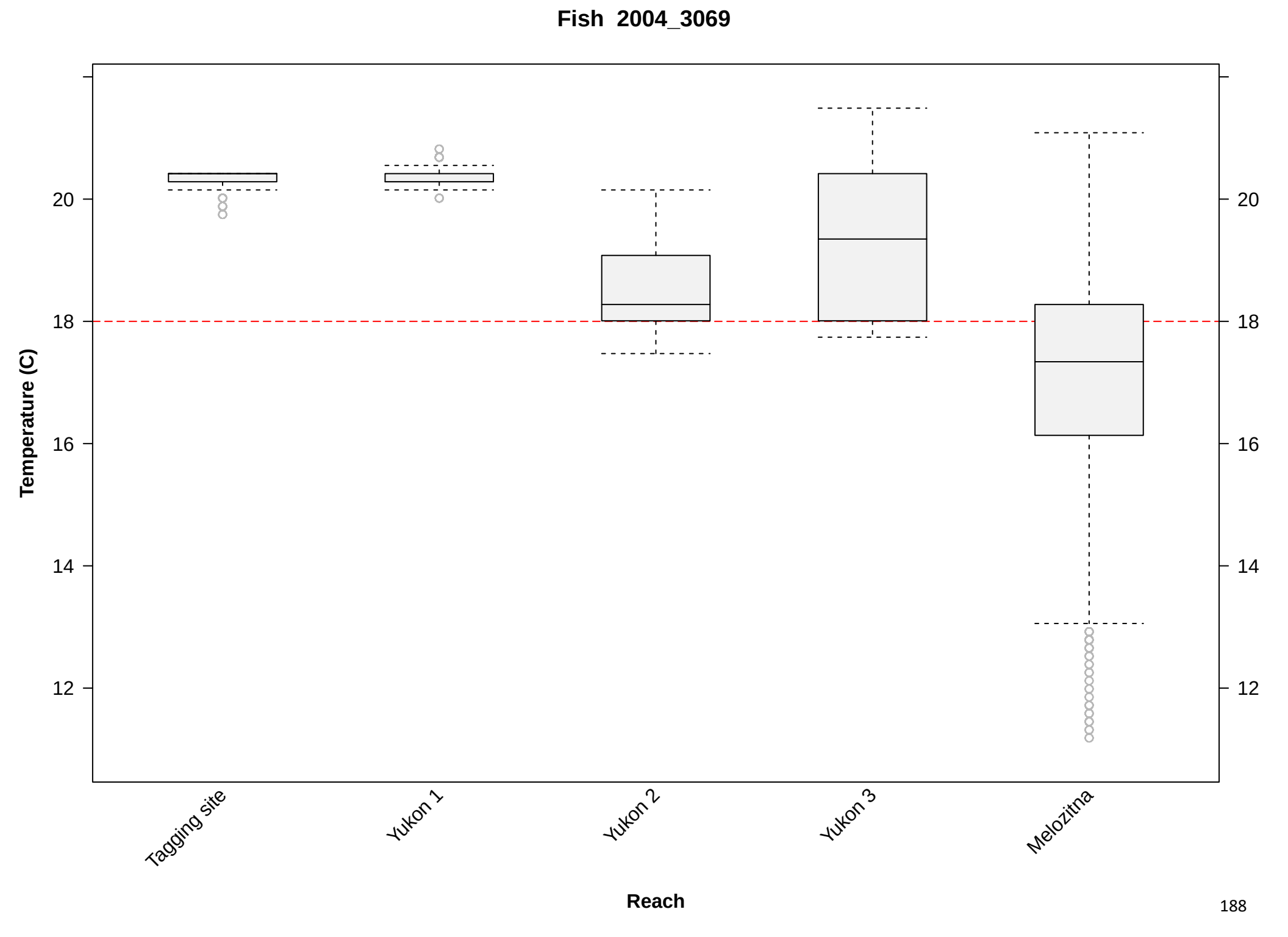

Fish 2004_3069
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Density
Depth (m)
0
5
10
15
20
25
1
0

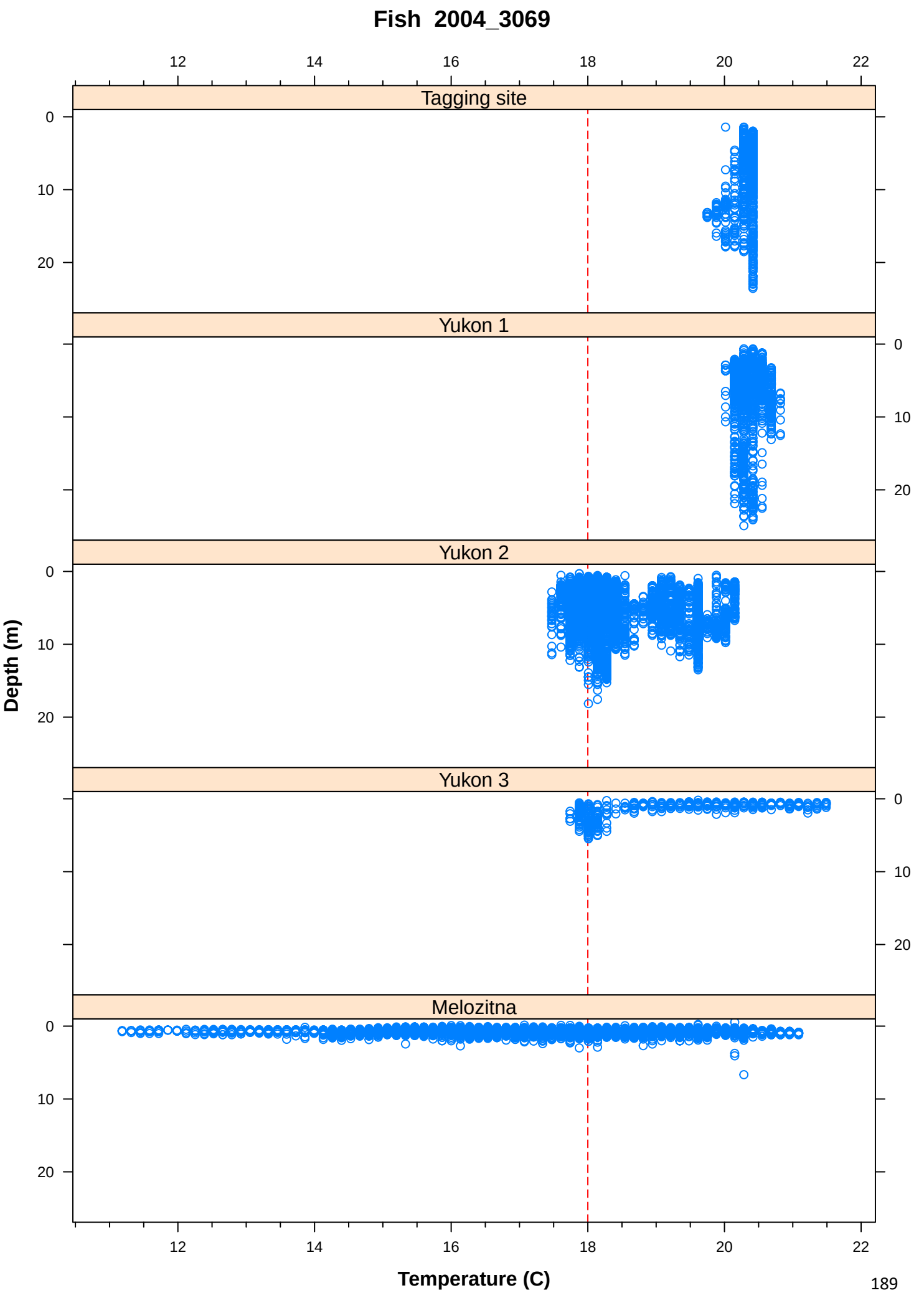

Fish 2004_3069
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Reach


Fish 2004_3069
0
100
200
300
400
500
600
22
21
20
19
18
17
Temperature (C)
Distance from Paimiut (km)


Fish 2004_3069
0
200
400
600
800
22
20
18
16
14
12
Temperature (C)
Hours since release


Fish 2004_3069
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Density
Temperature (C)
10
12
14
16
18
20
22
0
5


Fish 2004_3069
Temperature (C)
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Reach


Fish 2004_3069
Tagging site
Yukon 1
Yukon 2
Yukon 3
Melozitna
Depth (m)
Temperature (C)
12
14
16
18
20
22
0
10
20

Appendix 5. -- Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Tanana in 2002-2004.

Kantishna.....193

Tolovana.....233

Nenana.....264

Clear.....284

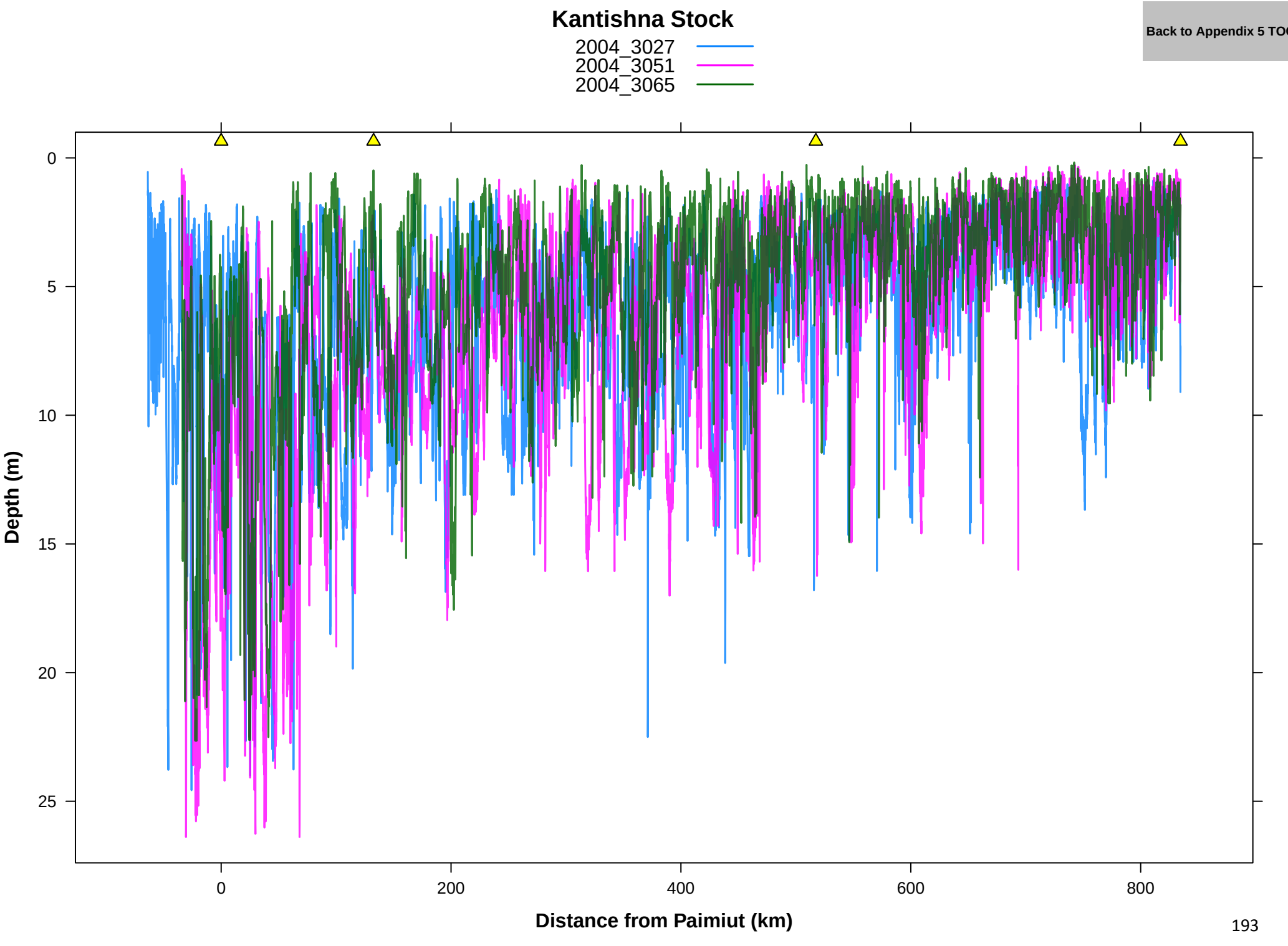
Chena.....295

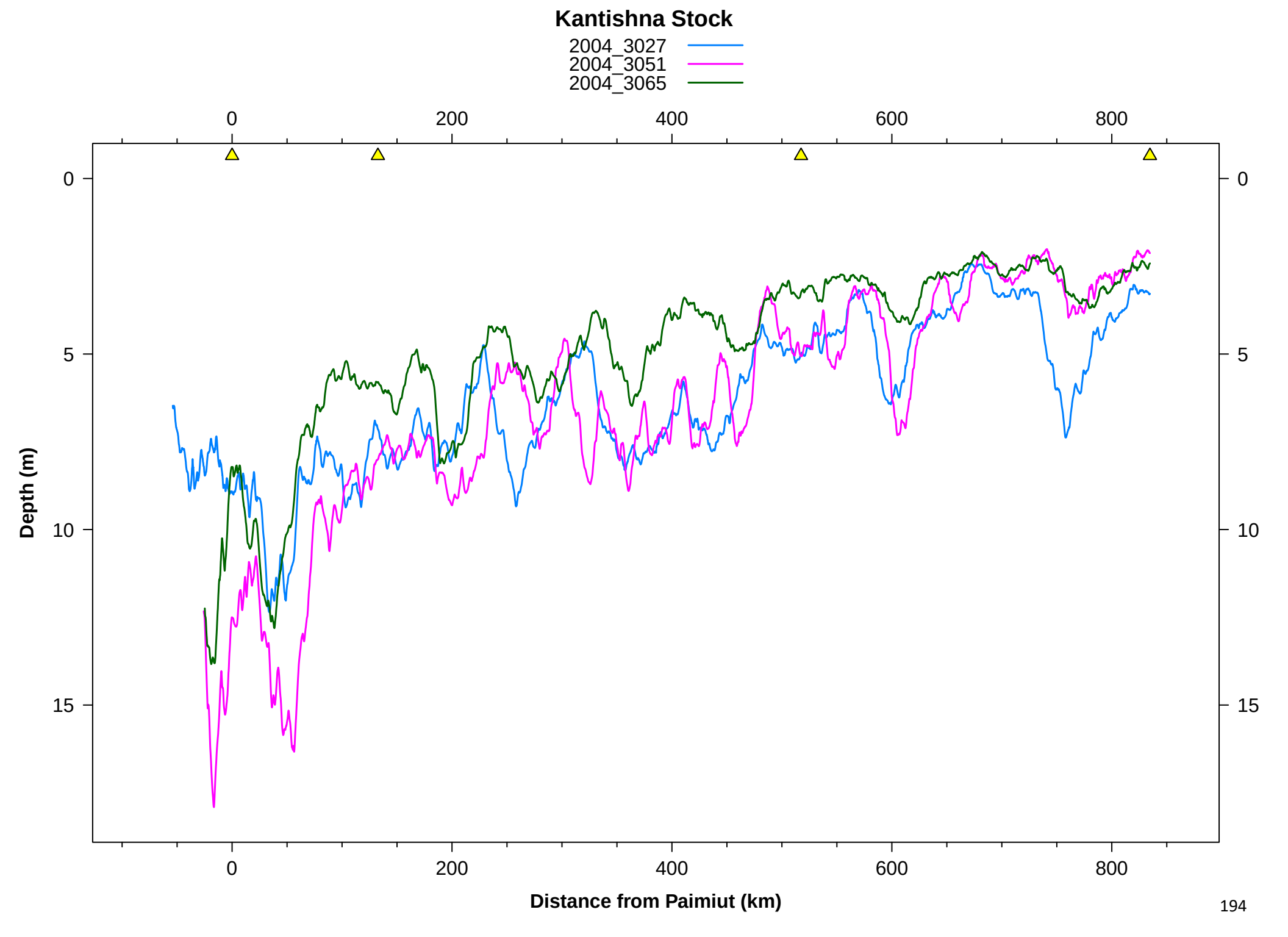
Salcha.....362

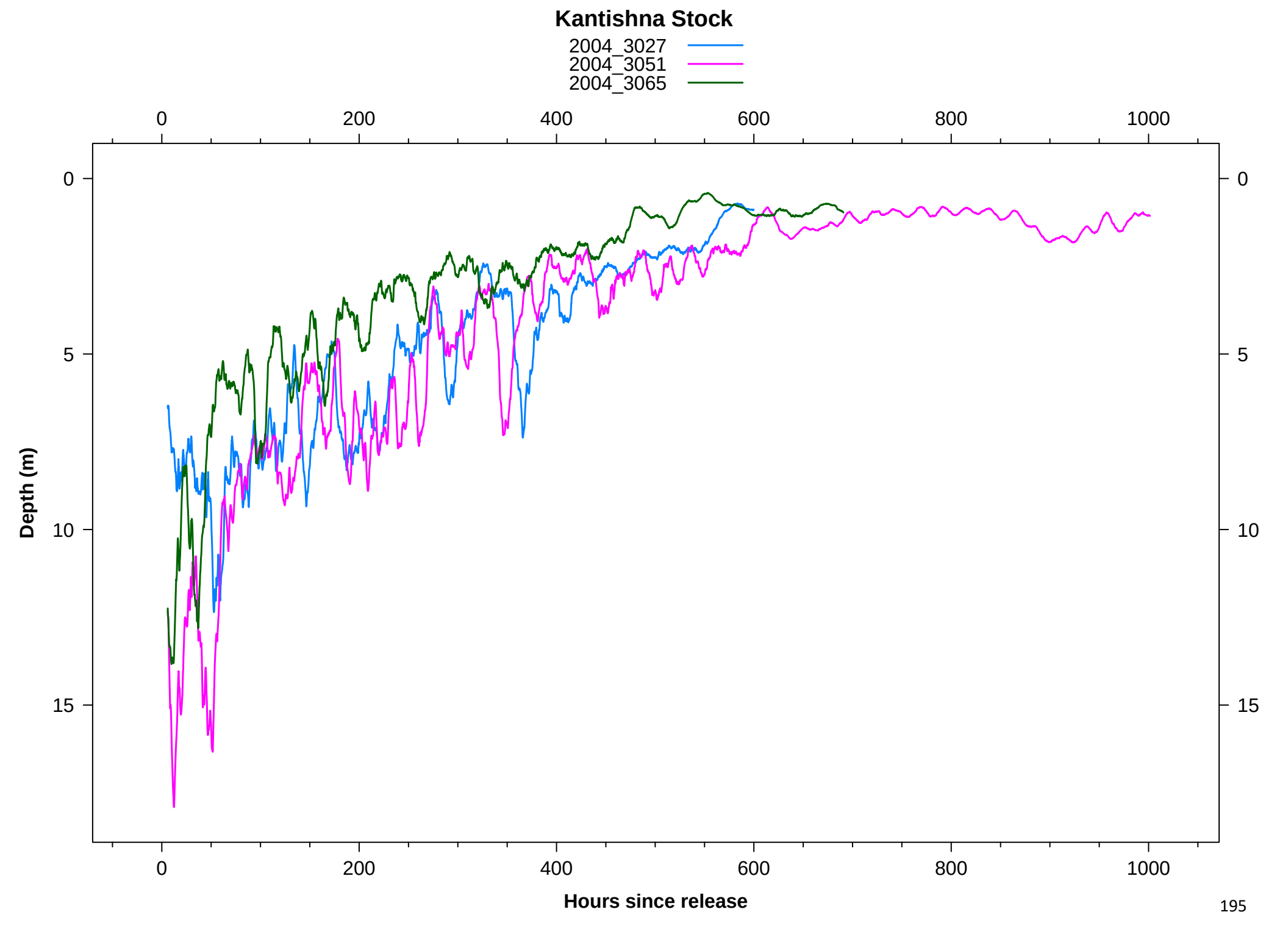
Goodpaster.....438

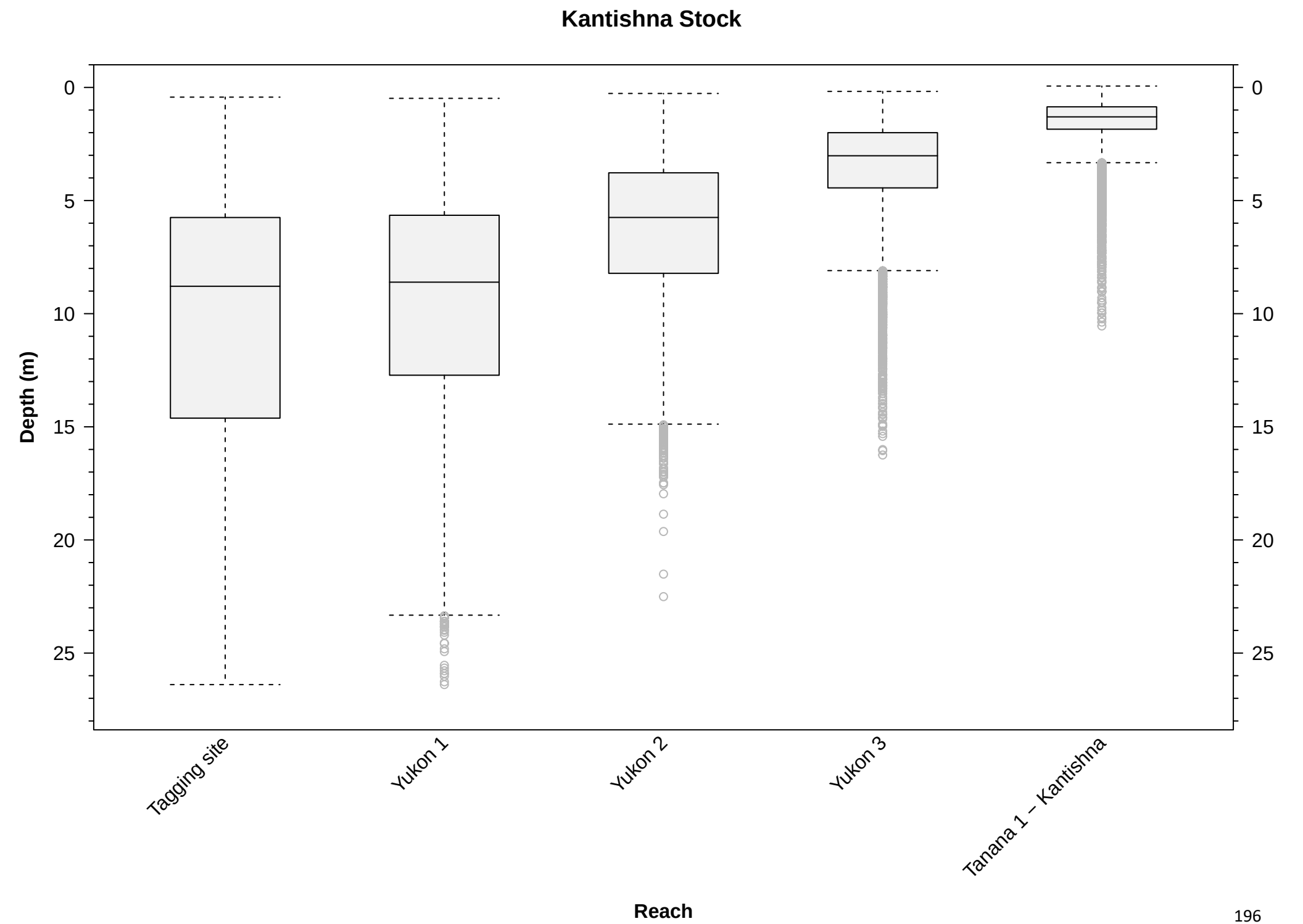
Tanana River fishery.....487

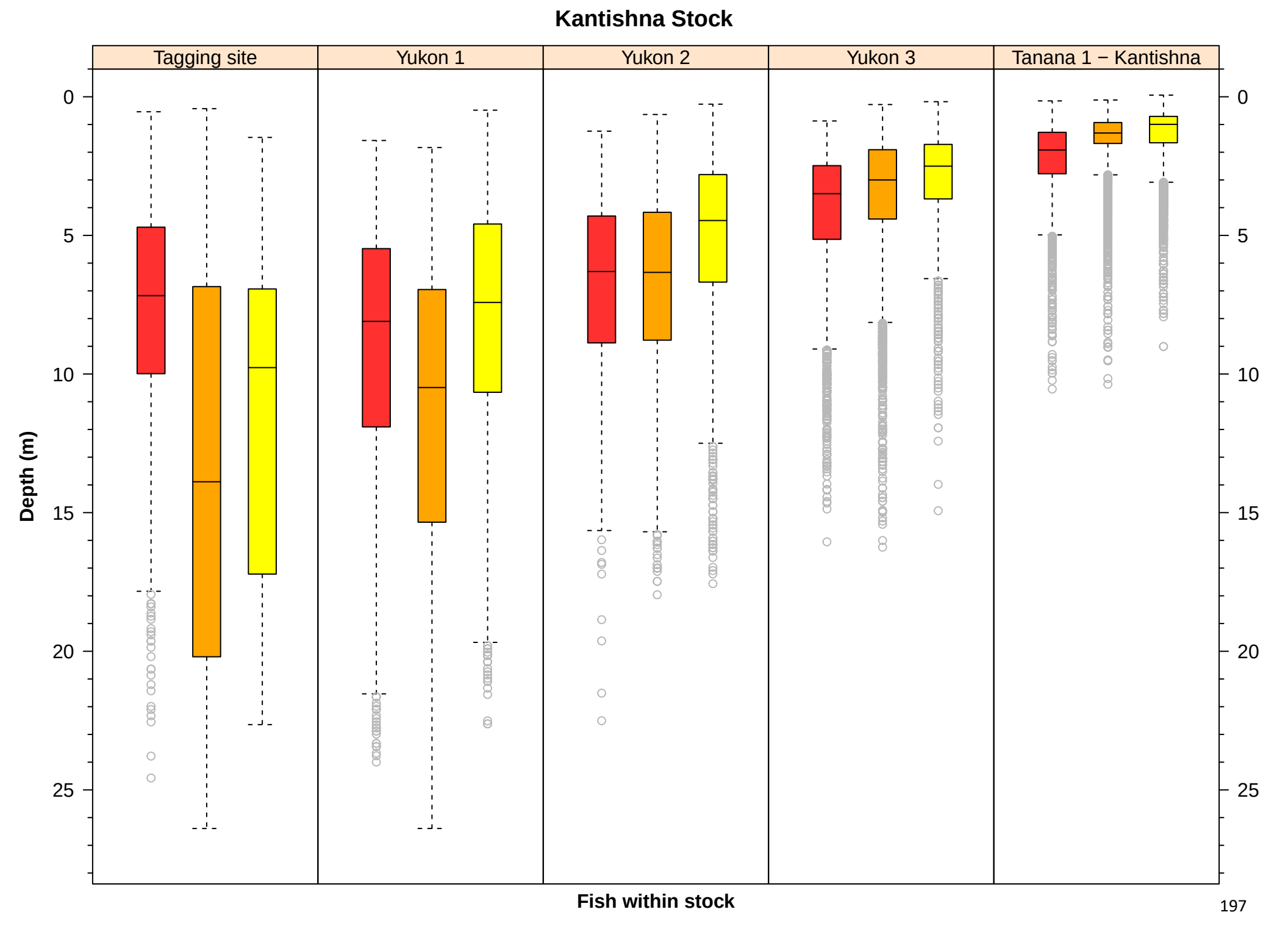
Back to Appendix 5 TOC

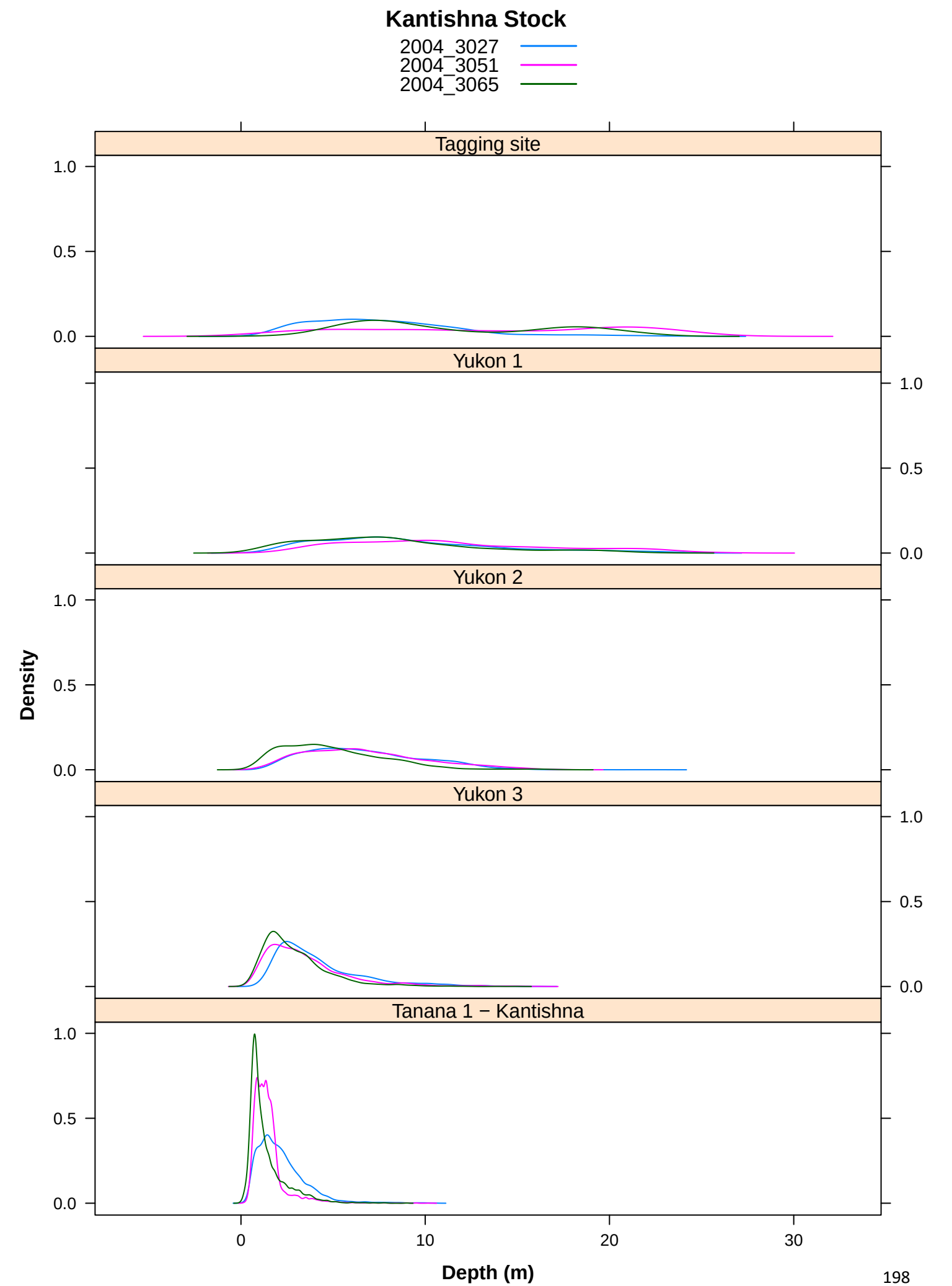


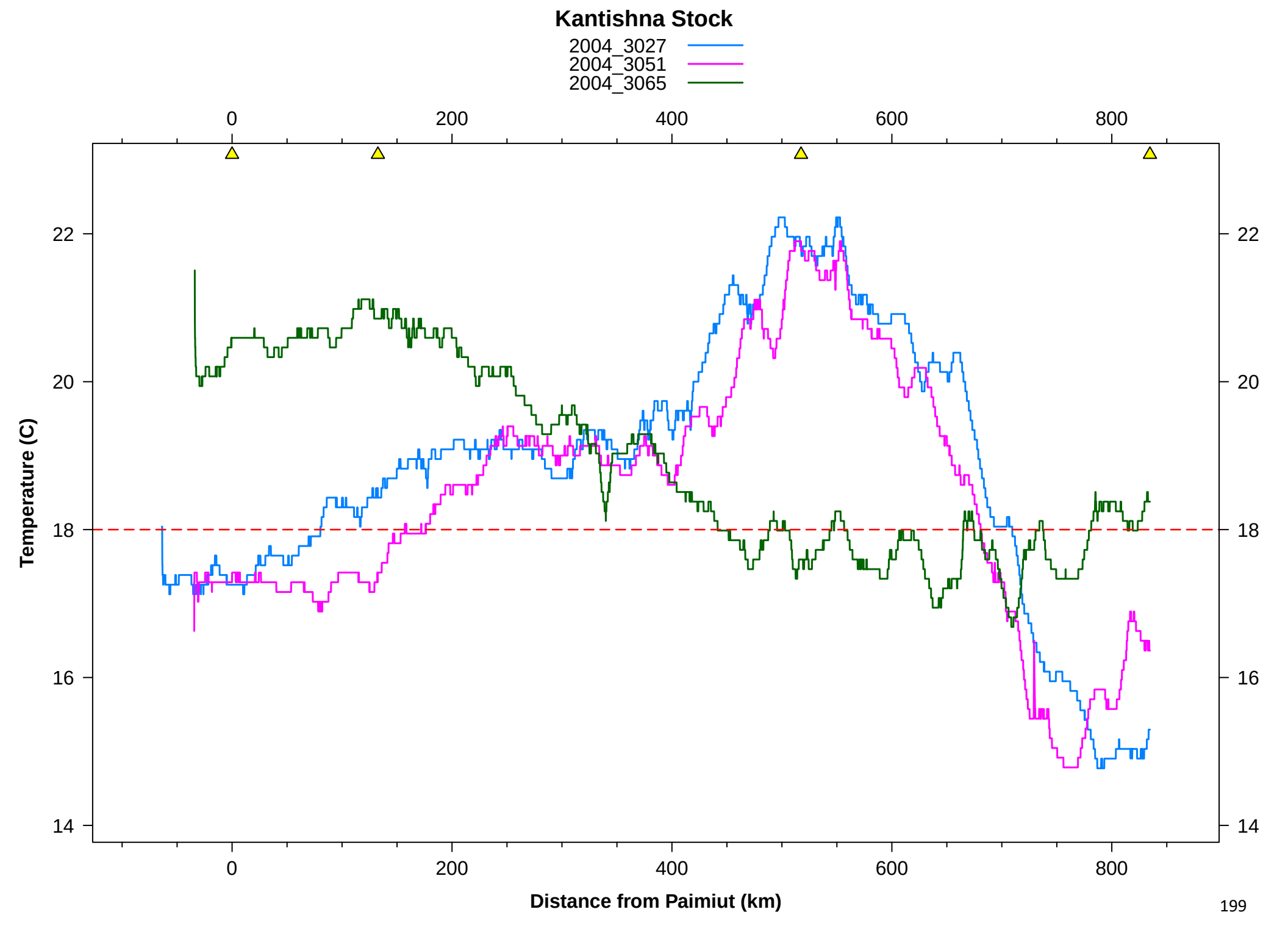

Kantishna Stock
2004_3027
2004_3051
2004_3065
0
200
400
600
800
0
5
10
15
Depth (m)
Distance from Paimiut (km)

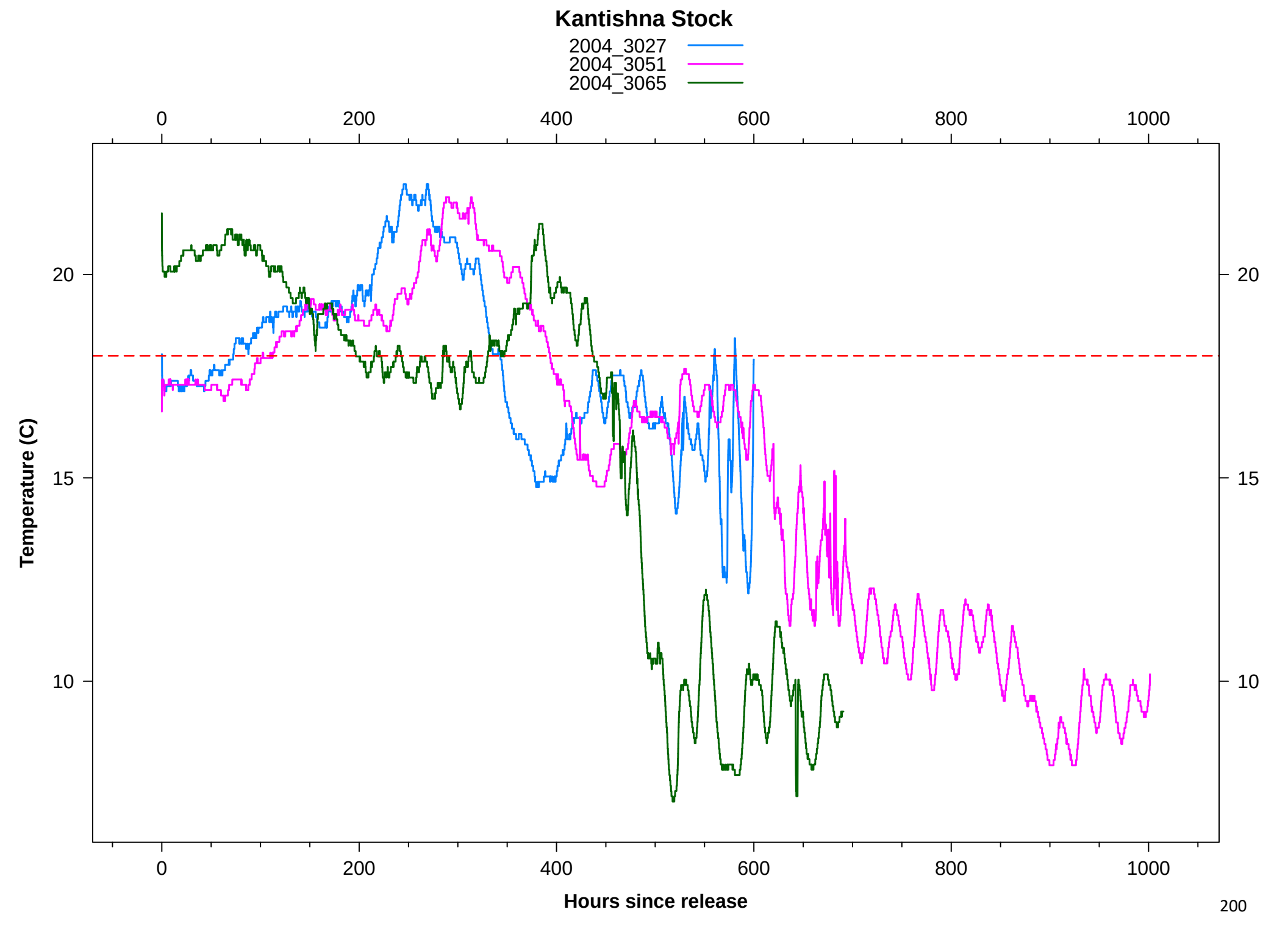

Kantishna Stock
2004_3027
2004_3051
2004_3065
0
200
400
600
800
1000
Depth (m)
0
5
10
15
Hours since release

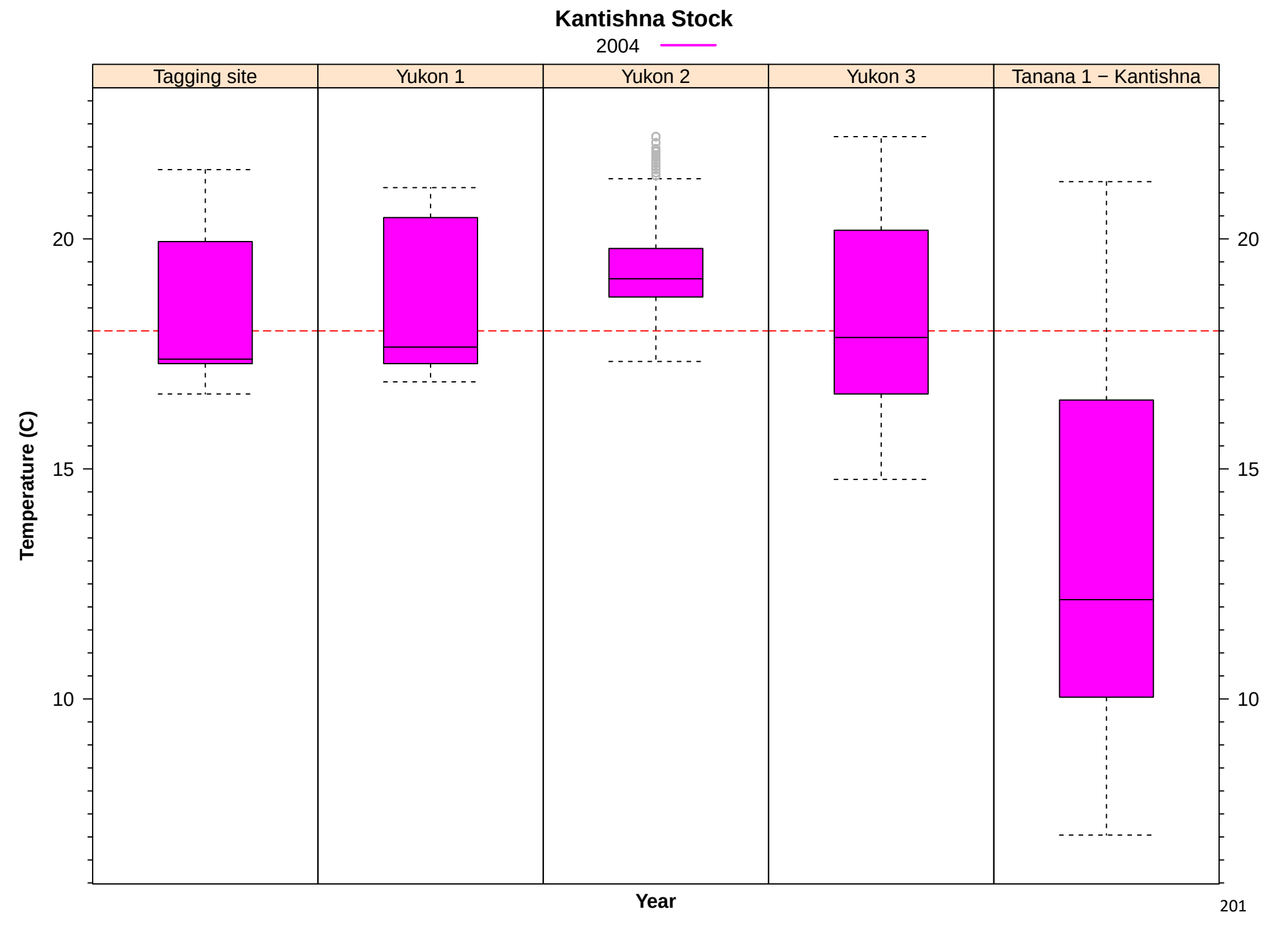

Kantishna Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Kantishna
Reach

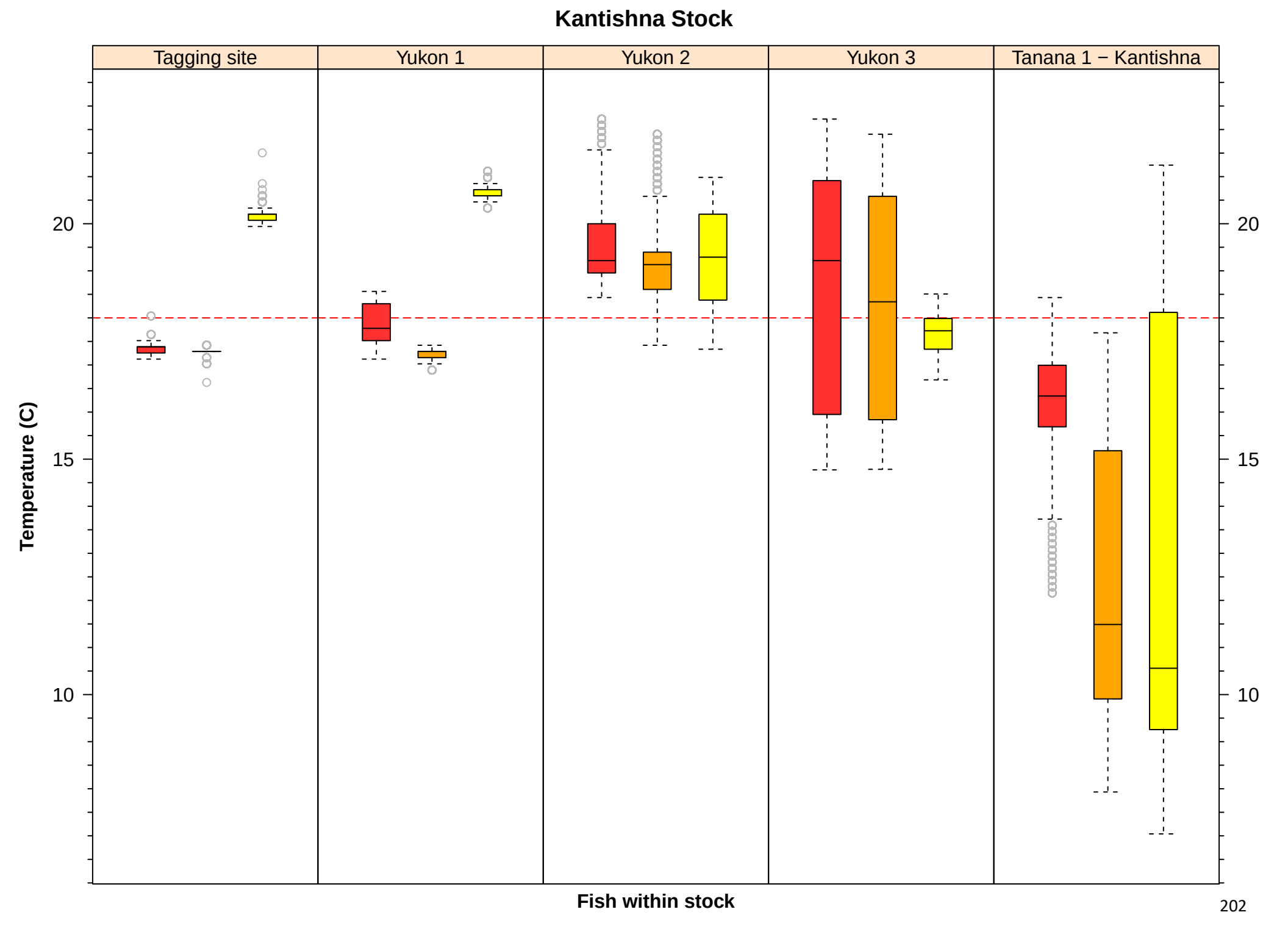

Kantishna Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Depth (m)
0
5
10
15
20
25
Fish within stock

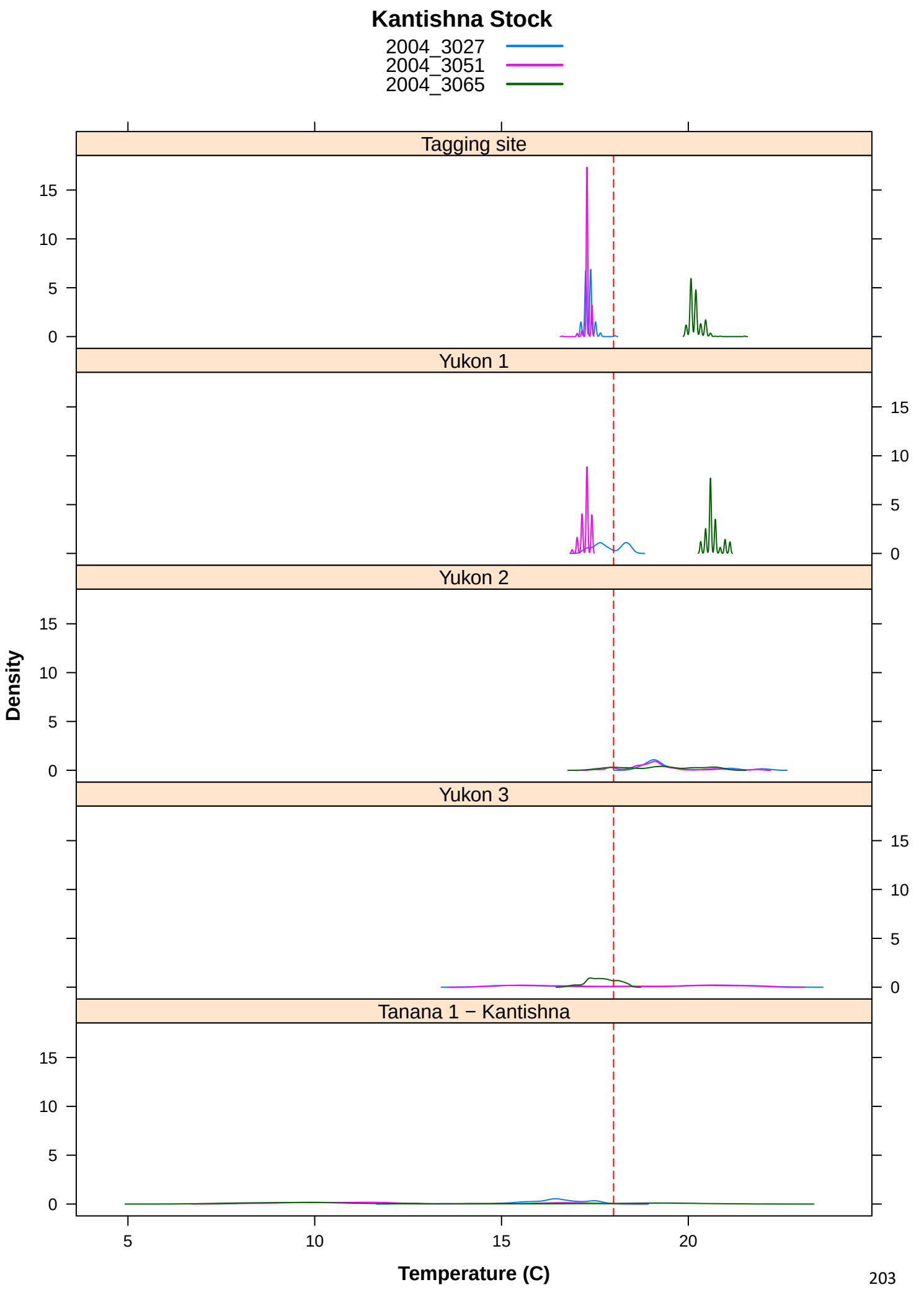

Kantishna Stock
2004_3027
2004_3051
2004_3065
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Density
1.0
0.5
0.0
0
10
20
30
Depth (m)

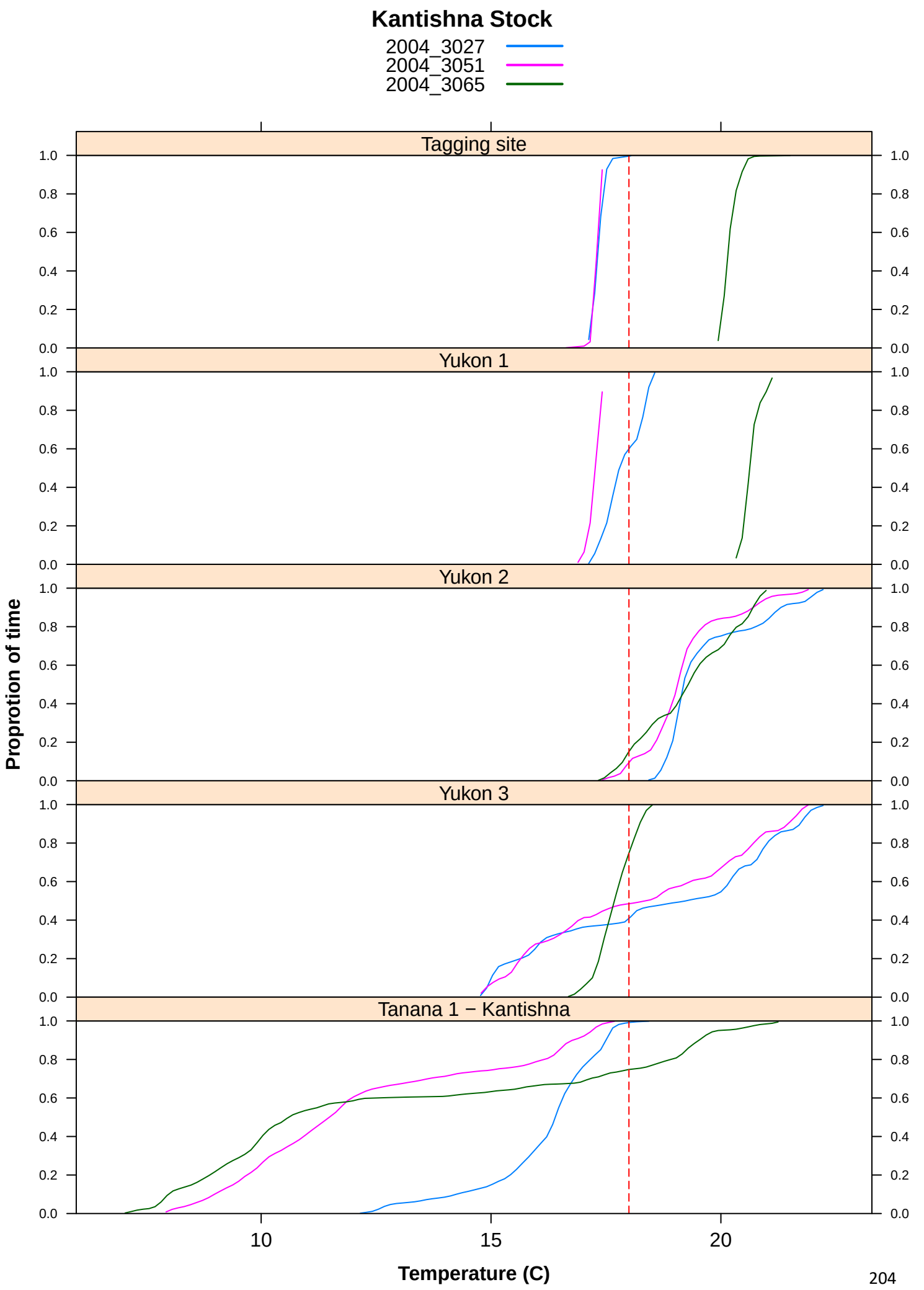

Kantishna Stock
2004_3027
2004_3051
2004_3065
0
200
400
600
800
22
20
18
16
14
Temperature (C)
Distance from Paimiut (km)

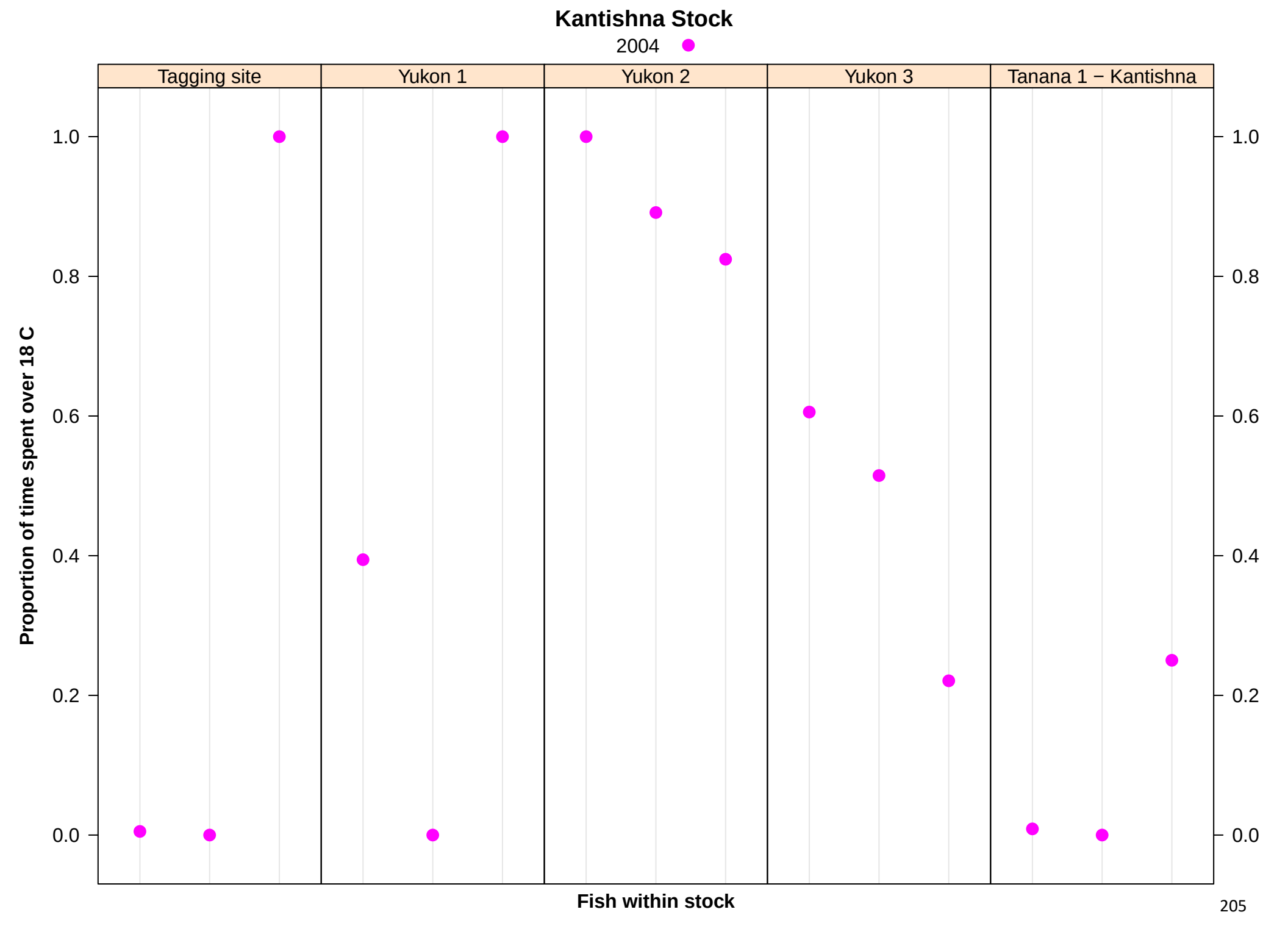

Kantishna Stock
2004_3027
2004_3051
2004_3065
0
200
400
600
800
1000
20
15
10
Temperature (C)
Hours since release

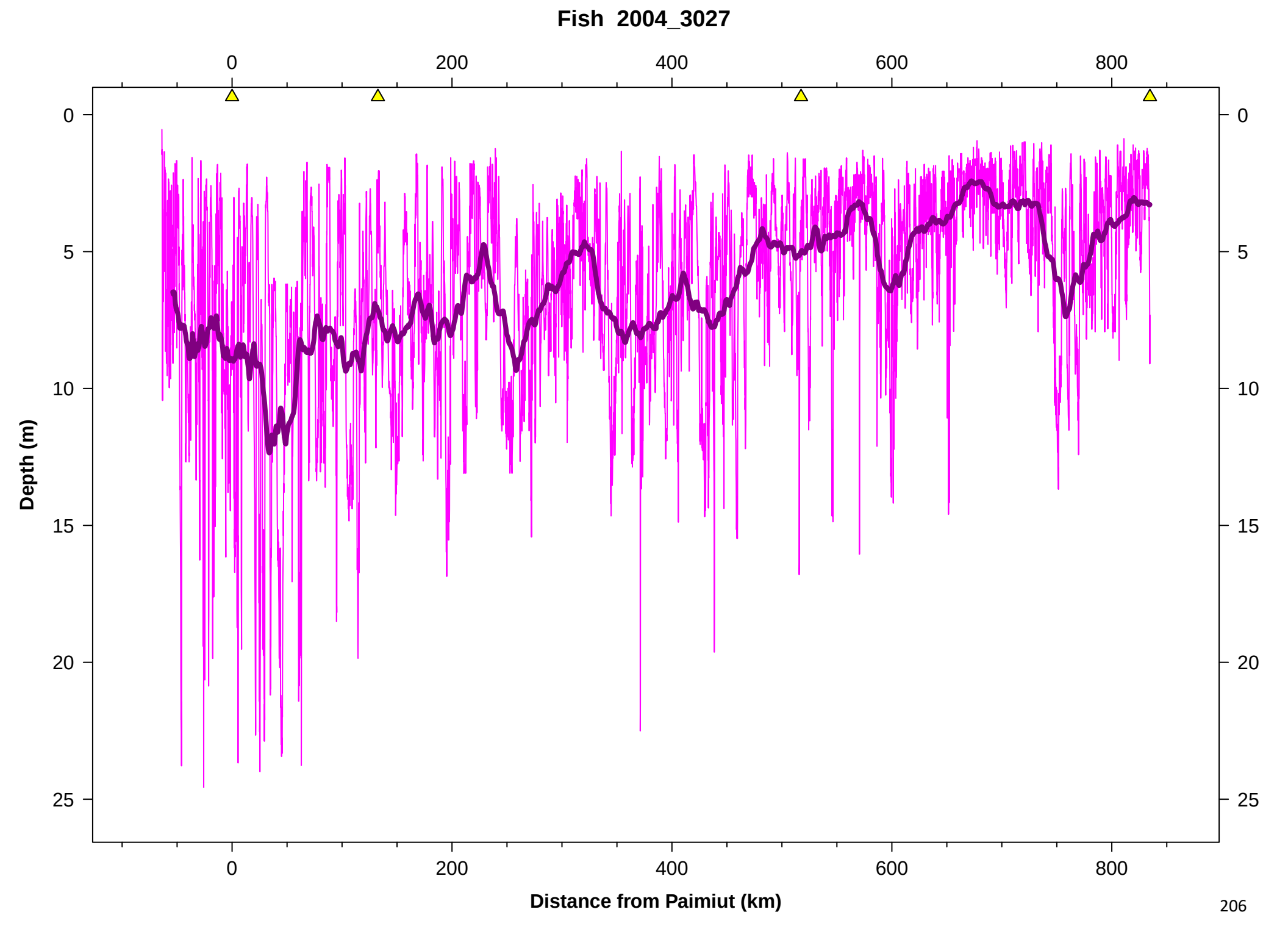

Kantishna Stock
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Temperature (C)
20
15
10
Year
201

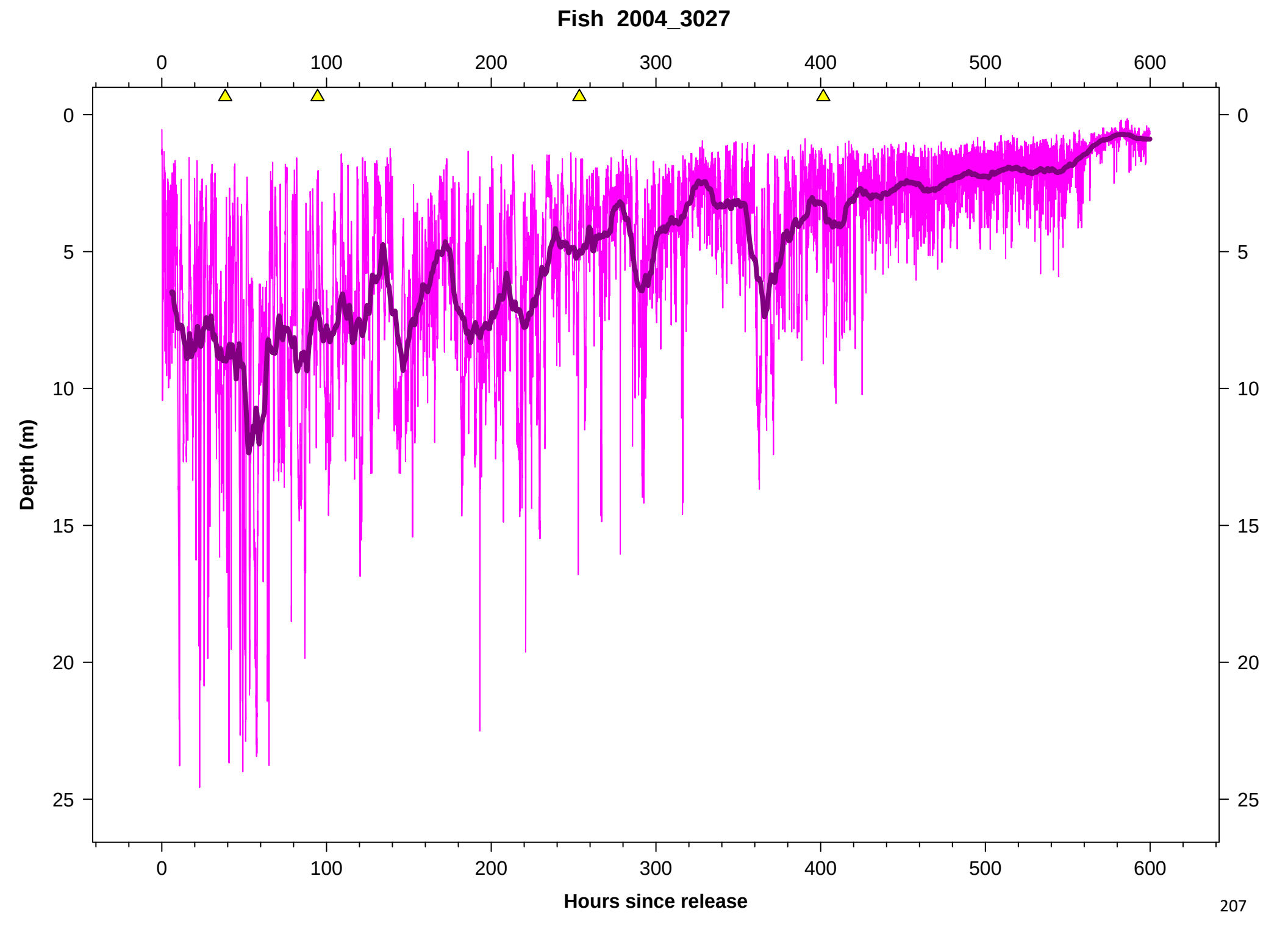

Kantishna Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Temperature (C)
20
15
10
Fish within stock
202

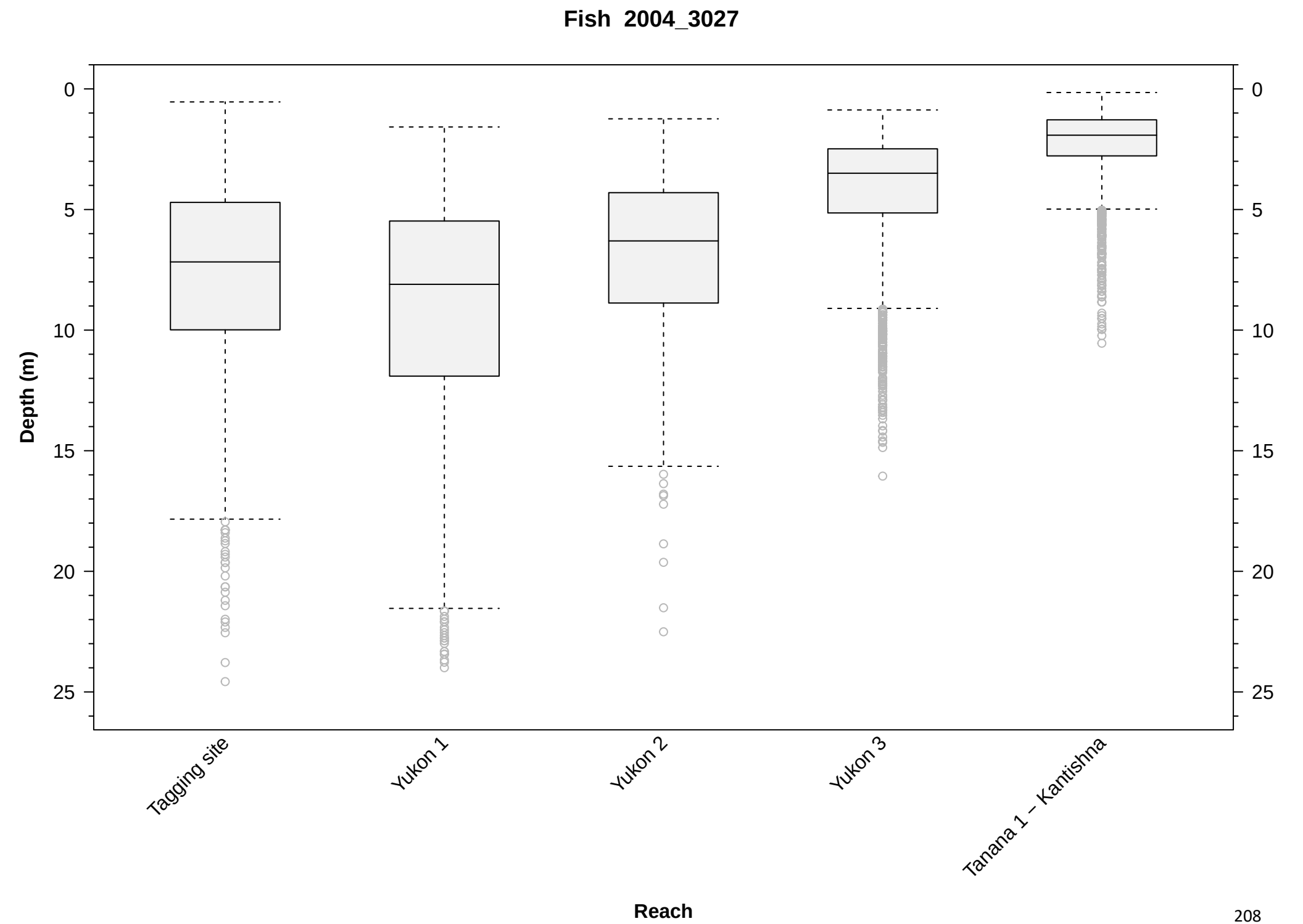

Kantishna Stock
2004_3027
2004_3051
2004_3065
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Density
Temperature (C)
0
5
10
15
20

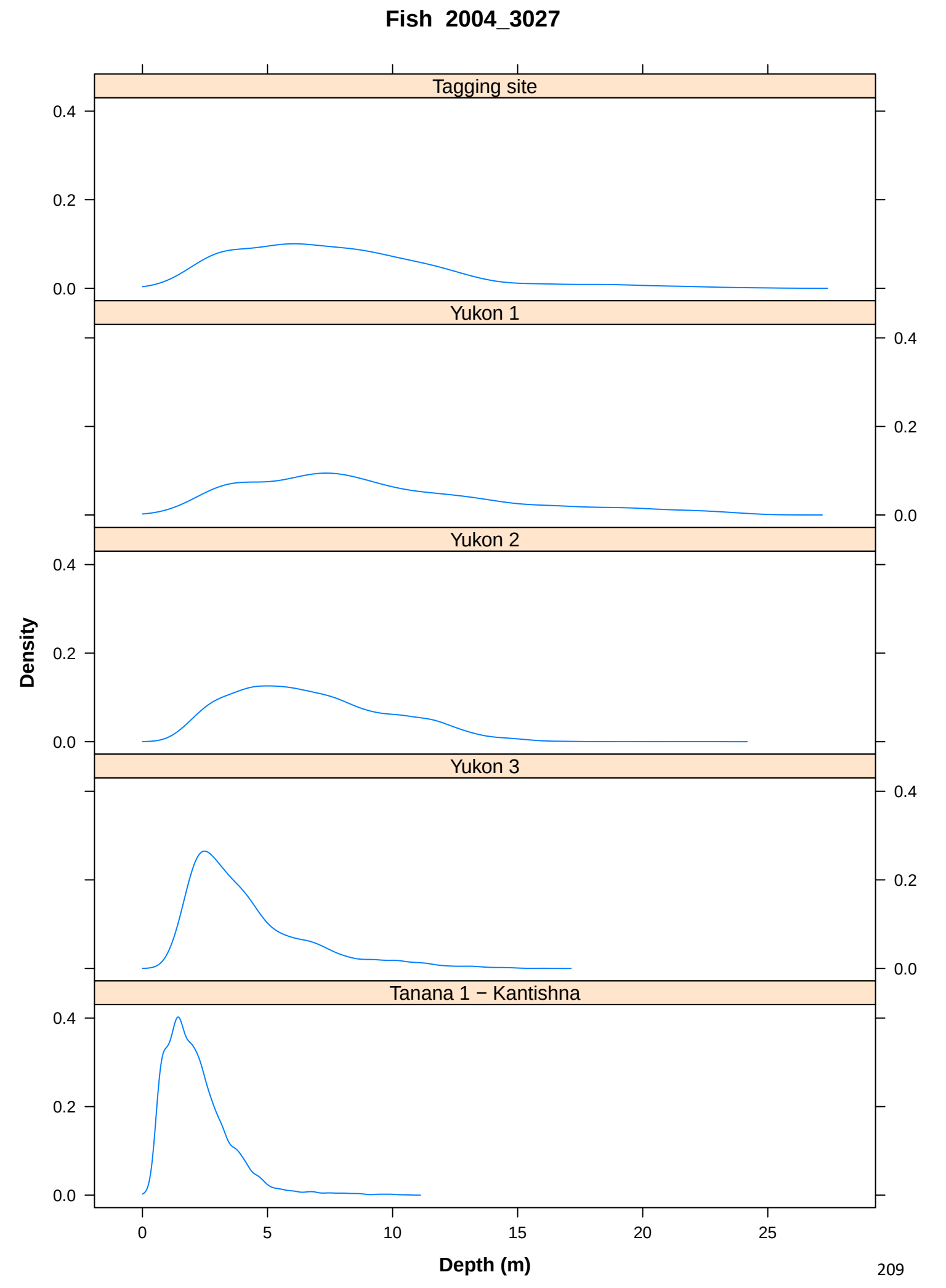

Kantishna Stock
2004_3027
2004_3051
2004_3065
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
10
15
20

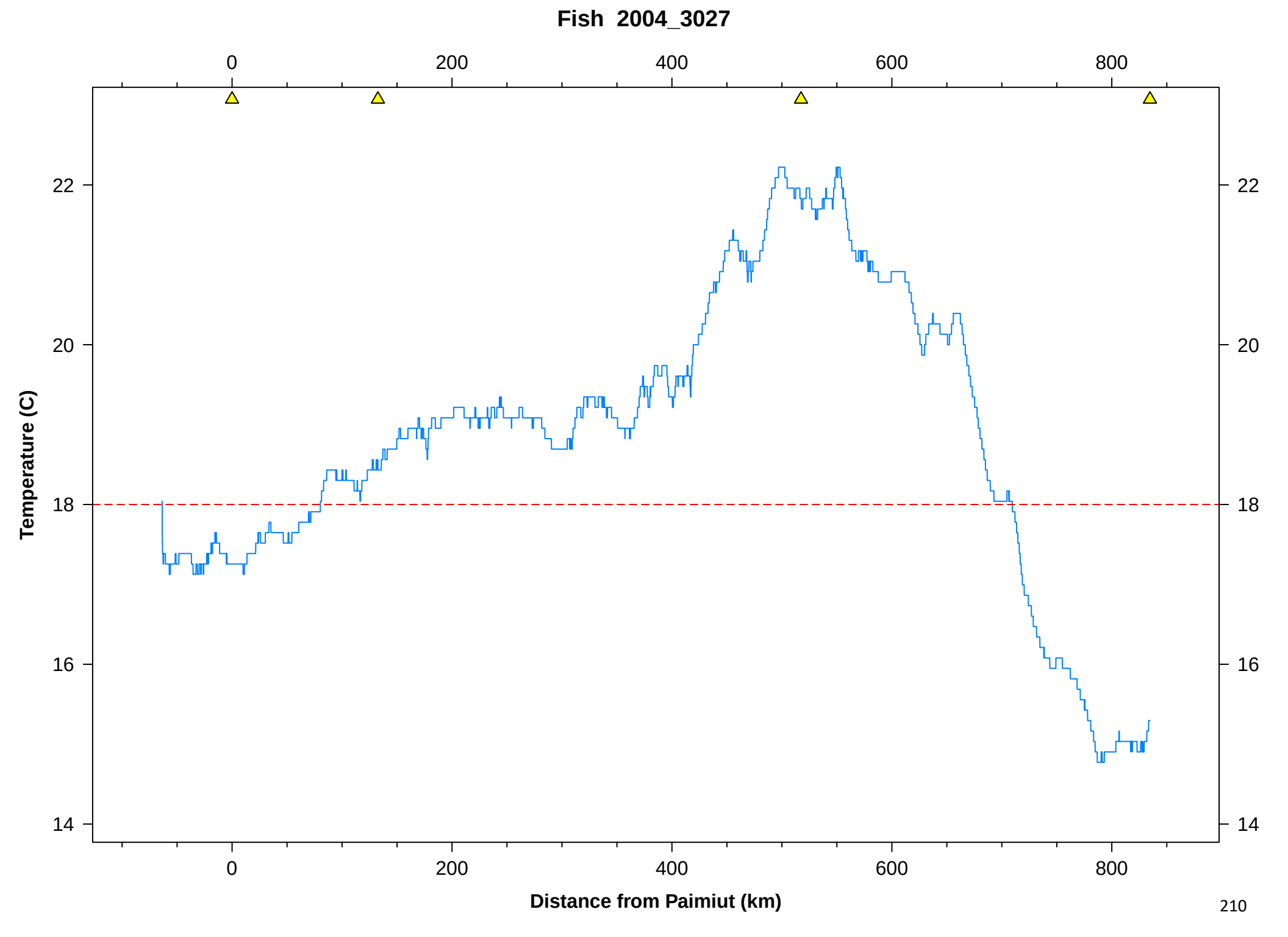

Kantishna Stock
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Proportion of time spent over 18 C
1.0
0.8
0.6
0.4
0.2
0.0
Fish within stock

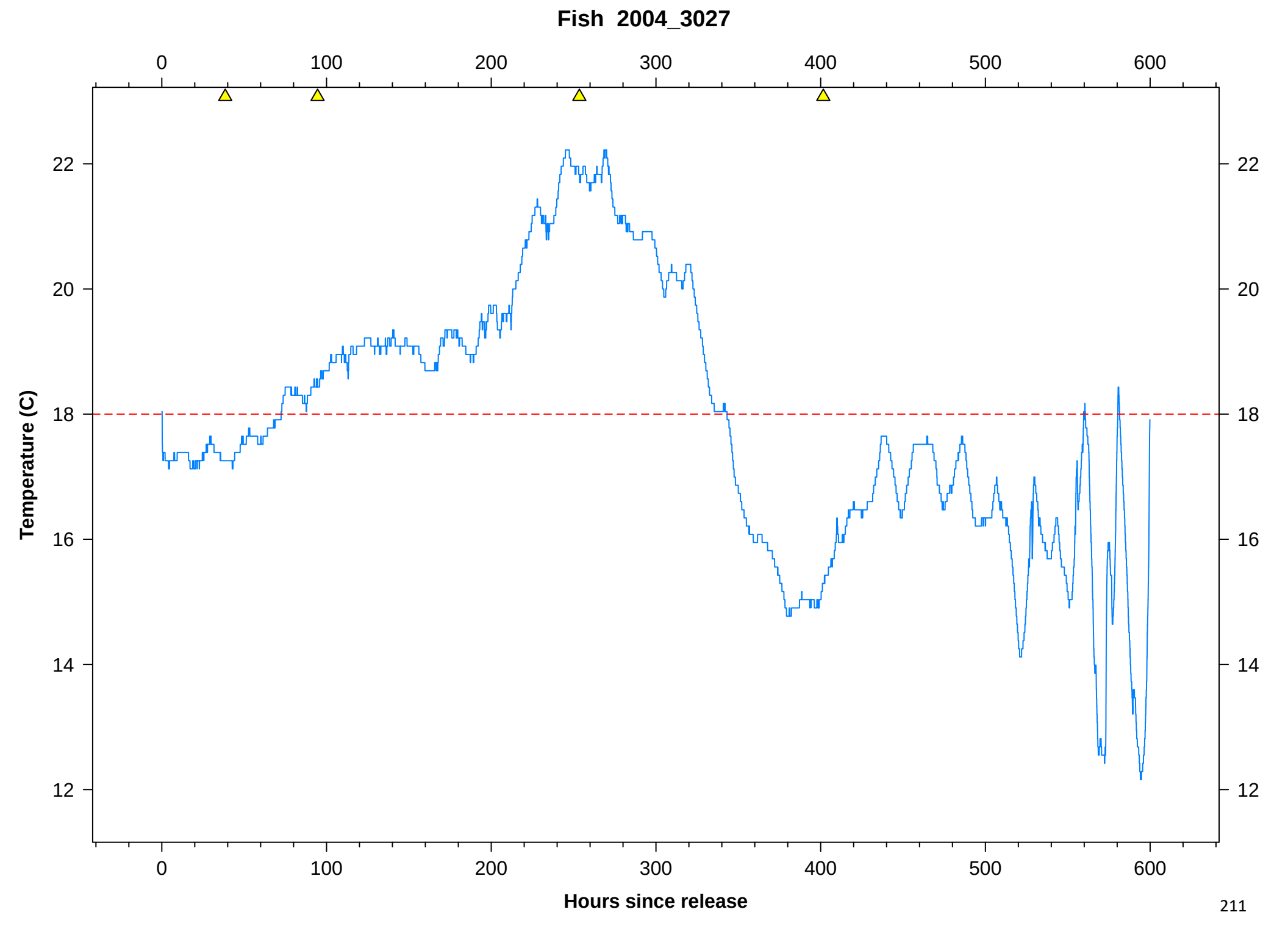

Fish 2004_3027
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

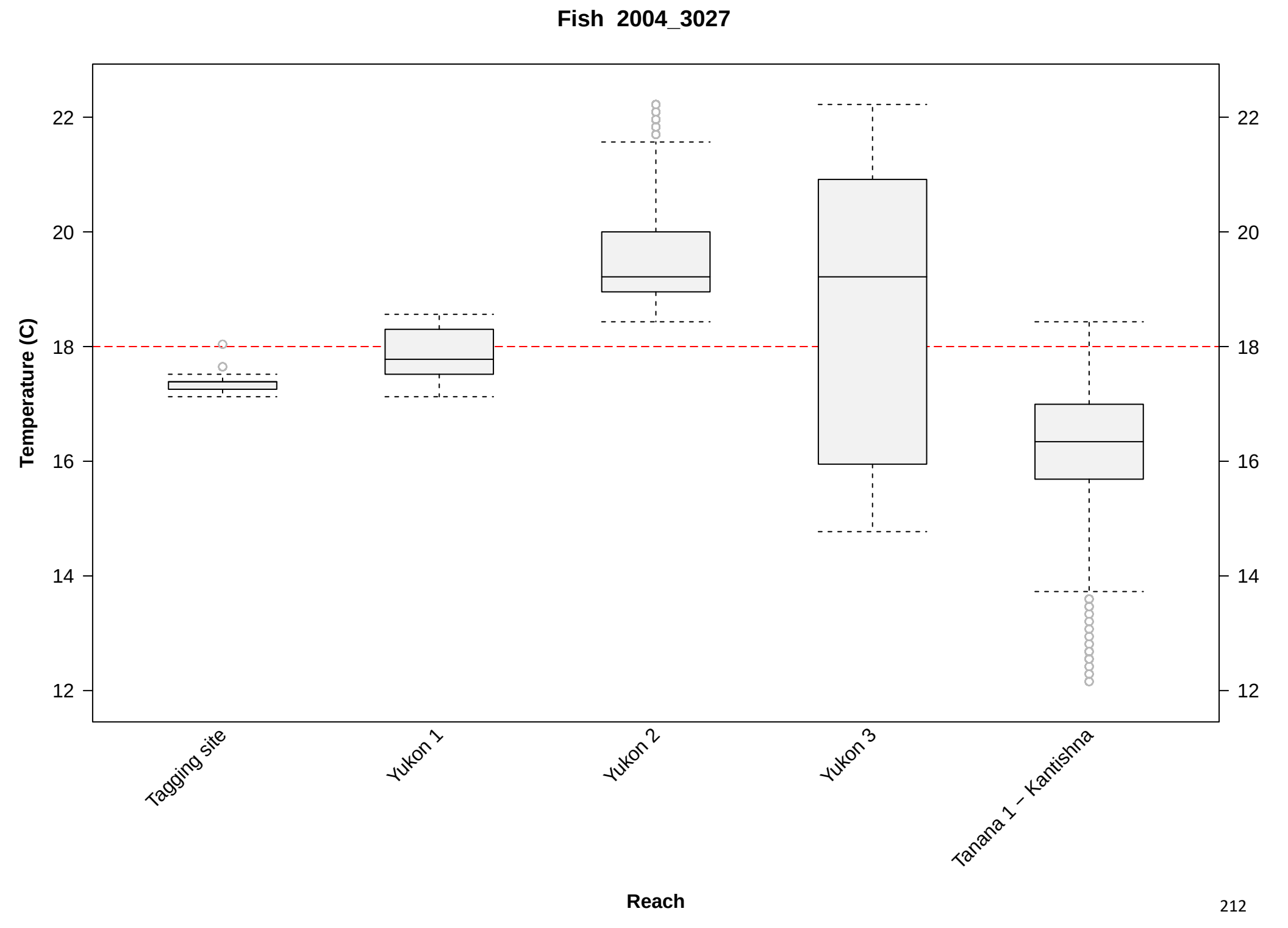

Fish 2004_3027
0
100
200
300
400
500
600
0
5
10
15
20
25
Depth (m)
Hours since release

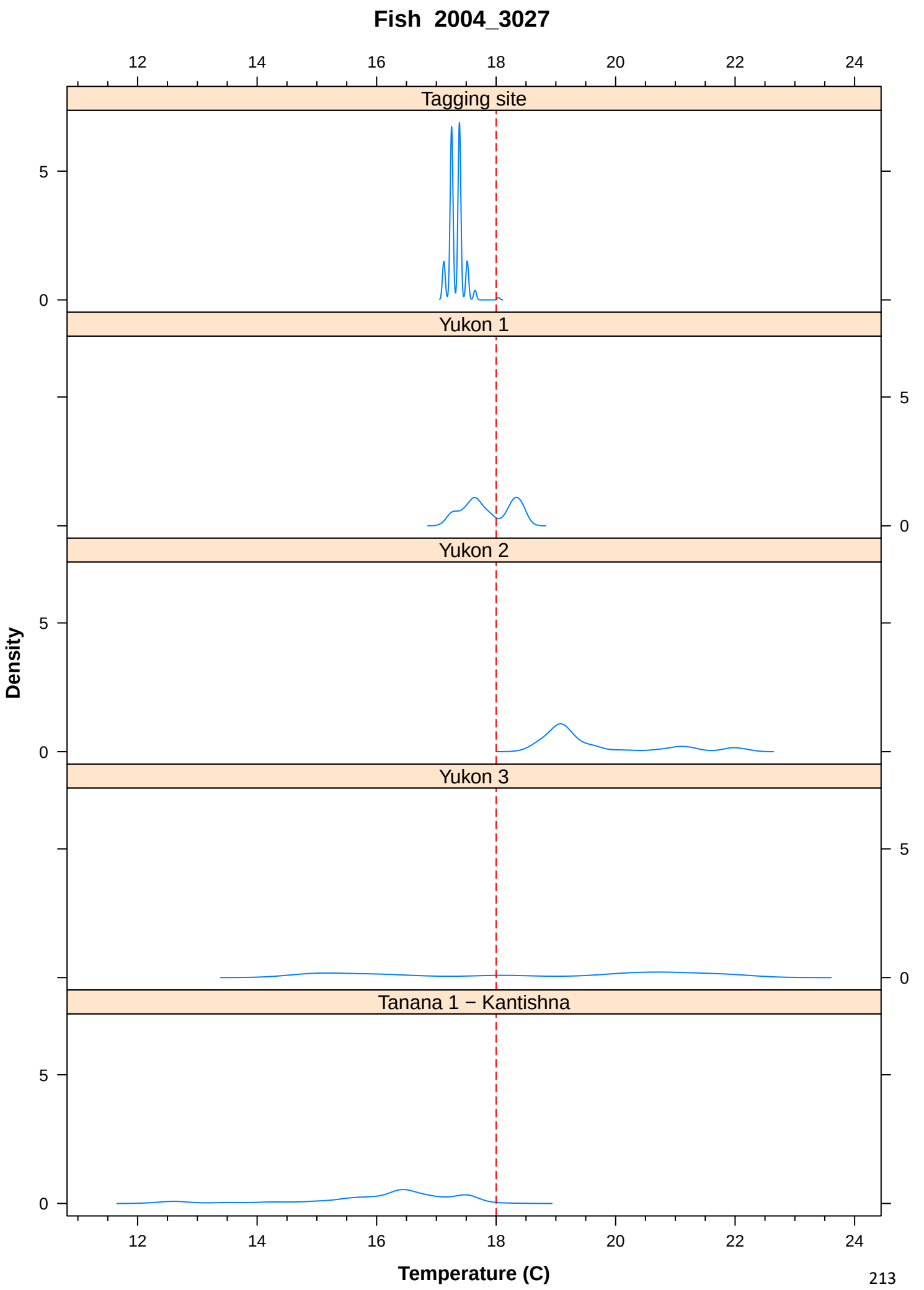

Fish 2004_3027
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Kantishna
Reach

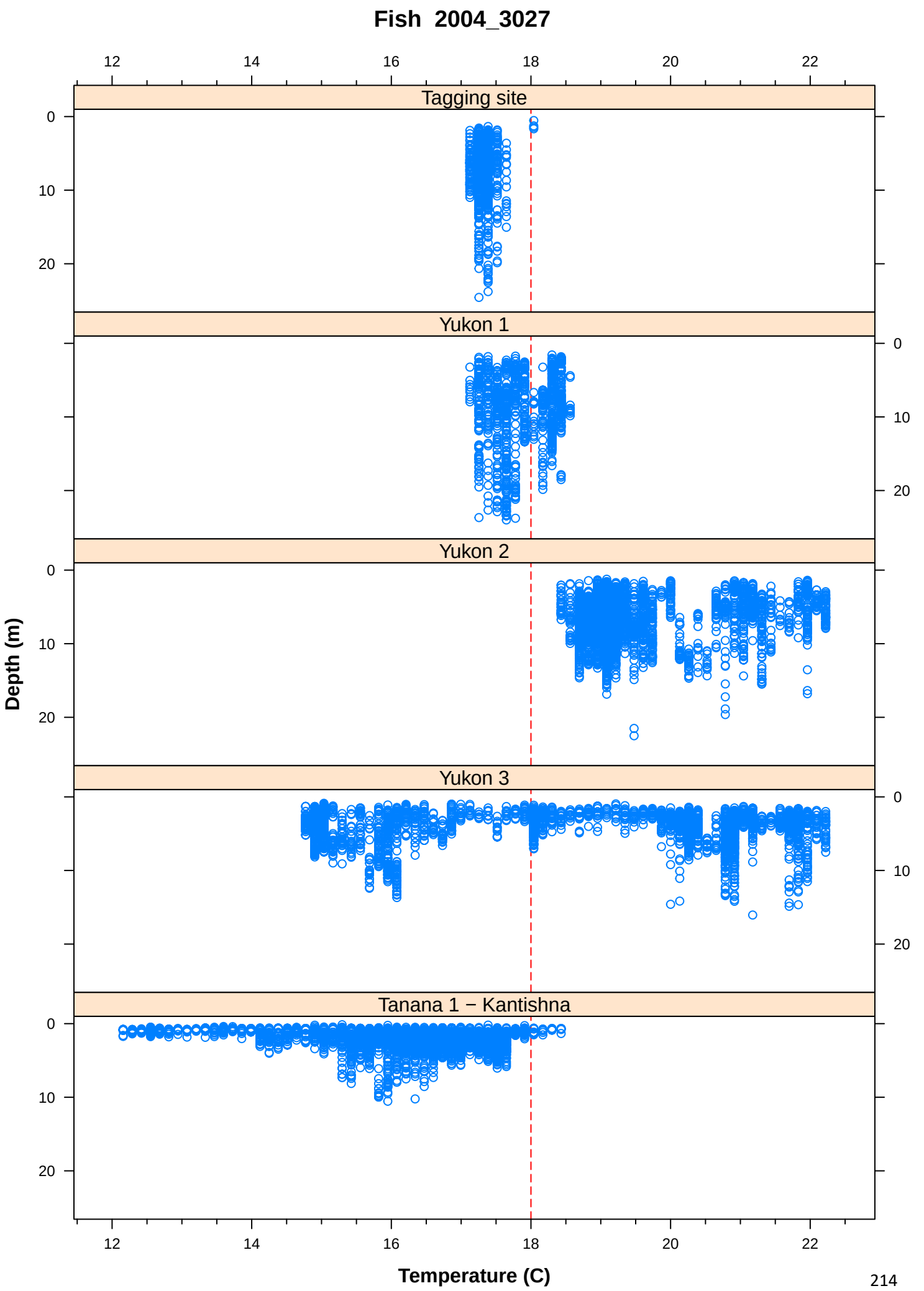

Fish 2004_3027
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Density
0.0
0.2
0.4
0
5
10
15
20
25
Depth (m)

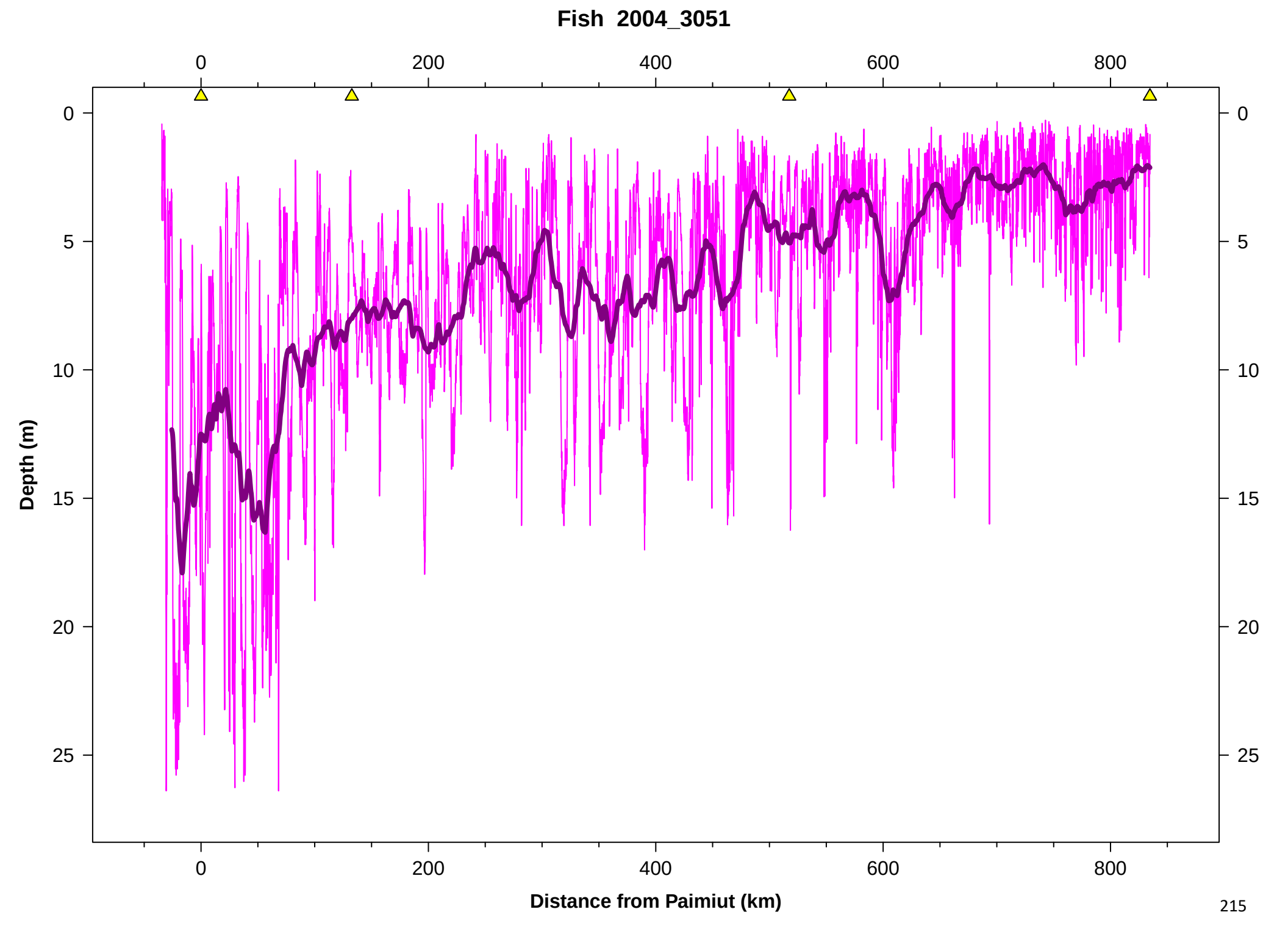

Fish 2004_3027
0
200
400
600
800
22
20
18
16
14
Temperature (C)
Distance from Paimiut (km)

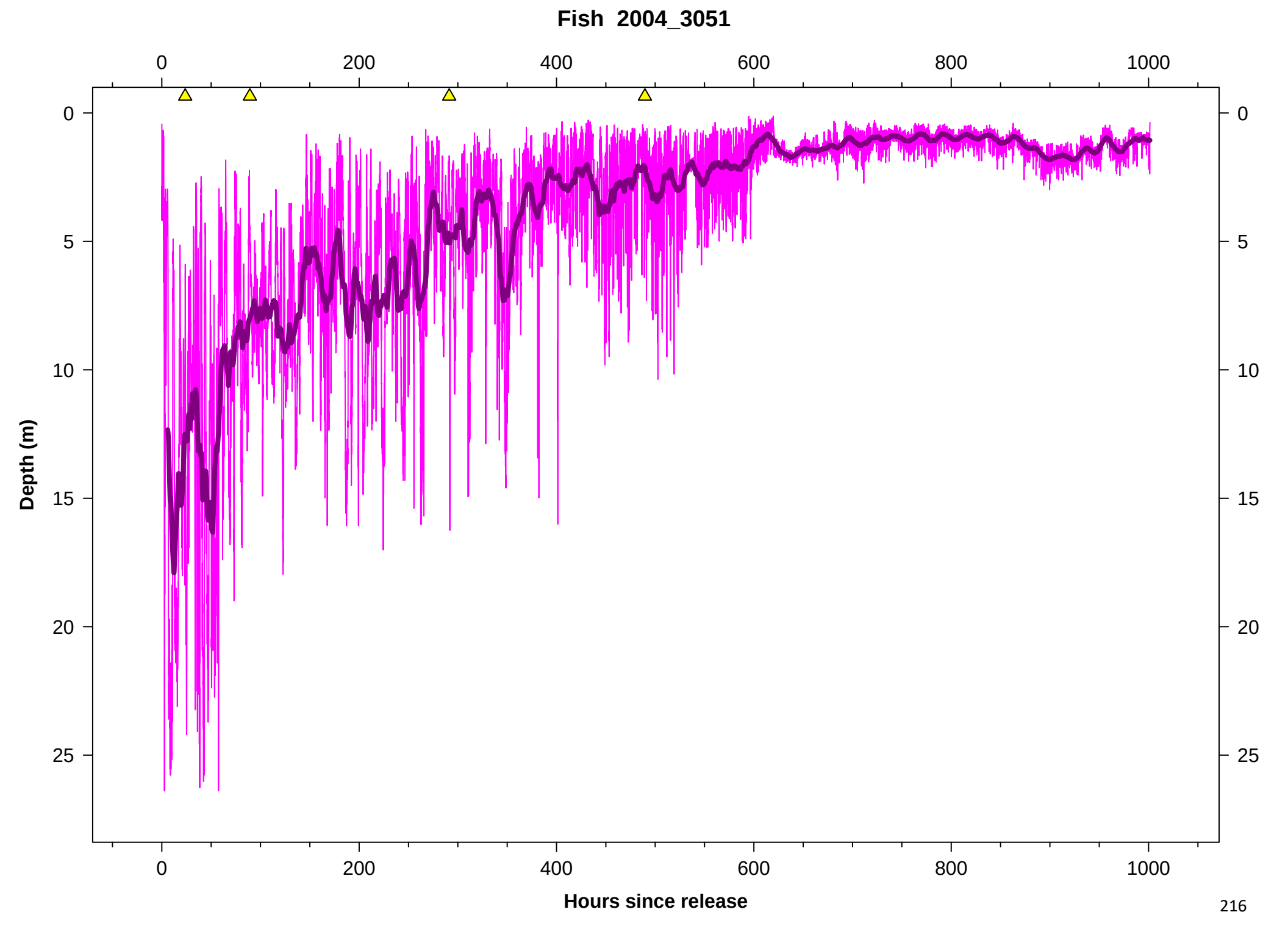

Fish 2004_3027
0
100
200
300
400
500
600
22
20
18
16
14
12
Temperature (C)
Hours since release

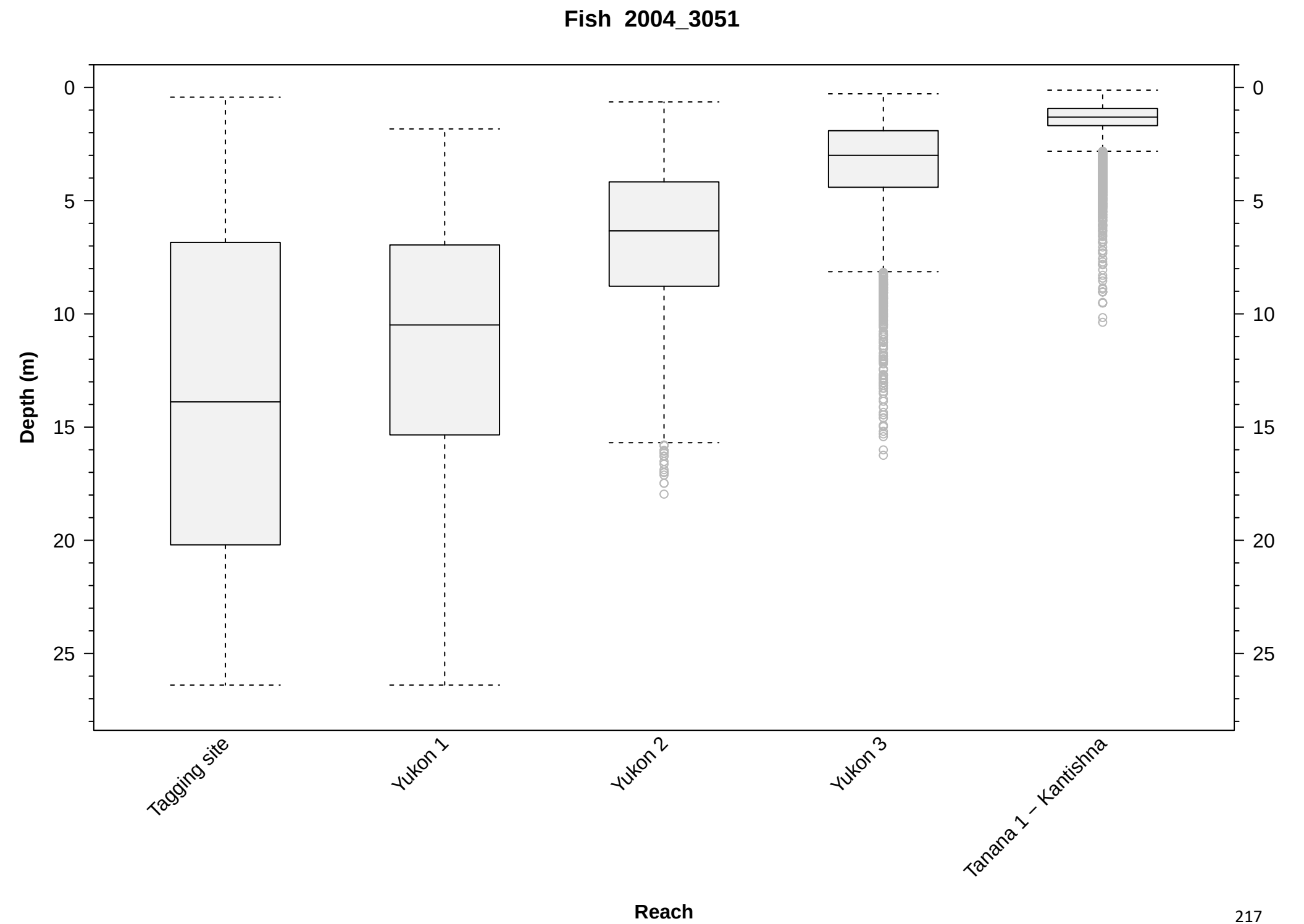

Fish 2004_3027
Temperature (C)
22
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Kantishna
Reach

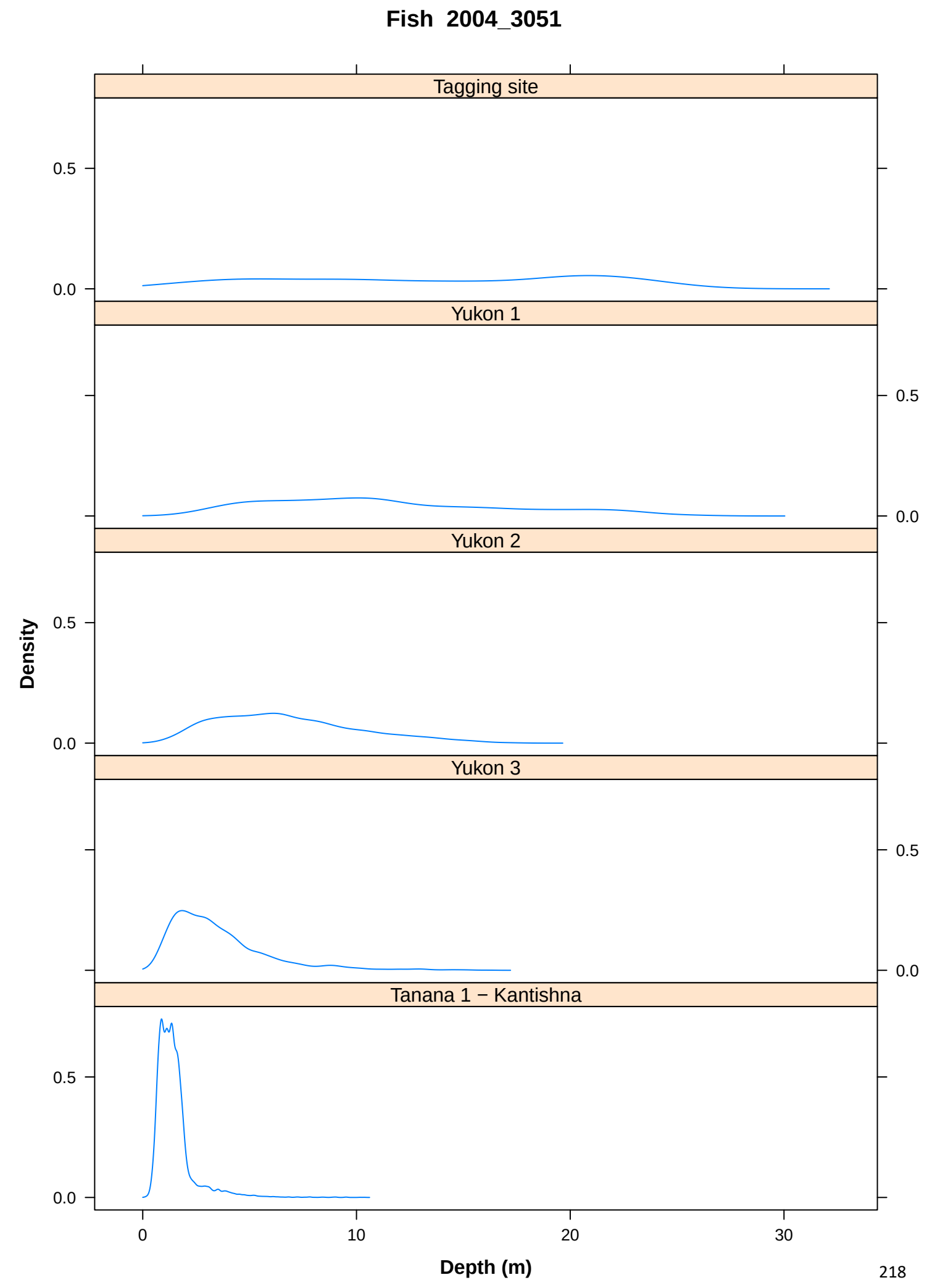

Fish 2004_3027
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Density
Temperature (C)
12
14
16
18
20
22
24
0
5

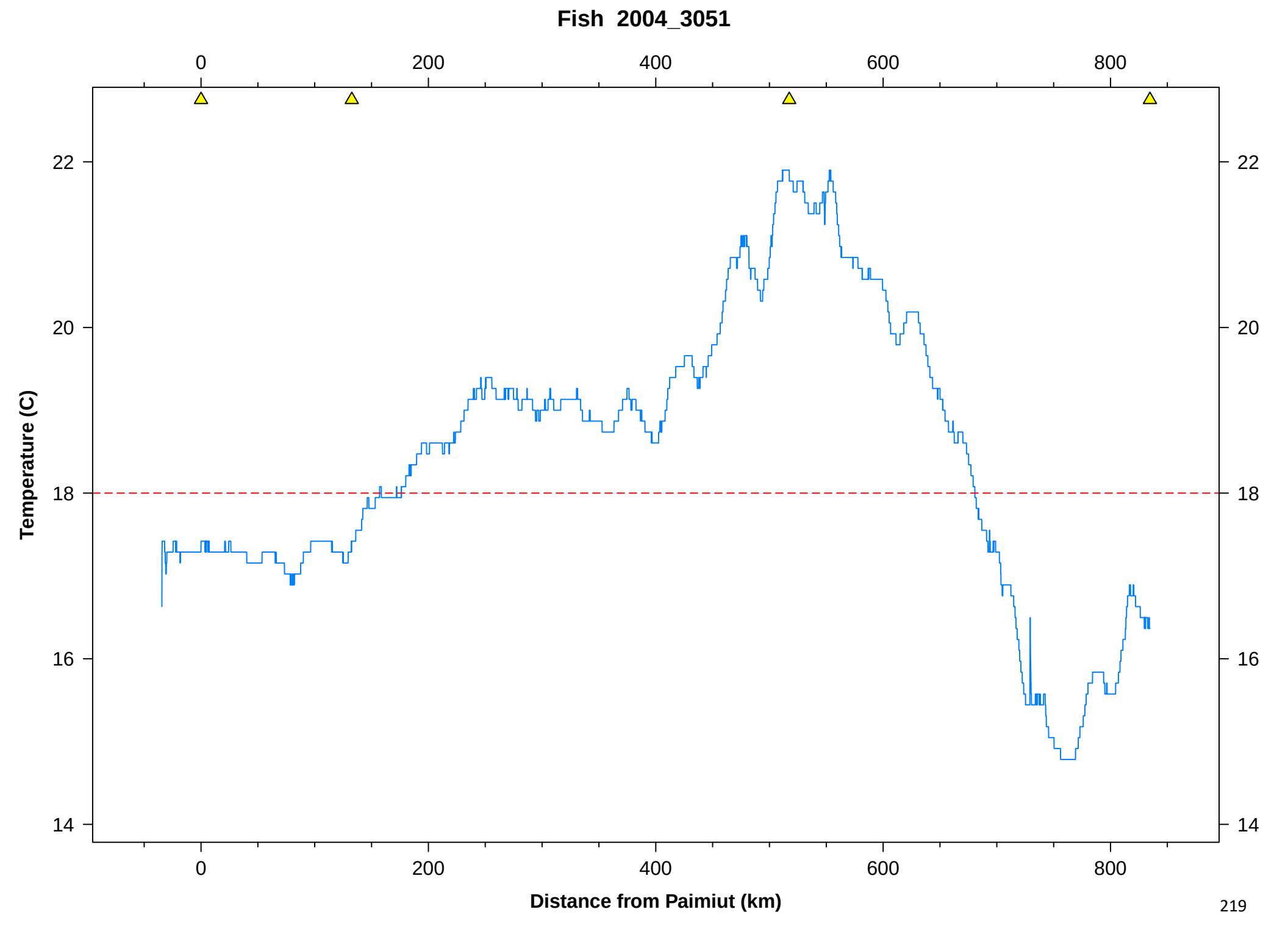

Fish 2004_3027
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Depth (m)
Temperature (C)
12
14
16
18
20
22
0
10
20

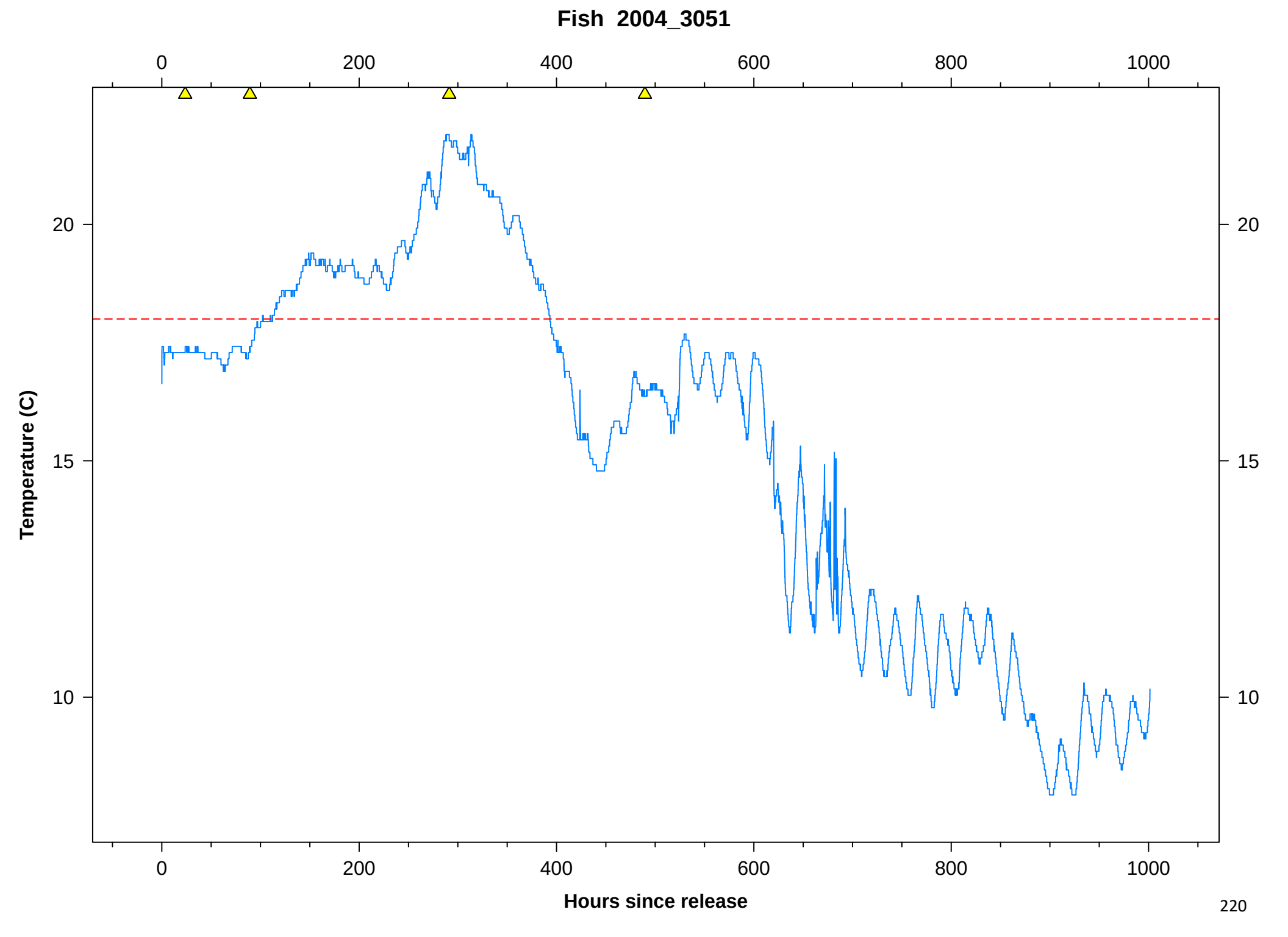

Fish 2004_3051
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

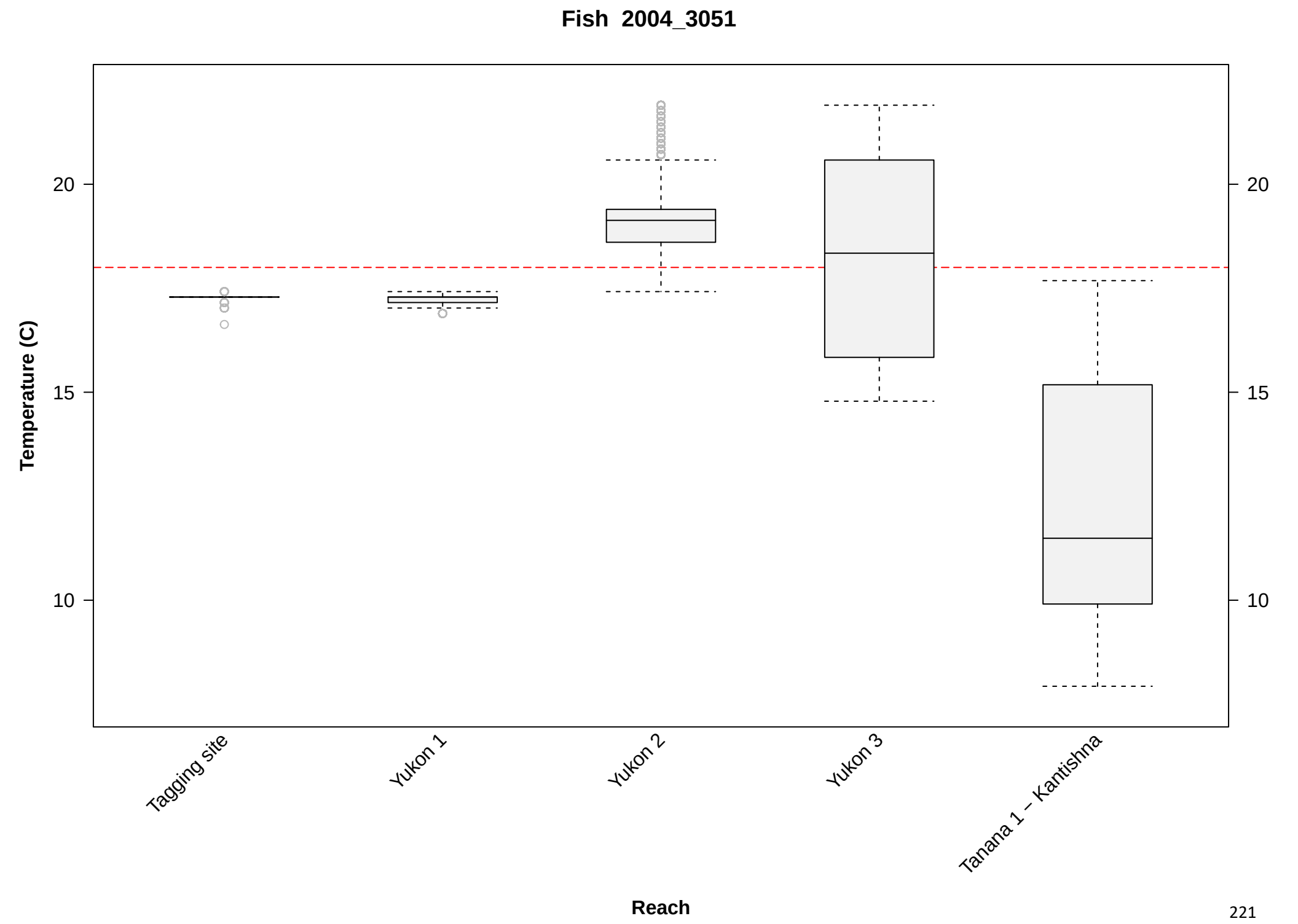

Fish 2004_3051
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release

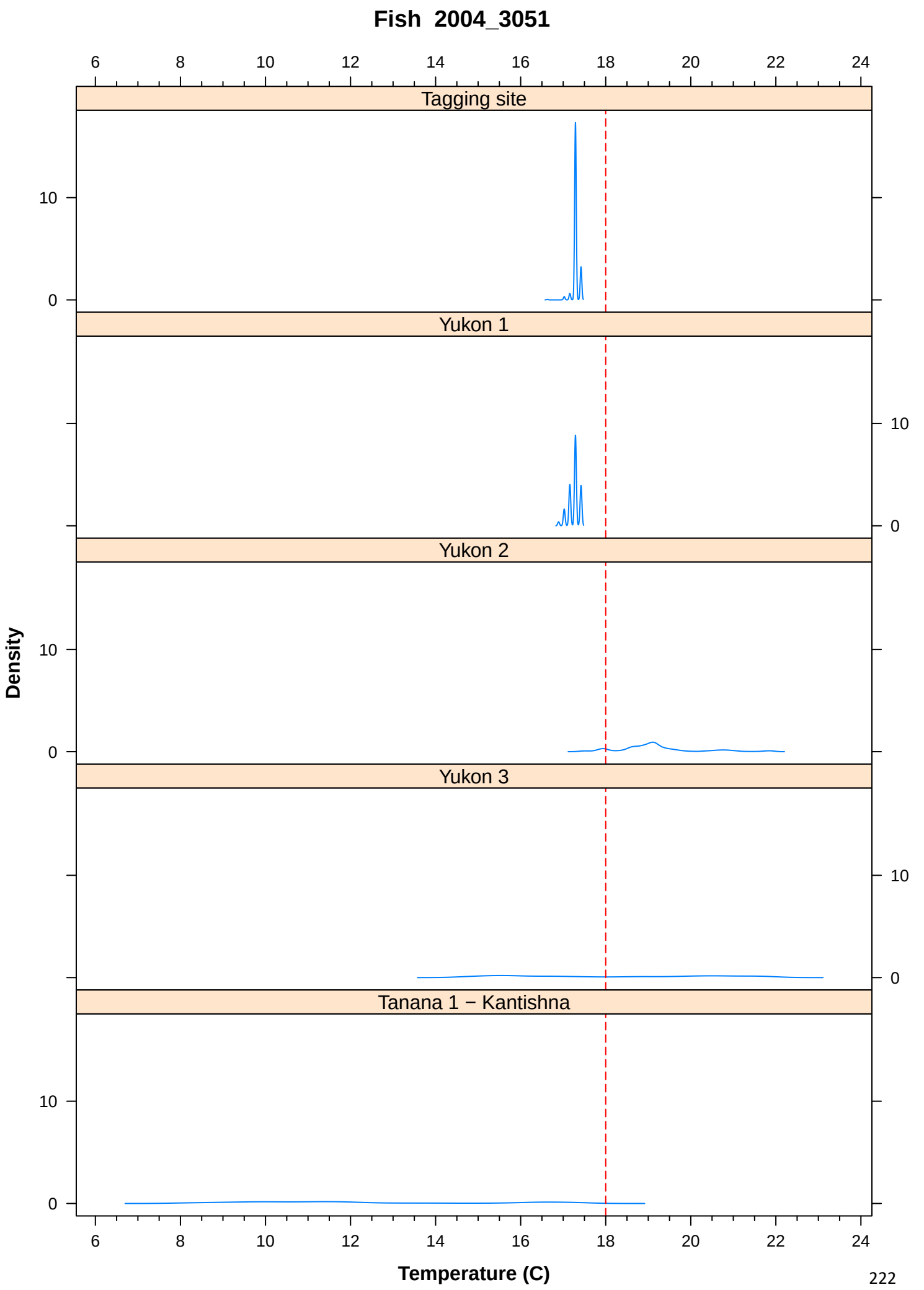

Fish 2004_3051
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Kantishna
Reach

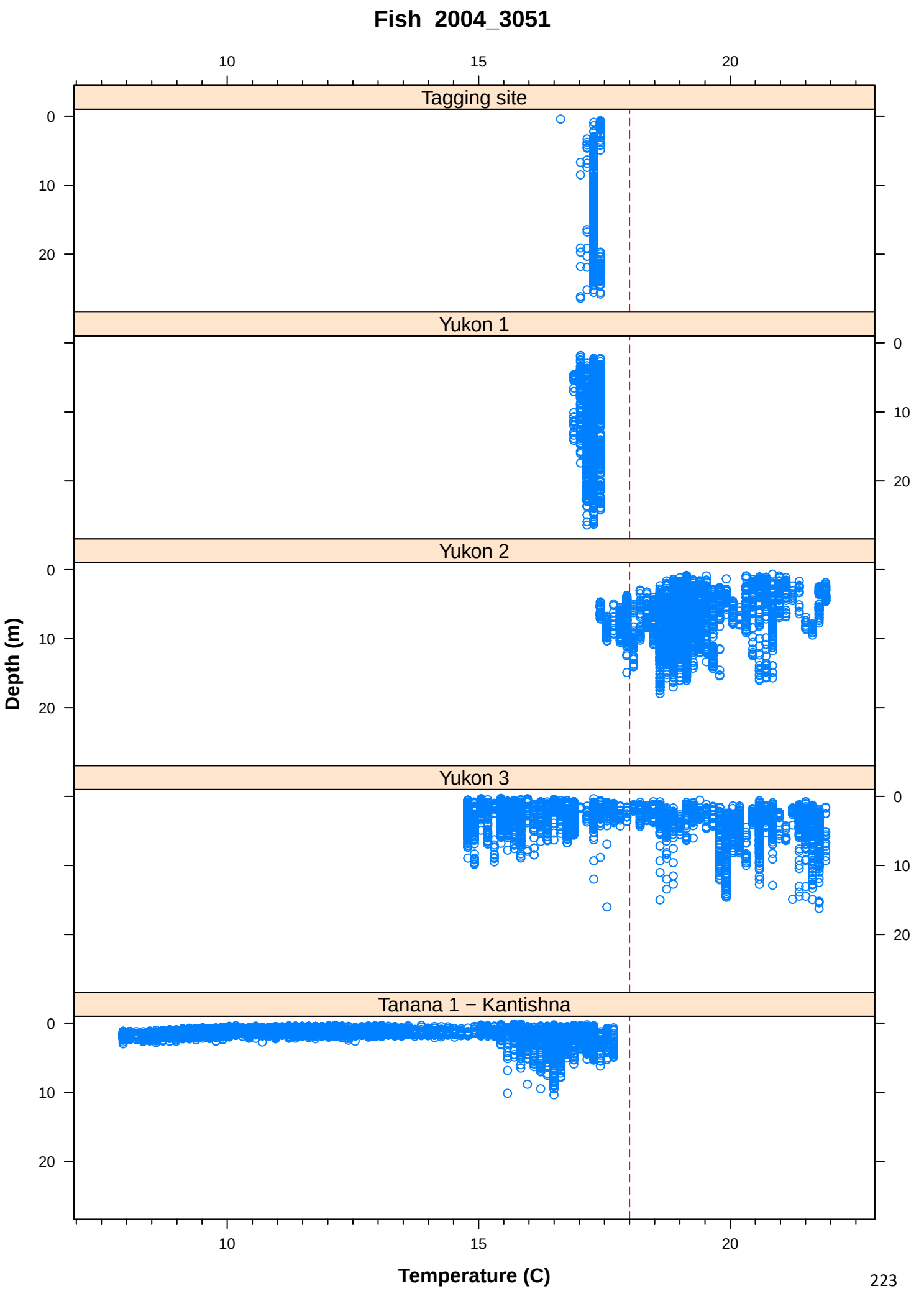

Fish 2004_3051
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Density
0.5
0.0
0
10
20
30
Depth (m)

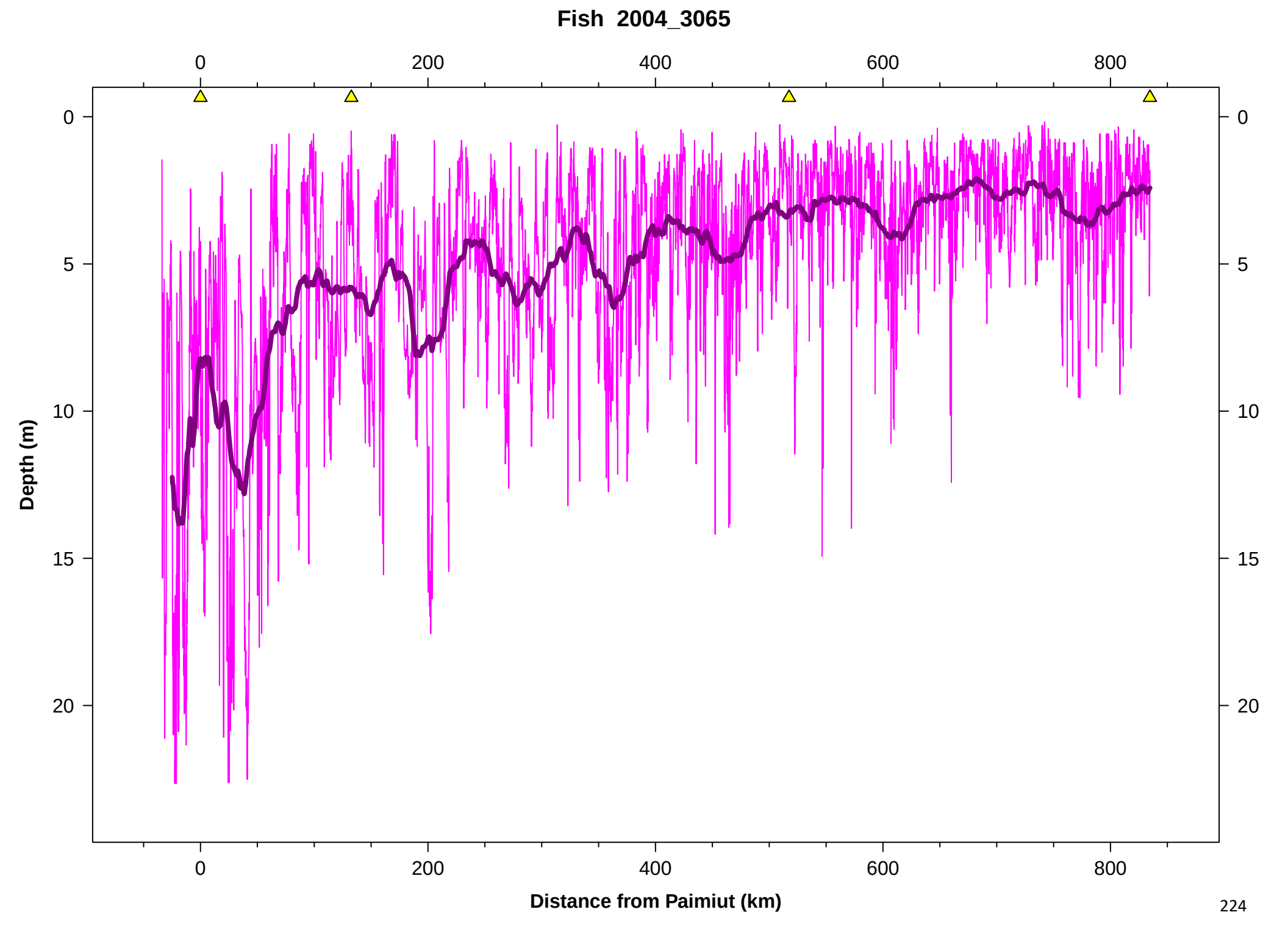

Fish 2004_3051
0
200
400
600
800
22
20
18
16
14
Temperature (C)
Distance from Paimiut (km)

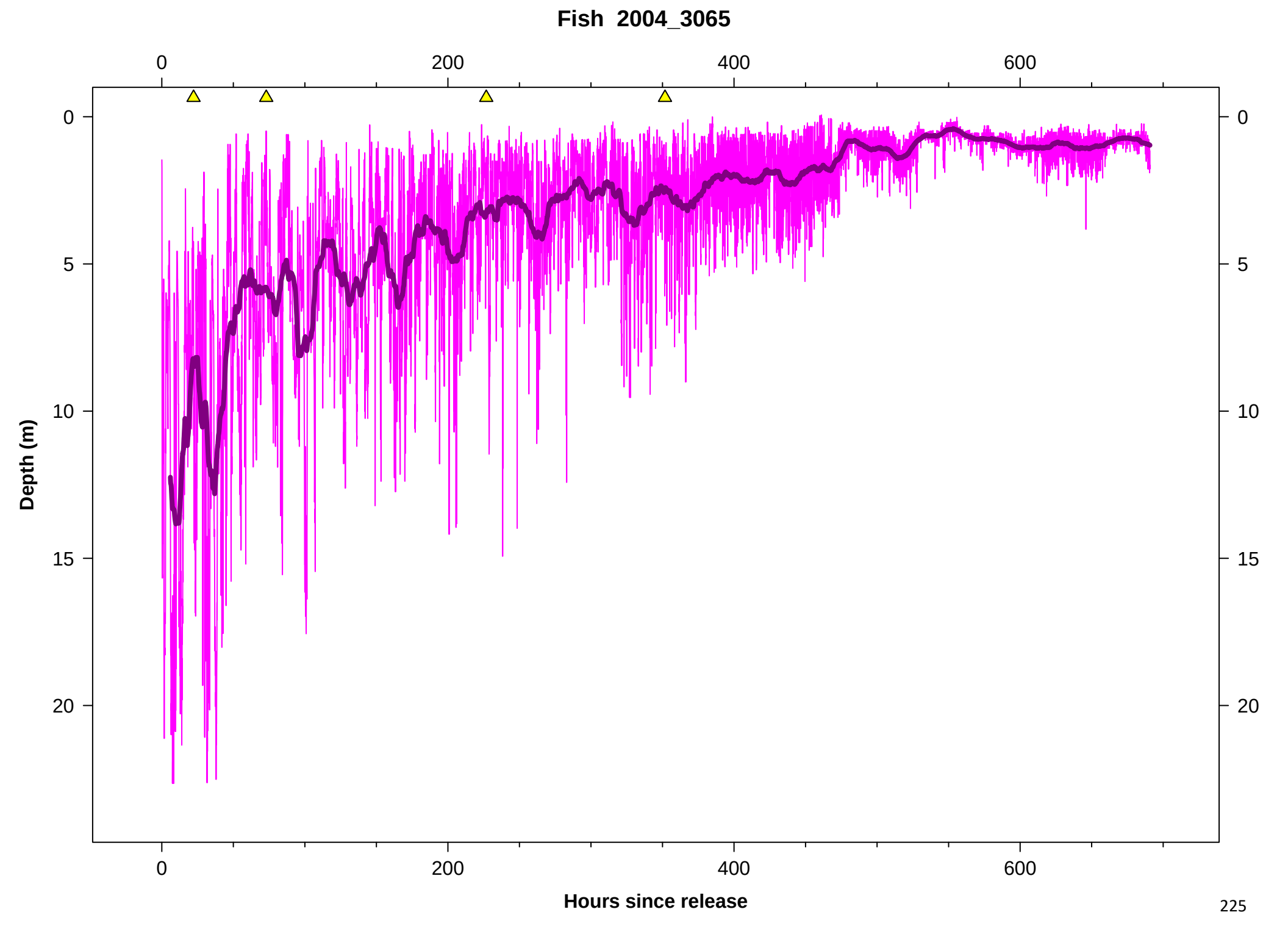

Fish 2004_3051
0
200
400
600
800
1000
20
15
10
Temperature (C)
Hours since release

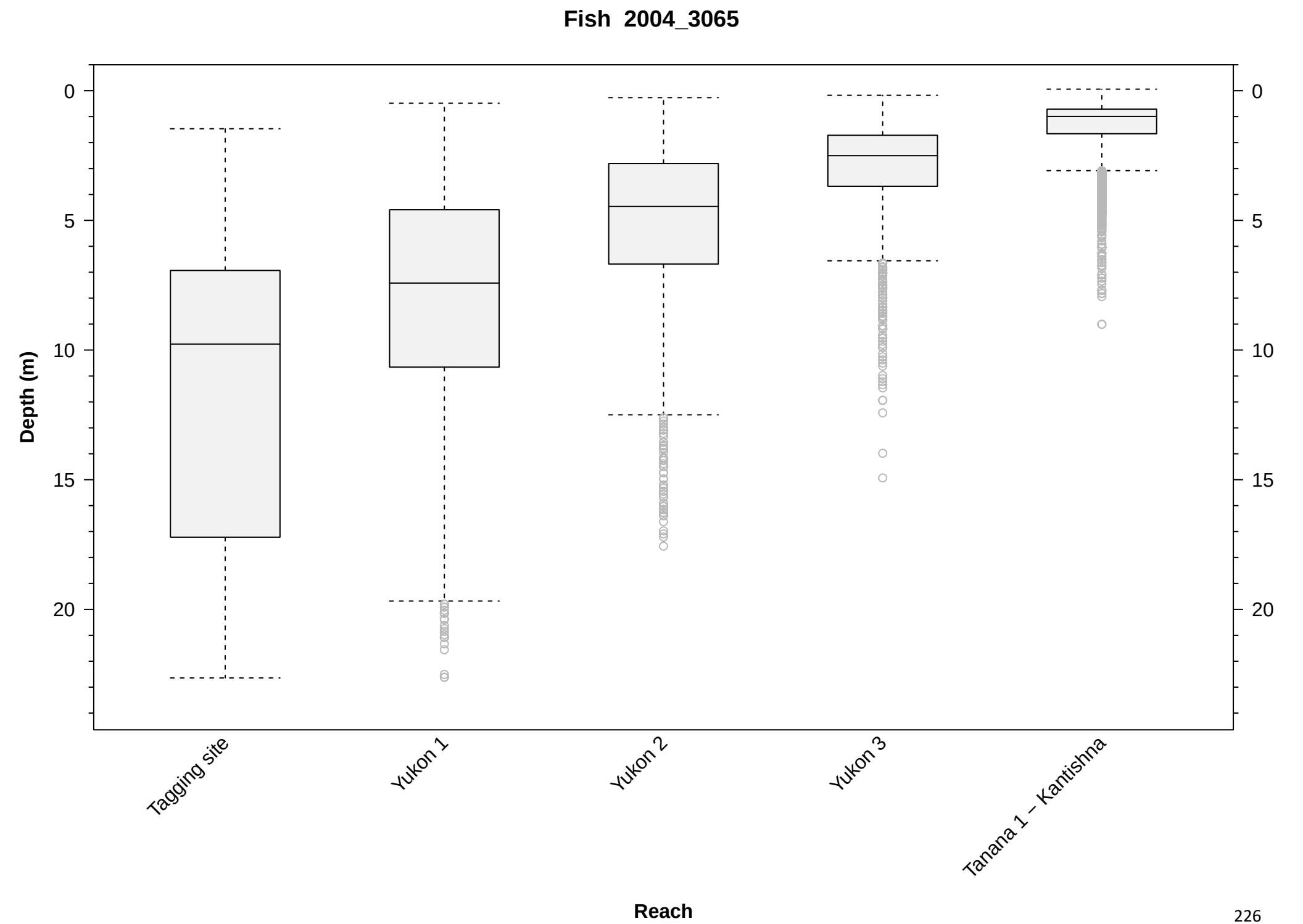

Fish 2004_3051
Temperature (C)
20
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Kantishna
Reach

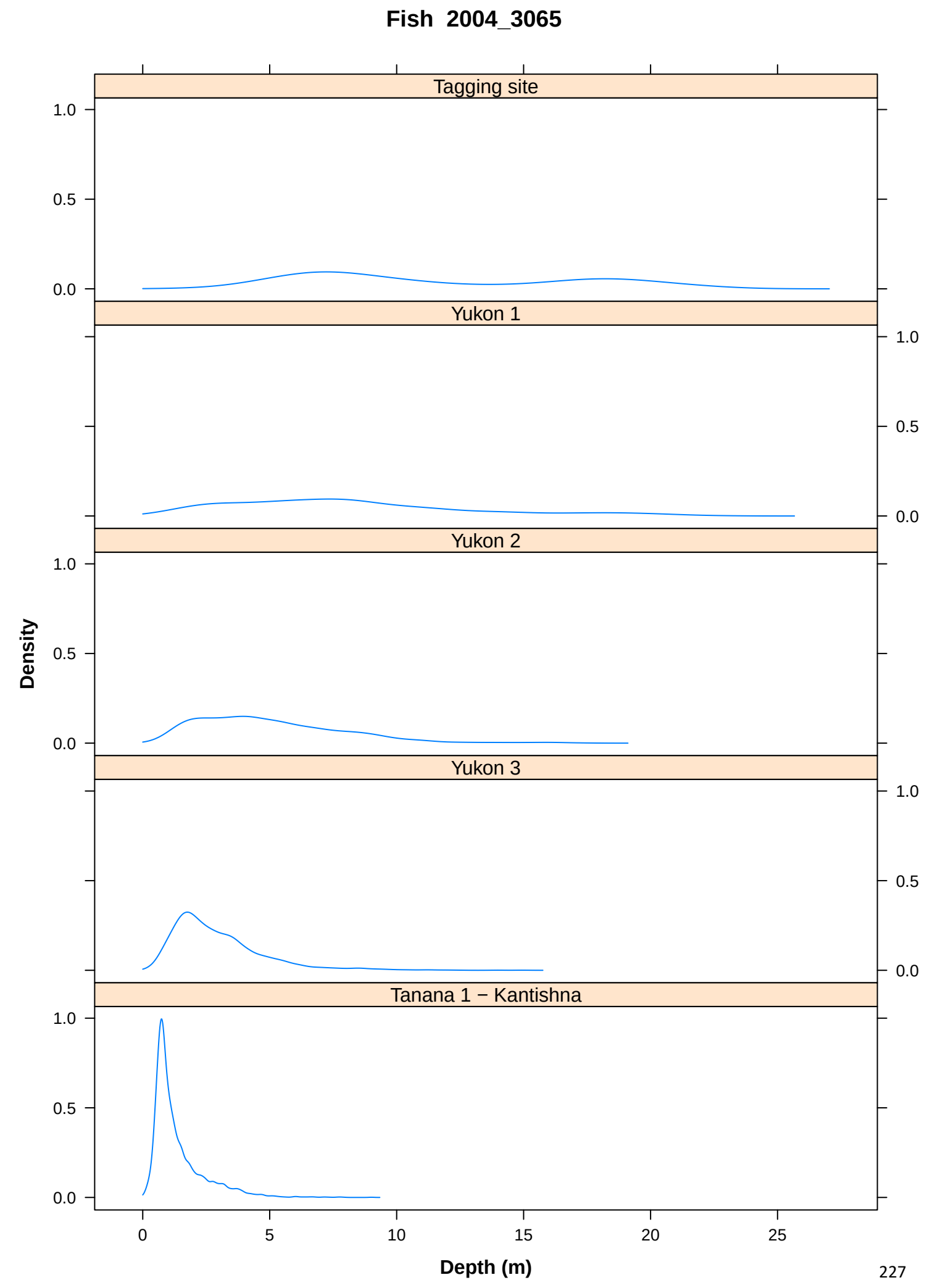

Fish 2004_3051
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Density
Temperature (C)
6
8
10
12
14
16
18
20
22
24
0
10

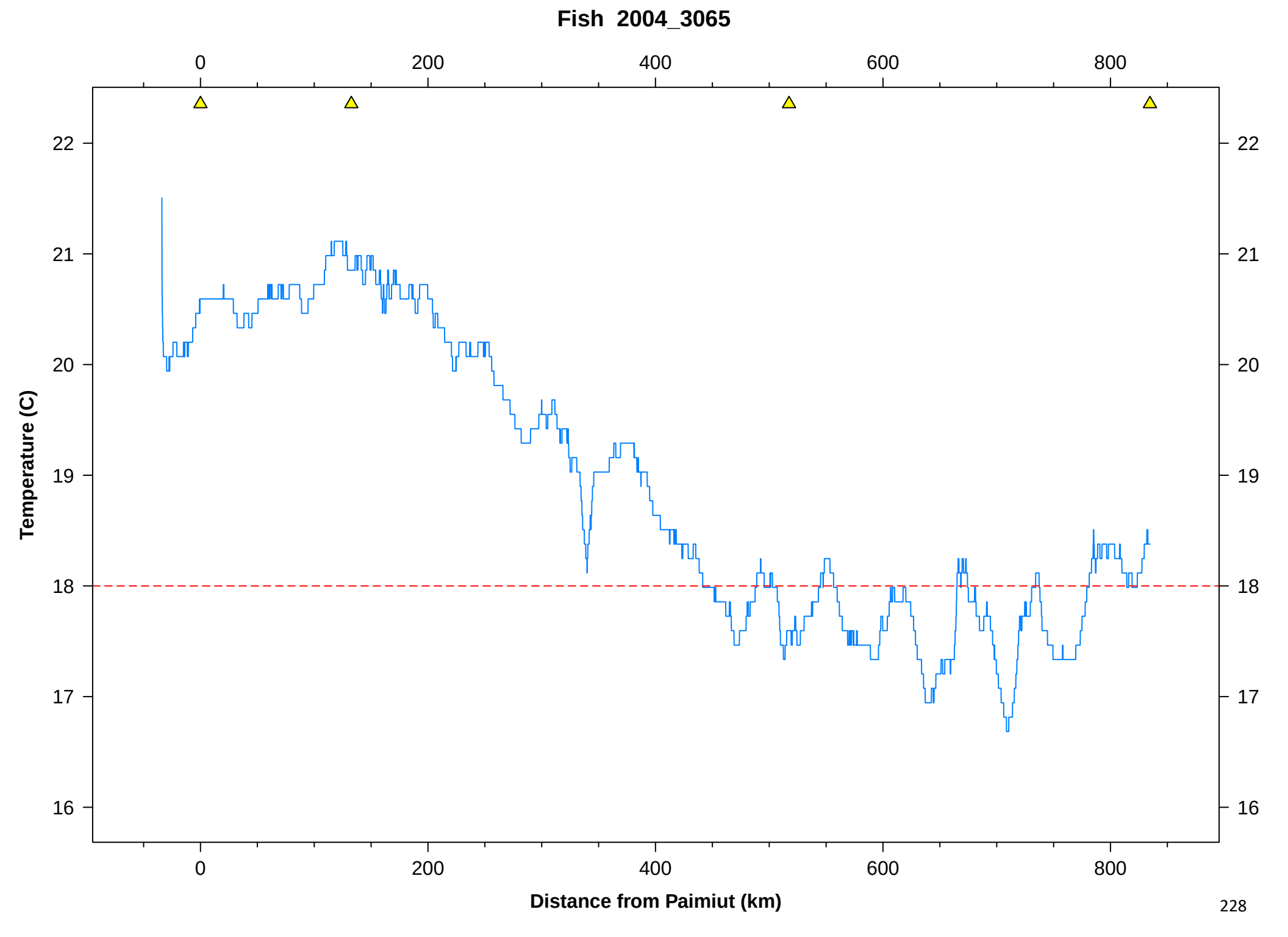

Fish 2004_3051
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Depth (m)
Temperature (C)
10
15
20
0
10
20

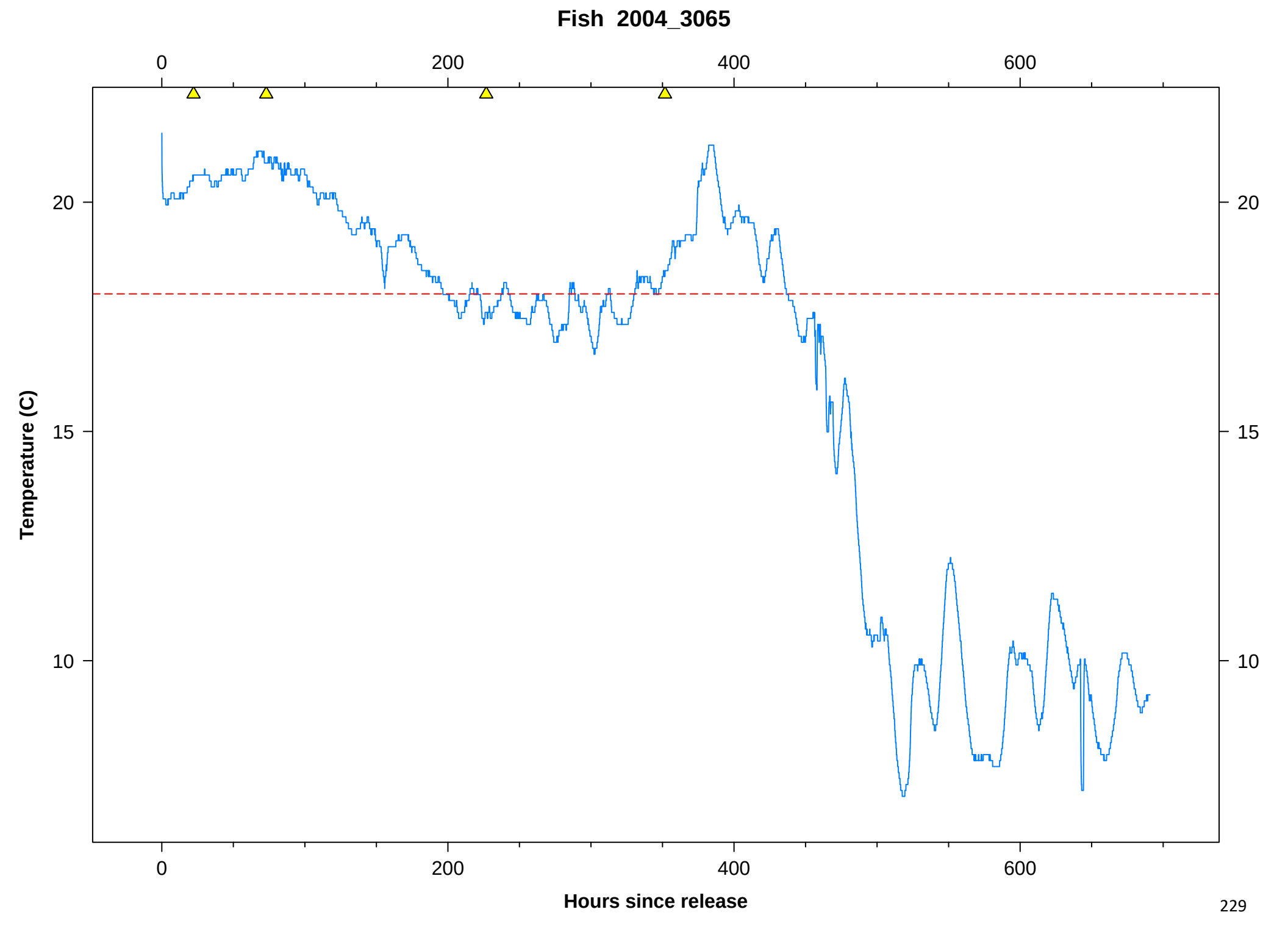

Fish 2004_3065
0
200
400
600
800
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

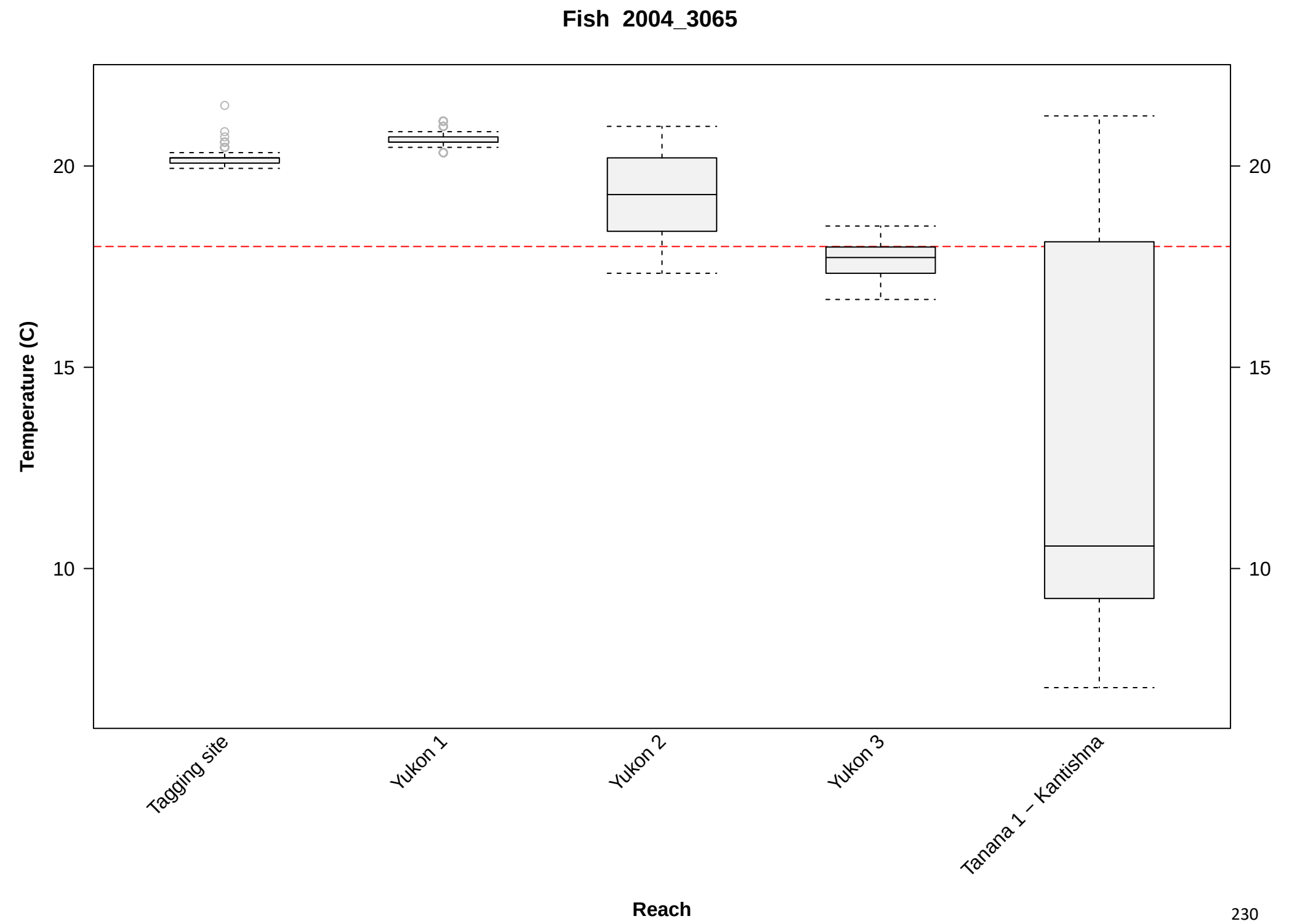

Fish 2004_3065
0
200
400
600
0
5
10
15
20
Depth (m)
Hours since release

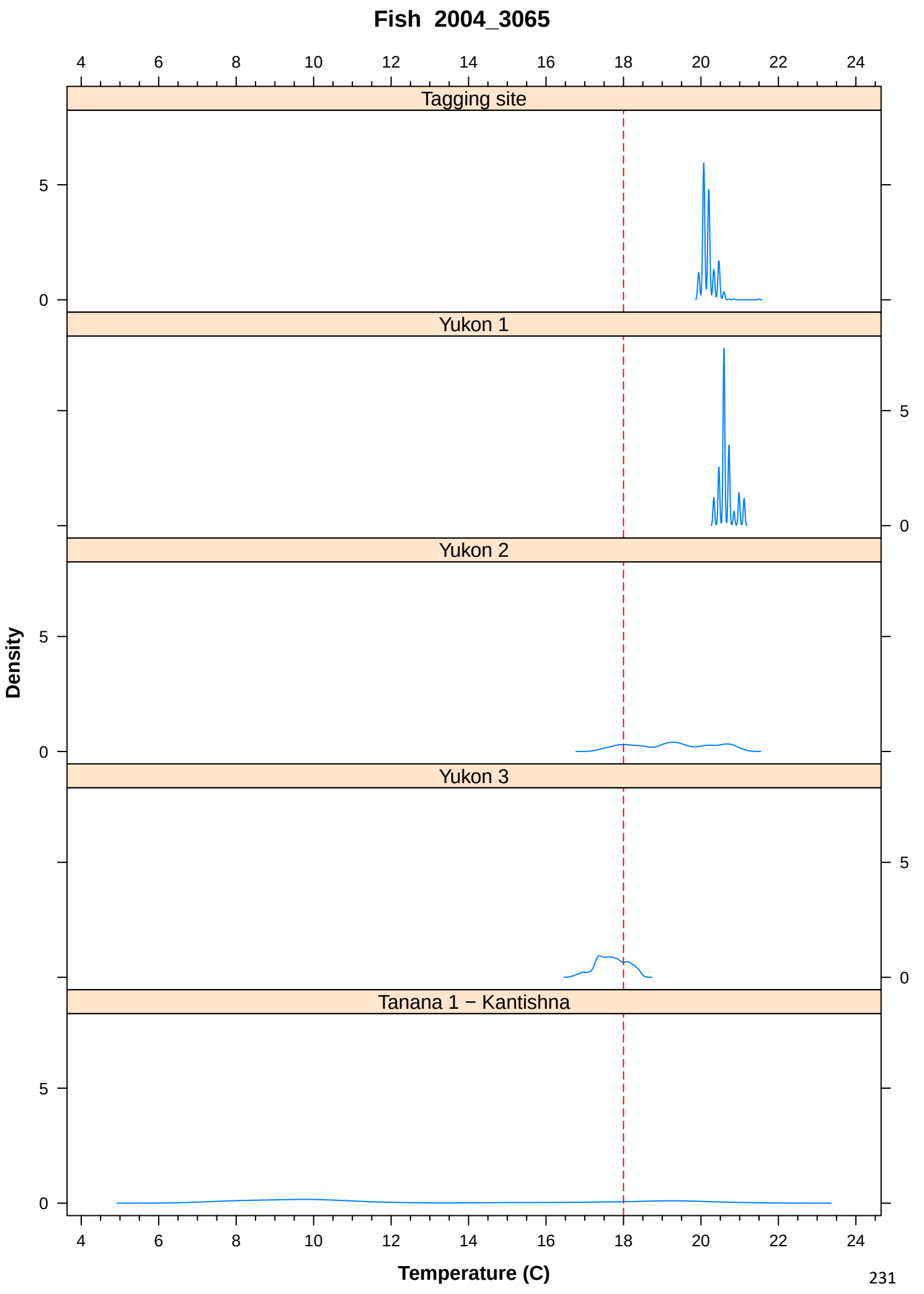

Fish 2004_3065
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Kantishna
Reach

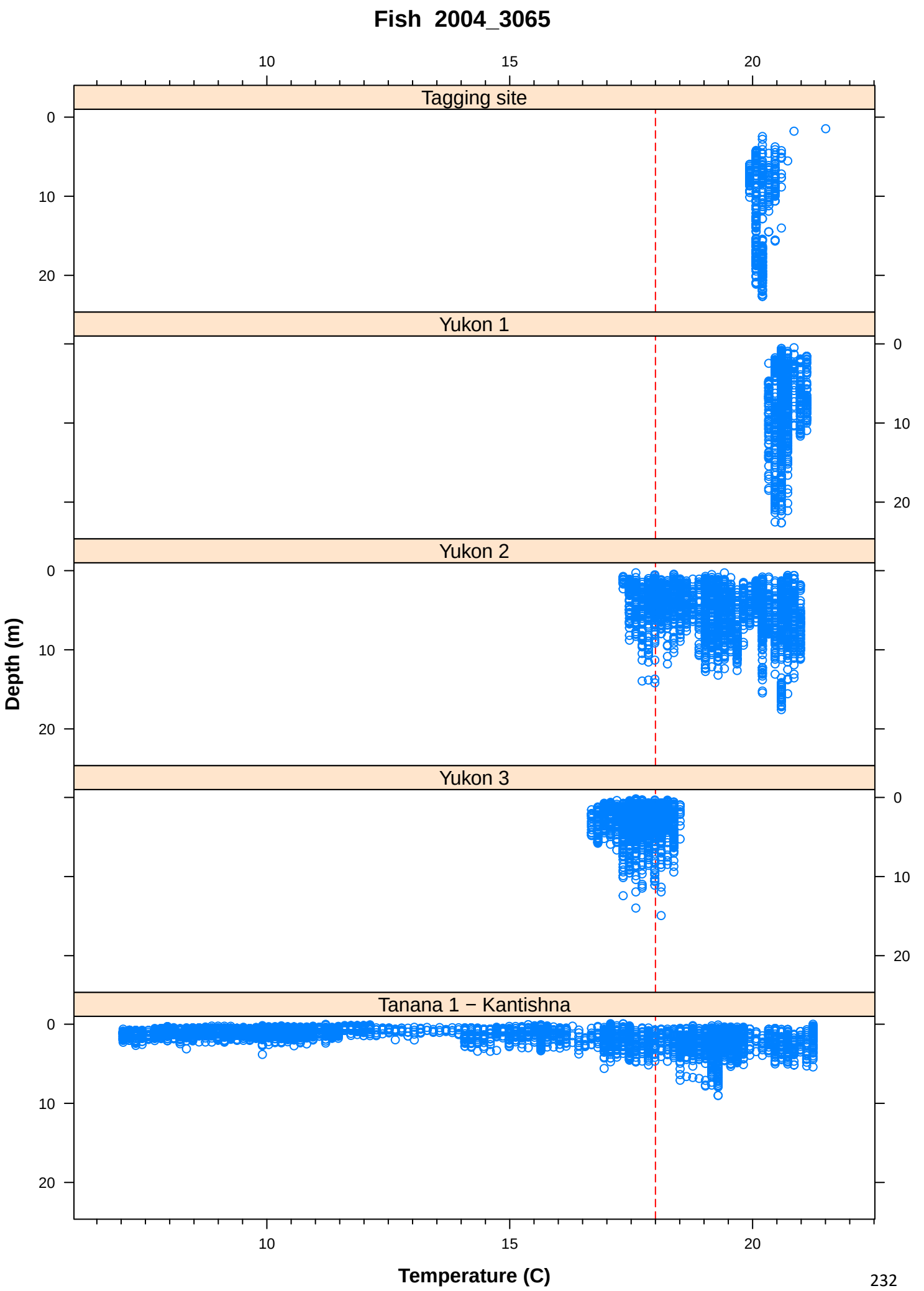

Fish 2004_3065
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Density
1.0
0.5
0.0
0
5
10
15
20
25
Depth (m)


Fish 2004_3065
0
200
400
600
800
22
21
20
19
18
17
16
Temperature (C)
Distance from Paimiut (km)

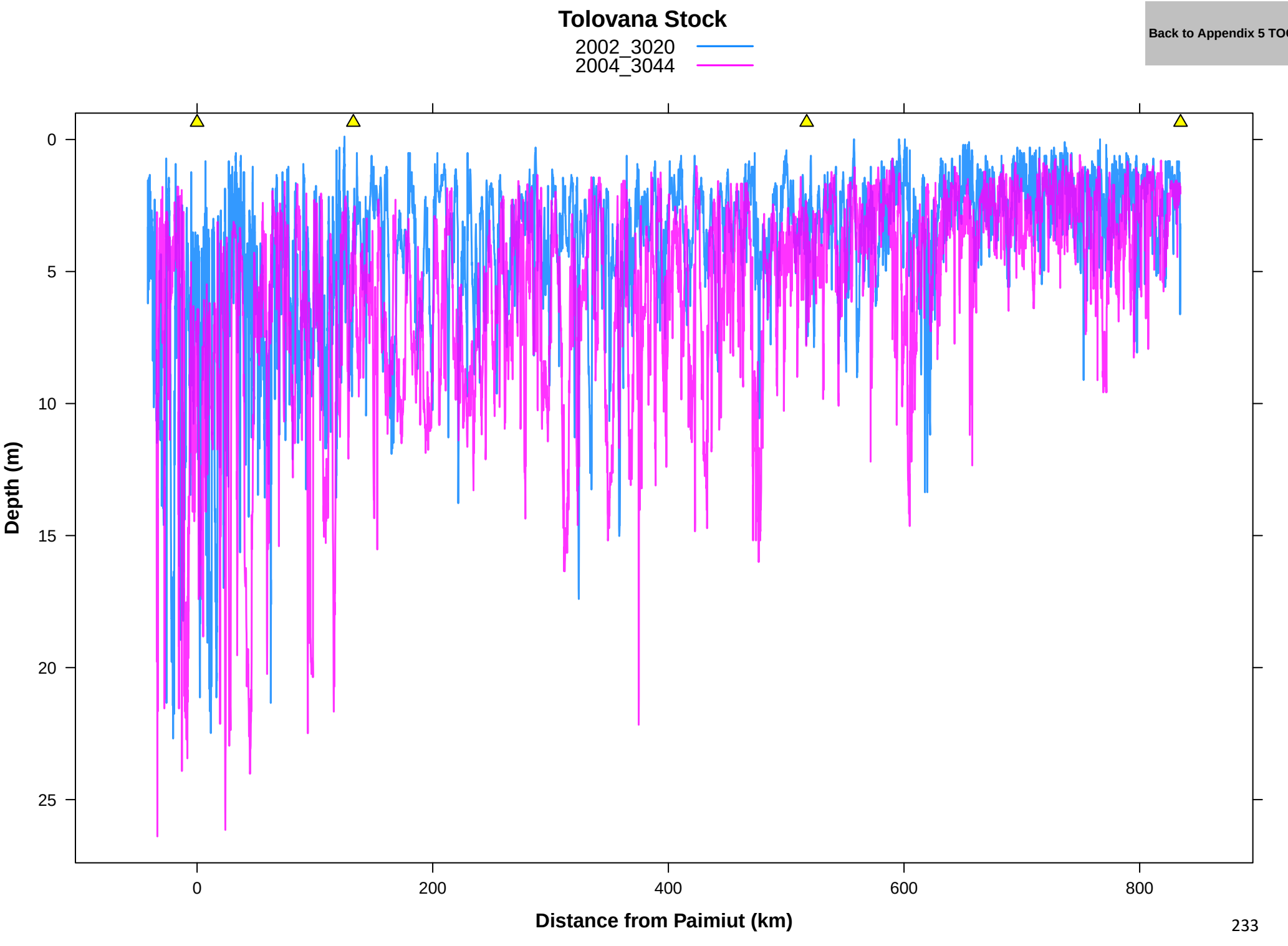

Fish 2004_3065
0
200
400
600
20
15
10
Temperature (C)
Hours since release

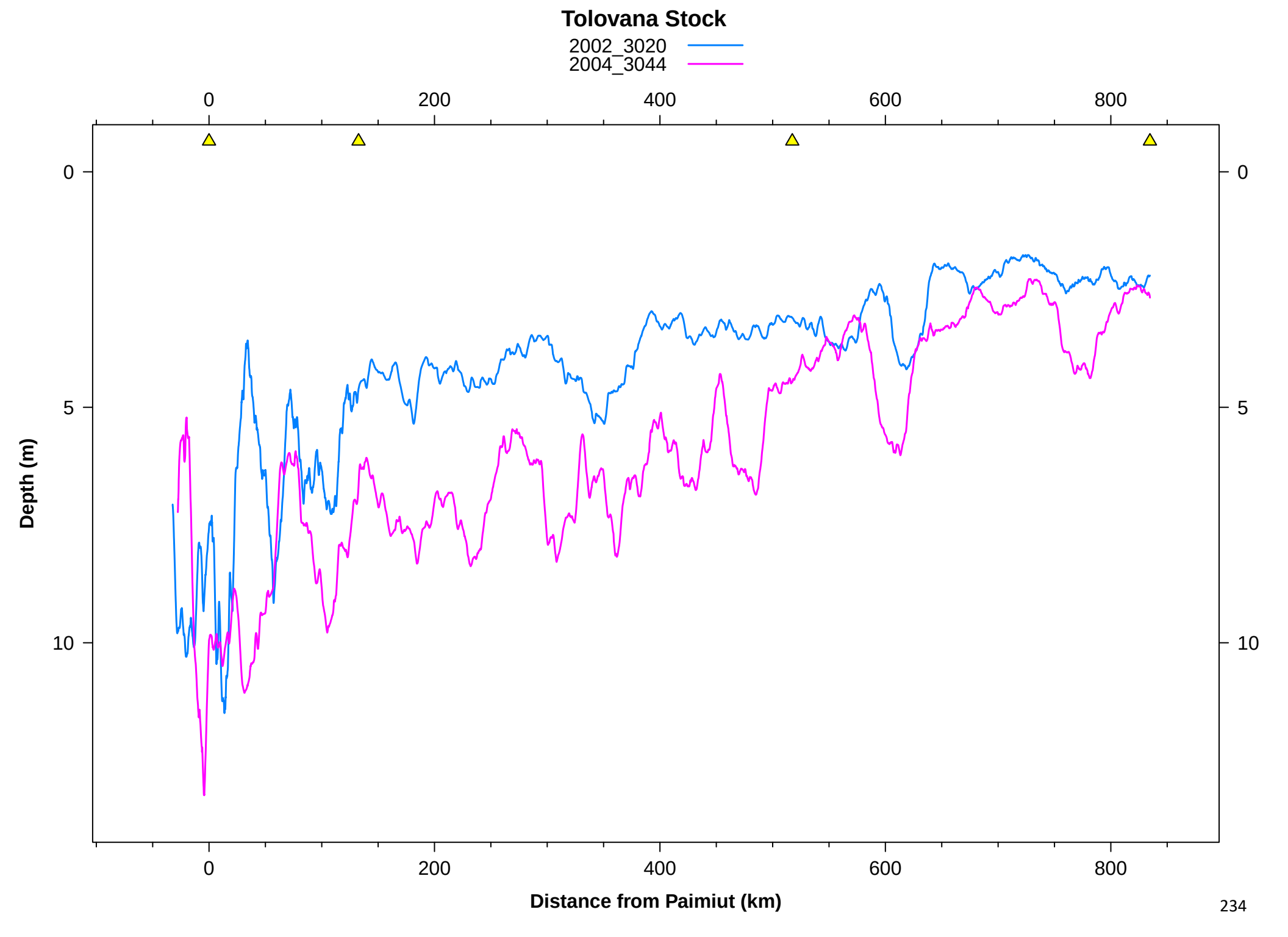

Fish 2004_3065
Temperature (C)
20
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Kantishna
Reach

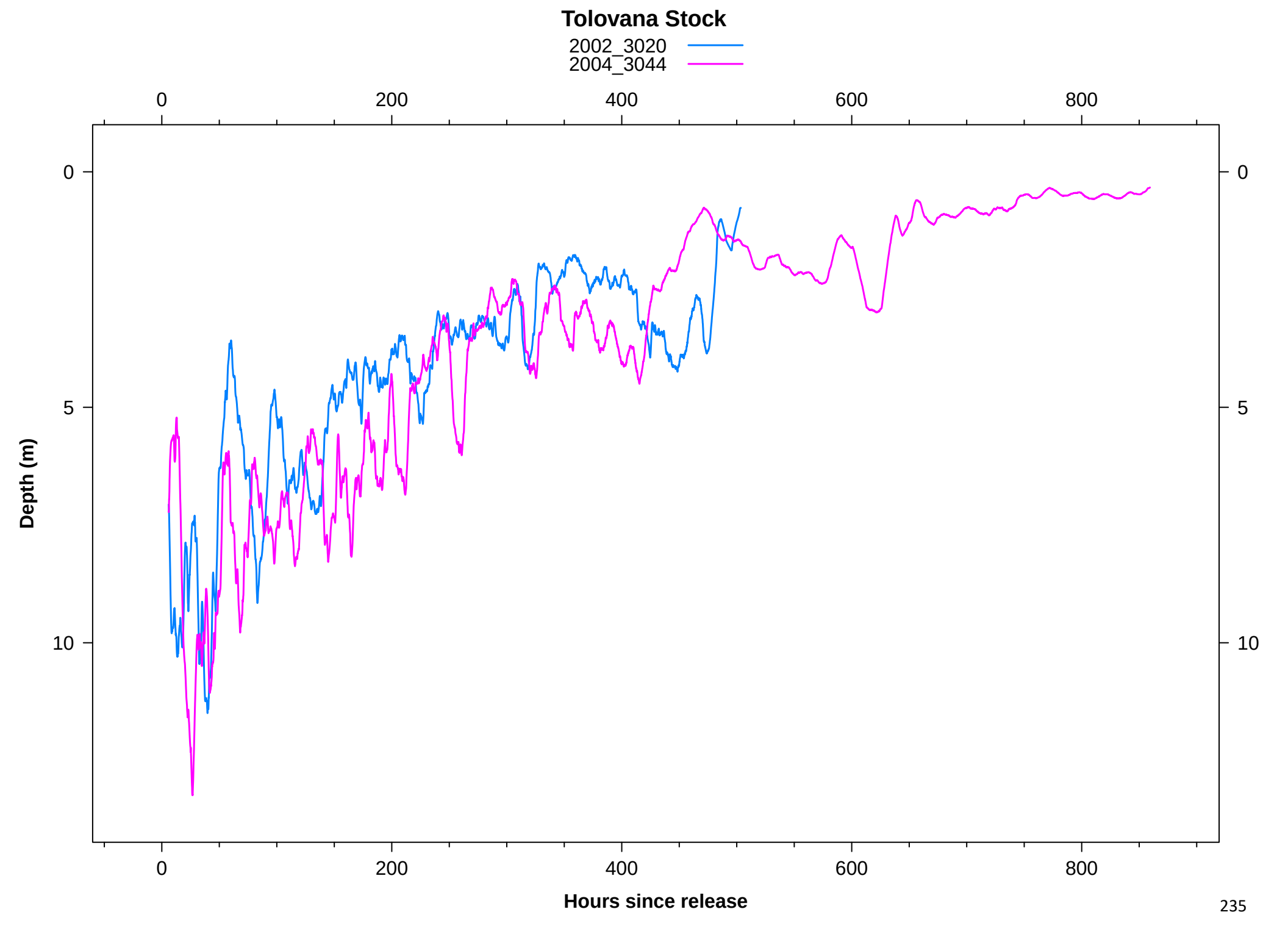

Fish 2004_3065
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Density
Temperature (C)
4
6
8
10
12
14
16
18
20
22
24
0
5

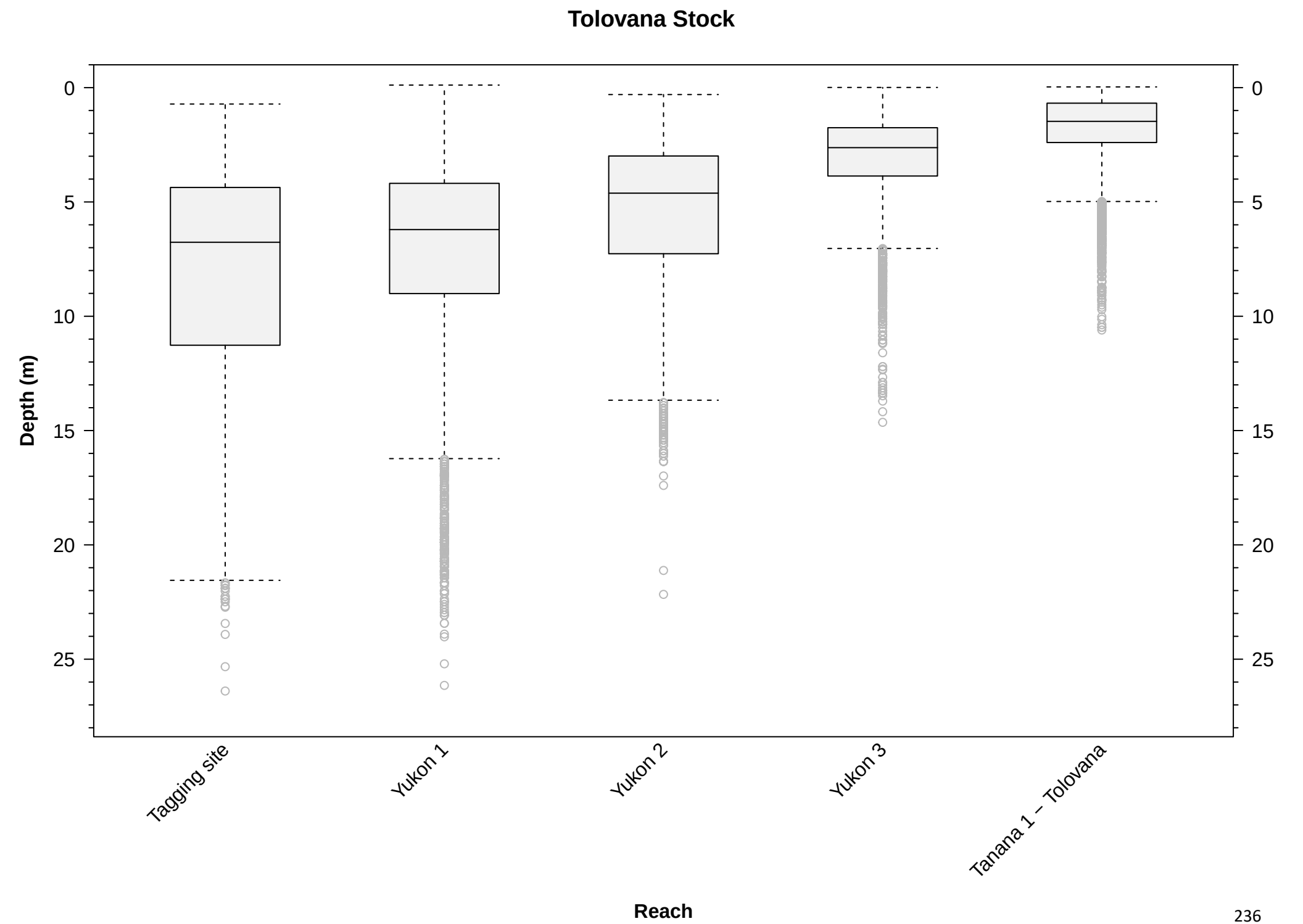

Fish 2004_3065
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Kantishna
Depth (m)
Temperature (C)
0
10
20
10
15
20

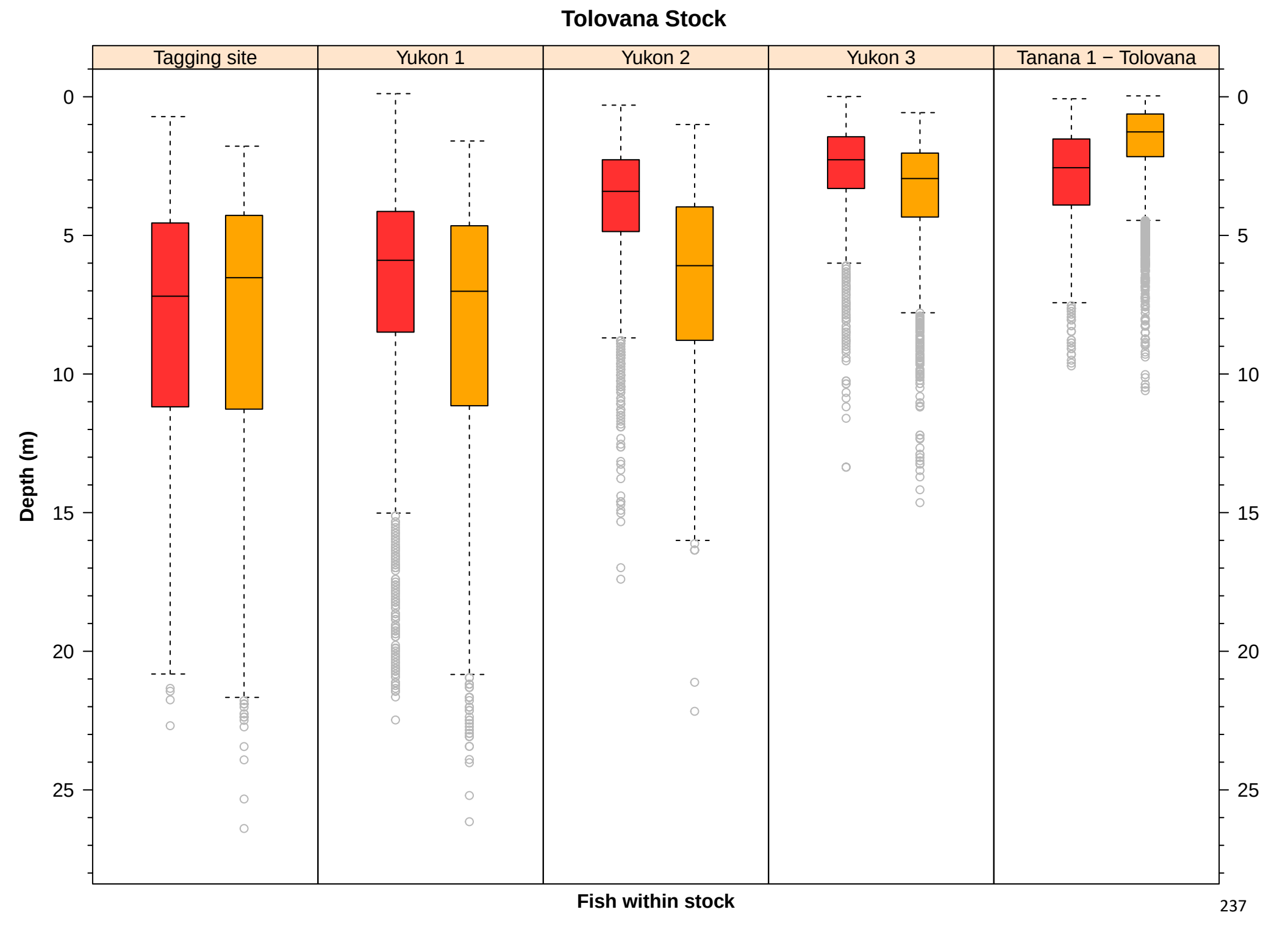
Back to Appendix 5 TOC

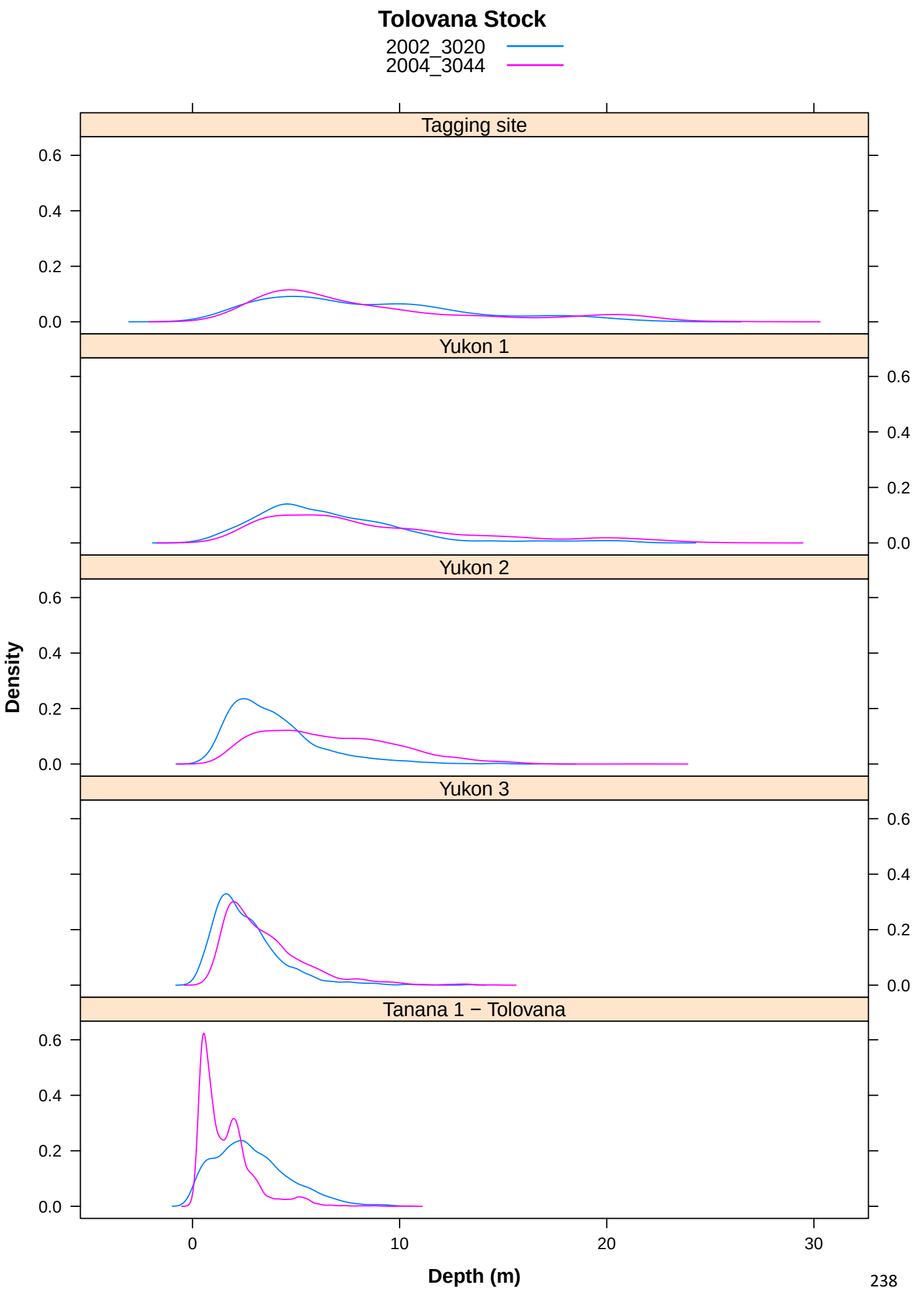


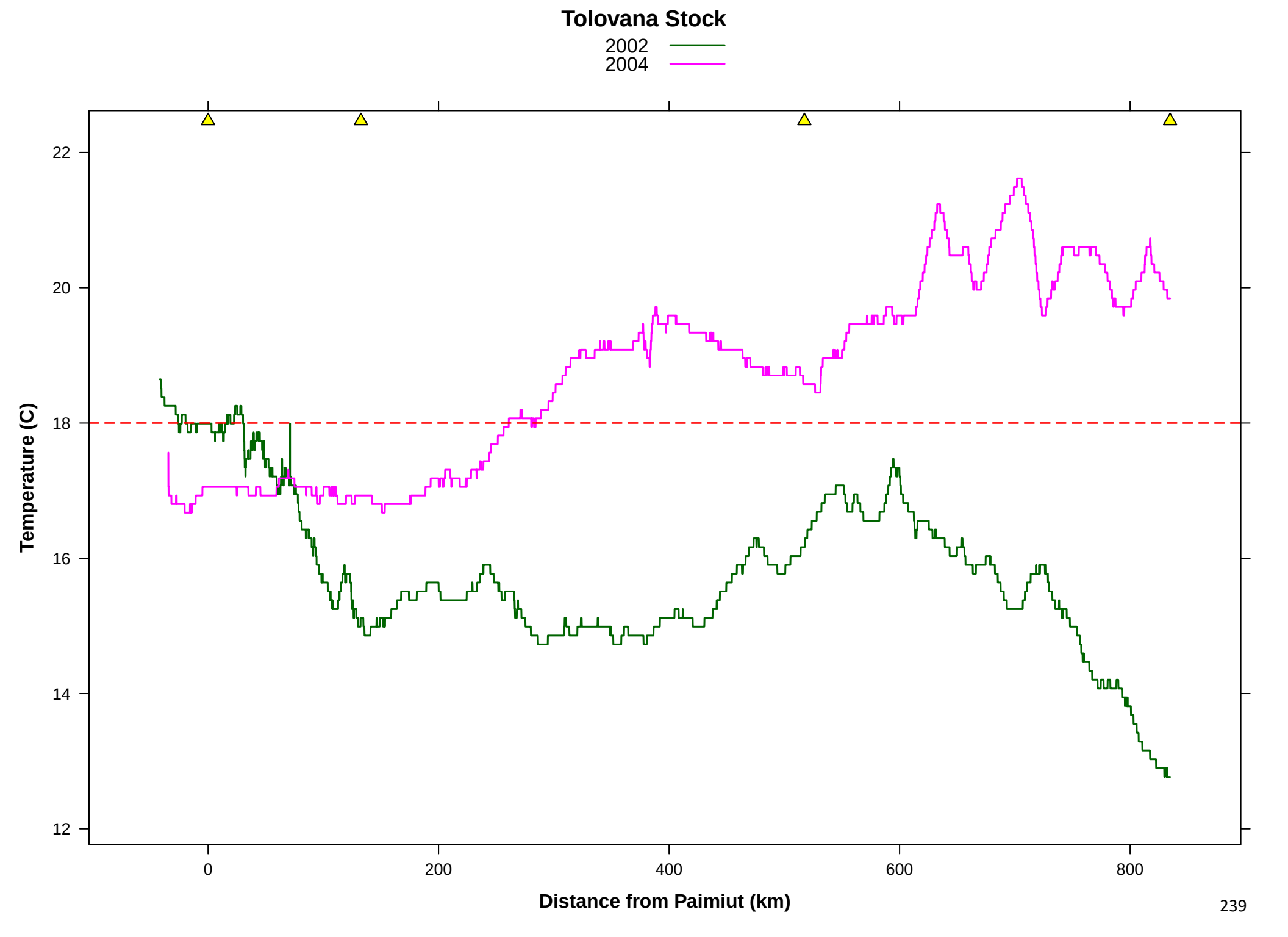

Tolovana Stock
2002_3020
2004_3044
0
200
400
600
800
0
5
10
Depth (m)
Distance from Paimiut (km)

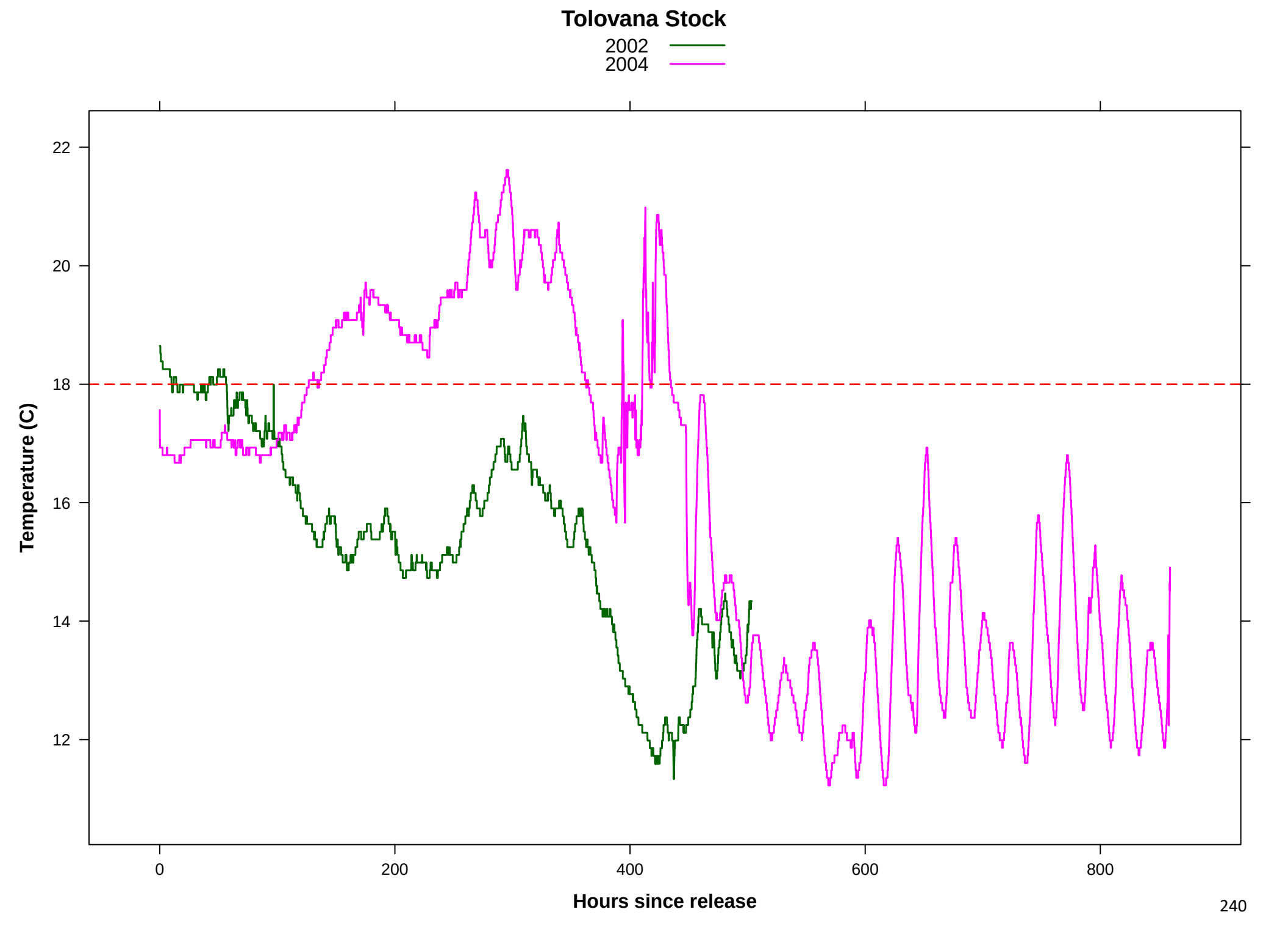

Tolovana Stock
2002_3020
2004_3044
0
200
400
600
800
0
5
10
Depth (m)
Hours since release

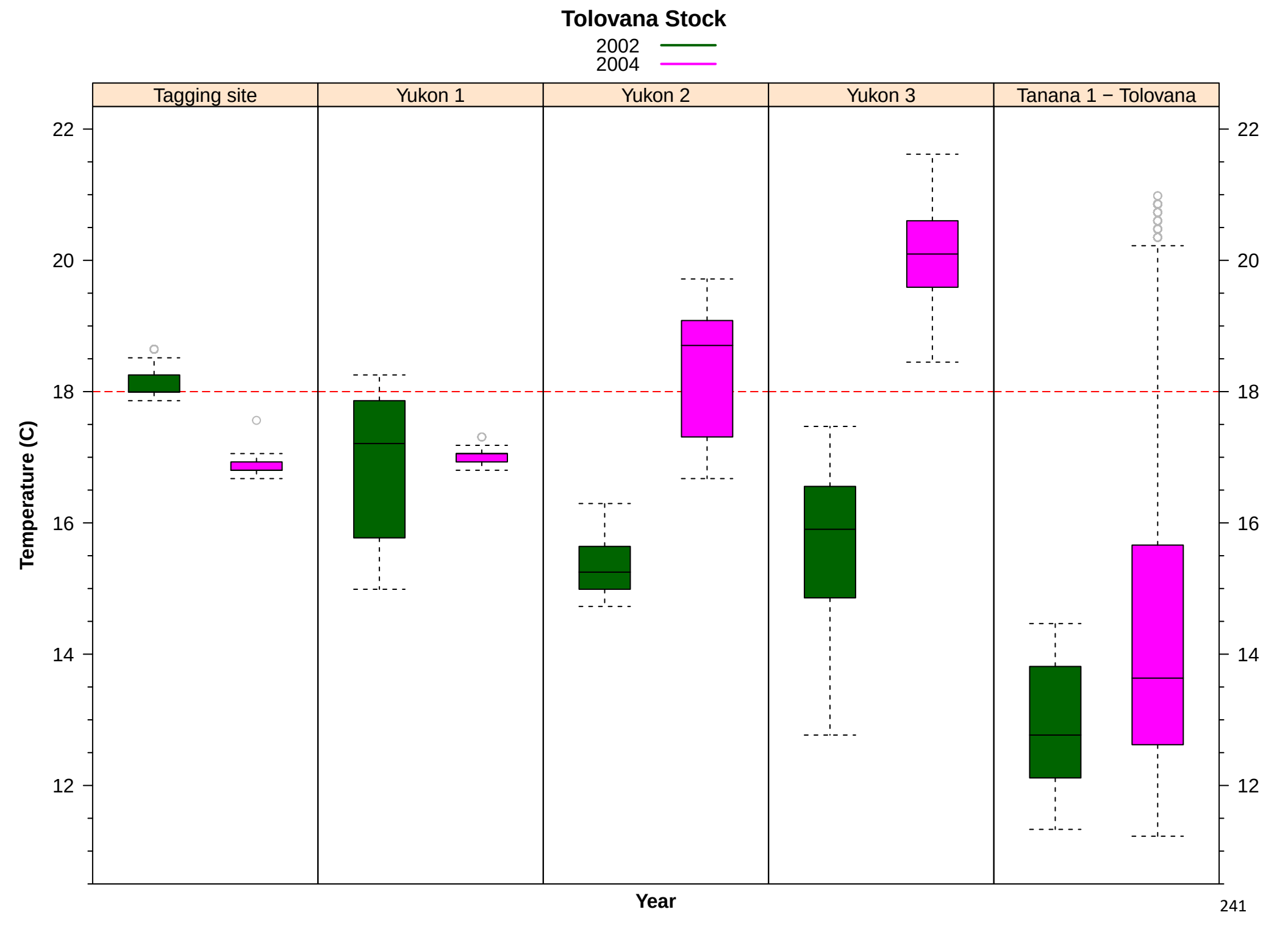

Tolovana Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Tolovana
Reach

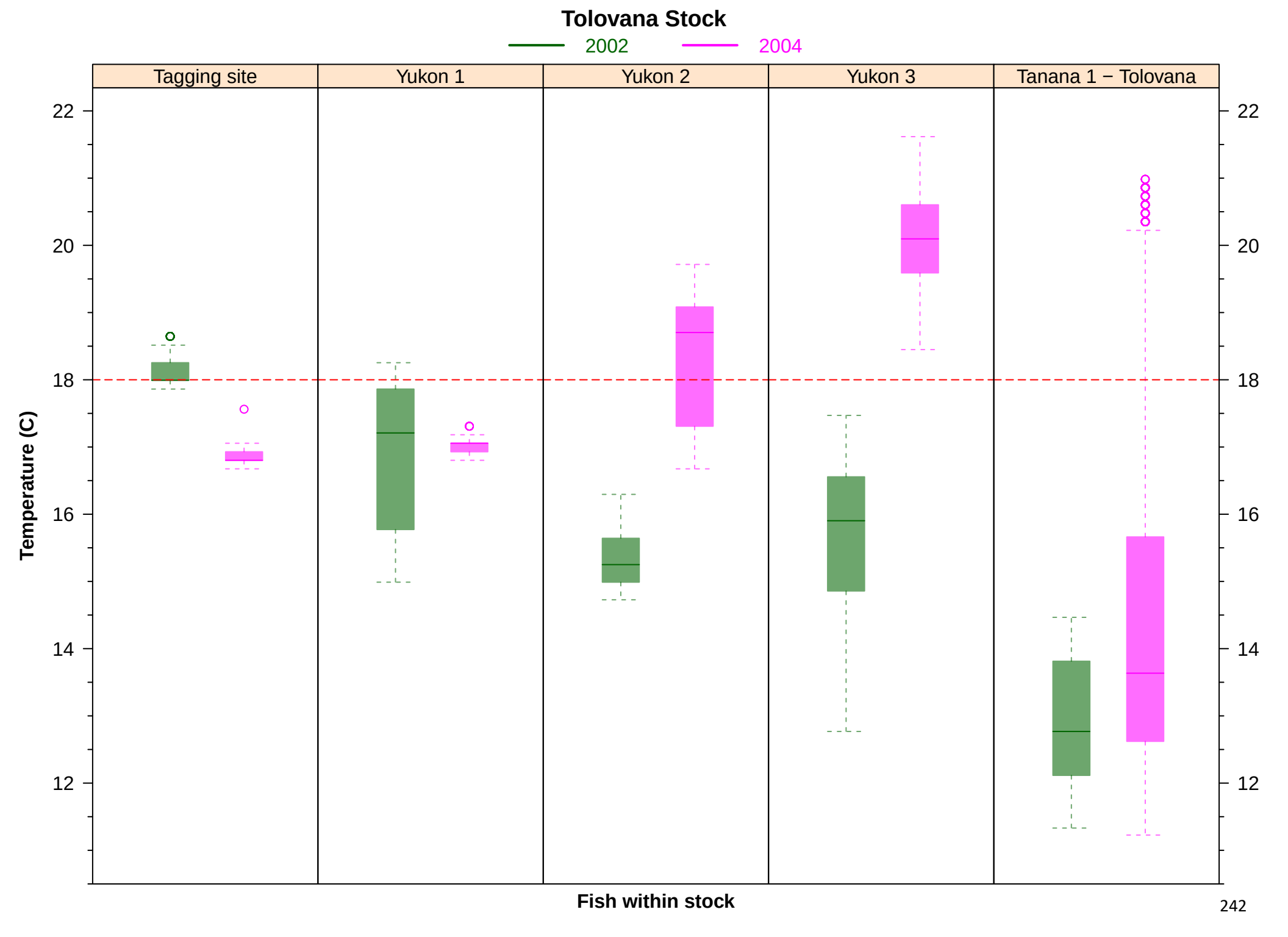

Tolovana Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
Depth (m)
0
5
10
15
20
25
Fish within stock

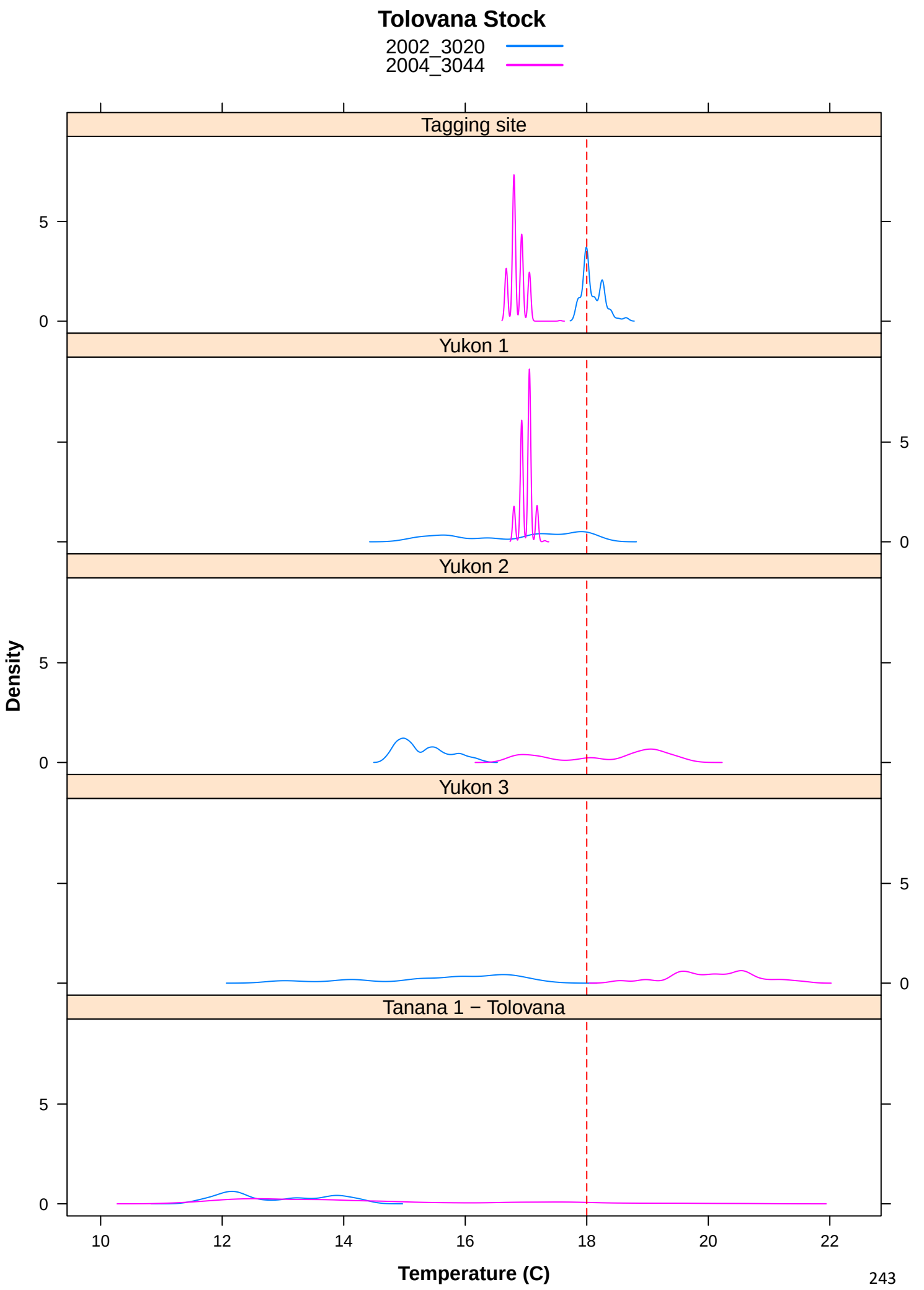

Tolovana Stock
2002_3020
2004_3044
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
Density
0.0
0.2
0.4
0.6
0
10
20
30
Depth (m)

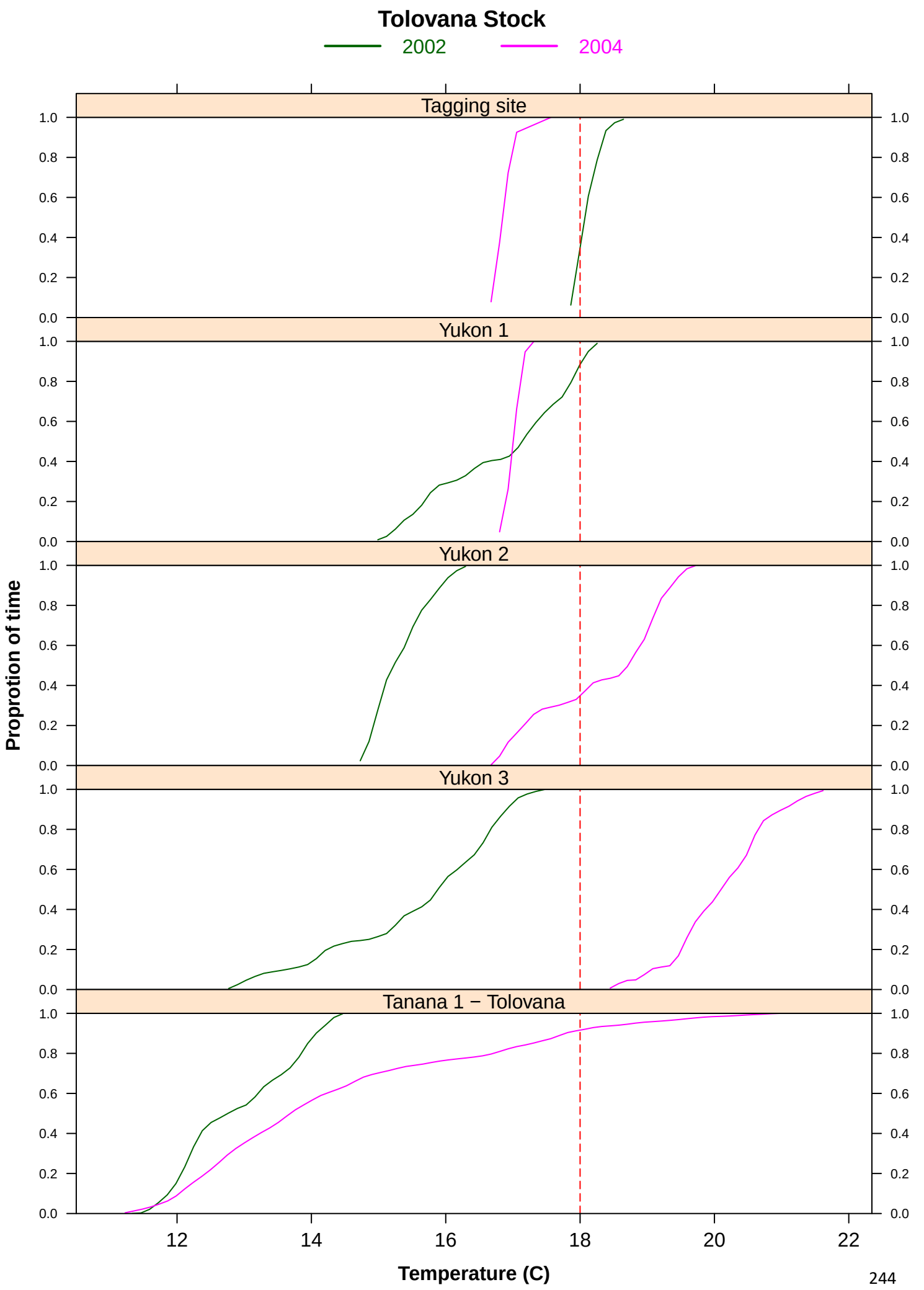

Tolovana Stock
2002
2004
22
20
18
16
14
12
Temperature (C)
0
200
400
600
800
Distance from Paimiut (km)

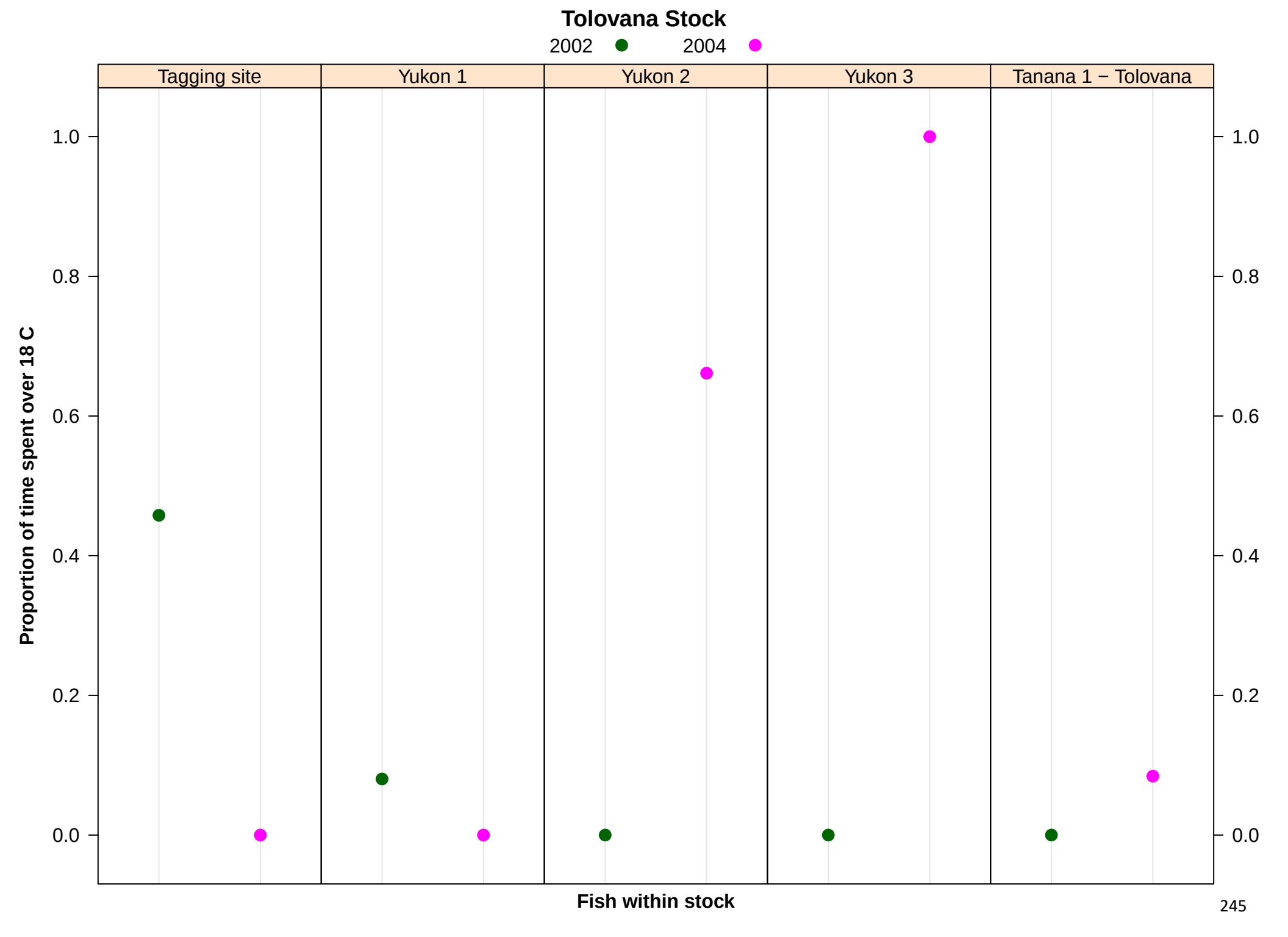

Tolovana Stock
2002
2004
Temperature (C)
22
20
18
16
14
12
0
200
400
600
800
Hours since release
240

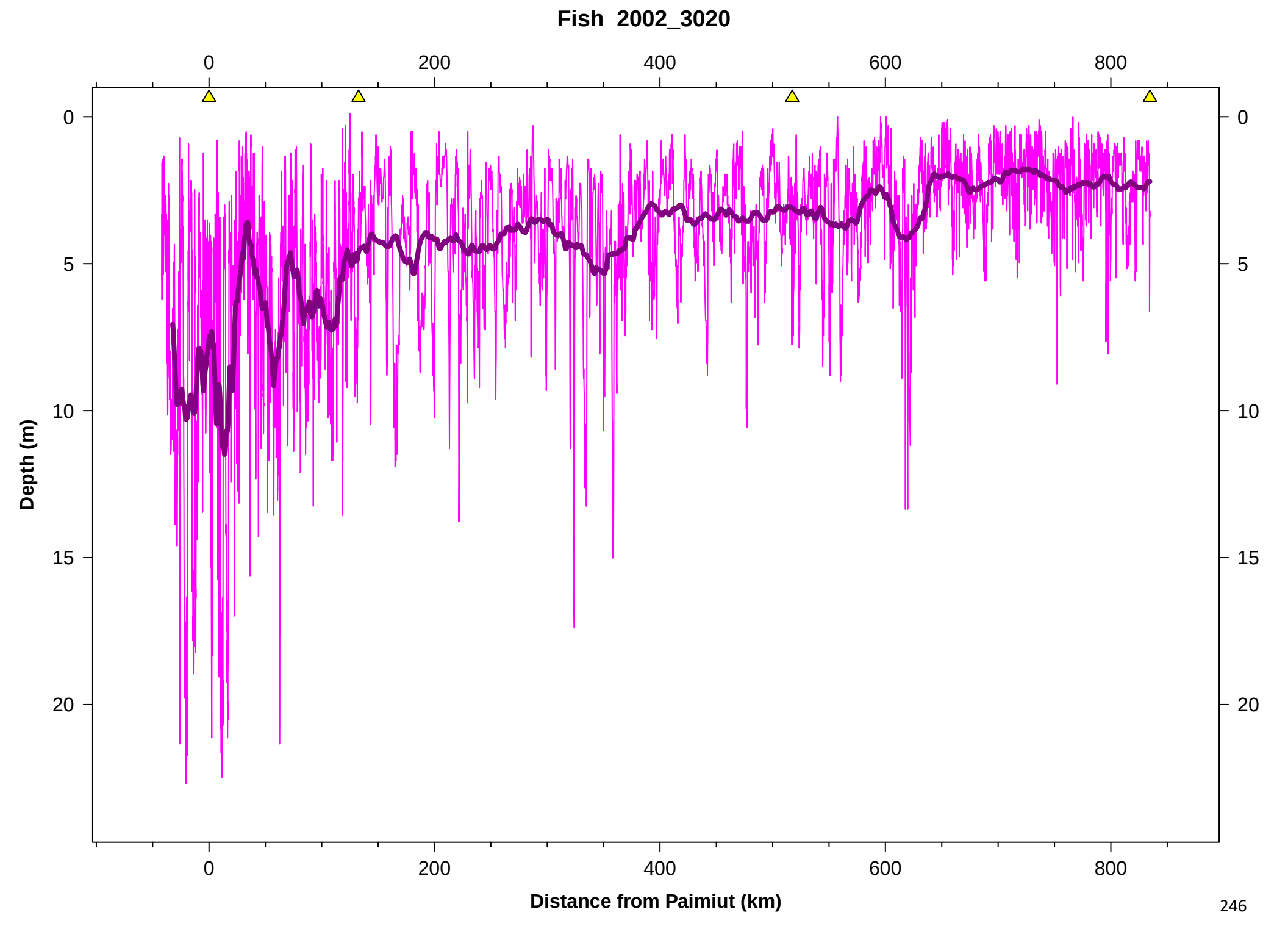

Tolovana Stock
2002
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
Temperature (C)
22
20
18
16
14
12
Year

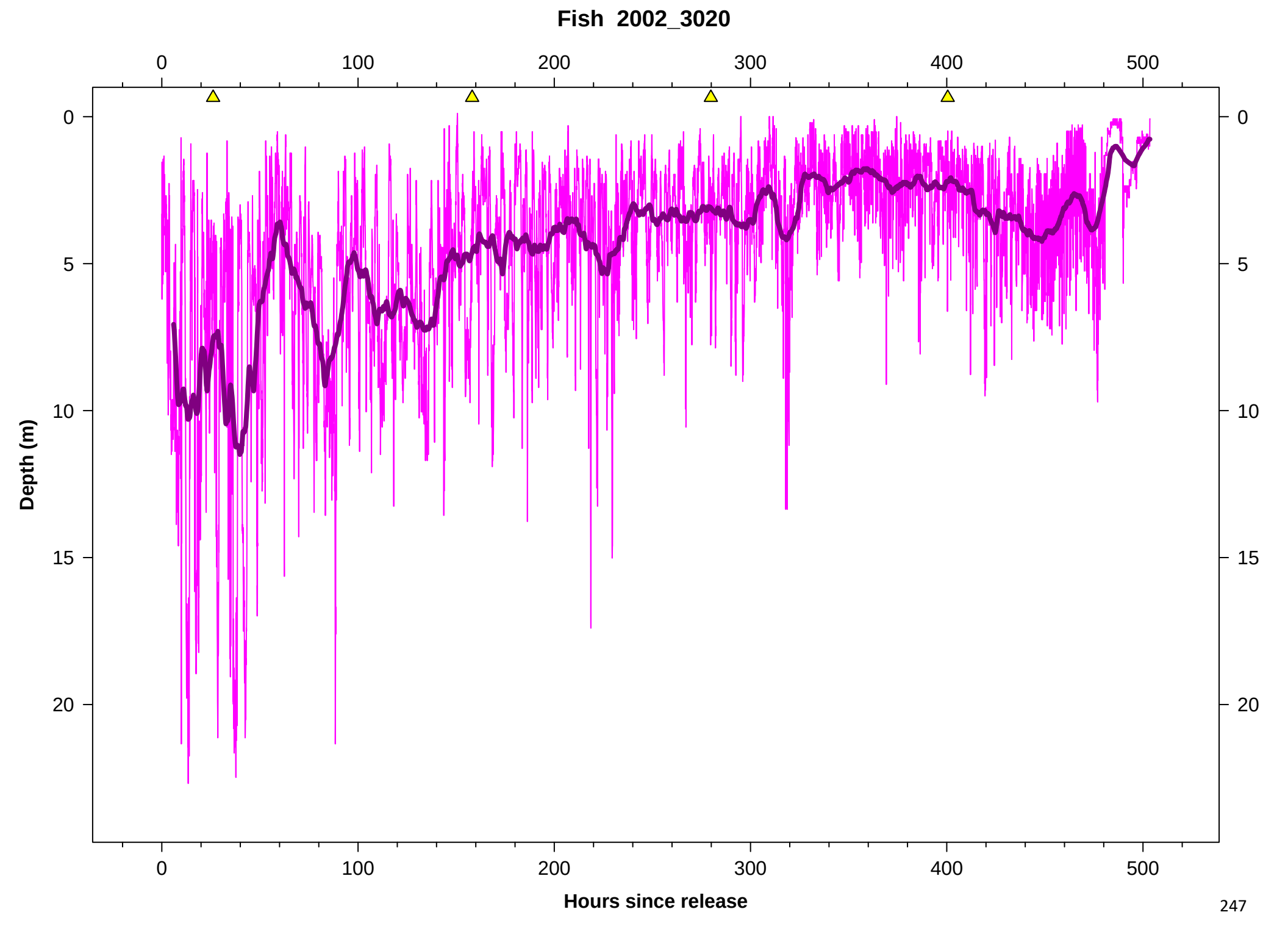

Tolovana Stock
2002
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
22
20
18
16
14
12
Temperature (C)
Fish within stock
242

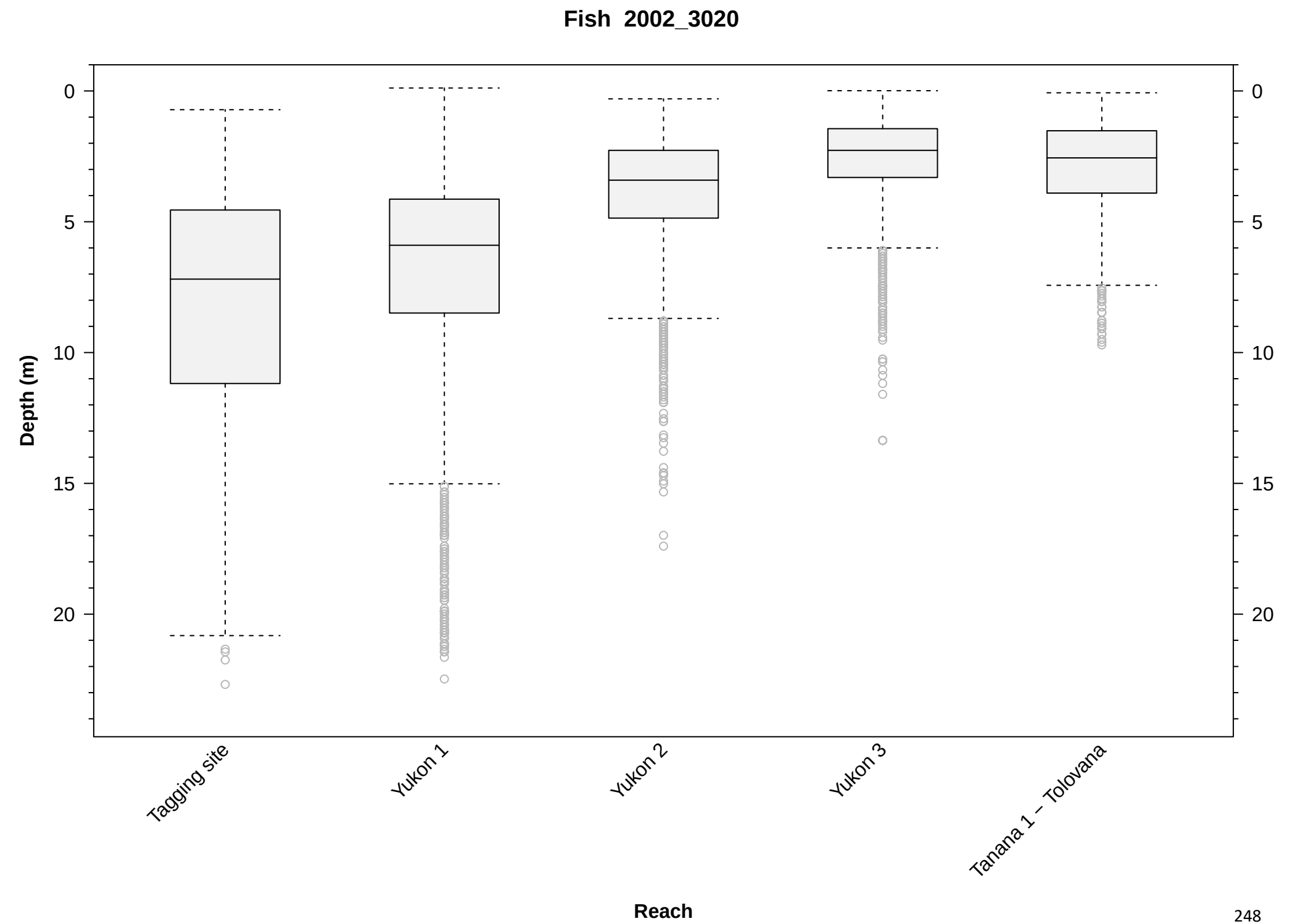

Tolovana Stock
2002_3020
2004_3044
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
Density
0
5
10
12
14
16
18
20
22
Temperature (C)

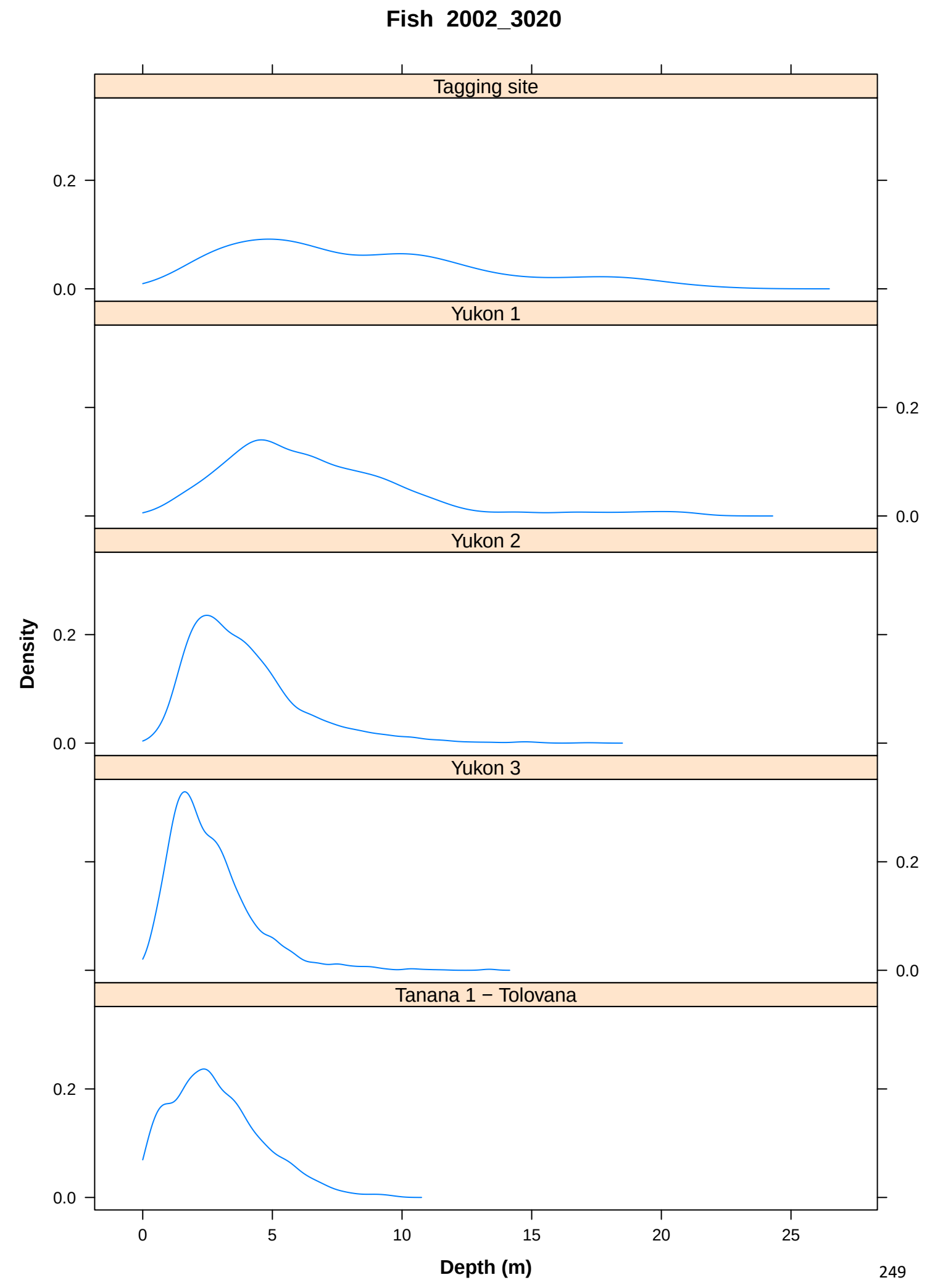

Tolovana Stock
2002
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
12
14
16
18
20
22

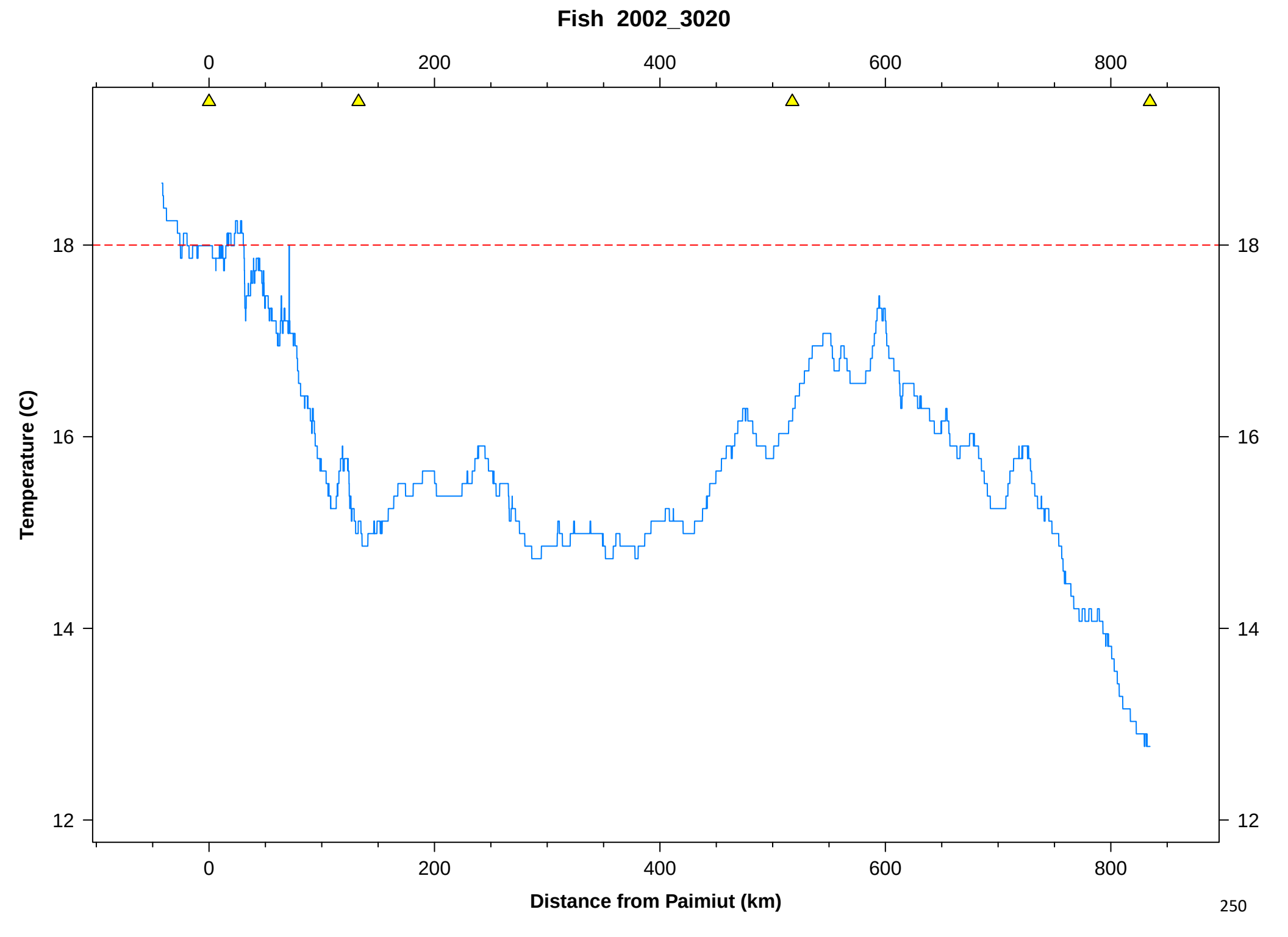

Tolovana Stock
2002
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock

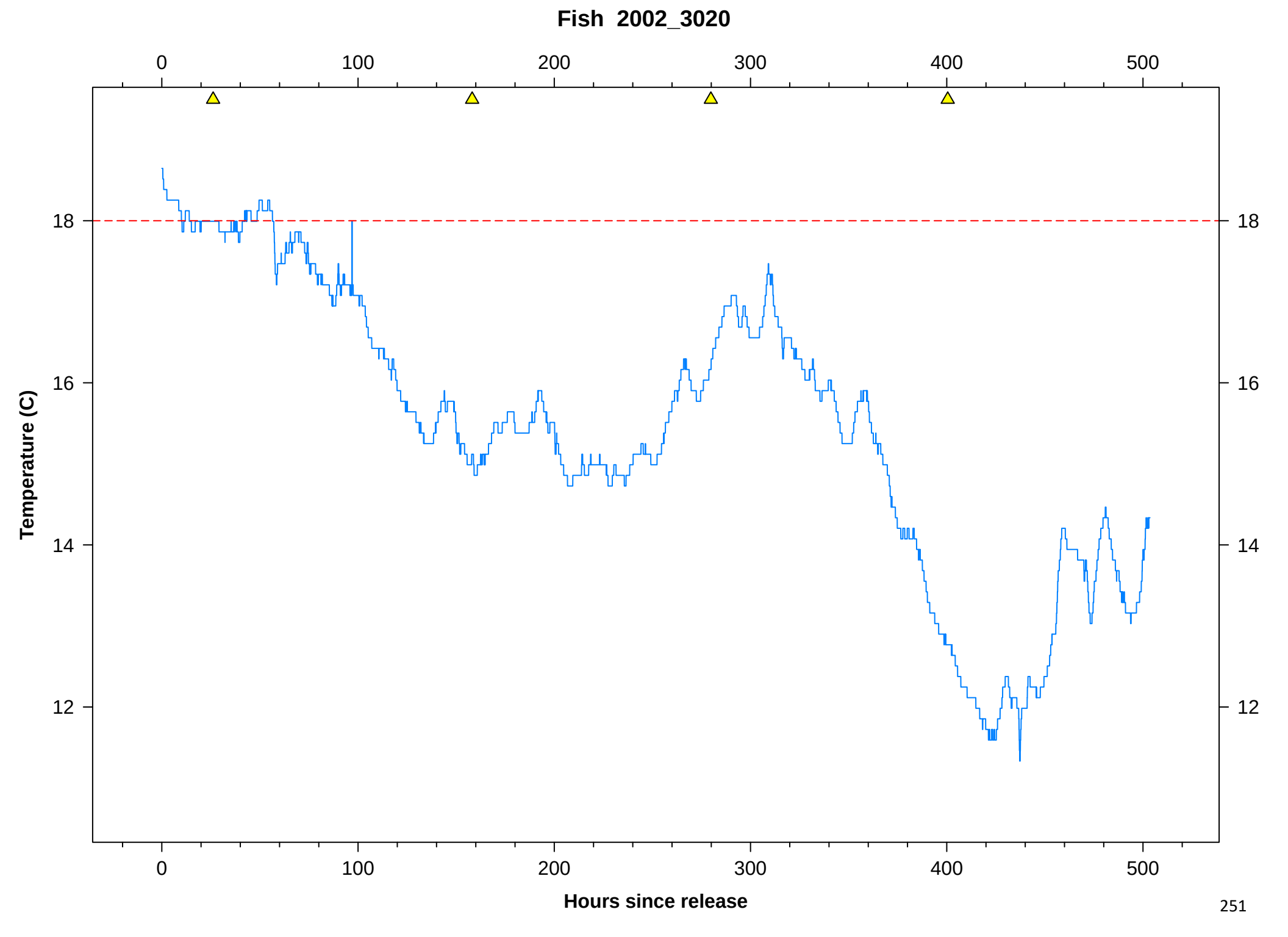

Fish 2002_3020
0
200
400
600
800
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

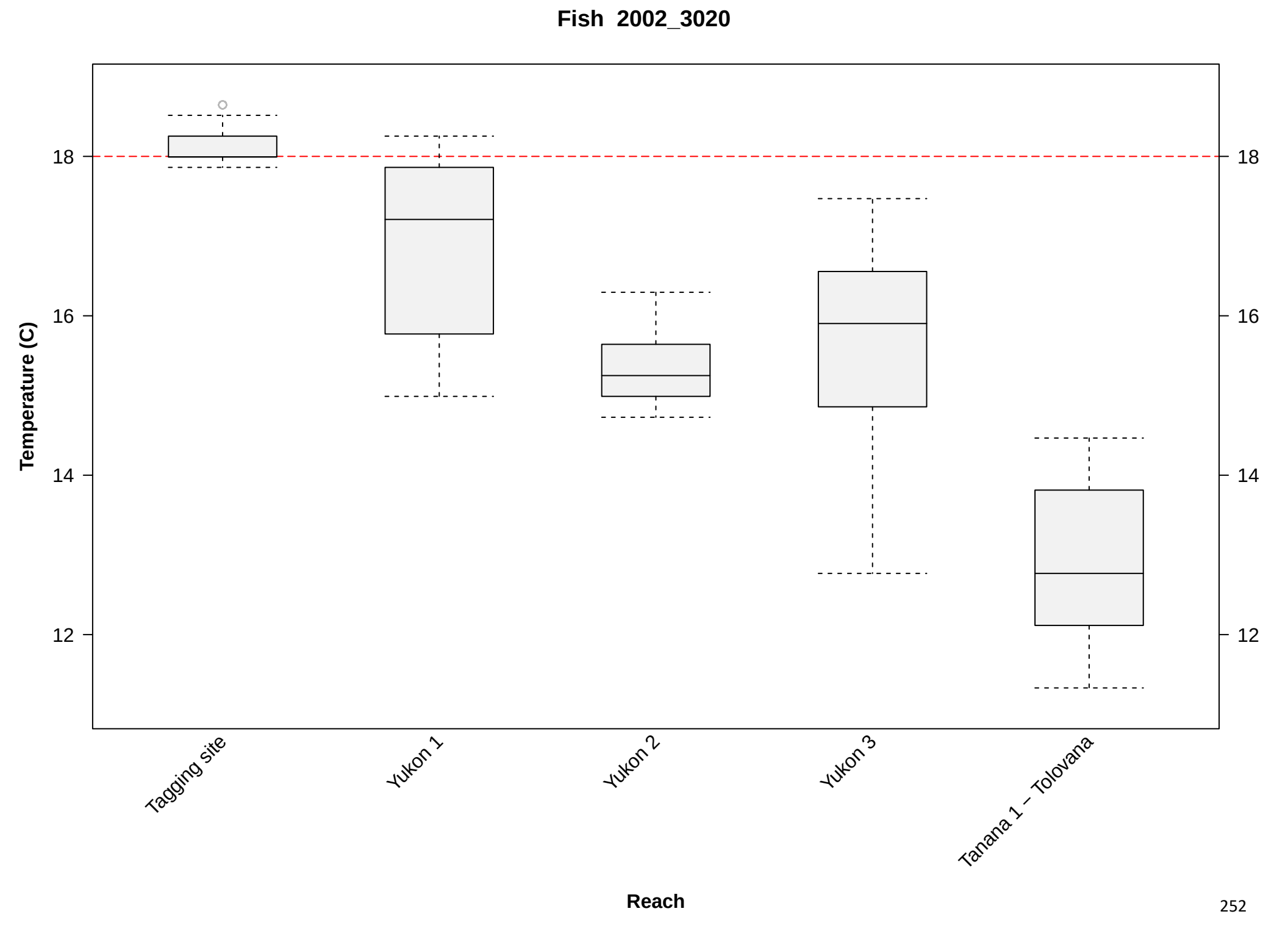

Fish 2002_3020
0
100
200
300
400
500
0
5
10
15
20
Depth (m)
Hours since release

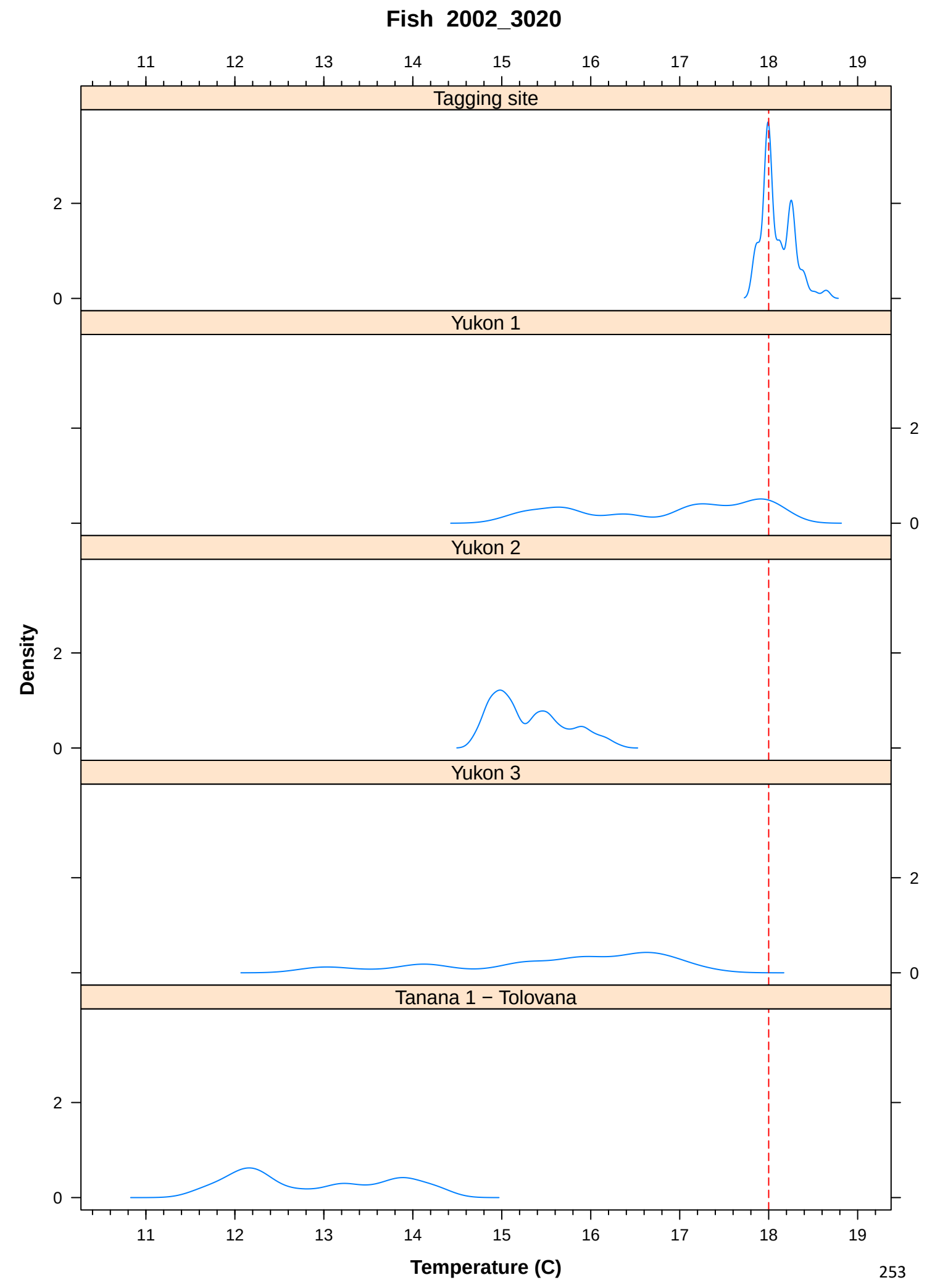

Fish 2002_3020
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Tolovana
Reach

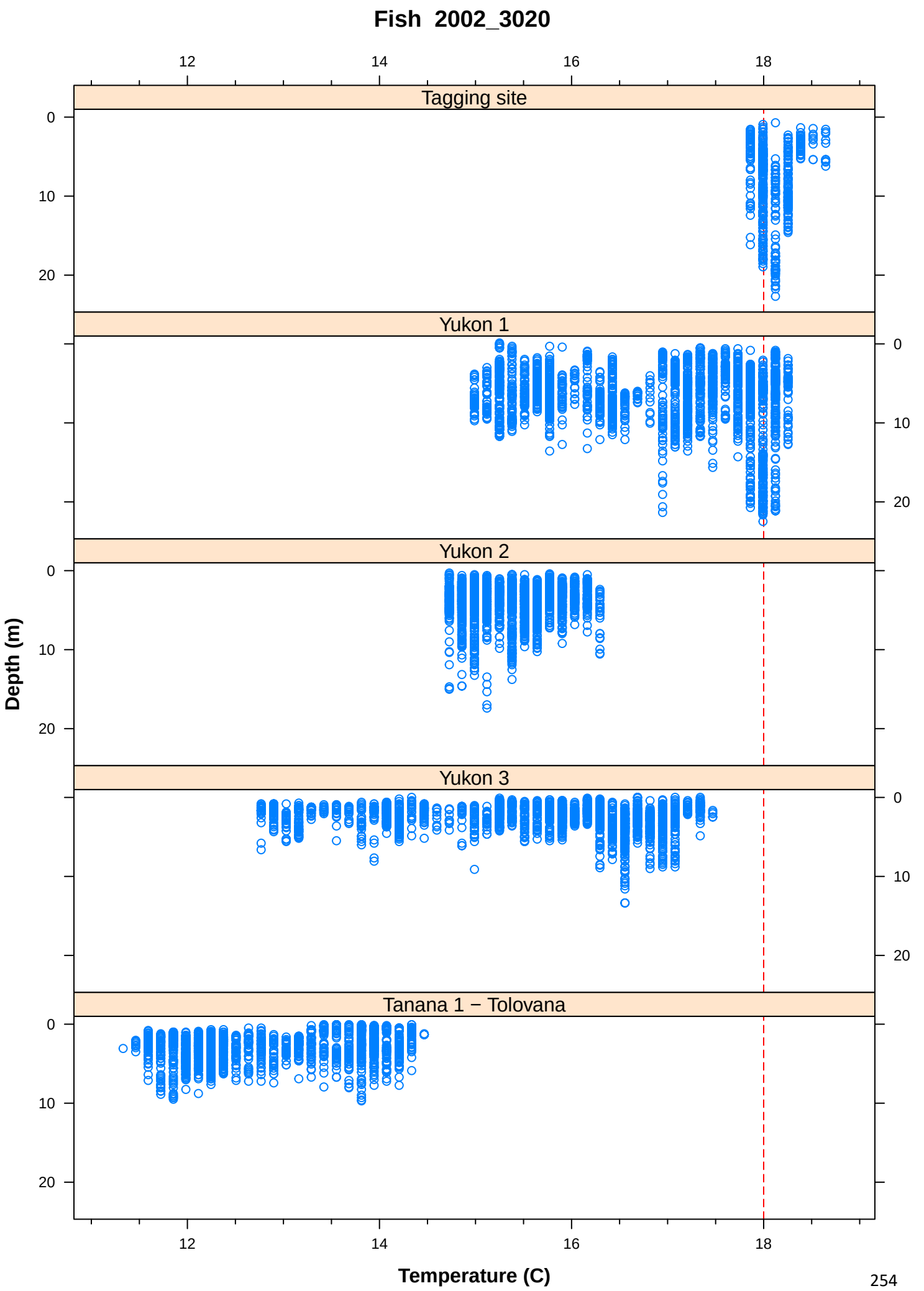

Fish 2002_3020
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
Density
0.0
0.2
0
5
10
15
20
25
Depth (m)

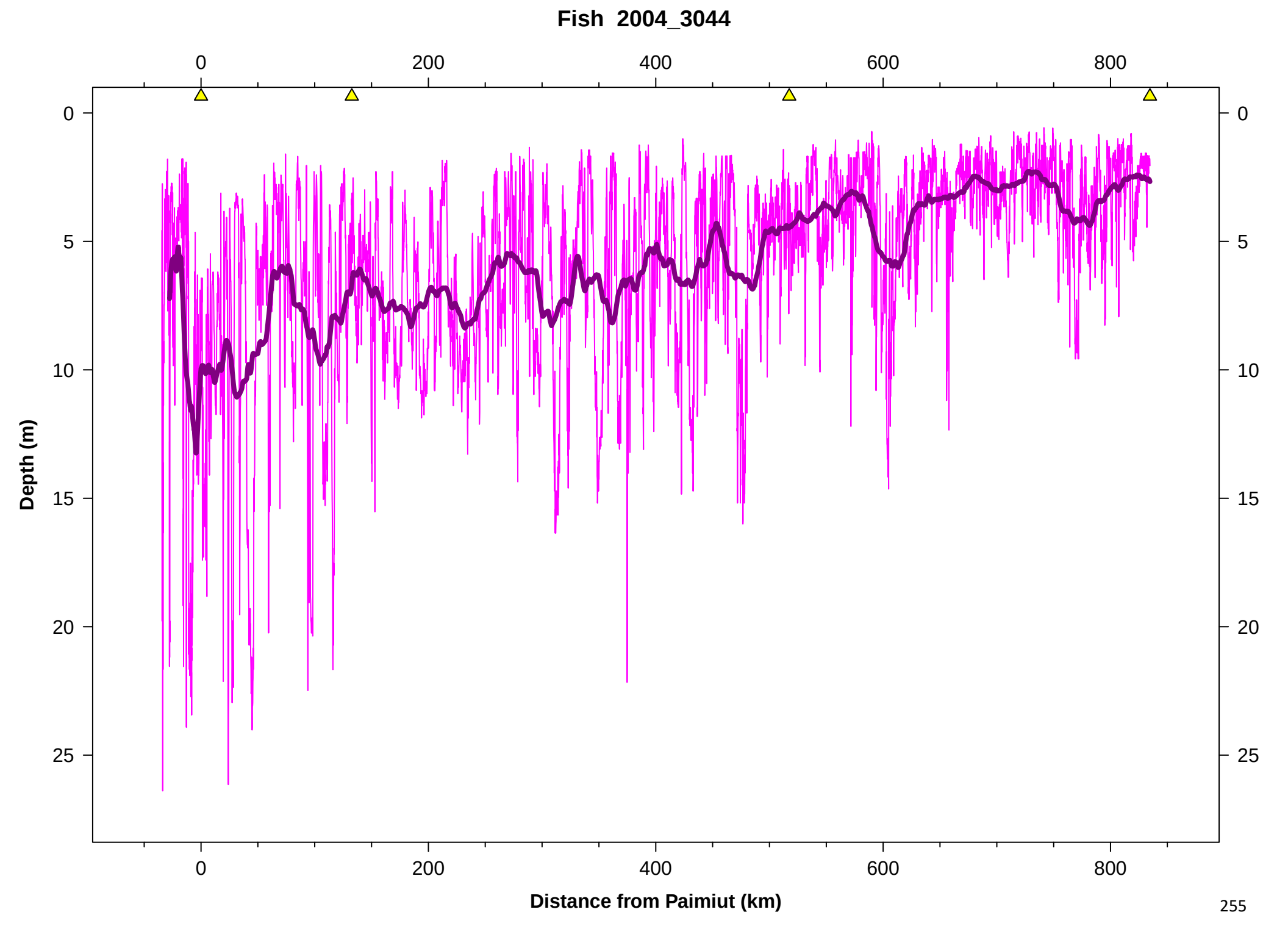

Fish 2002_3020
0
200
400
600
800
18
16
14
12
Temperature (C)
Distance from Paimiut (km)

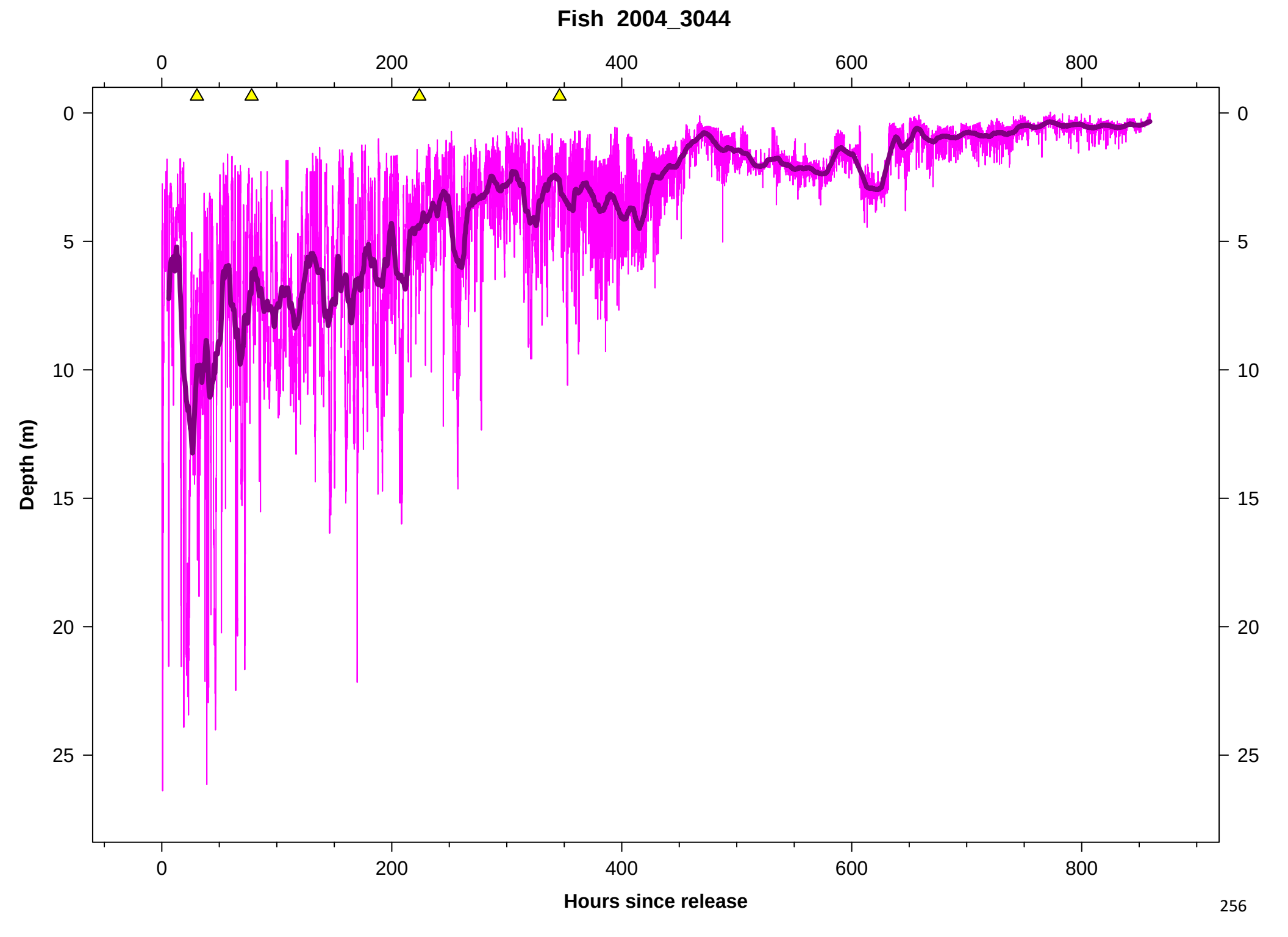

Fish 2002_3020
0
100
200
300
400
500
18
16
14
12
Temperature (C)
Hours since release

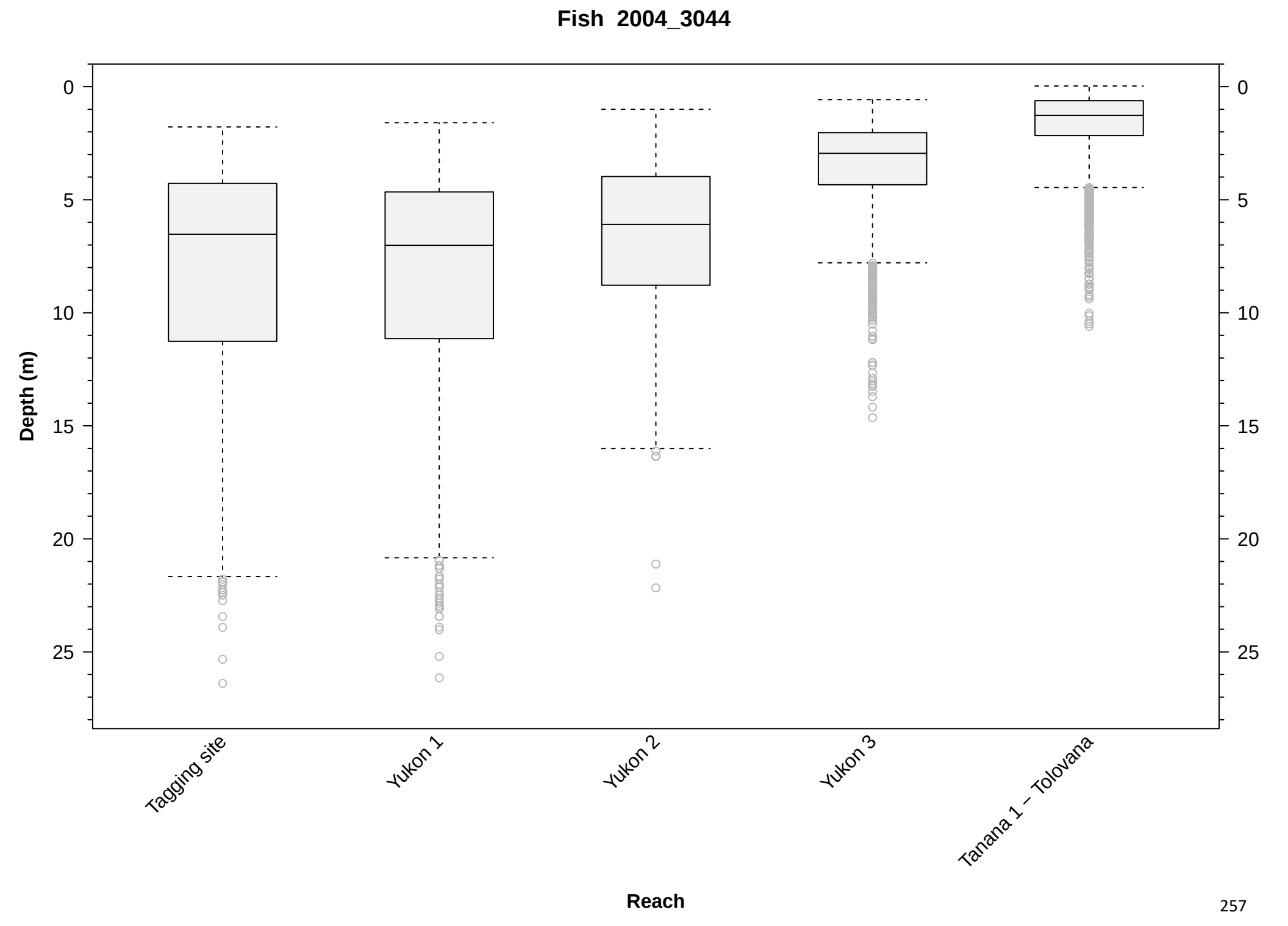

Fish 2002_3020
Temperature (C)
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Tolovana
Reach

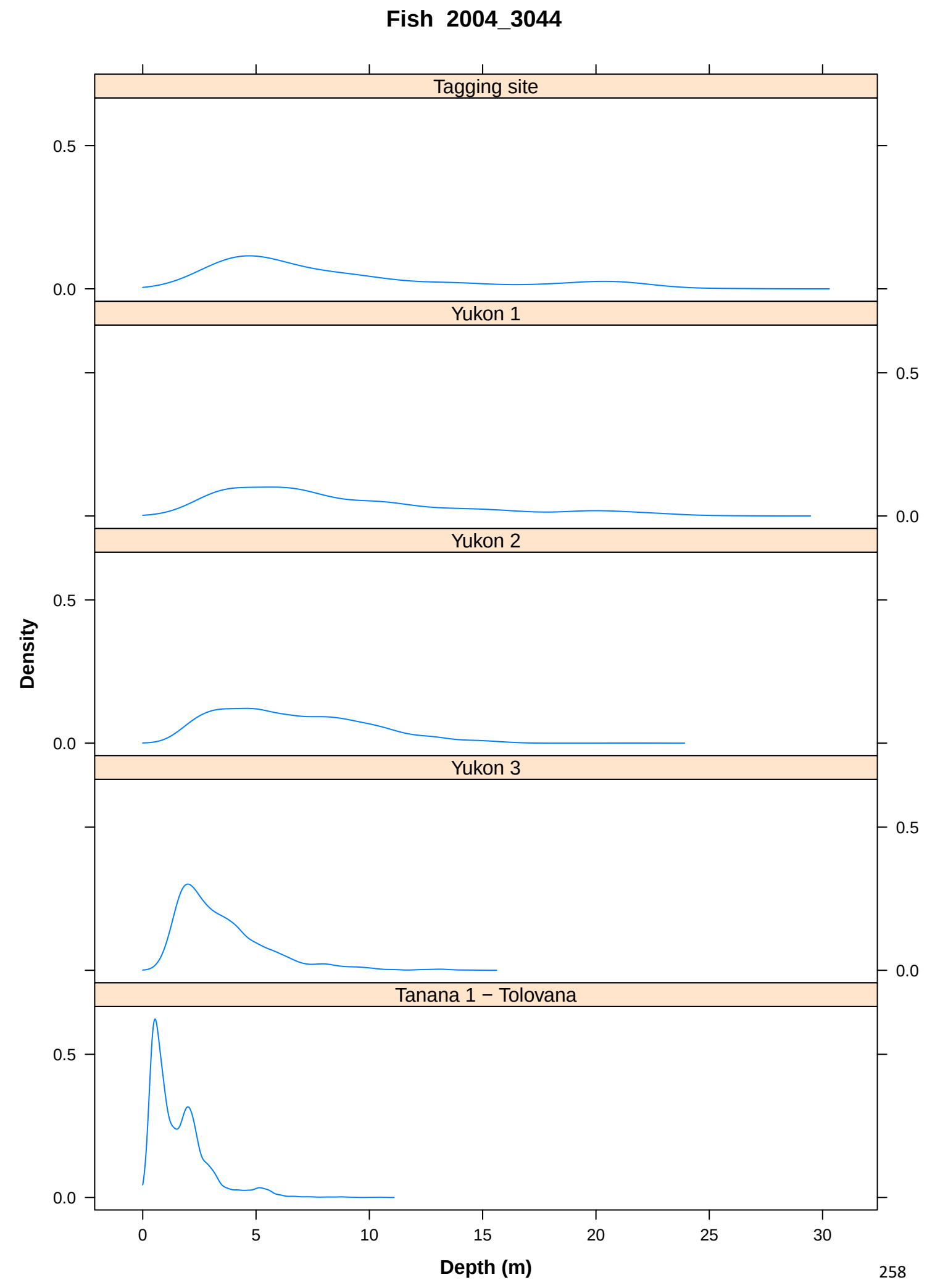

Fish 2002_3020
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
Density
Temperature (C)
11
12
13
14
15
16
17
18
19
0
2

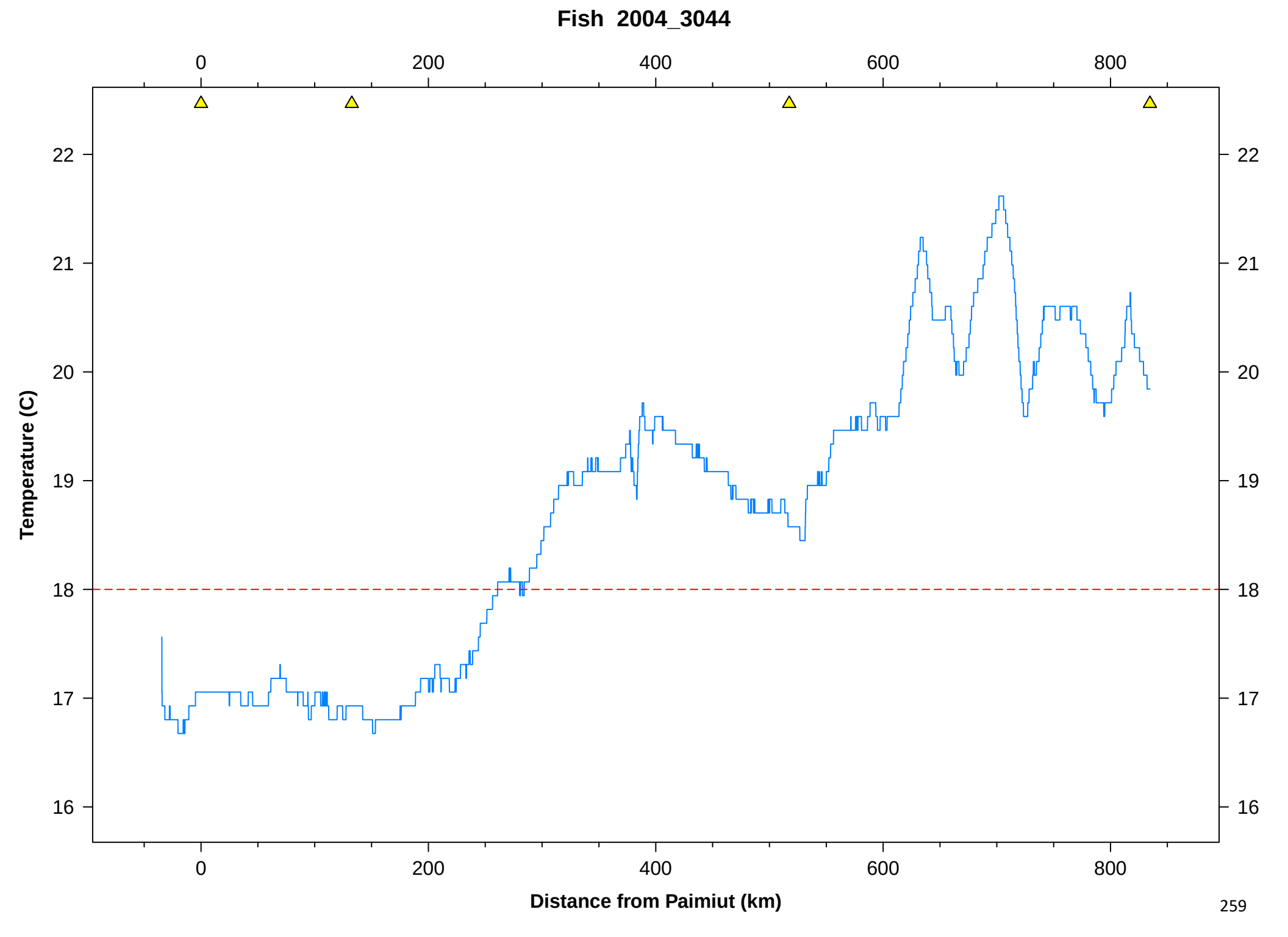

Fish 2002_3020
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
Depth (m)
Temperature (C)
12
14
16
18
0
10
20

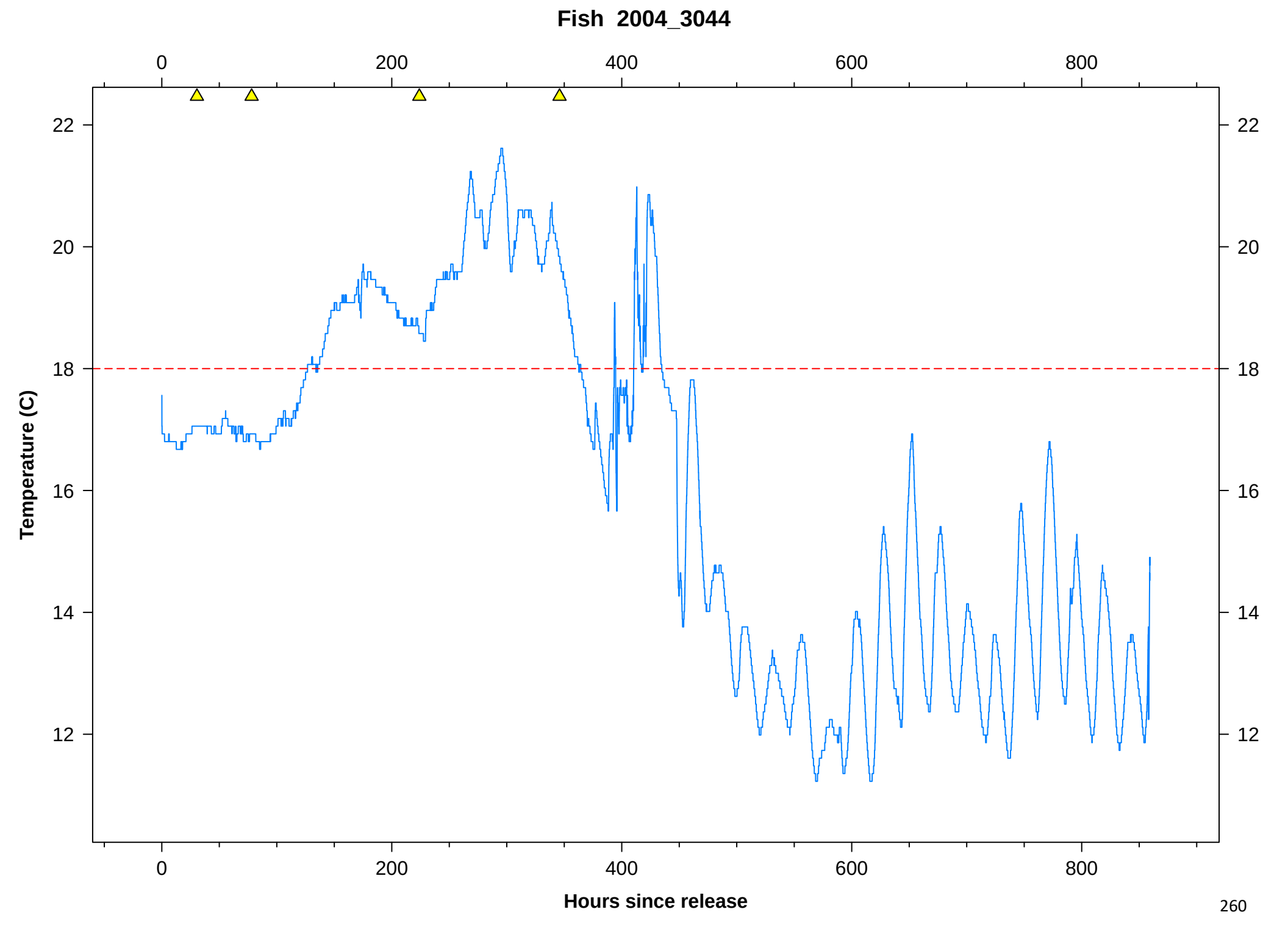

Fish 2004_3044
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

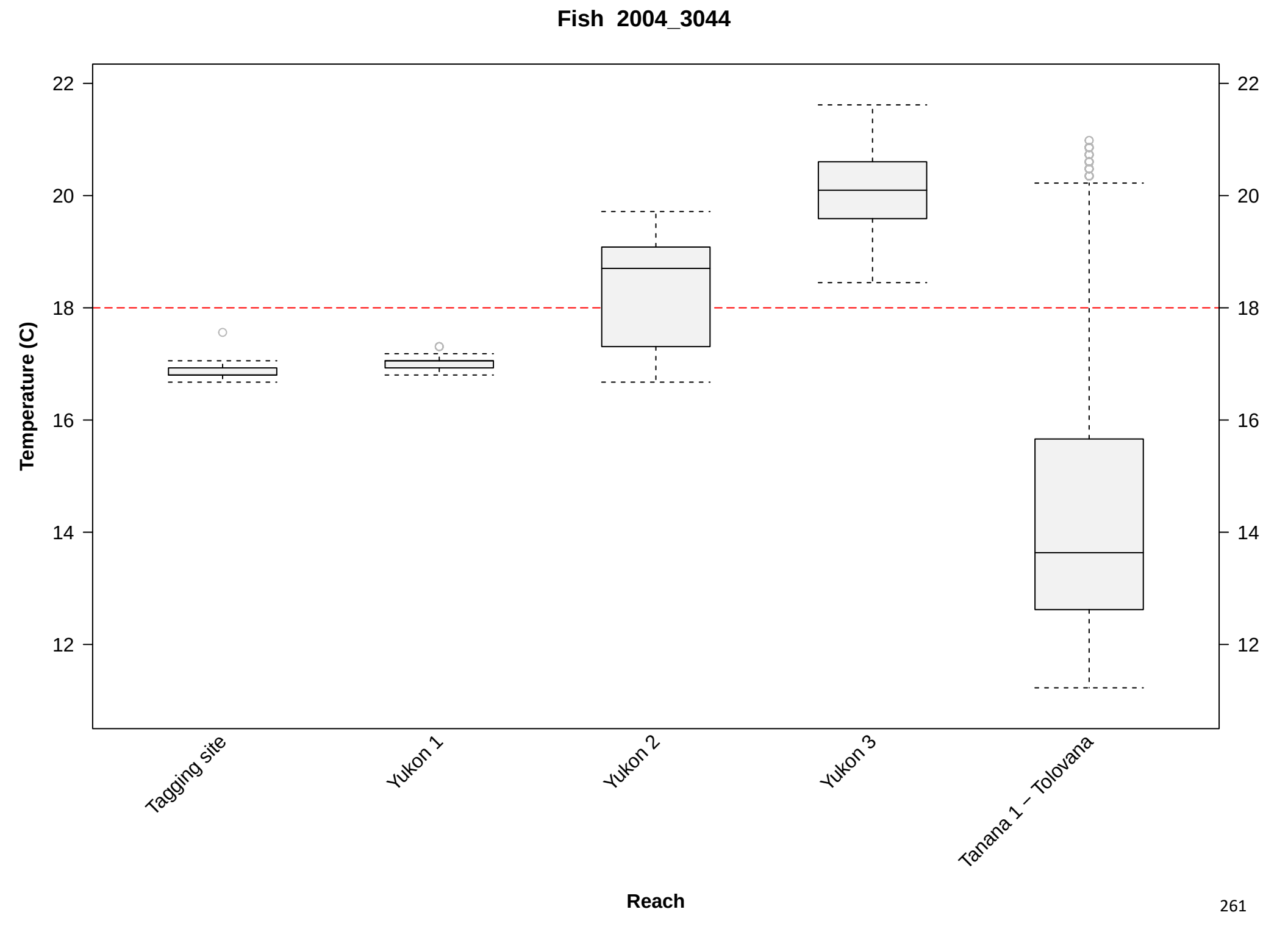

Fish 2004_3044
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Hours since release

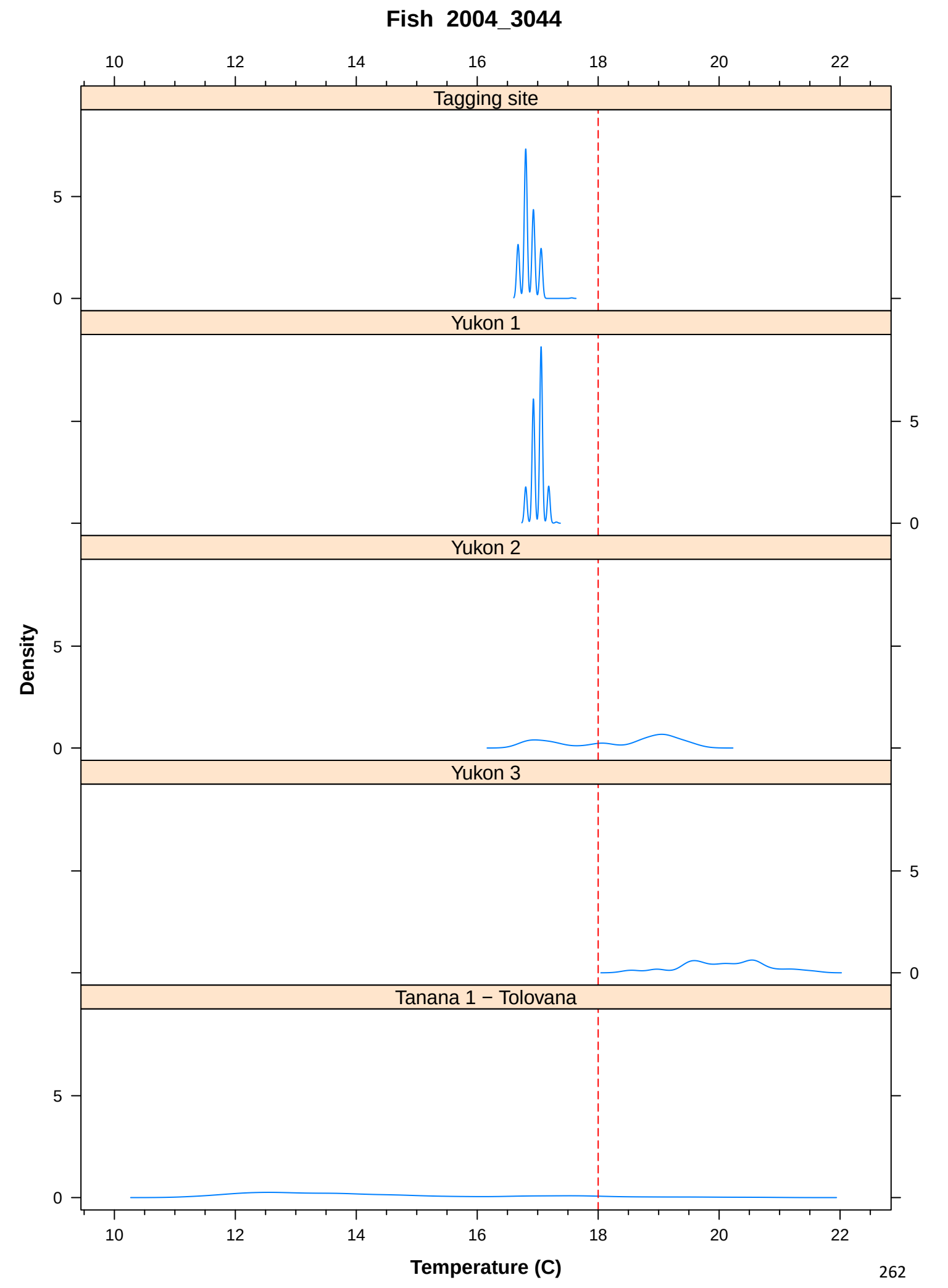

Fish 2004_3044
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Tolovana
Reach

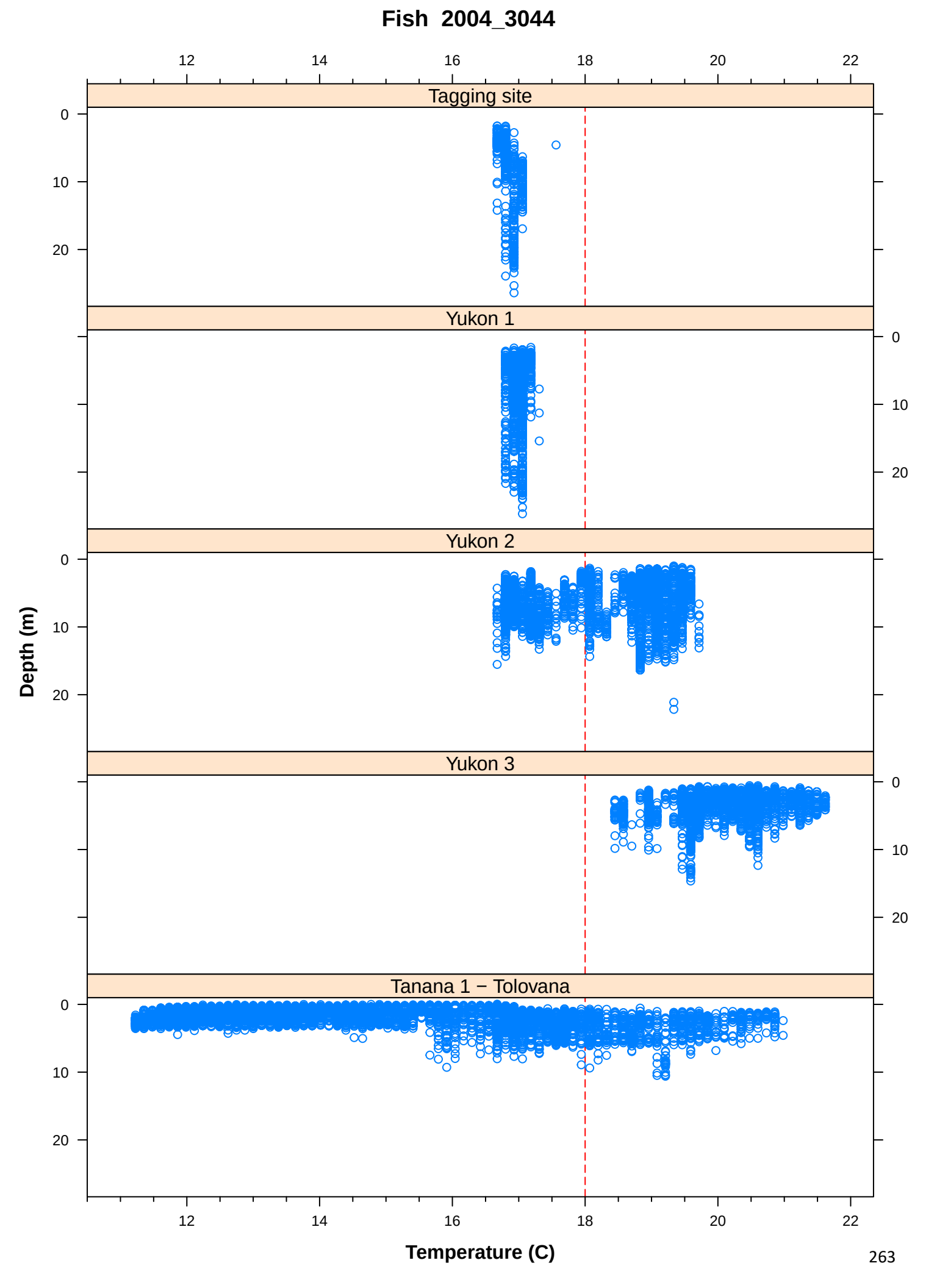

Fish 2004_3044
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
Density
0.5
0.0
0
5
10
15
20
25
30
Depth (m)


Fish 2004_3044
0
200
400
600
800
22
21
20
19
18
17
16
Temperature (C)
Distance from Paimiut (km)

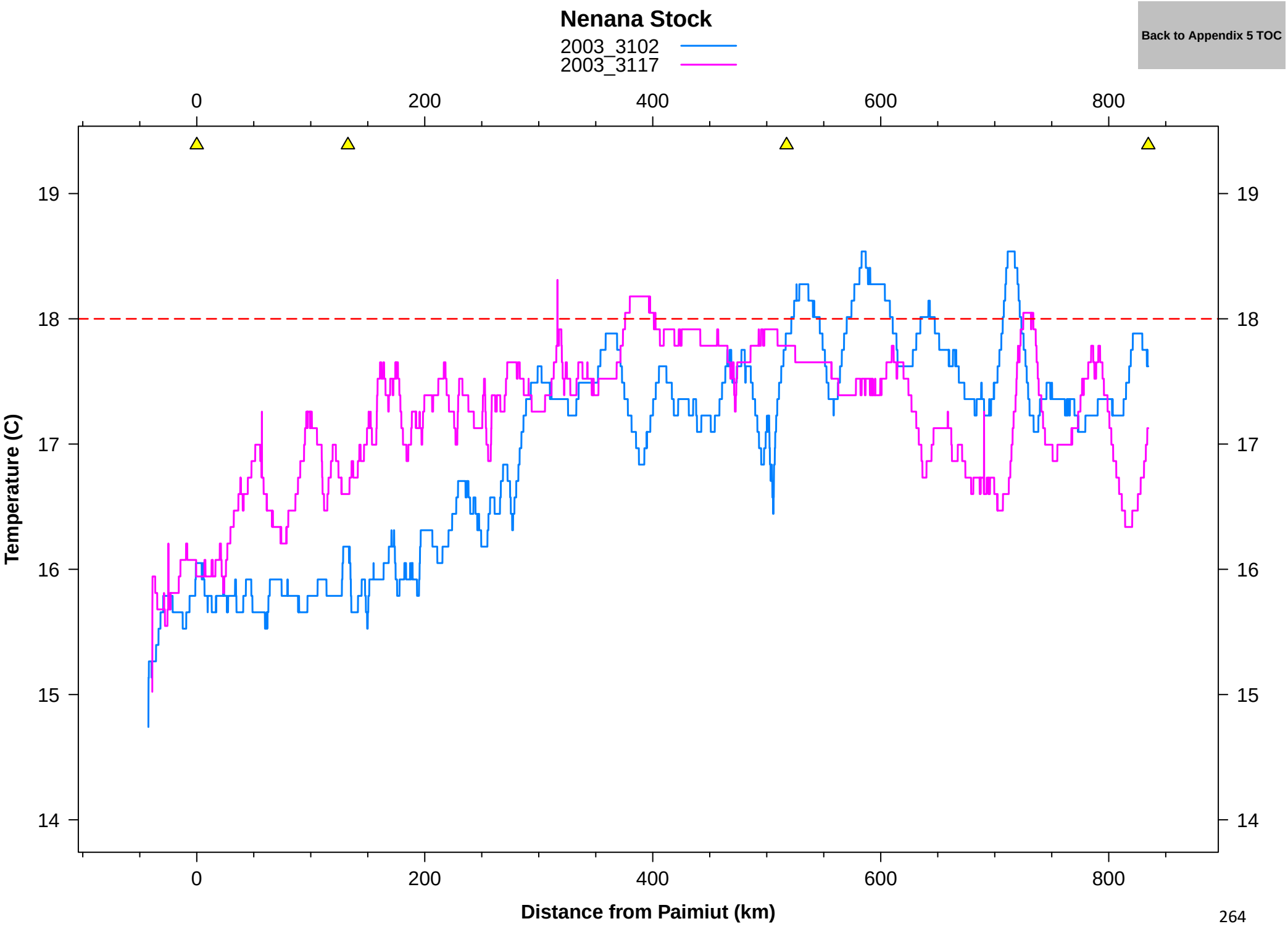

Fish 2004_3044
0
200
400
600
800
22
20
18
16
14
12
Temperature (C)
Hours since release

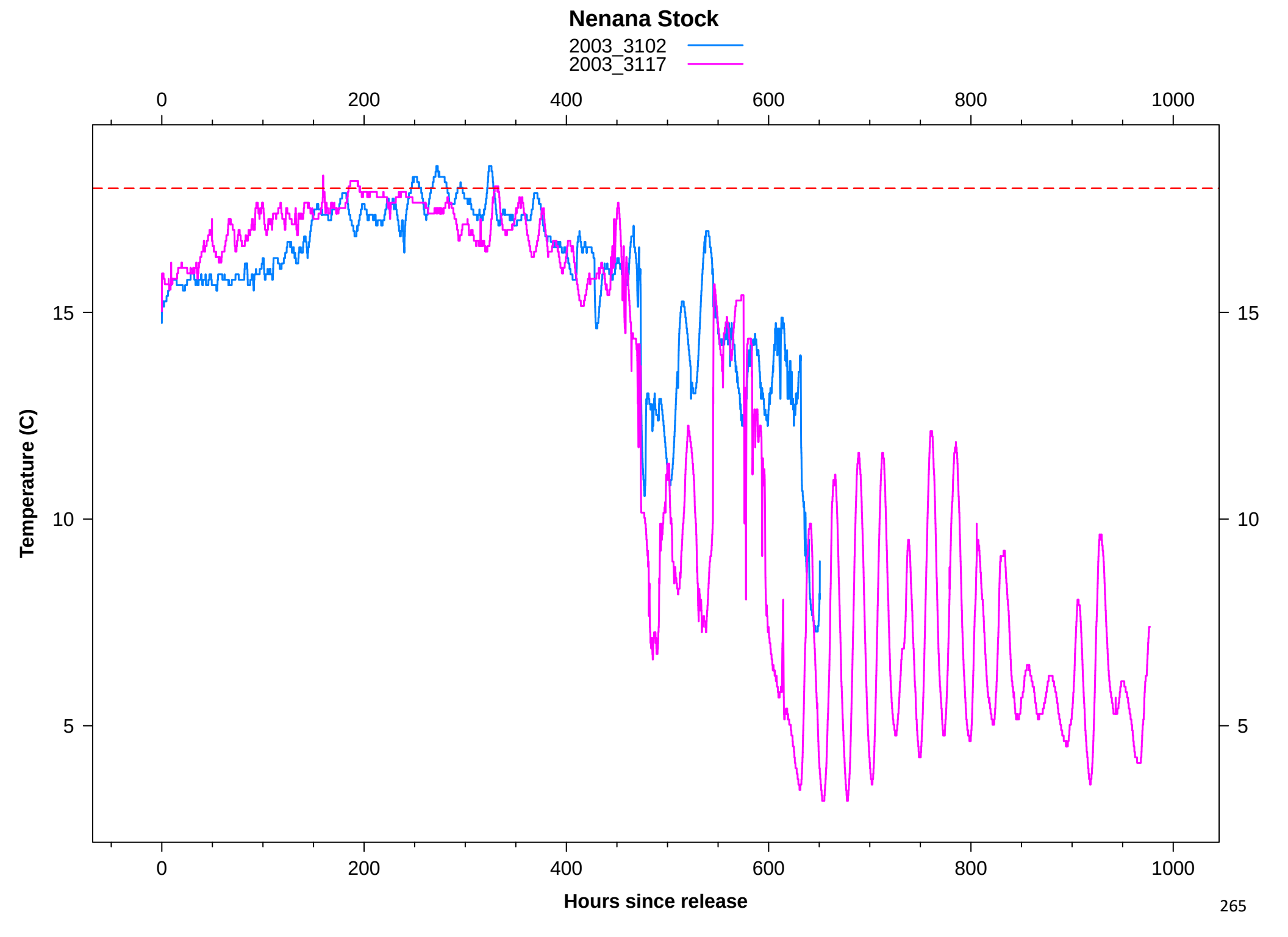

Fish 2004_3044
Temperature (C)
22
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Tolovana
Reach

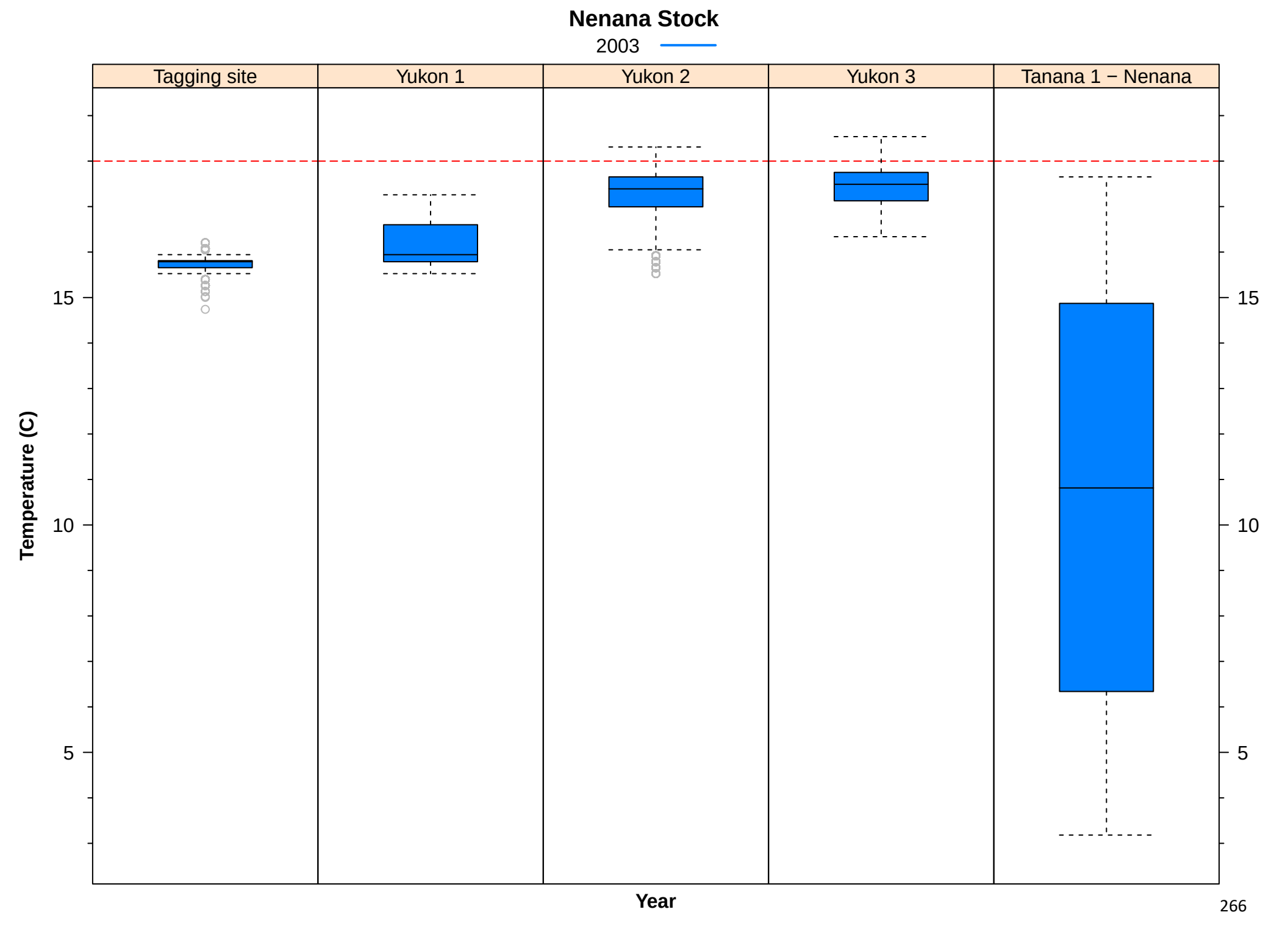

Fish 2004_3044
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
Density
Temperature (C)
10
12
14
16
18
20
22
0
5

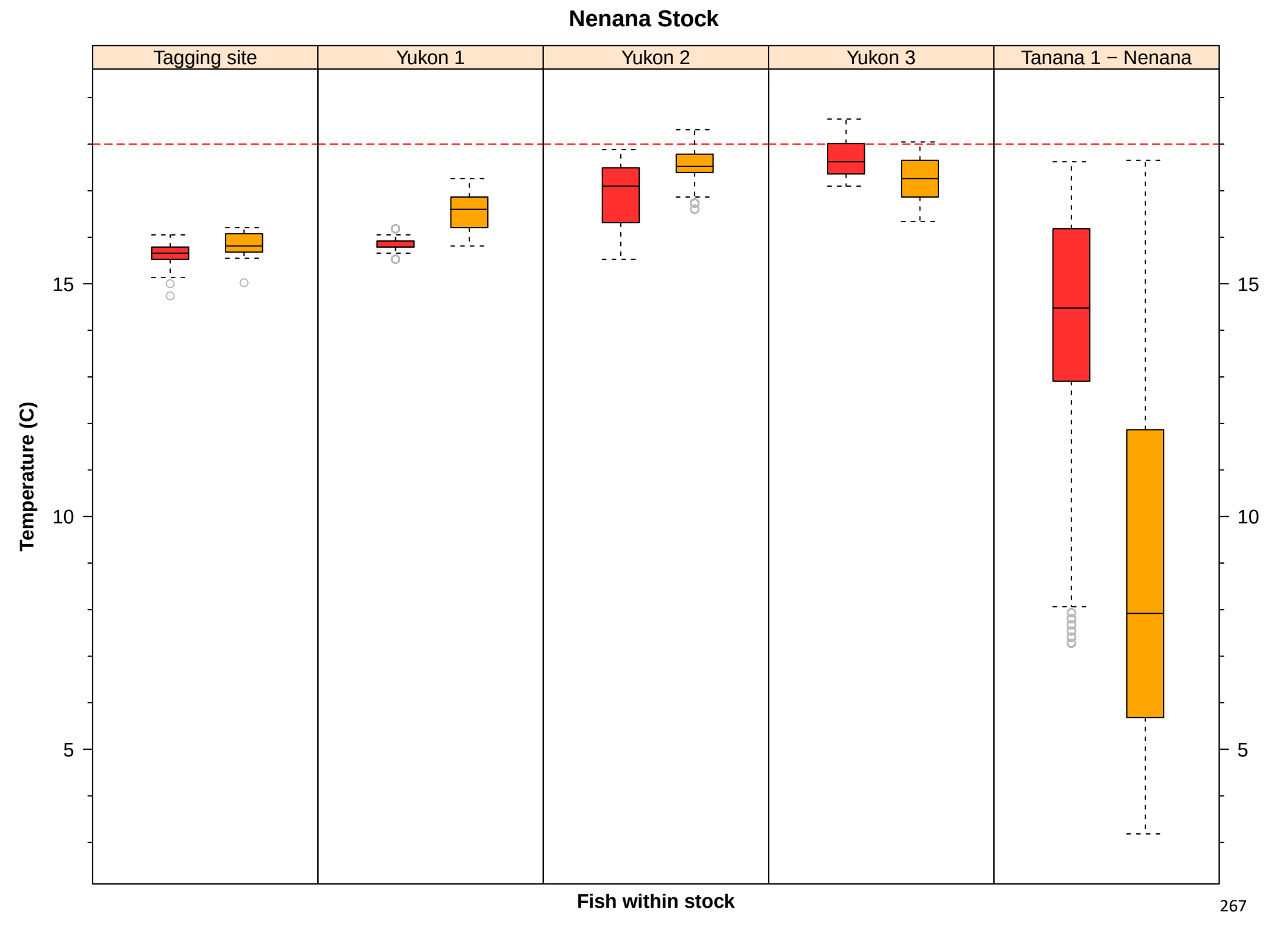

Fish 2004_3044
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Tolovana
Depth (m)
Temperature (C)
12
14
16
18
20
22
0
10
20

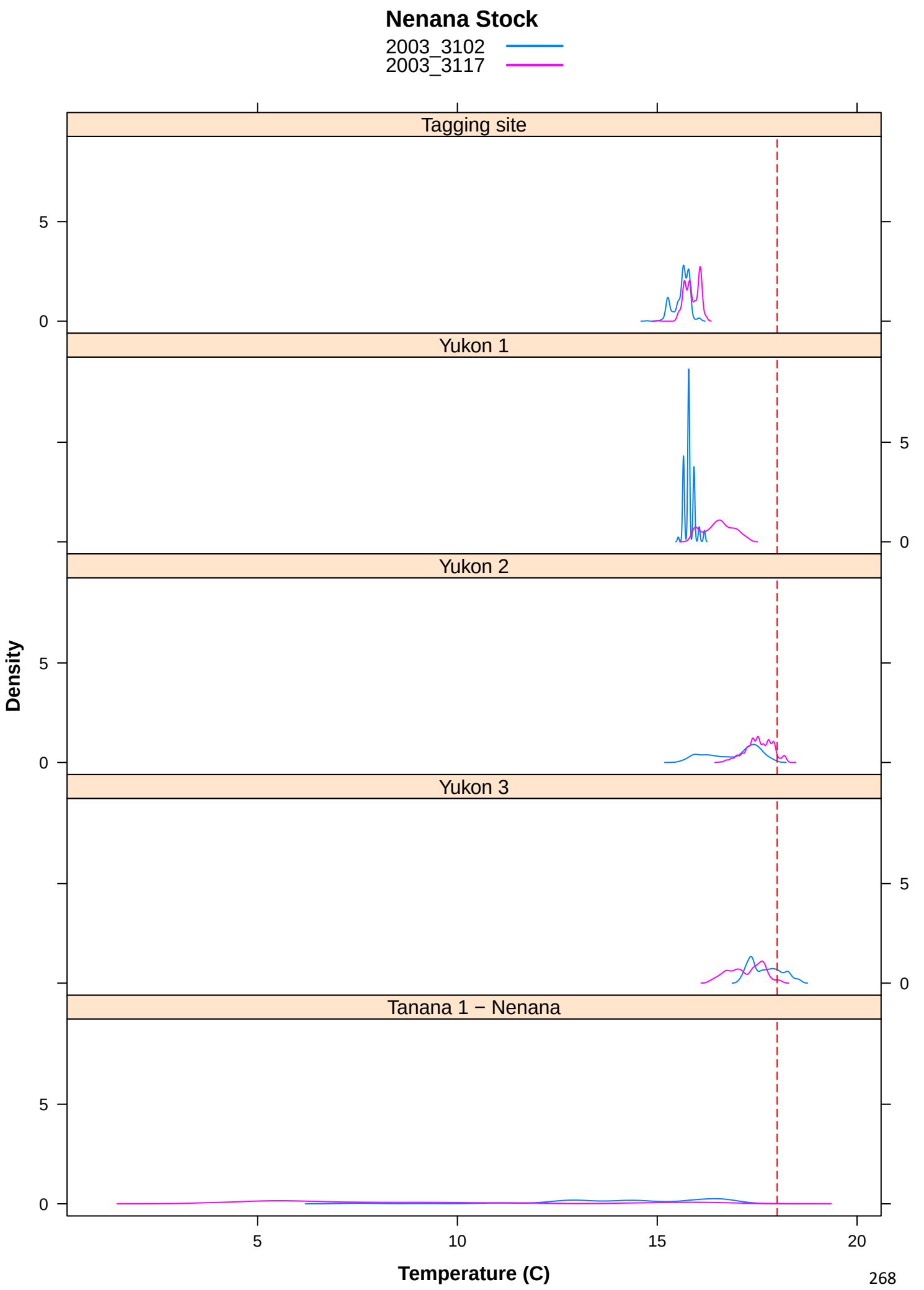
Back to Appendix 5 TOC

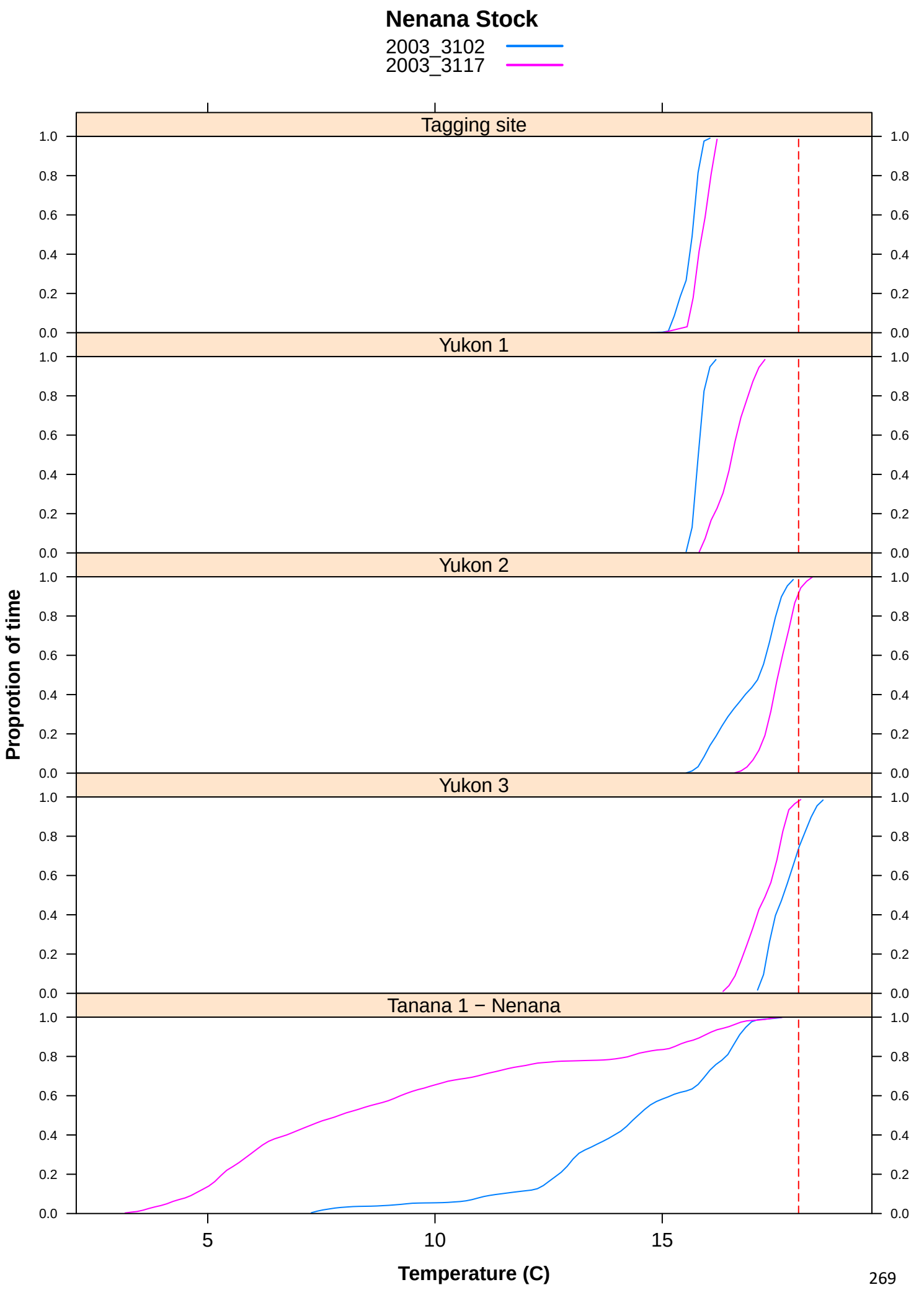


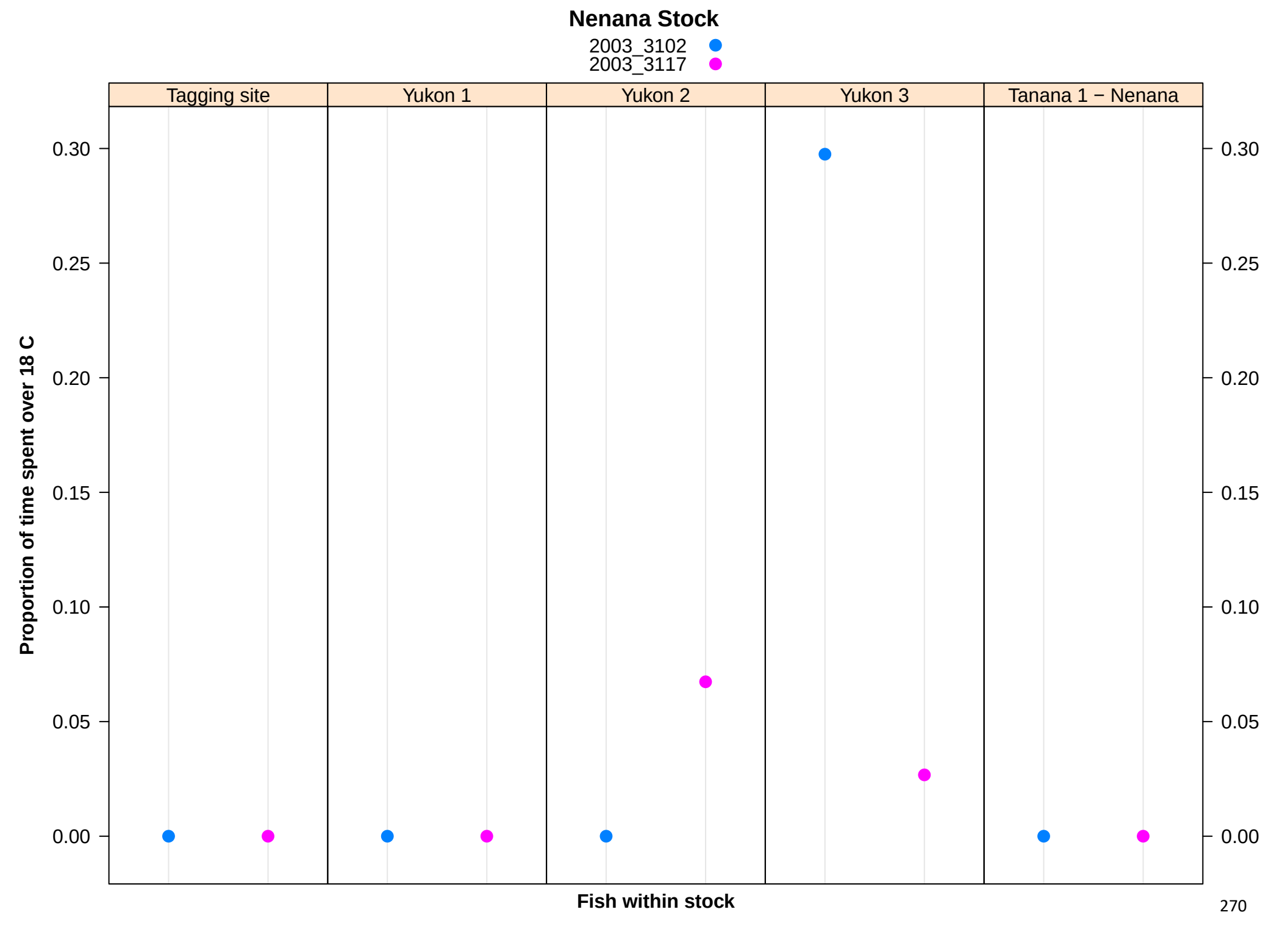

Nenana Stock
2003_3102
2003_3117
0
200
400
600
800
1000
15
10
5
Temperature (C)
Hours since release

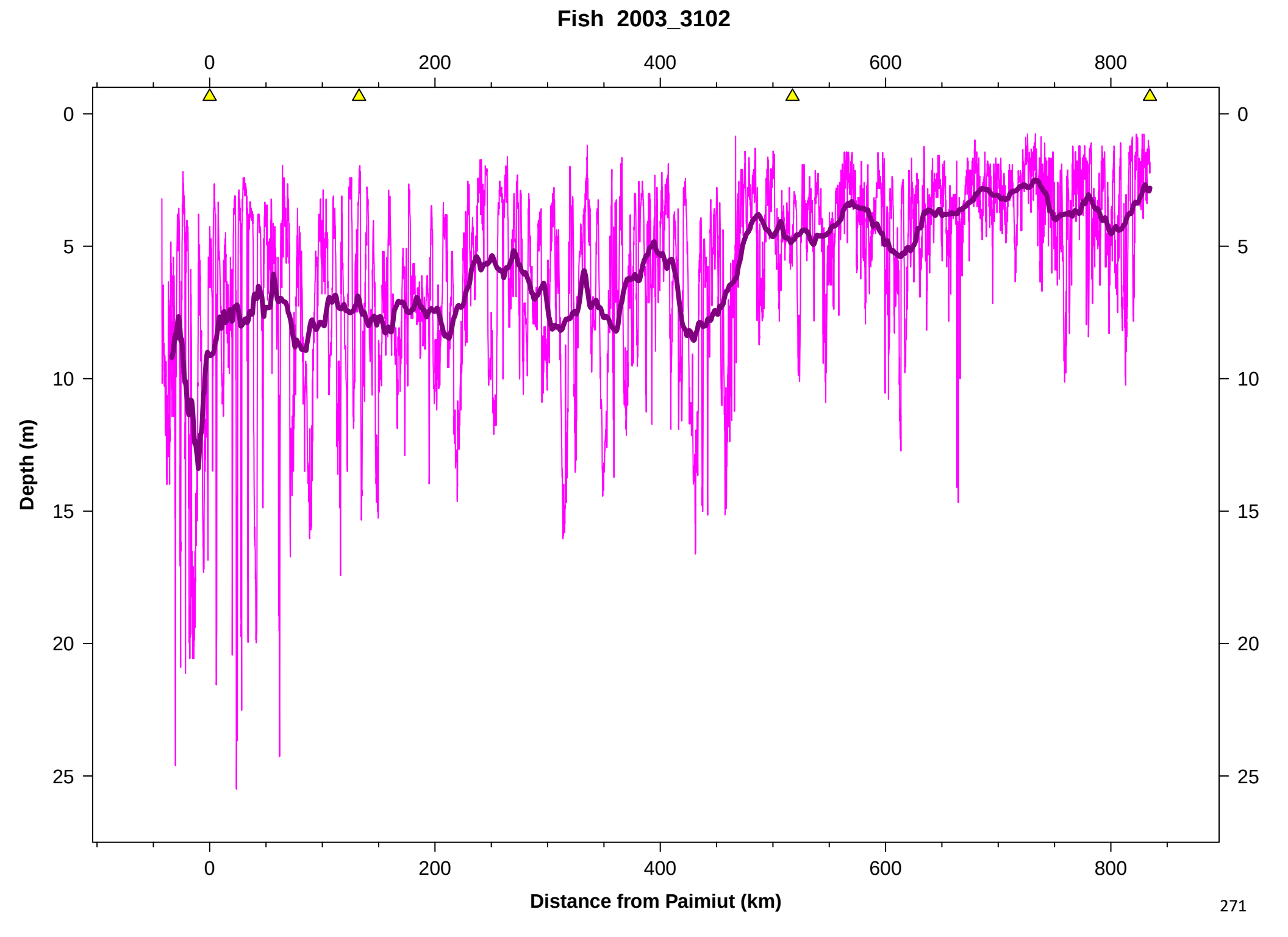

Nenana Stock
2003
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Nenana
Temperature (C)
15
10
5
Year

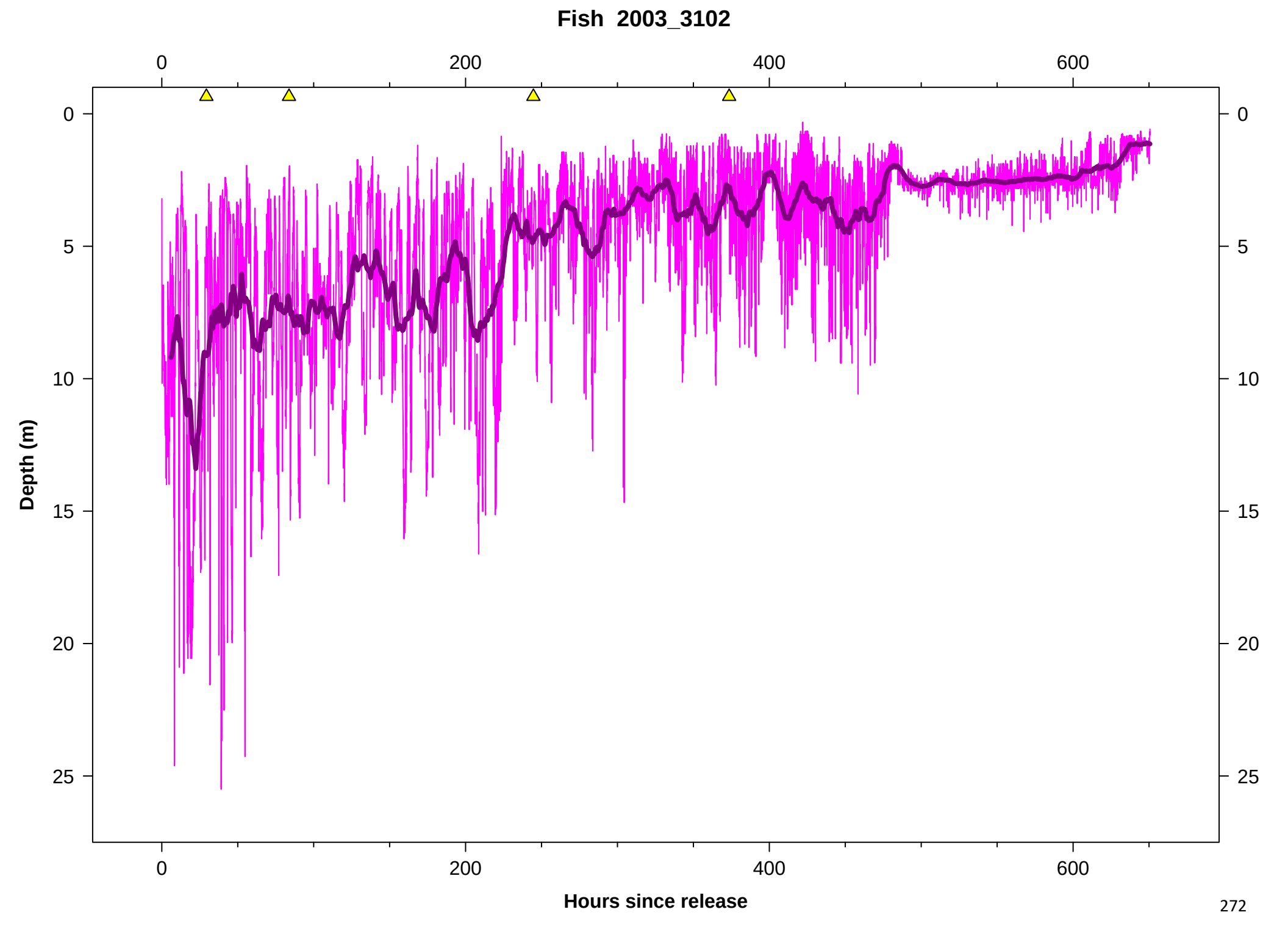

Nenana Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Nenana
Temperature (C)
15
10
5
Fish within stock
267

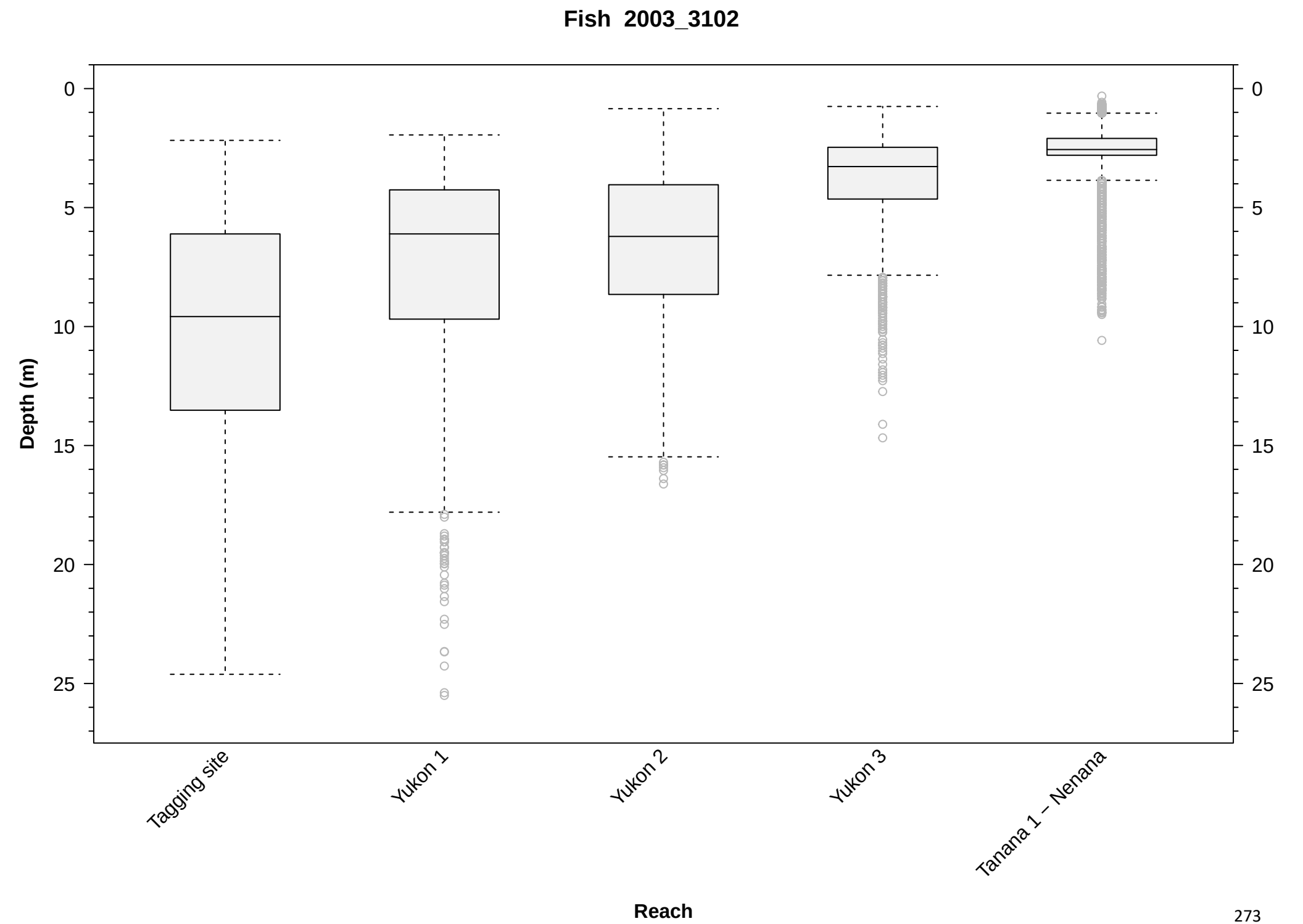

Nenana Stock
2003_3102
2003_3117
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Nenana
Density
Temperature (C)
0
5
10
15
20

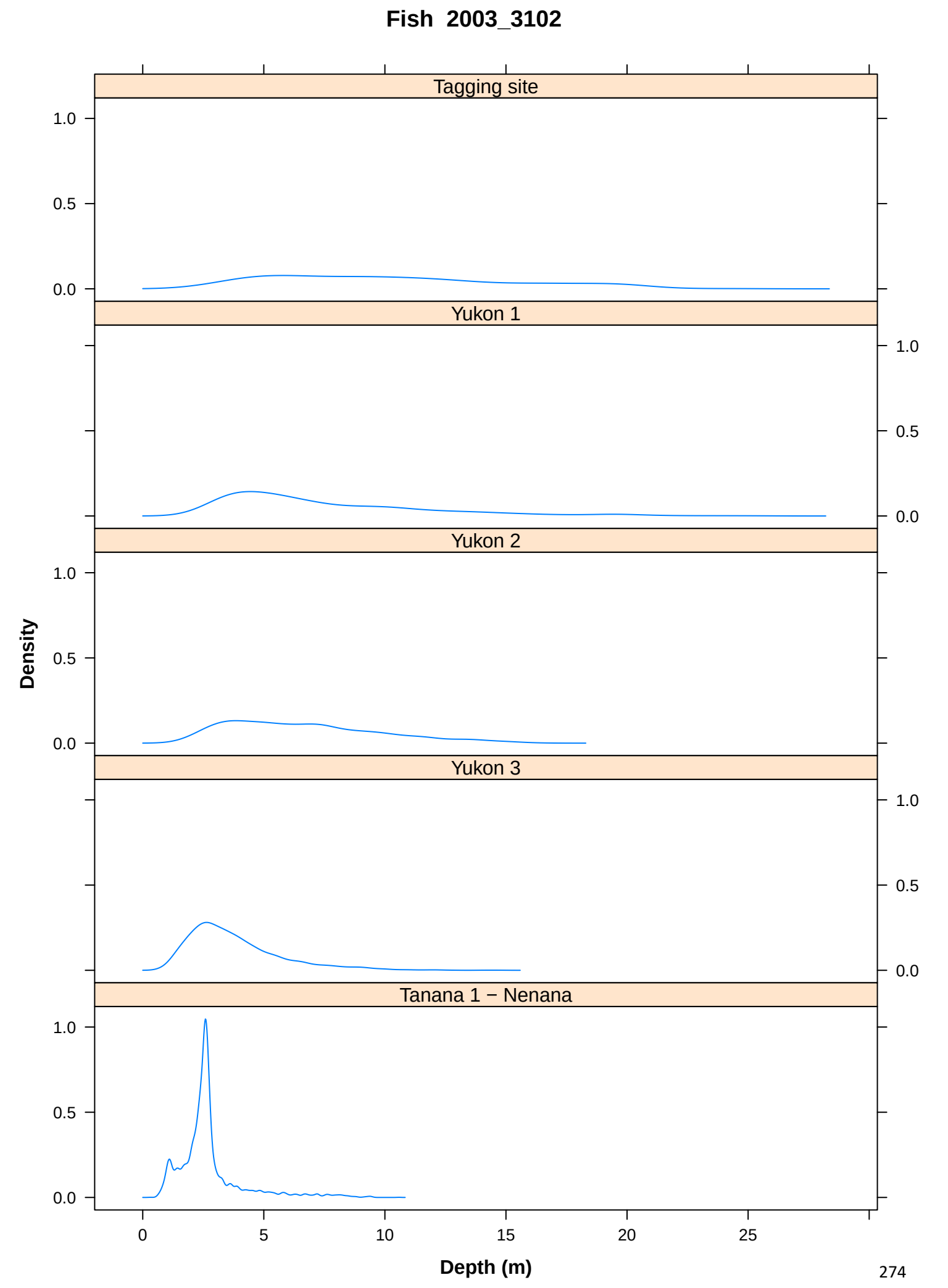

Nenana Stock
2003_3102
2003_3117
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Nenana
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
5
10
15

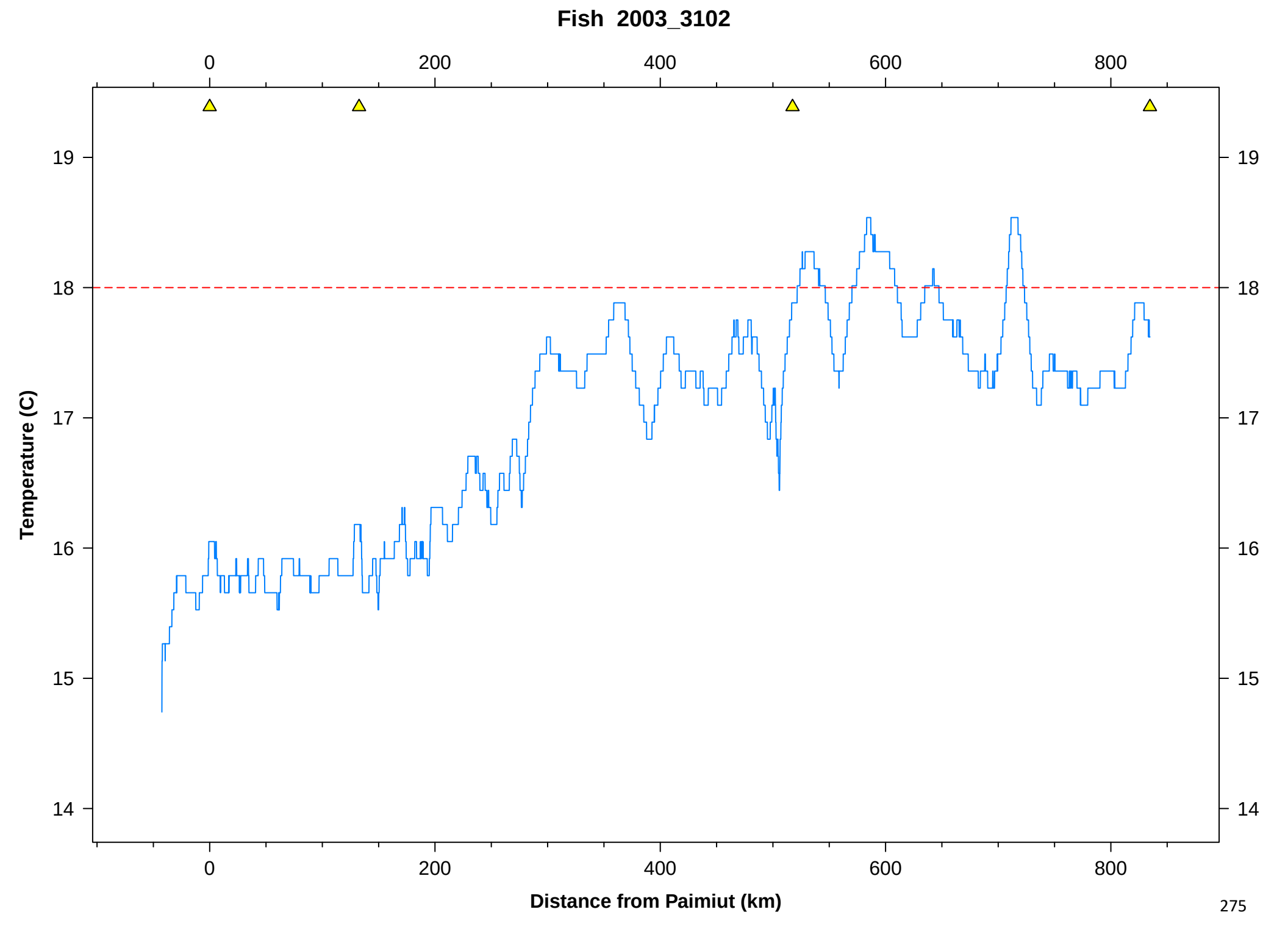

Nenana Stock
2003_3102
2003_3117
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Nenana
Proportion of time spent over 18 C
0.00
0.05
0.10
0.15
0.20
0.25
0.30
Fish within stock

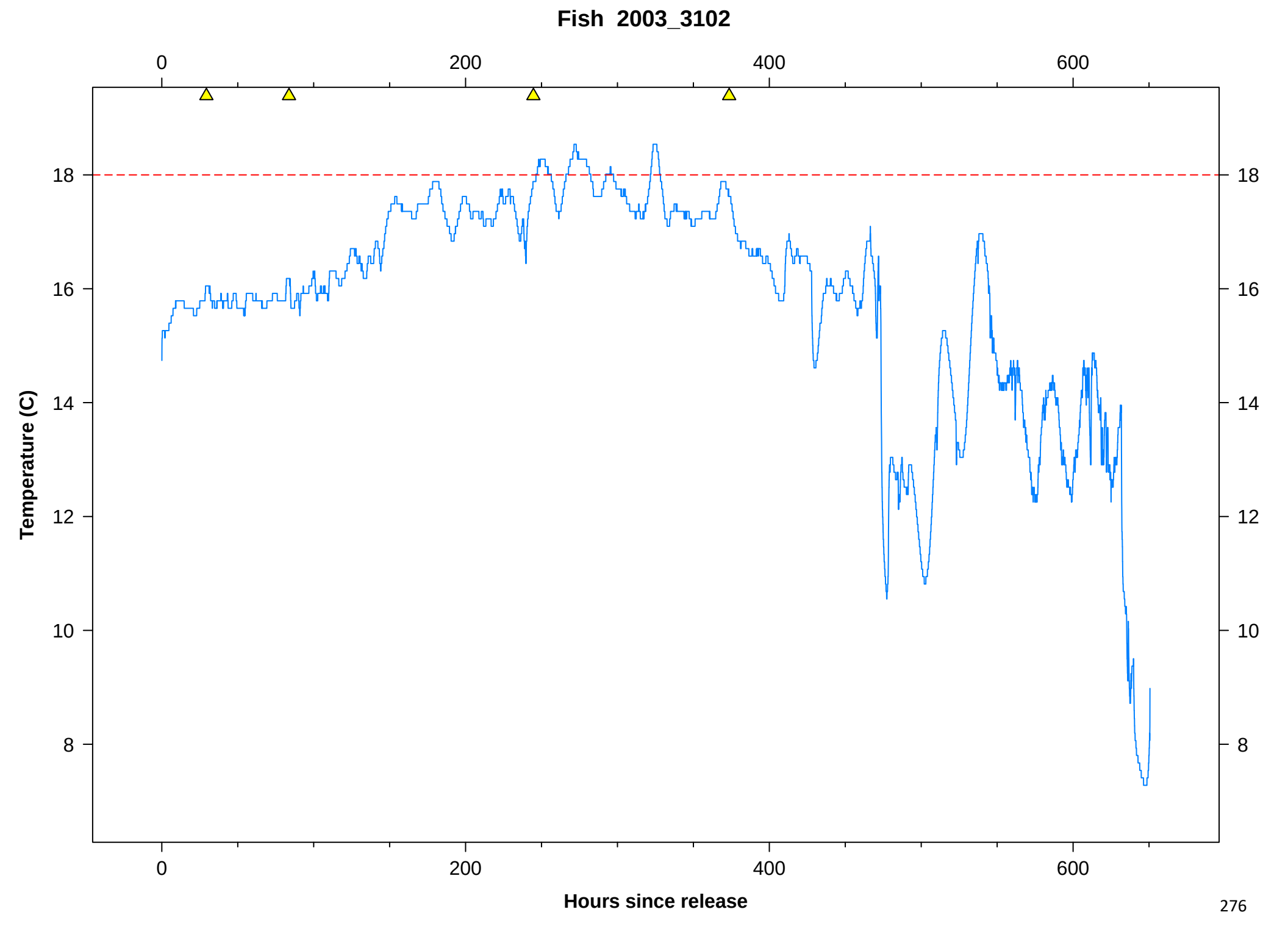

Fish 2003_3102
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

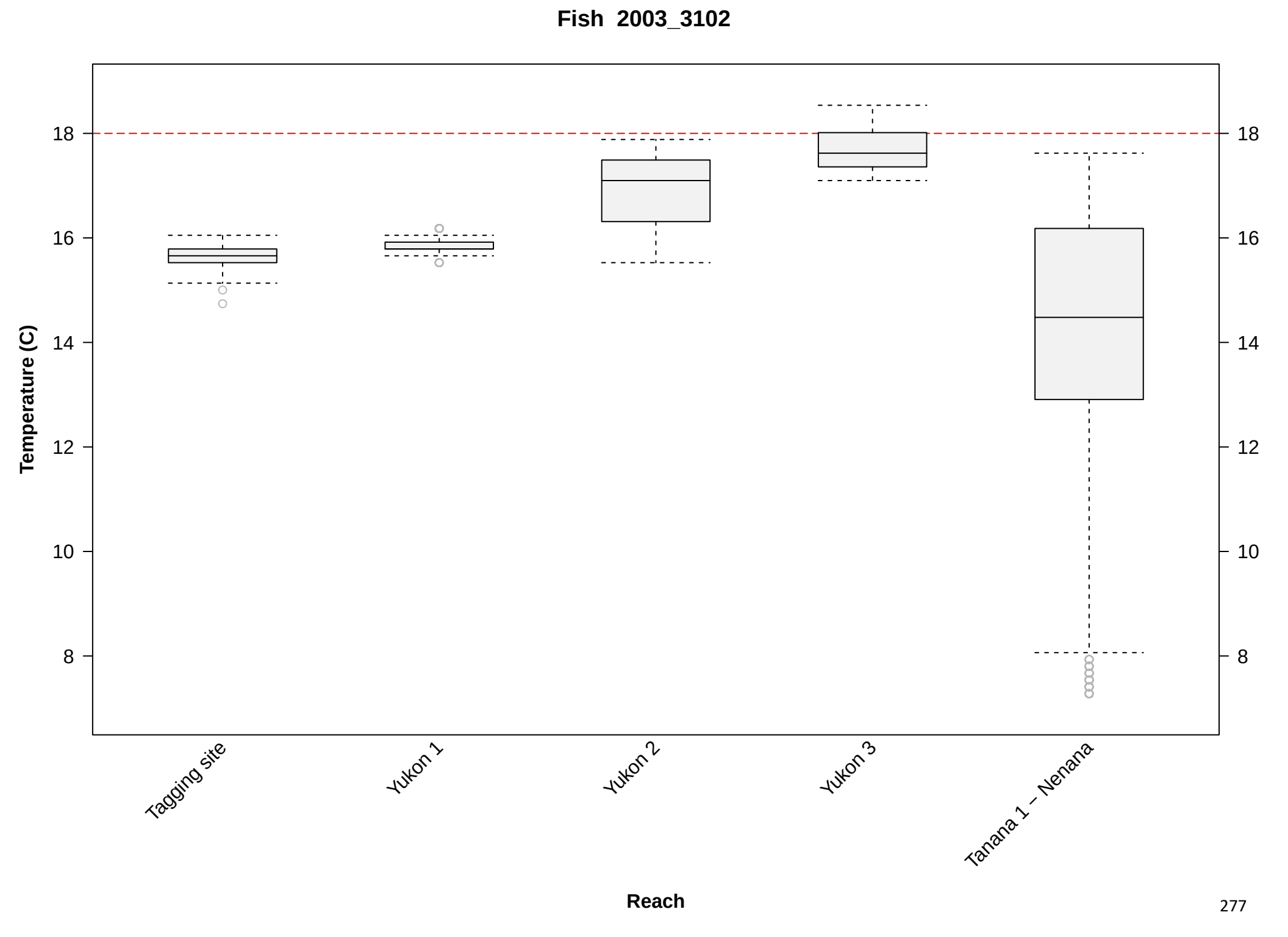

Fish 2003_3102
0
200
400
600
0
5
10
15
20
25
Depth (m)
Hours since release

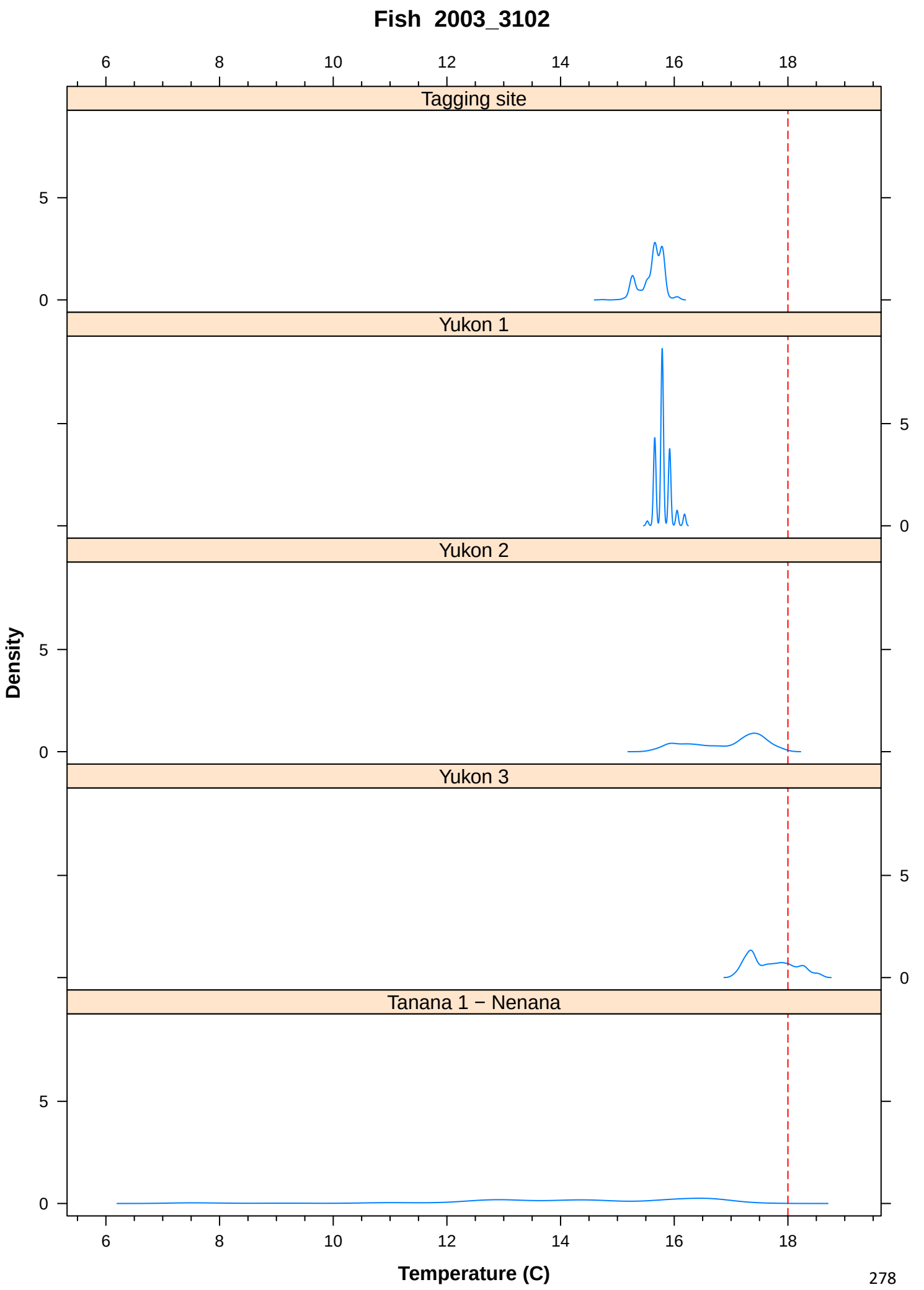

Fish 2003_3102
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Nenana
Reach

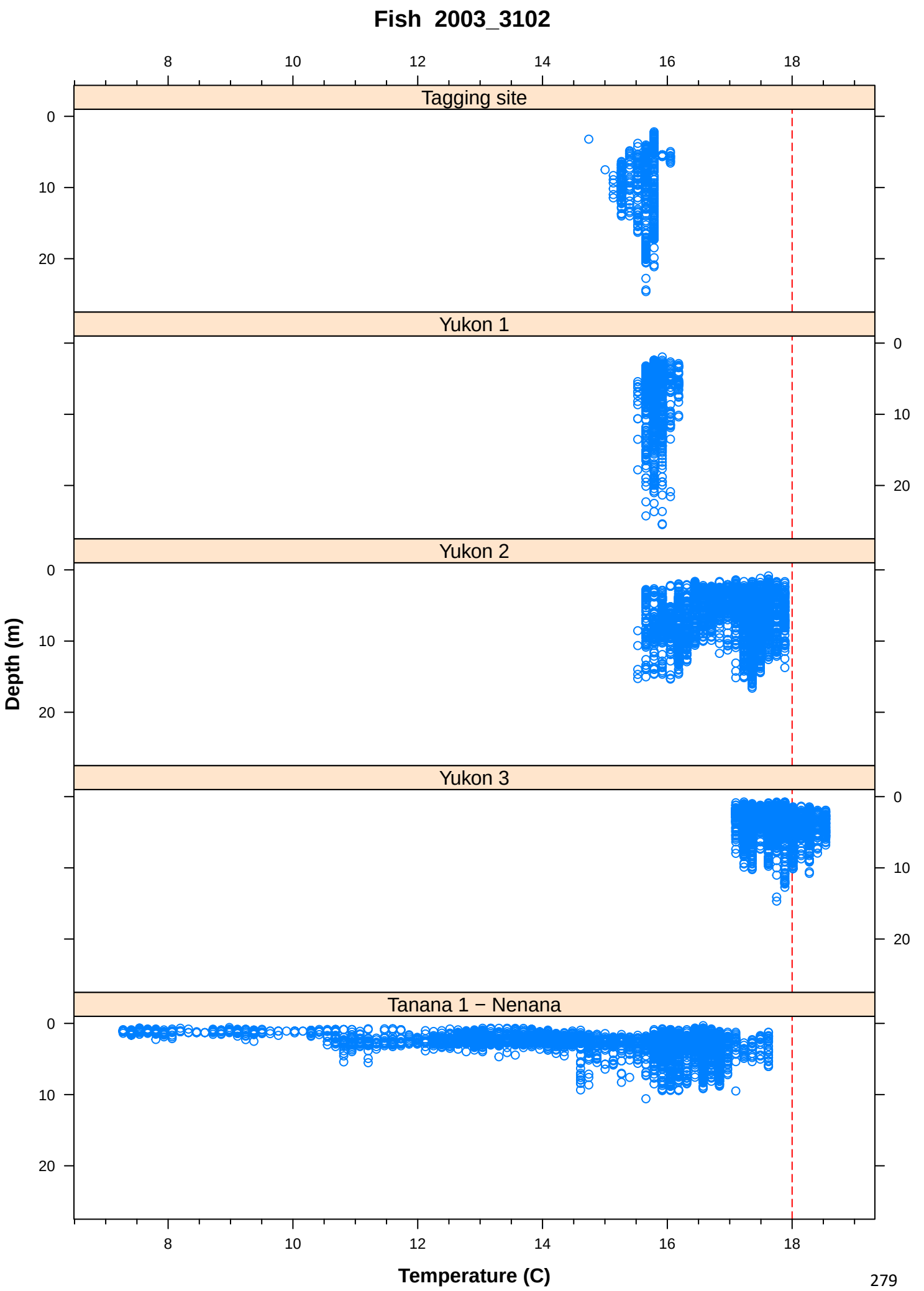

Fish 2003_3102
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Nenana
Density
1.0
0.5
0.0
0
5
10
15
20
25
Depth (m)

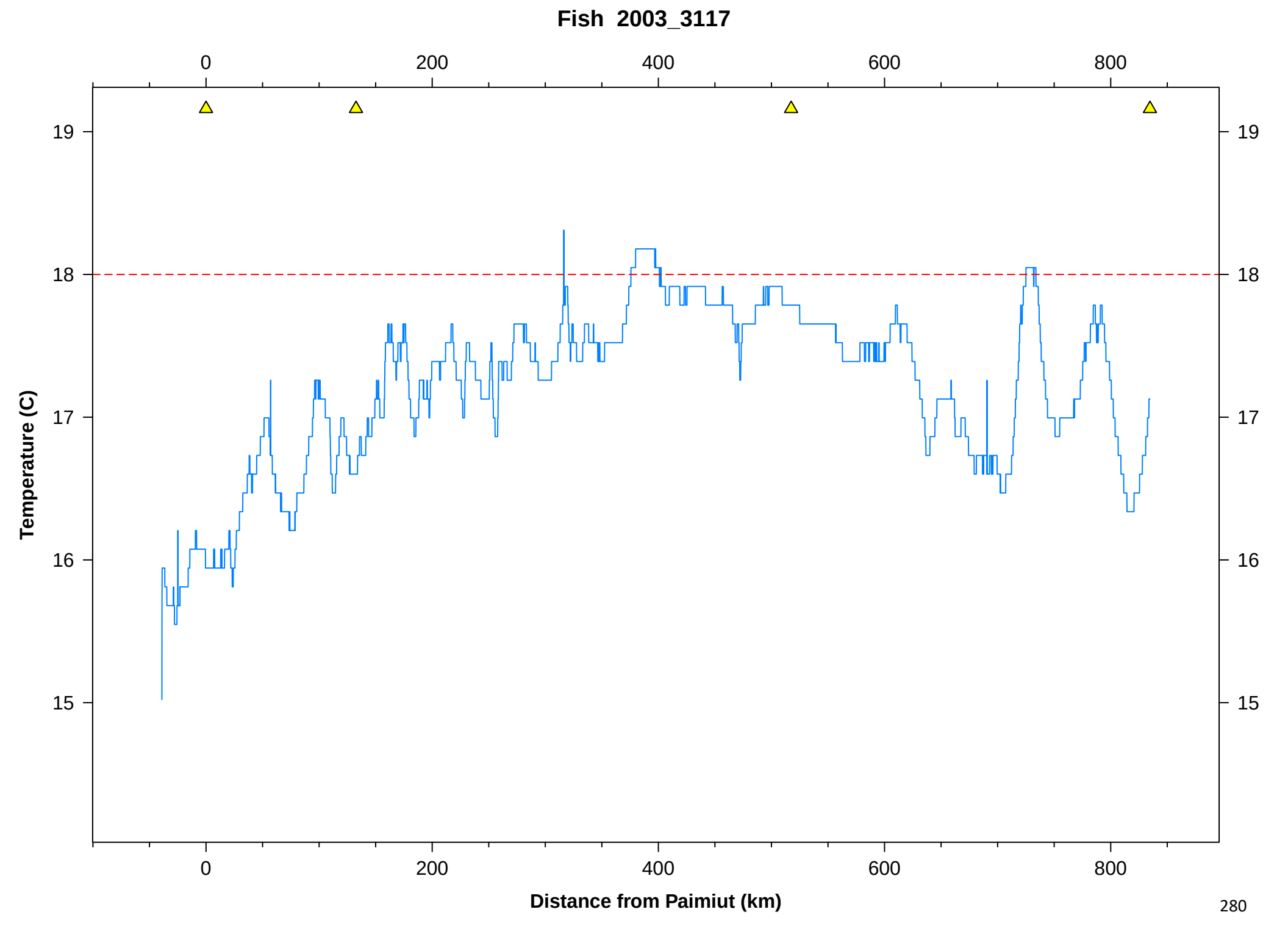

Fish 2003_3102
0
200
400
600
800
19
18
17
16
15
14
Temperature (C)
Distance from Paimiut (km)

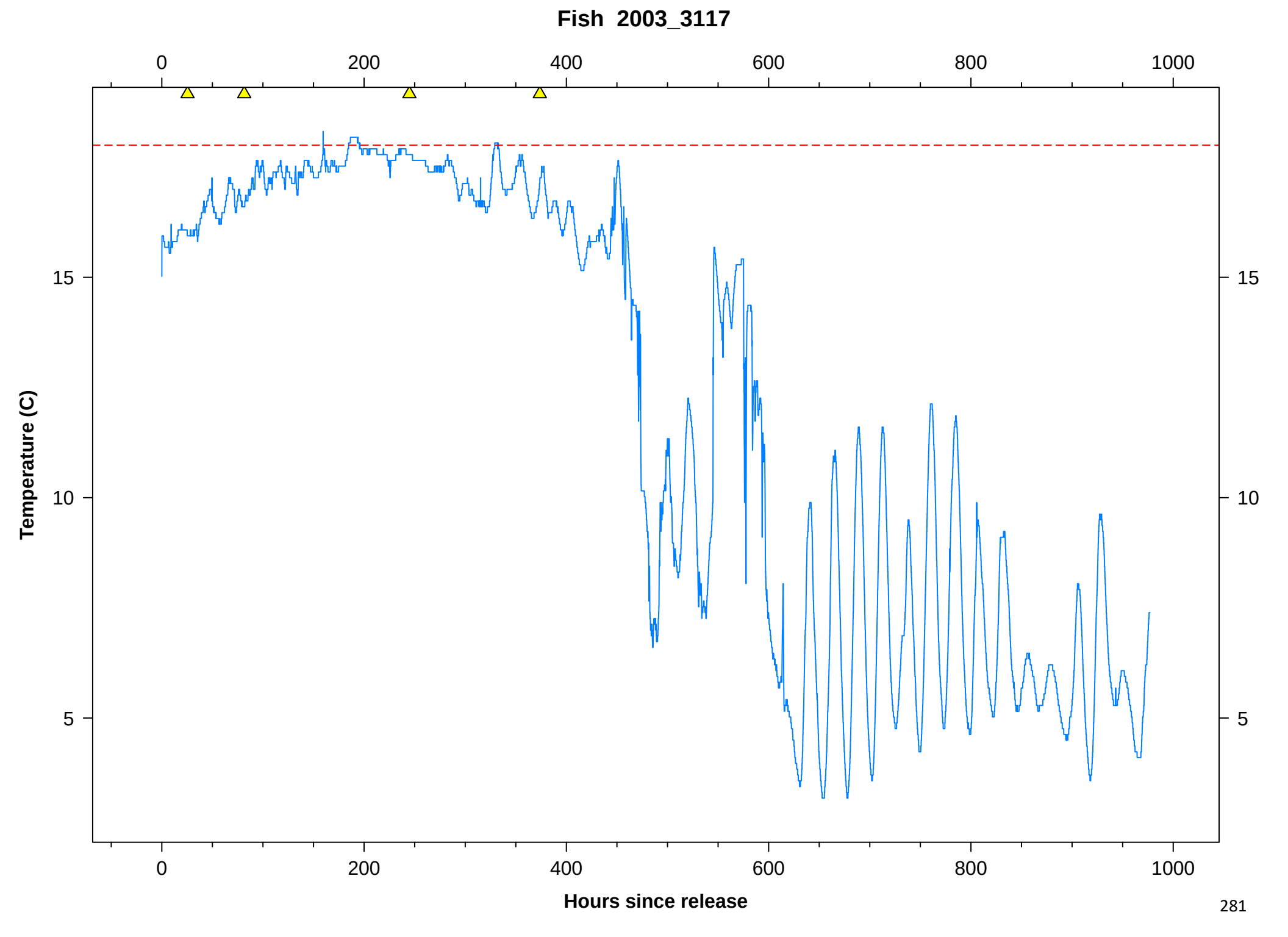

Fish 2003_3102
0
200
400
600
18
16
14
12
10
8
Temperature (C)
Hours since release

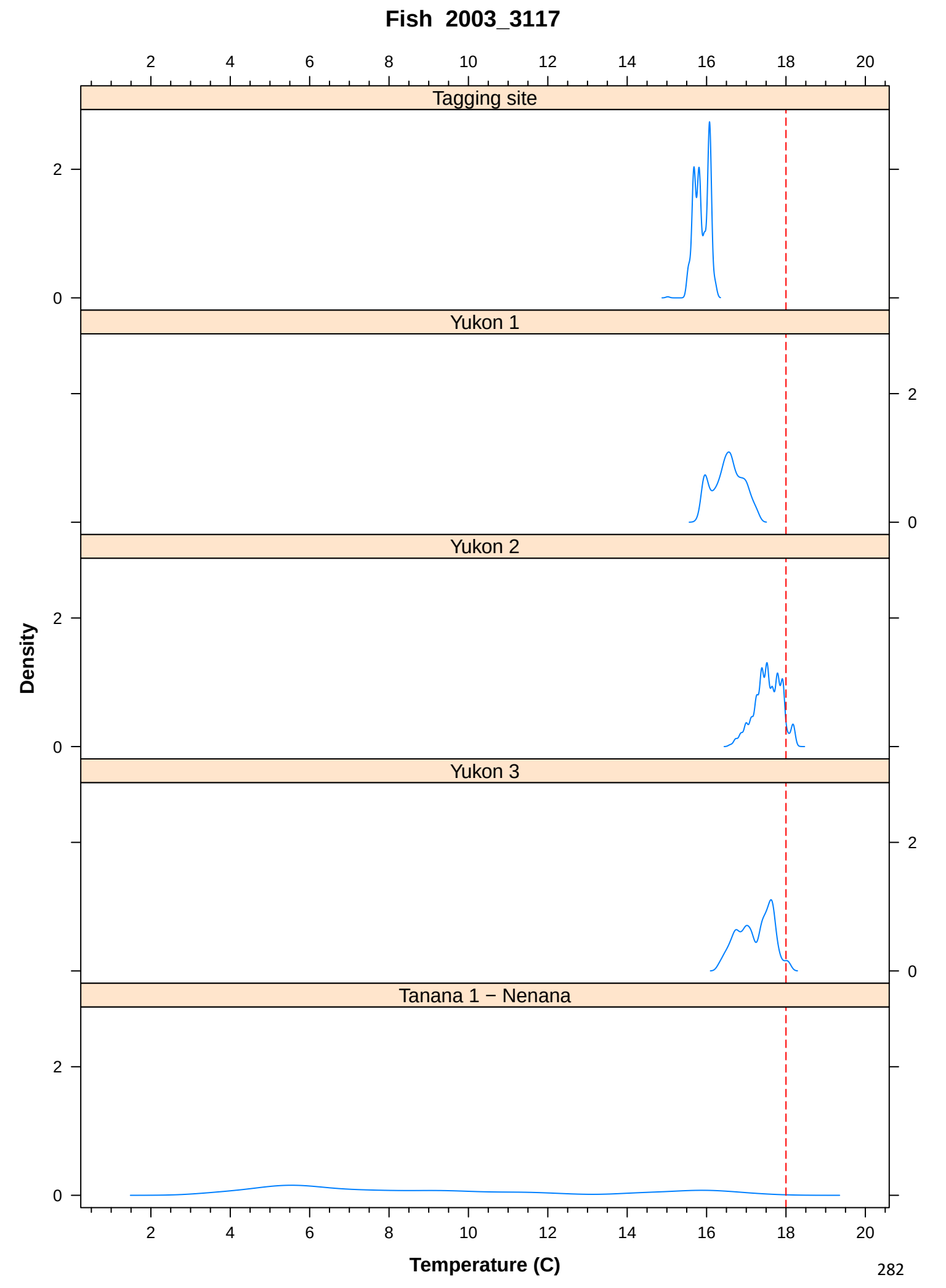

Fish 2003_3102
Temperature (C)
18
16
14
12
10
8
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Nenana
Reach

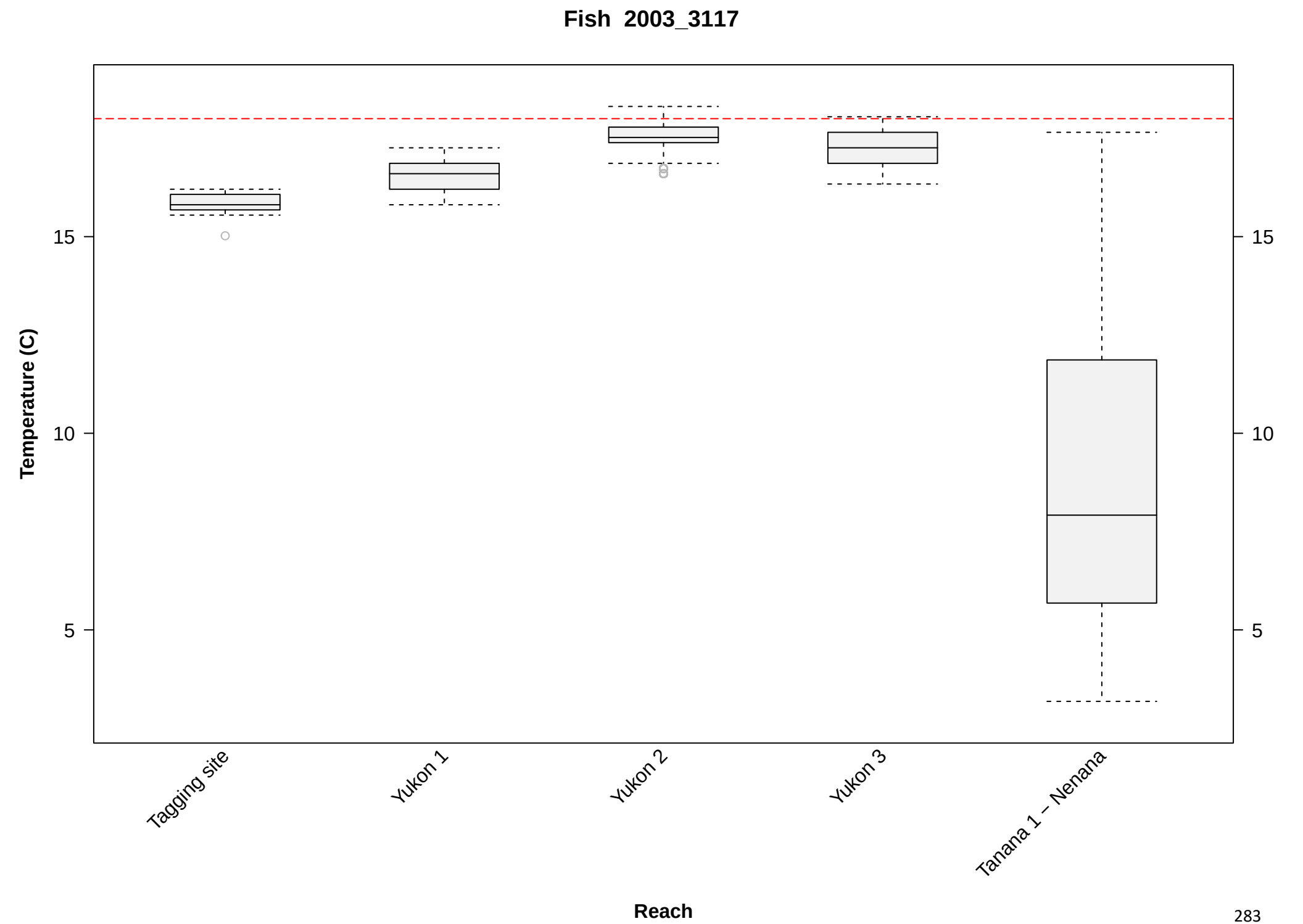

Fish 2003_3102
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Nenana
Density
Temperature (C)
6
8
10
12
14
16
18
0
5


Fish 2003_3102
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Nenana
Depth (m)
Temperature (C)
8
10
12
14
16
18
0
10
20


Fish 2003_3117
0
200
400
600
800
19
18
17
16
15
Temperature (C)
Distance from Paimiut (km)

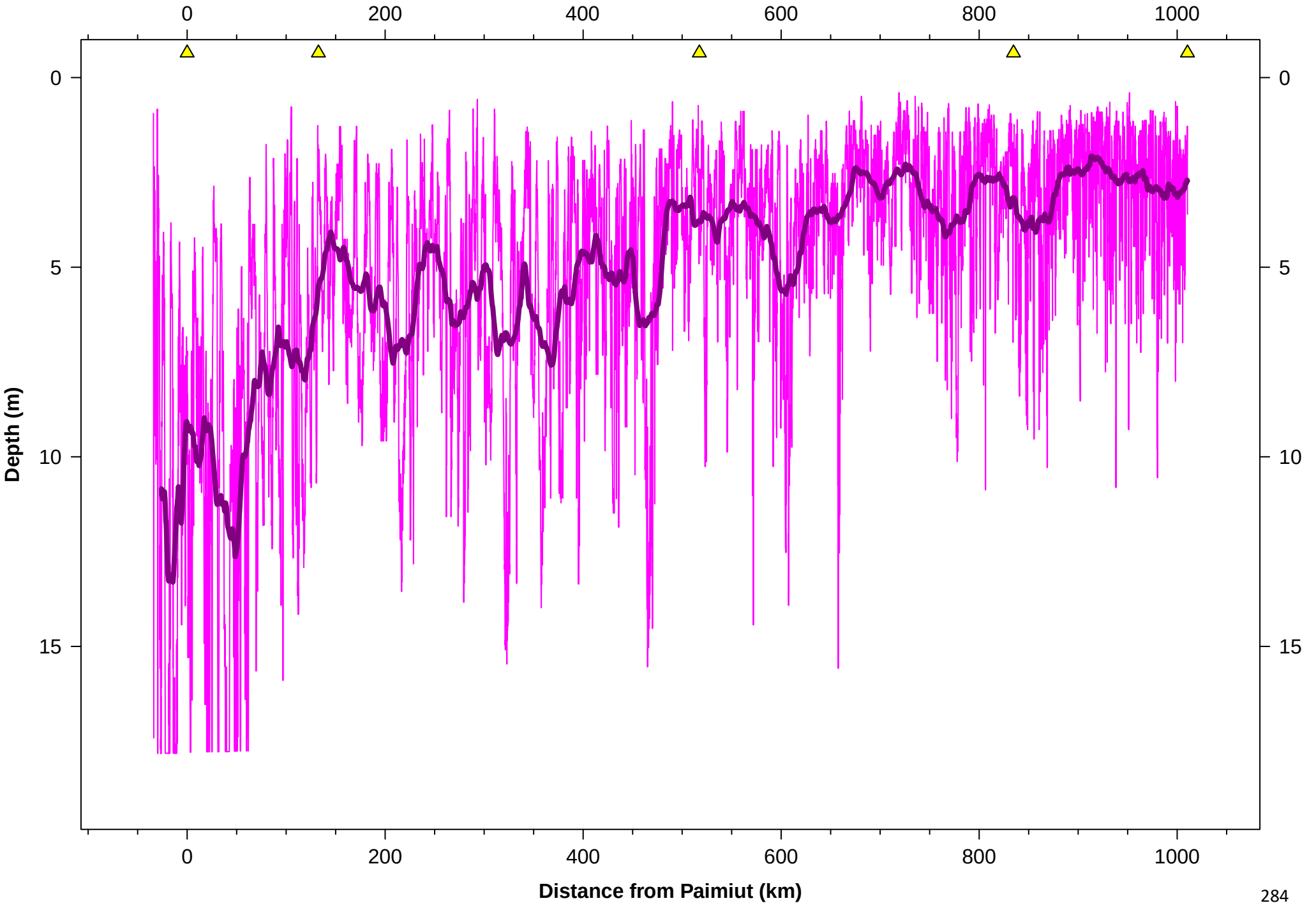

Fish 2003_3117
0
200
400
600
800
1000
15
10
5
Temperature (C)
Hours since release

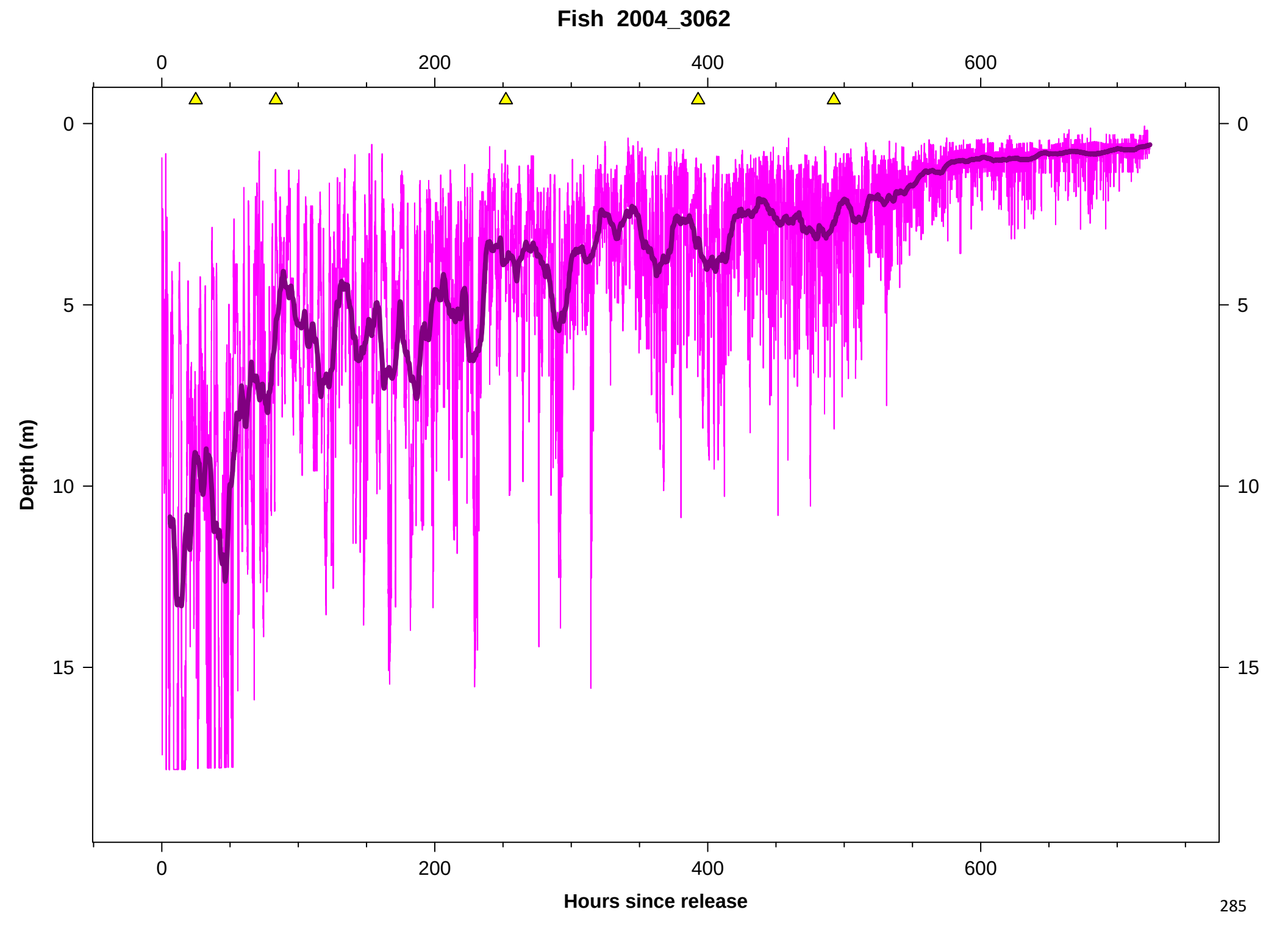

Fish 2003_3117
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 − Nenana
Density
Temperature (C)
2
4
6
8
10
12
14
16
18
20
0
2

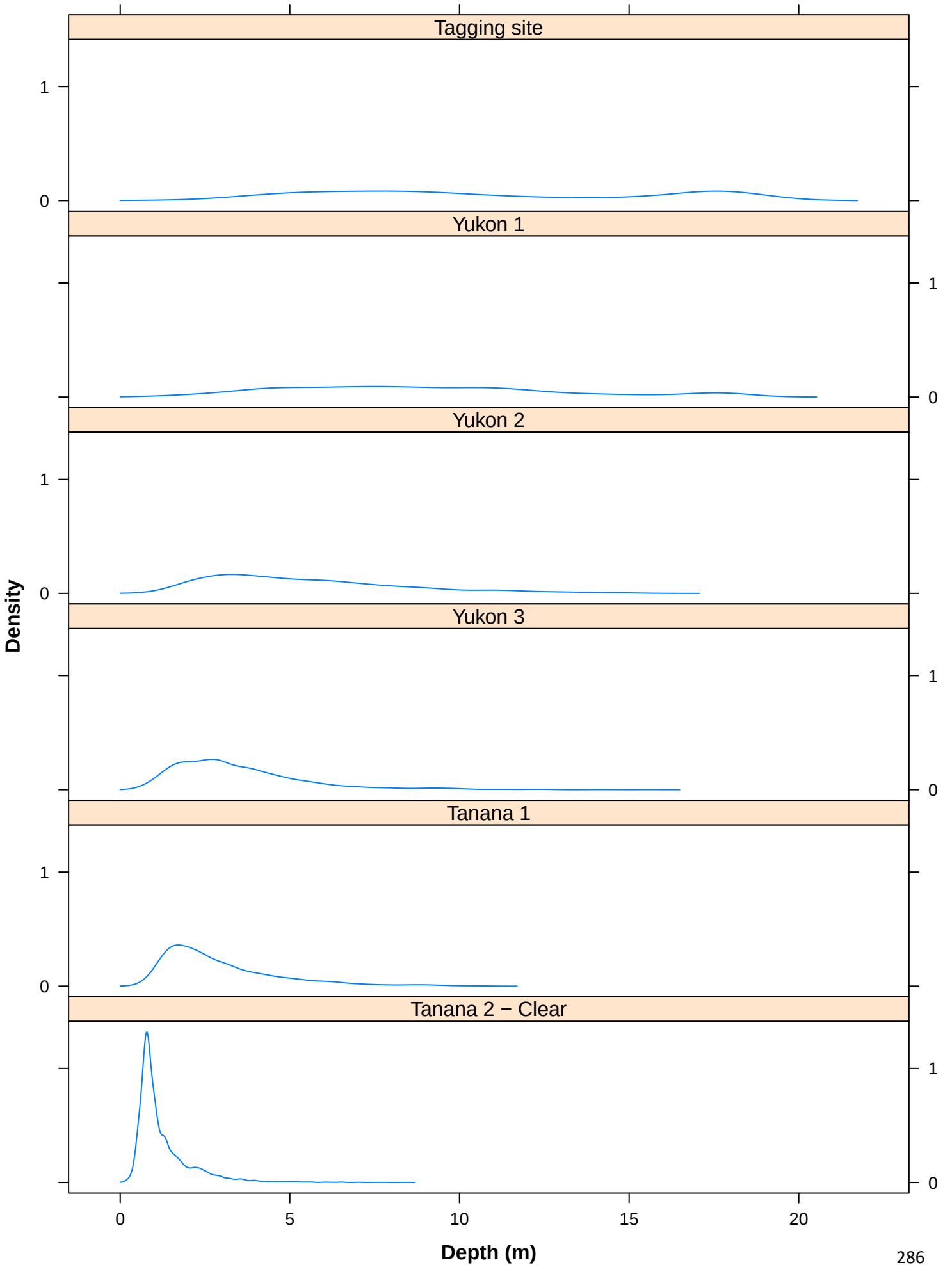

Fish 2003_3117
Temperature (C)
15
10
5
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1 – Nenana
Reach

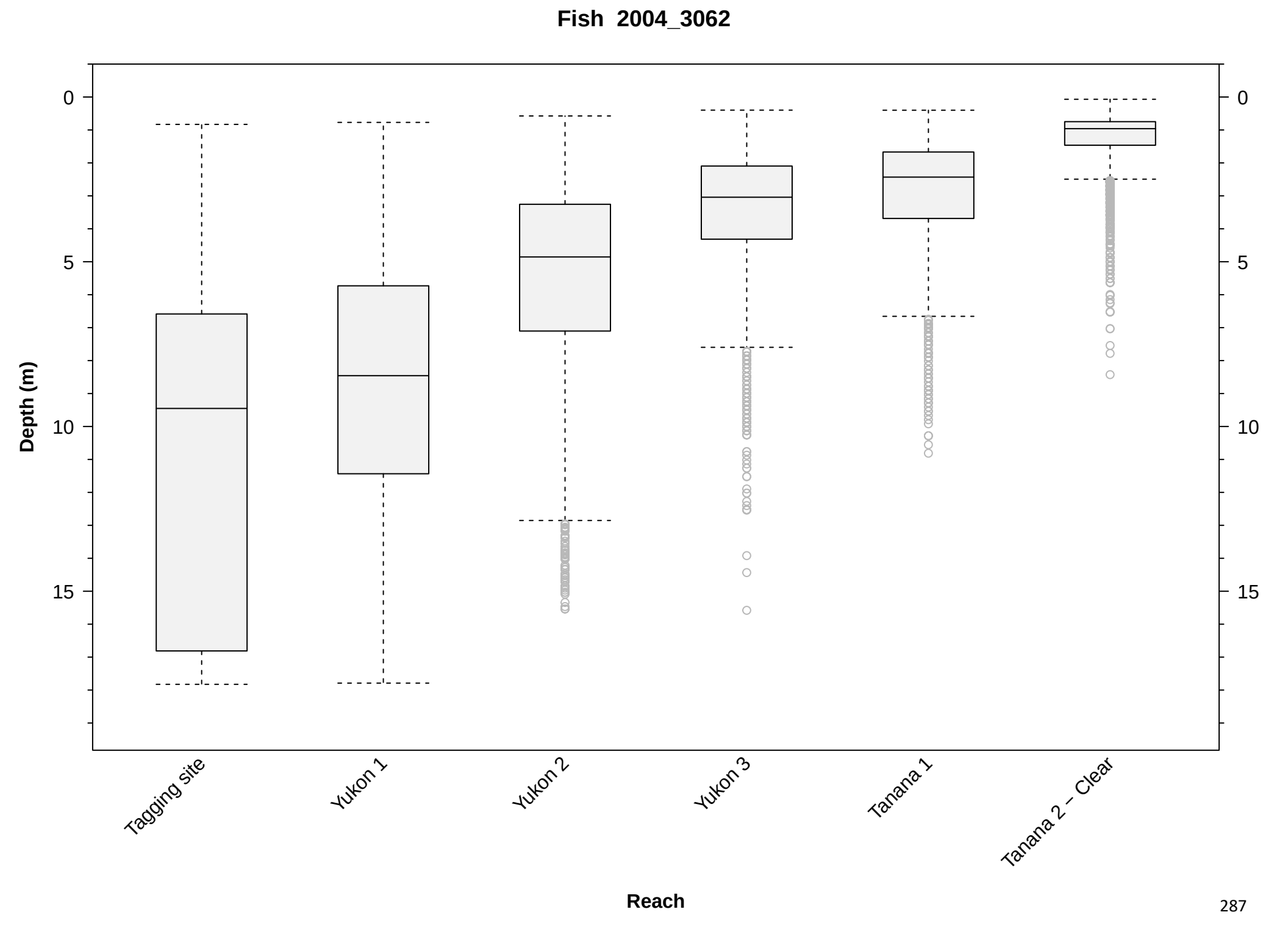
Back to Appendix 5 TOC

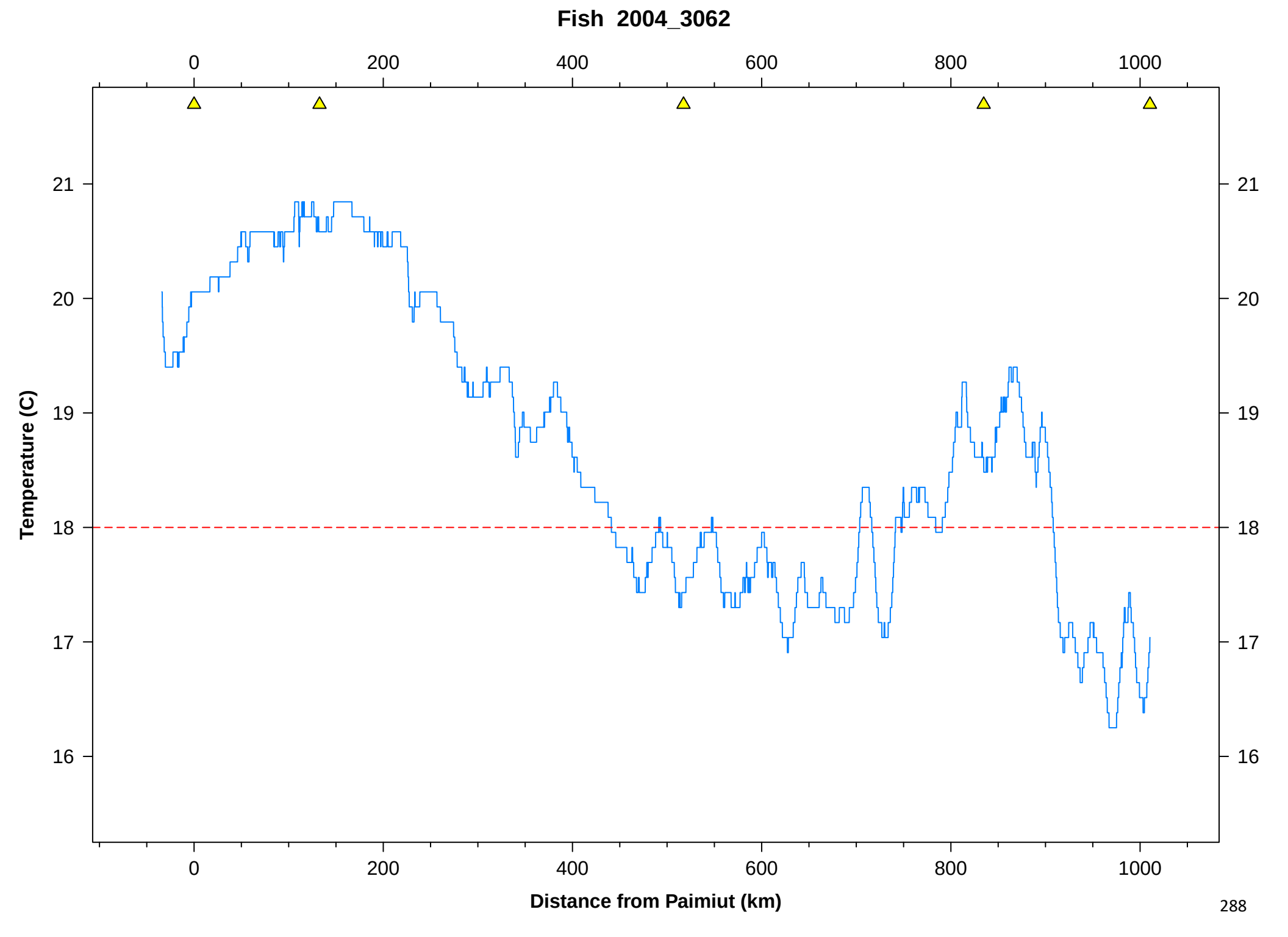
Clear Stock - Fish 2004_3062

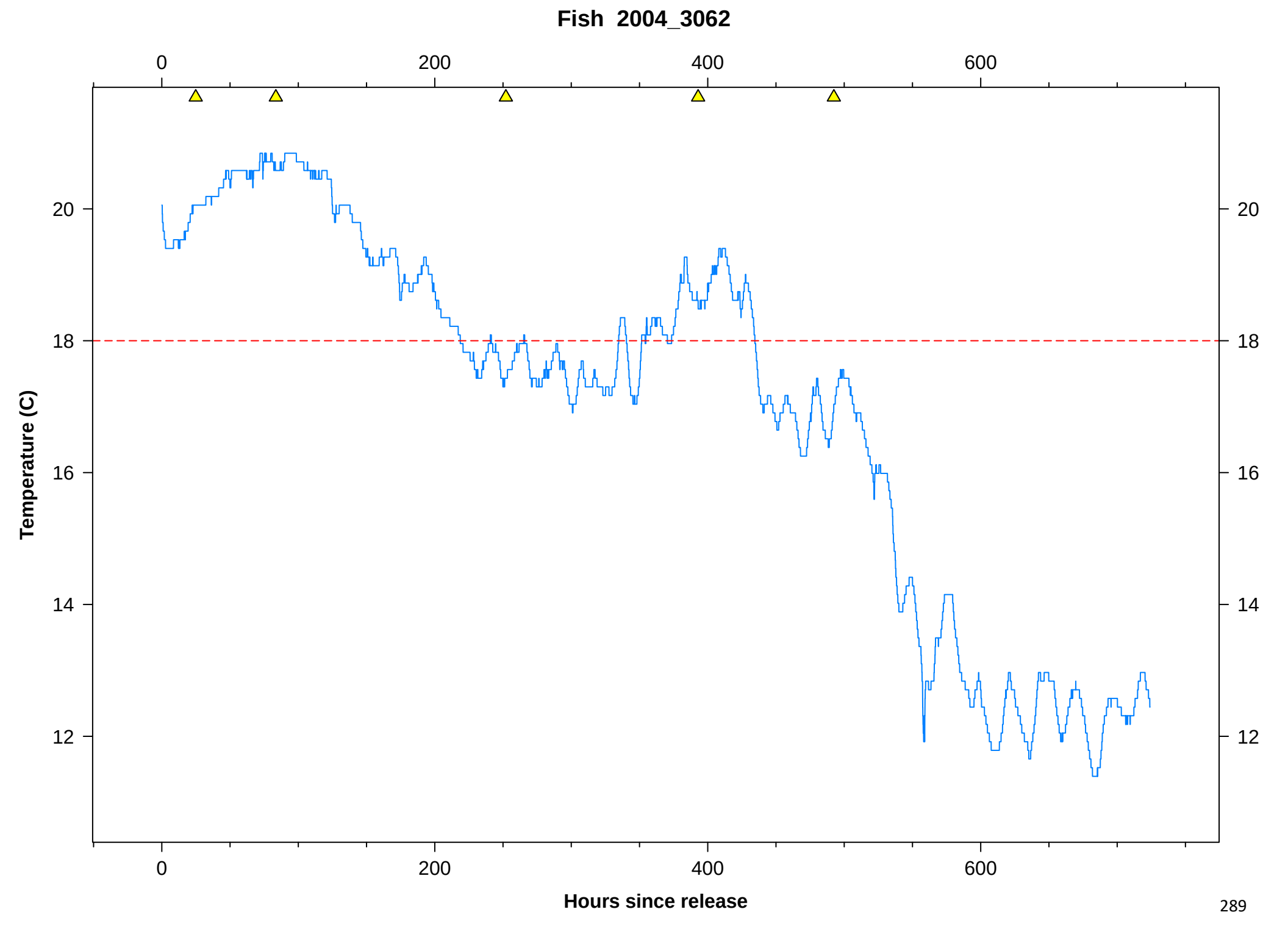


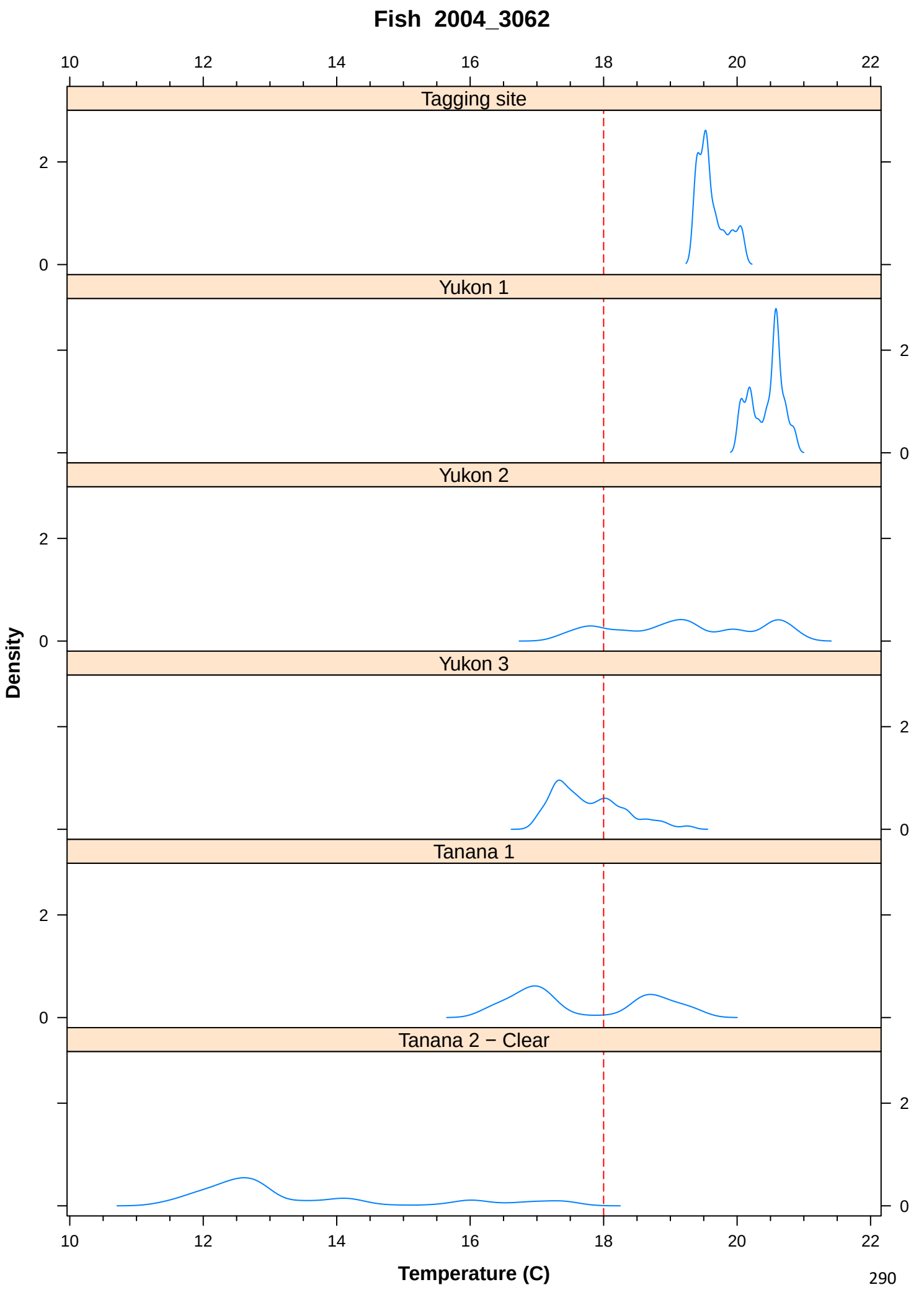

Fish 2004_3062
0
200
400
600
0
5
10
15
Depth (m)
Hours since release

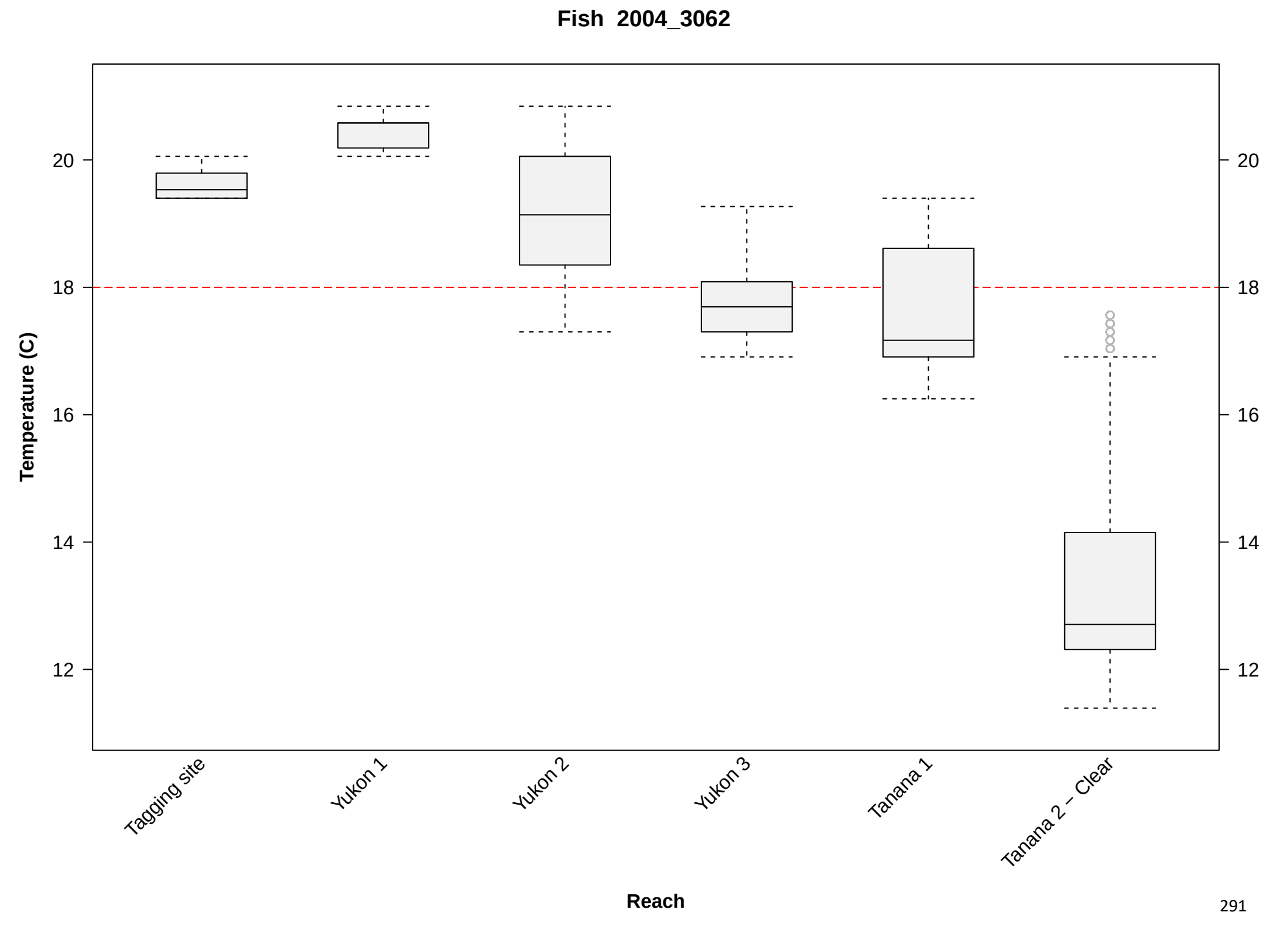

Fish 2004_3062
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − Clear
Density
Depth (m)
0
5
10
15
20
1
0

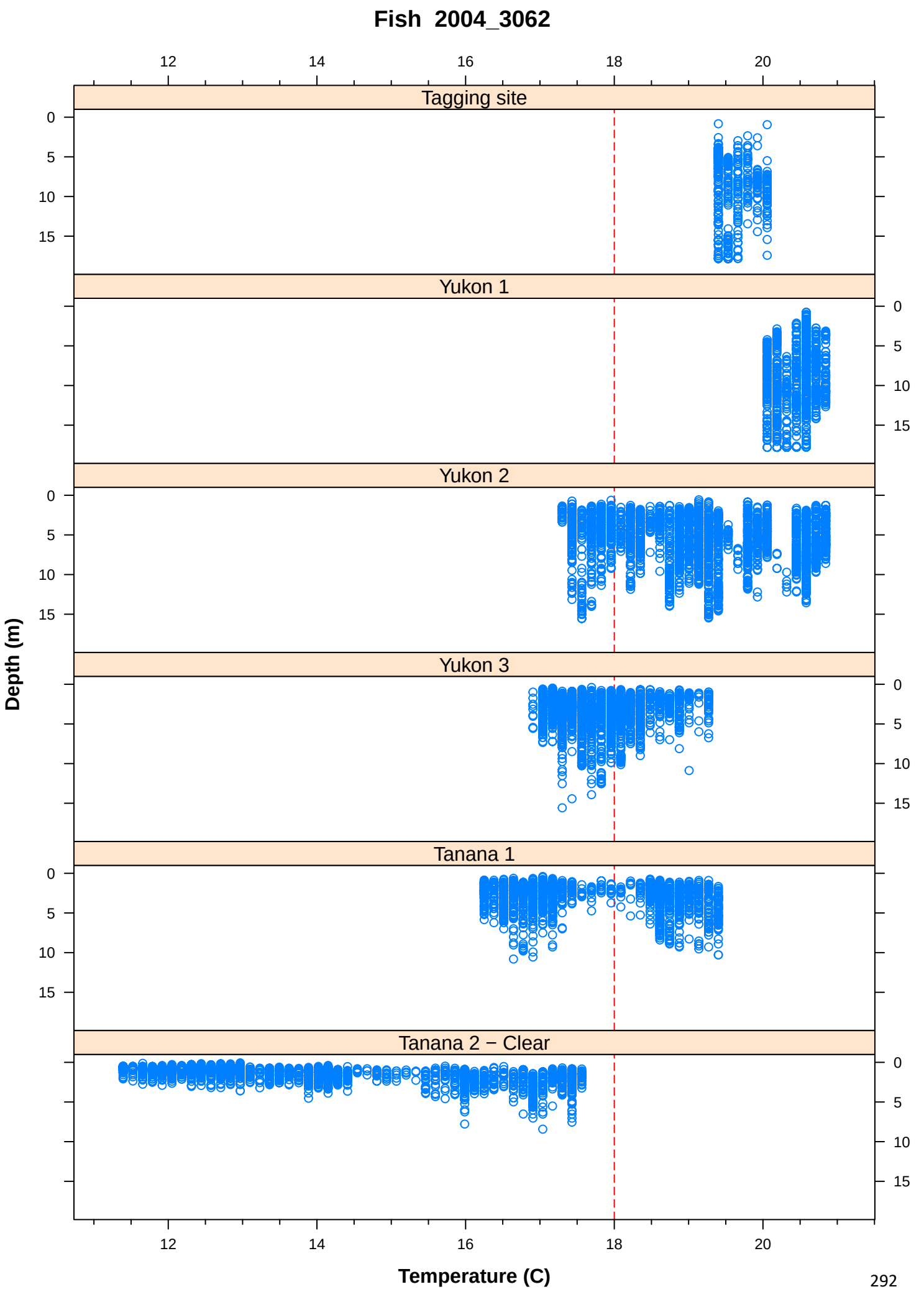

Fish 2004_3062
Depth (m)
0
5
10
15
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 – Clear
Reach

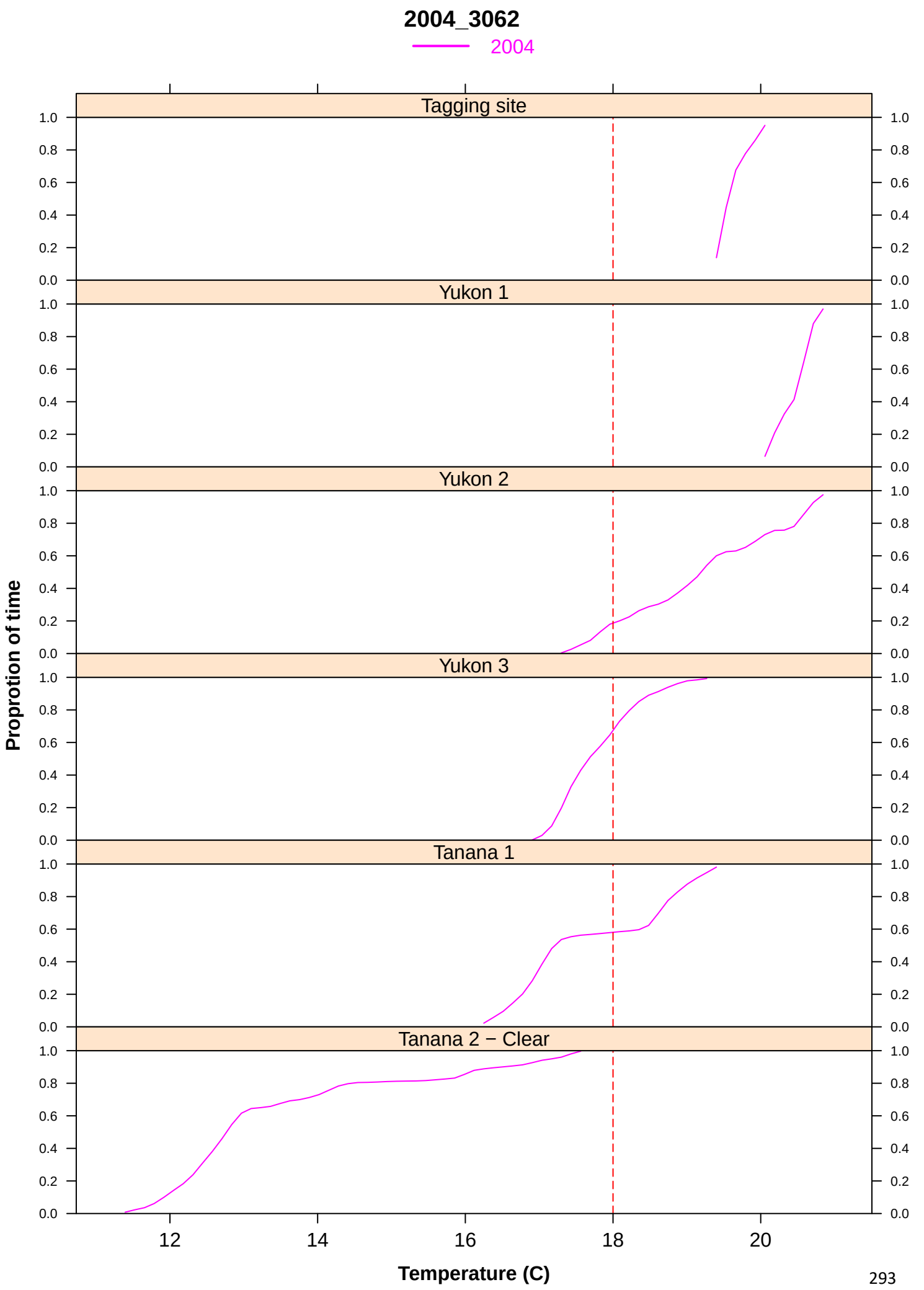

Fish 2004_3062
0
200
400
600
800
1000
21
20
19
18
17
16
Temperature (C)
Distance from Paimiut (km)

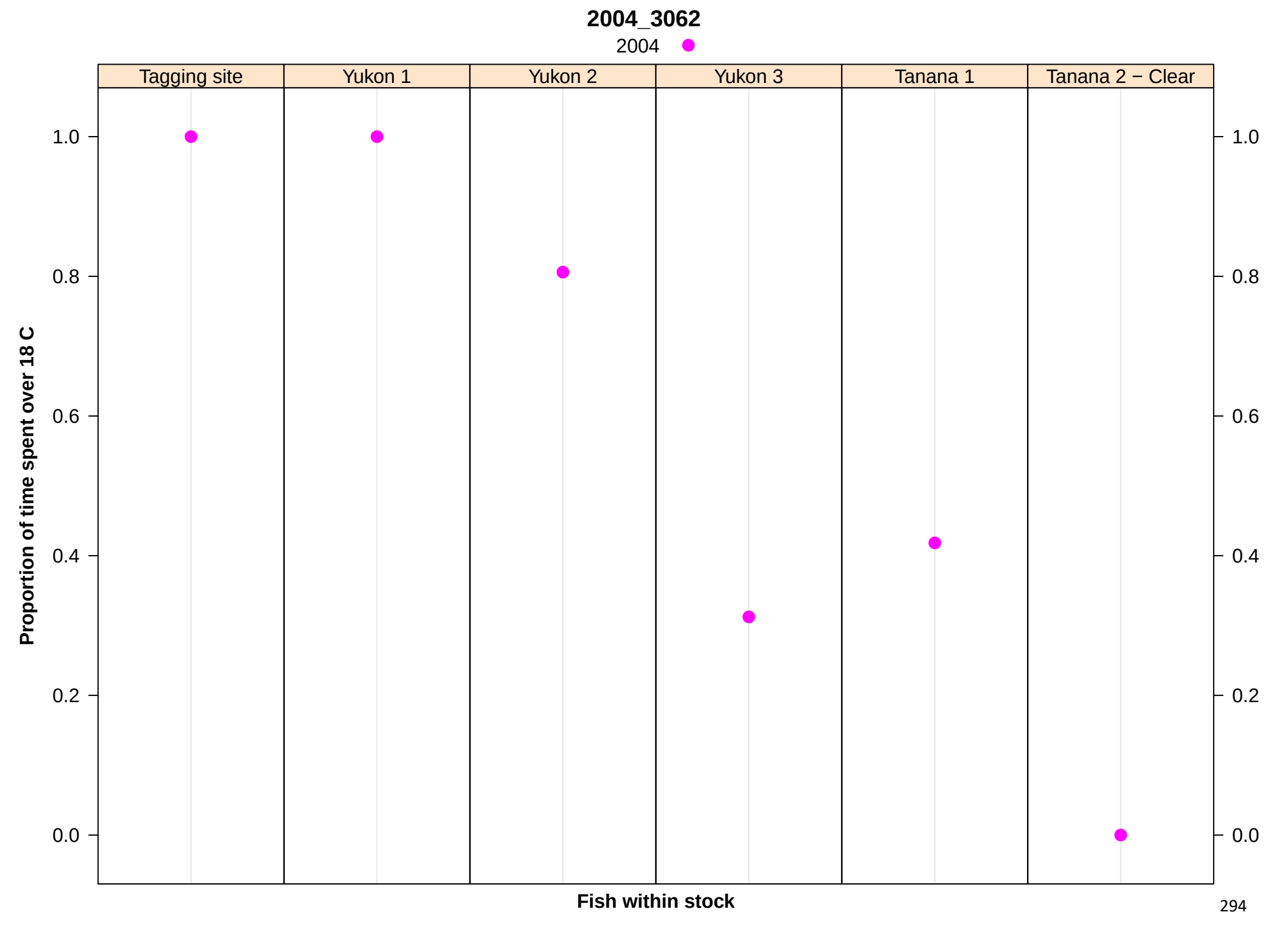

Fish 2004_3062
0
200
400
600
20
18
16
14
12
Temperature (C)
Hours since release


Fish 2004_3062
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − Clear
Density
Temperature (C)
10
12
14
16
18
20
22
0
2

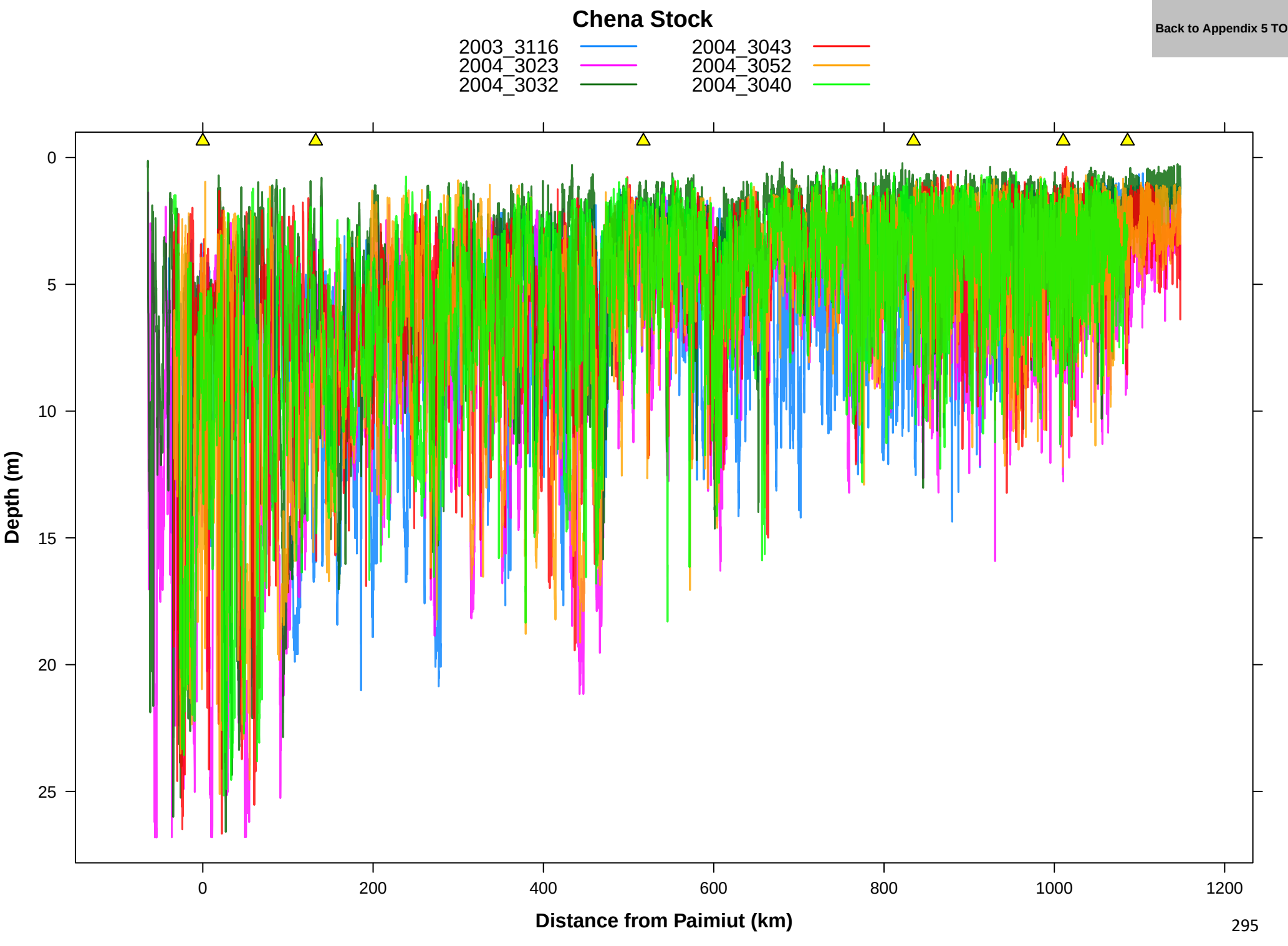

Fish 2004_3062
Temperature (C)
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 – Clear
Reach

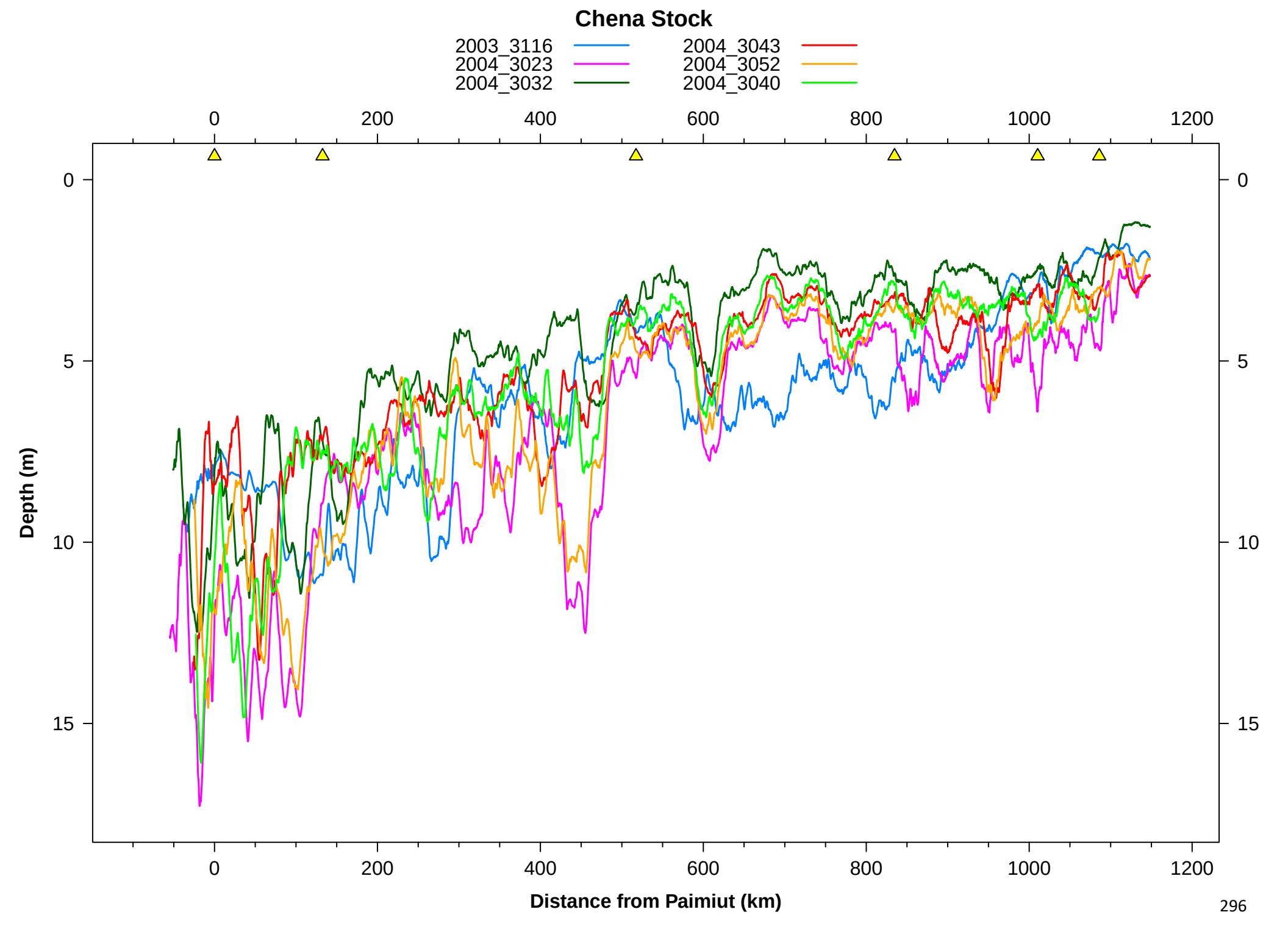

Fish 2004_3062
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − Clear
Depth (m)
Temperature (C)
12
14
16
18
20
0
5
10
15

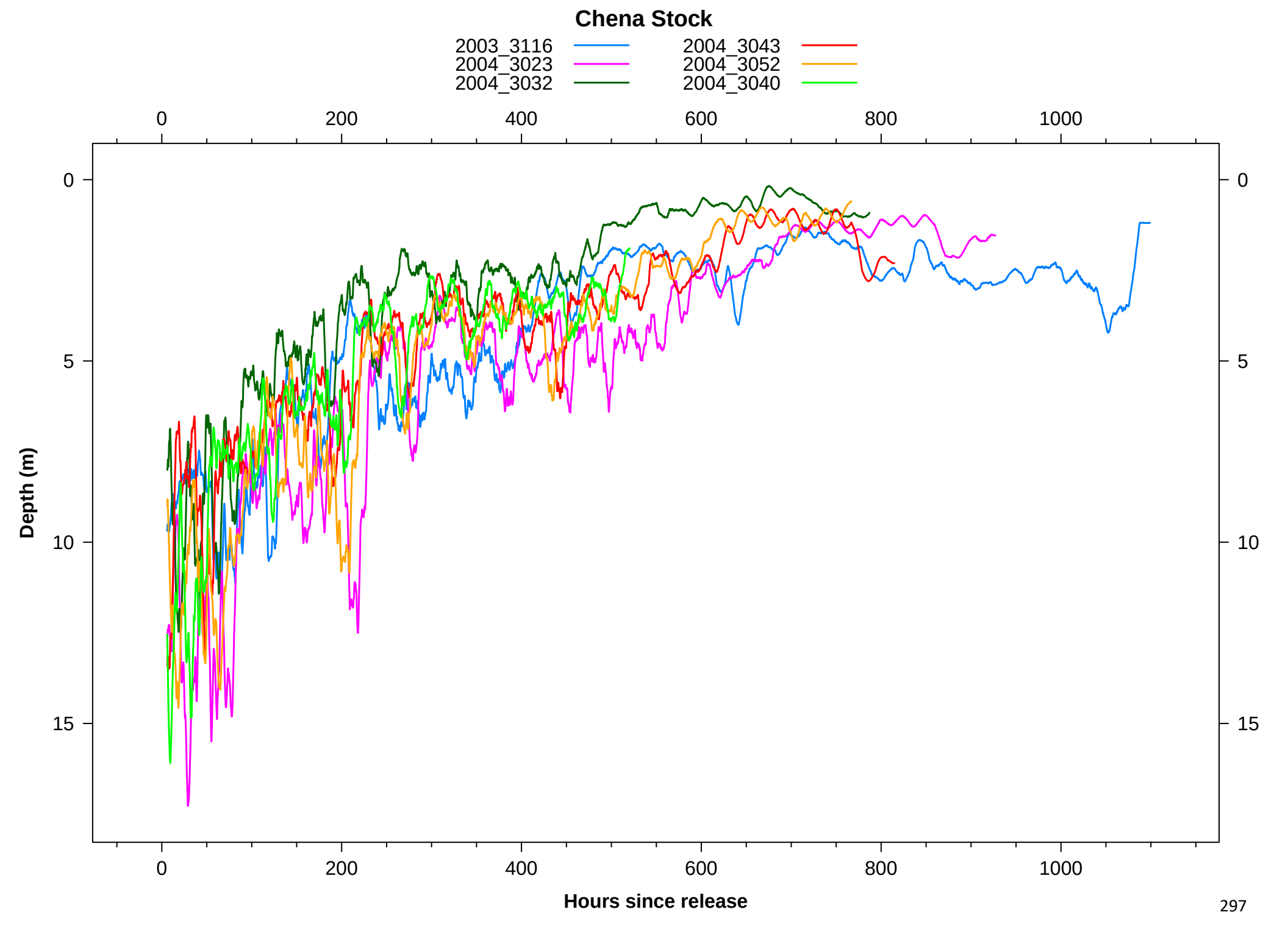

2004_3062
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − Clear
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
12
14
16
18
20

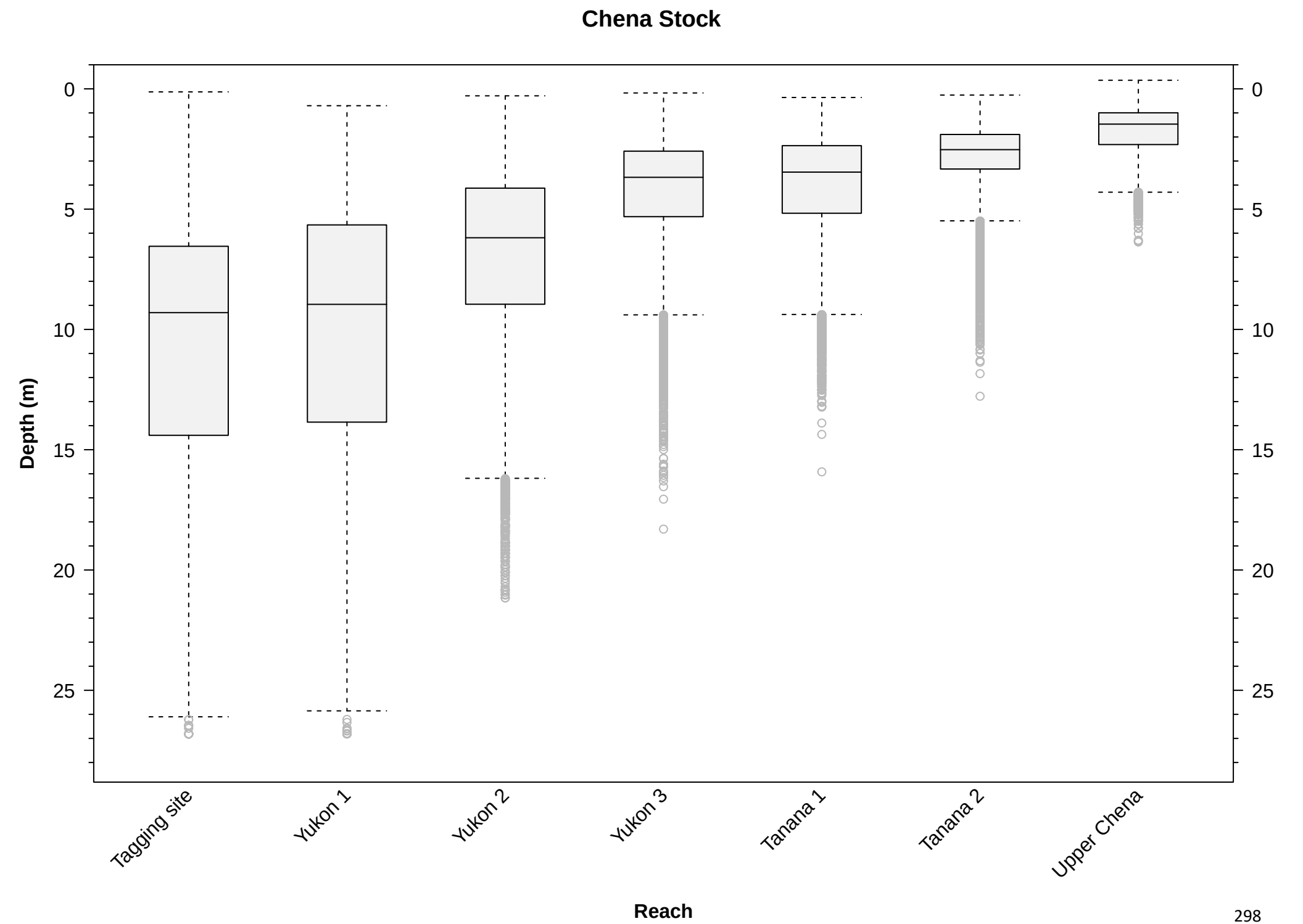

2004_3062
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − Clear
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock
294

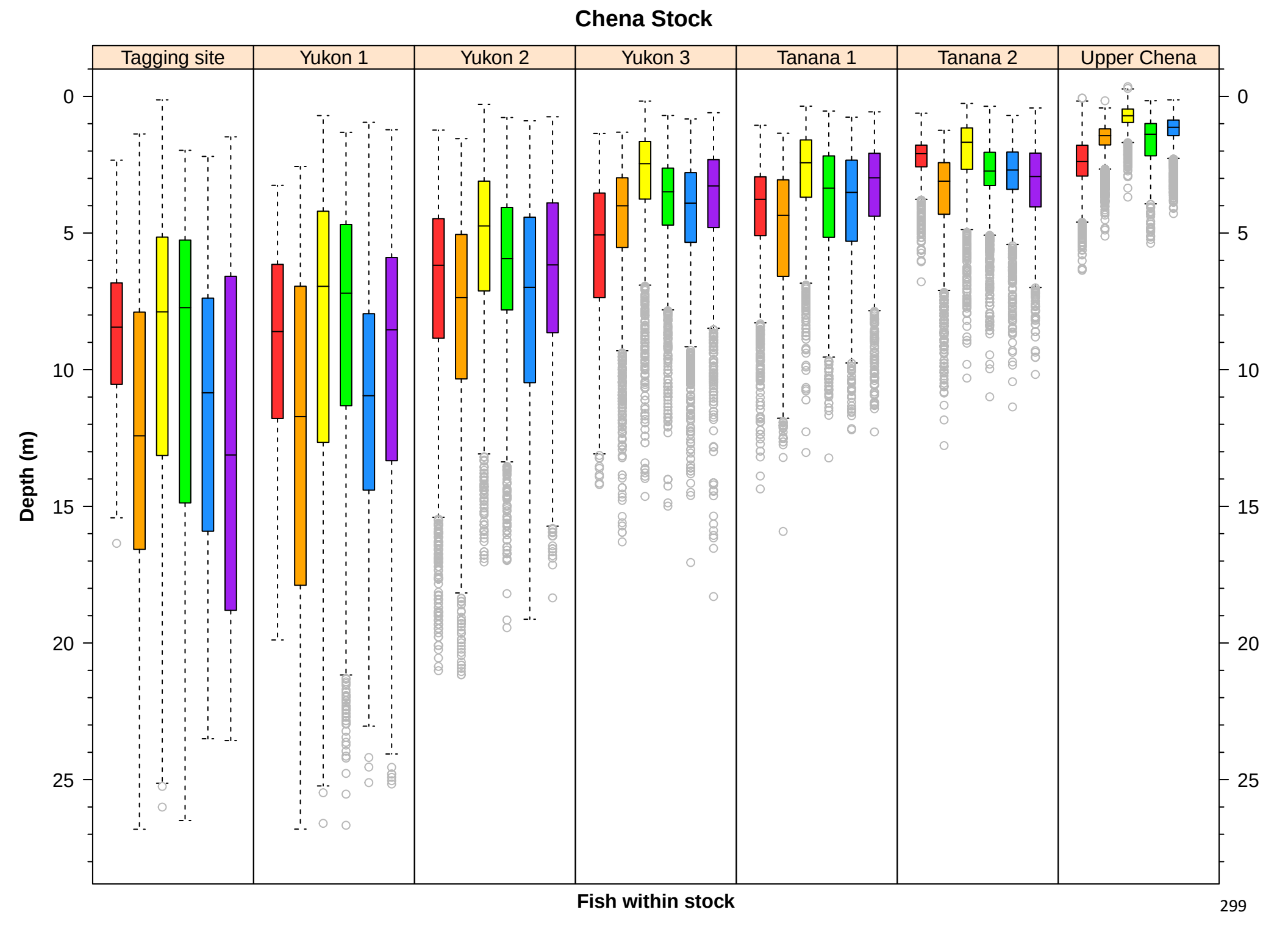
Back to Appendix 5 TOC

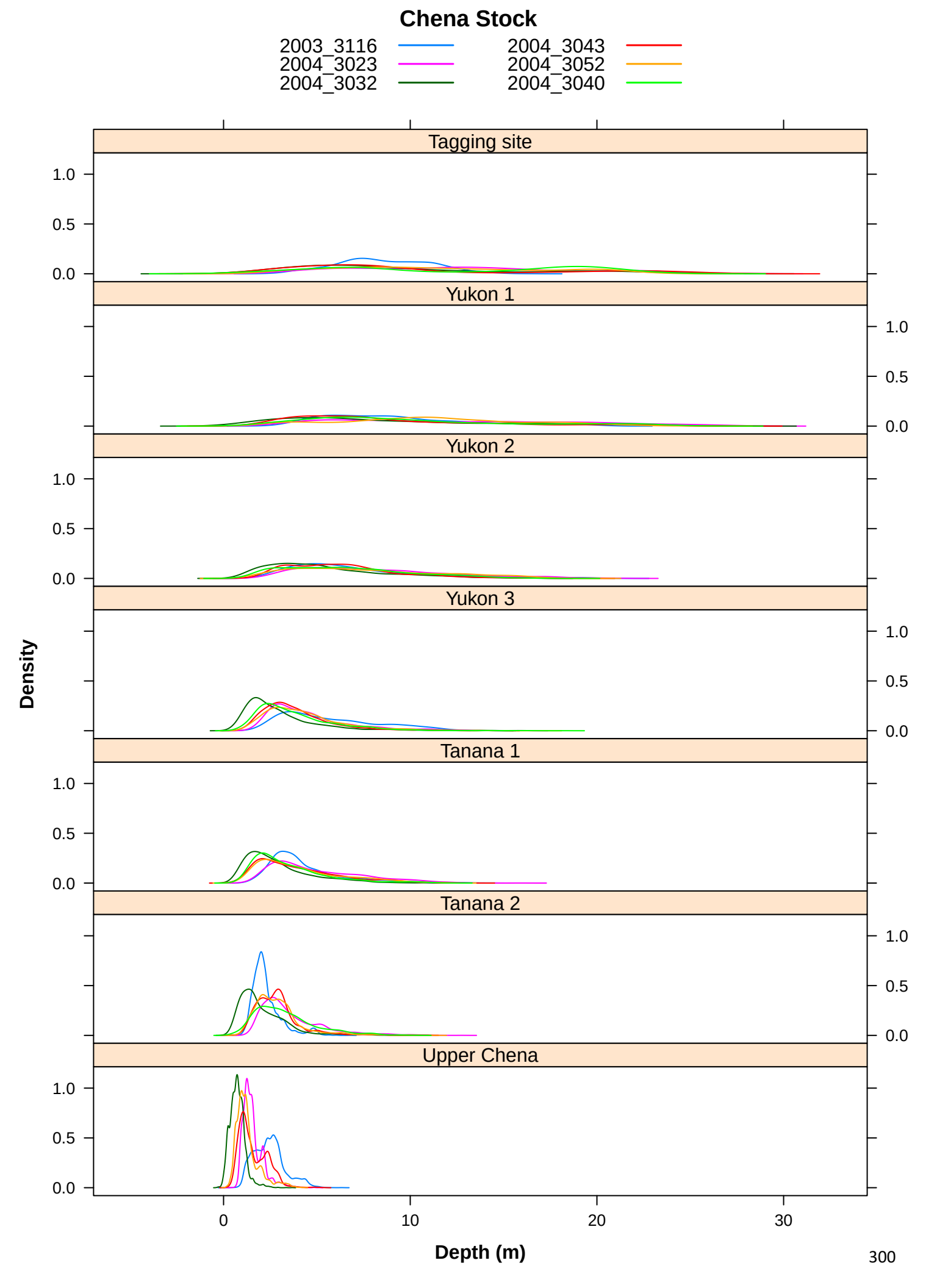


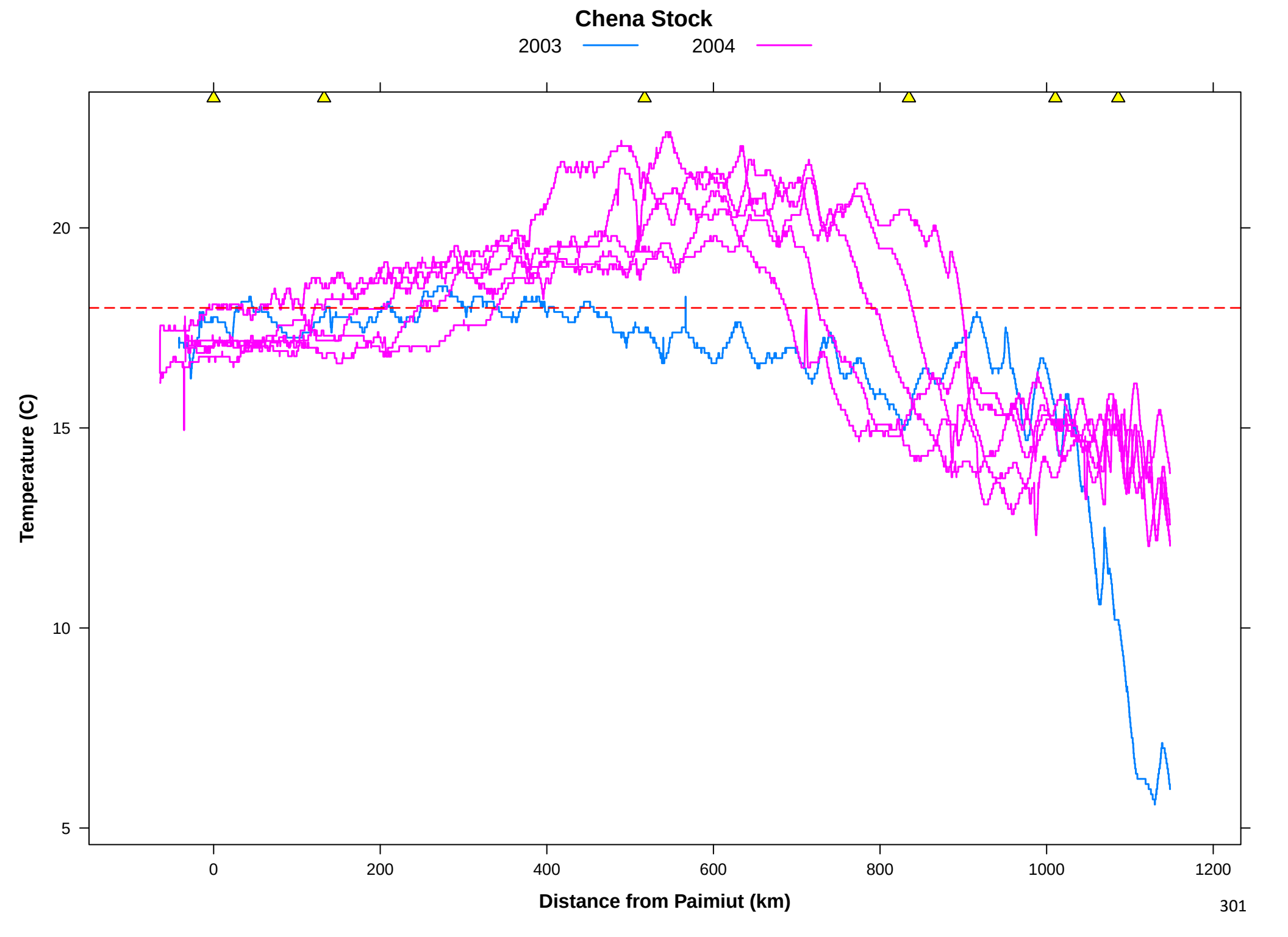

Chena Stock
2003_3116
2004_3023
2004_3032
2004_3043
2004_3052
2004_3040
0
200
400
600
800
1000
1200
0
5
10
15
Depth (m)
Distance from Paimiut (km)

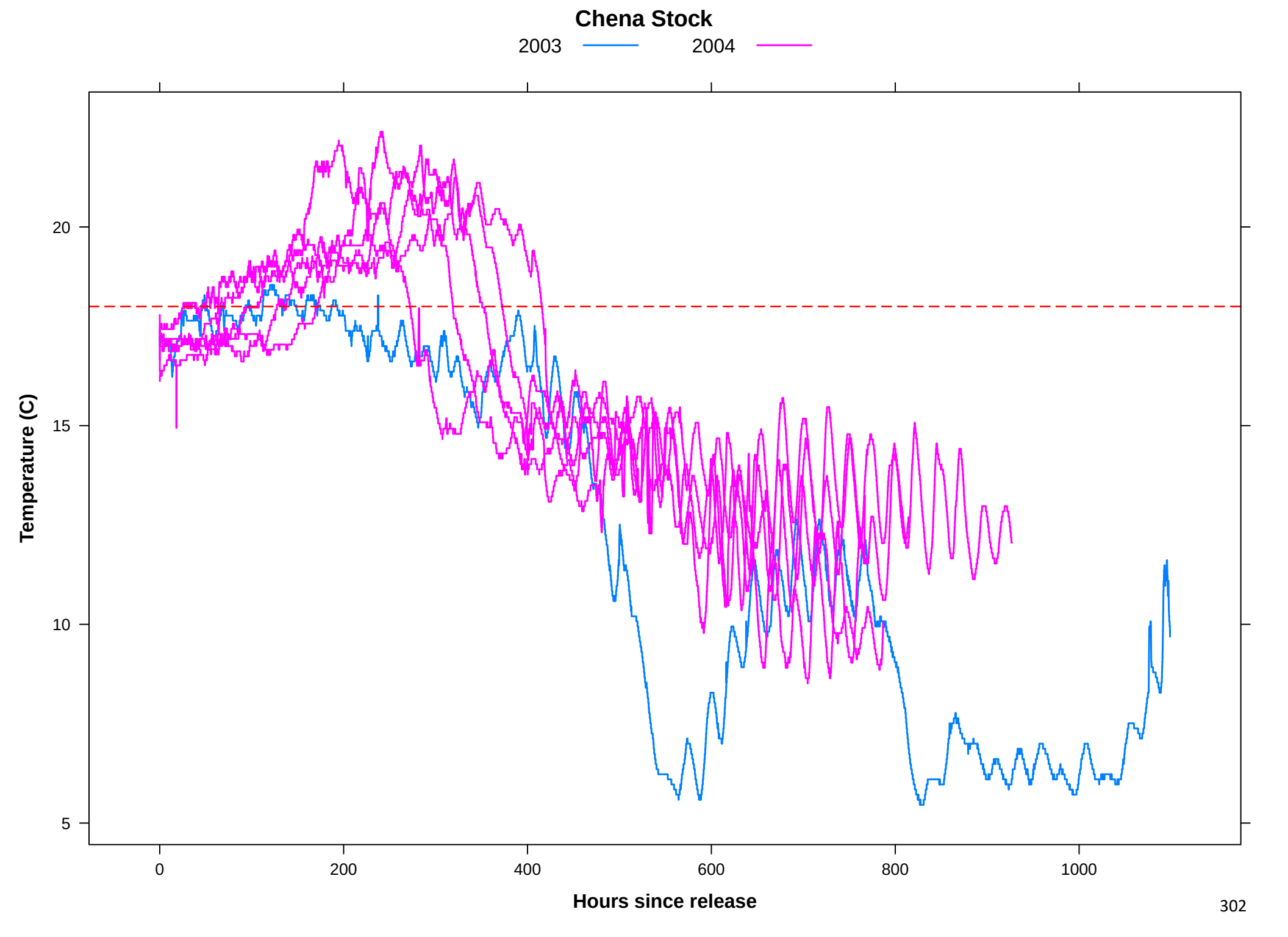

Chena Stock
2003_3116
2004_3023
2004_3032
2004_3043
2004_3052
2004_3040
0
200
400
600
800
1000
0
5
10
15
Depth (m)
Hours since release

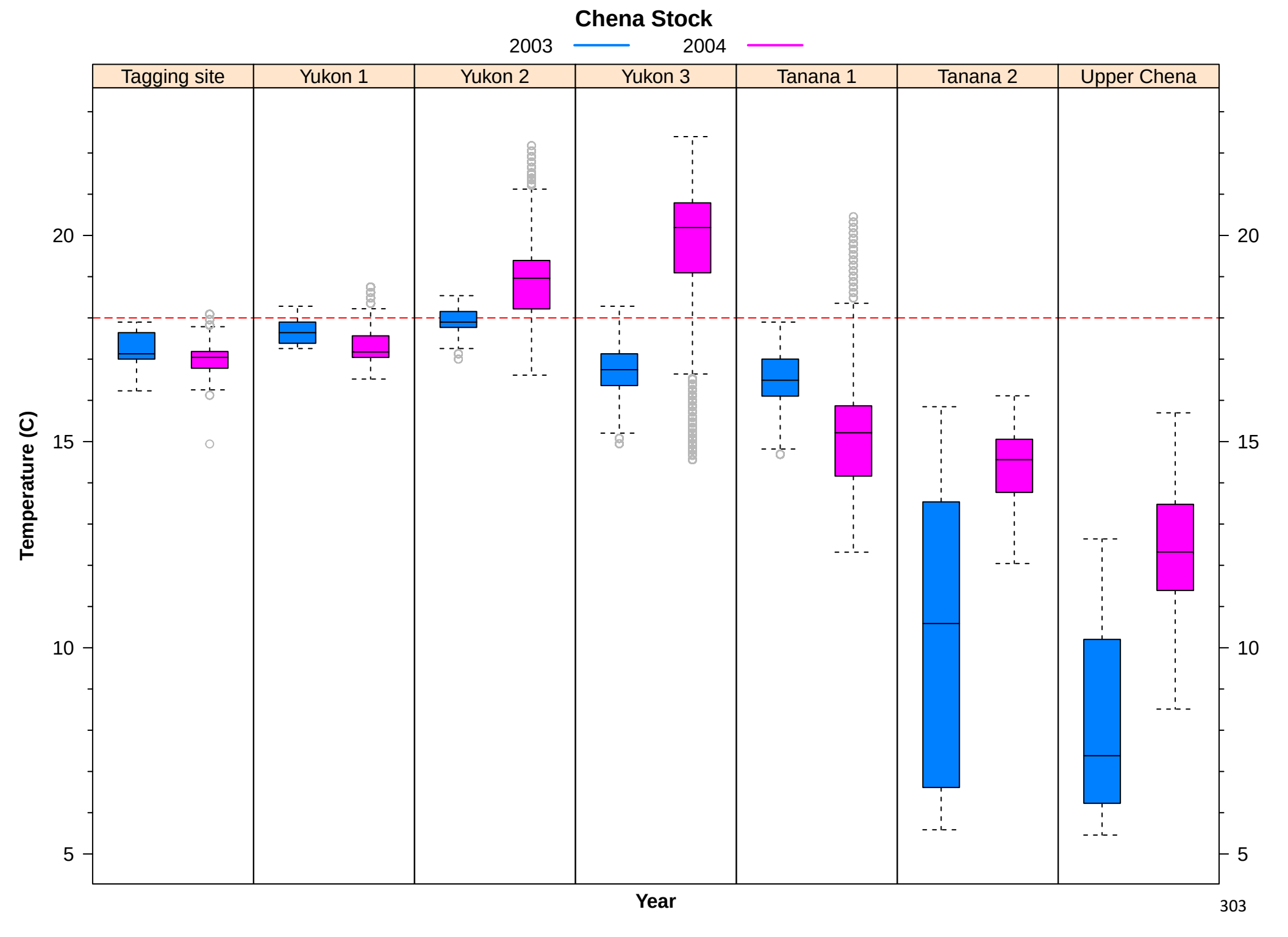

Chena Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Reach

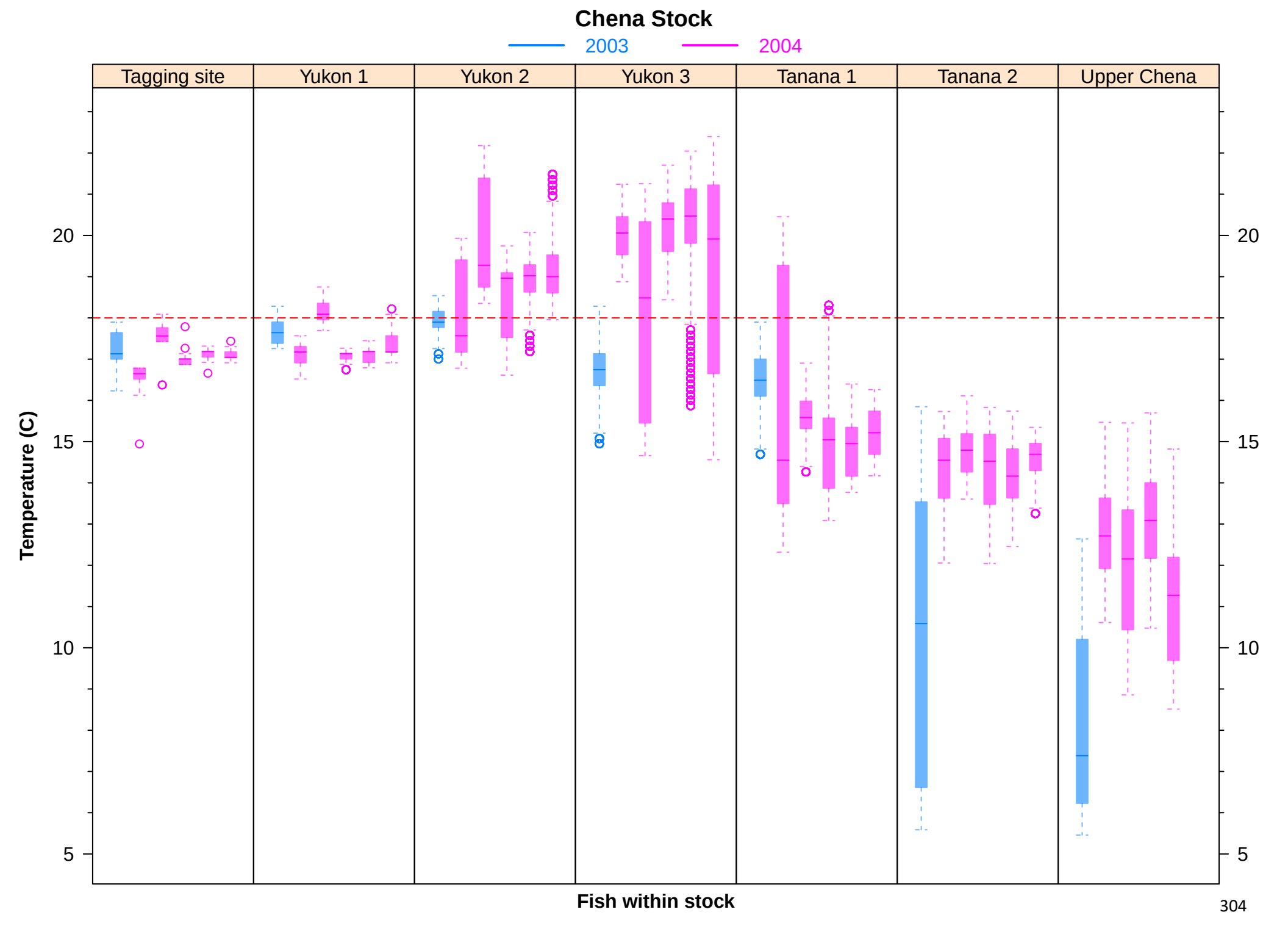

Chena Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Depth (m)
0
5
10
15
20
25
Fish within stock

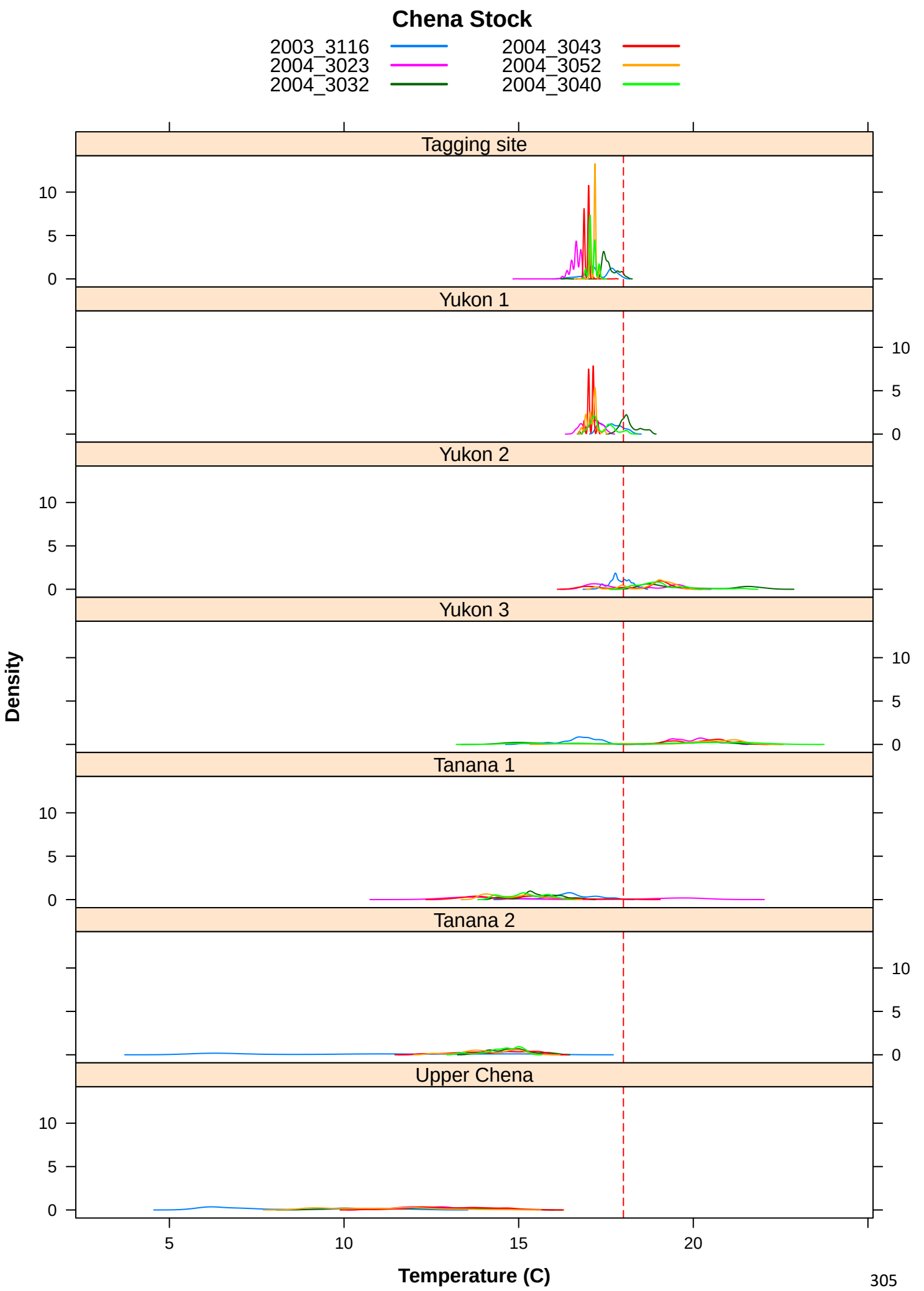

Chena Stock
2003_3116
2004_3023
2004_3032
2004_3043
2004_3052
2004_3040
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Density
1.0
0.5
0.0
0
10
20
30
Depth (m)
300

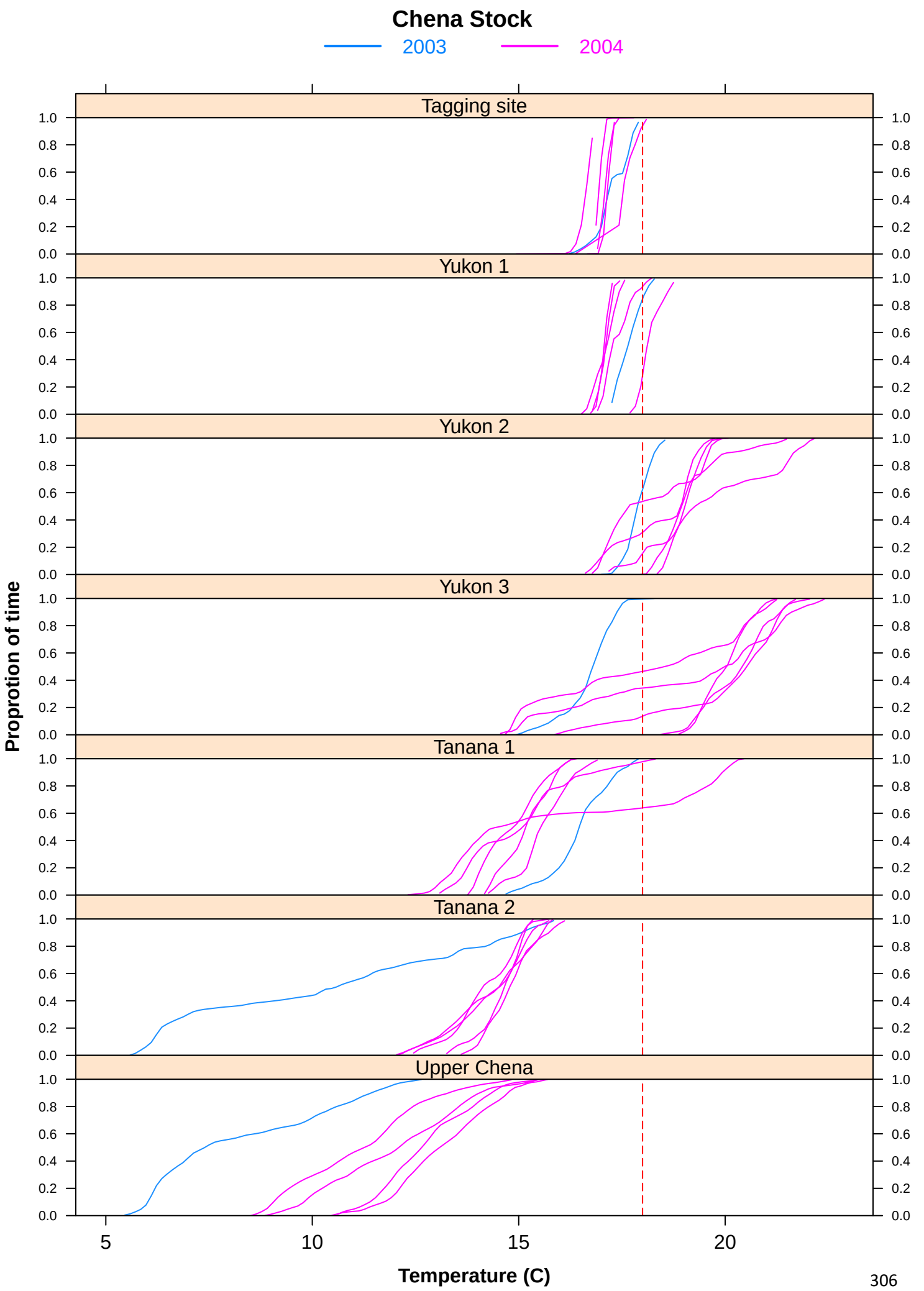

Chena Stock
2003
2004
Temperature (C)
20
15
10
5
0
200
400
600
800
1000
1200
Distance from Paimiut (km)

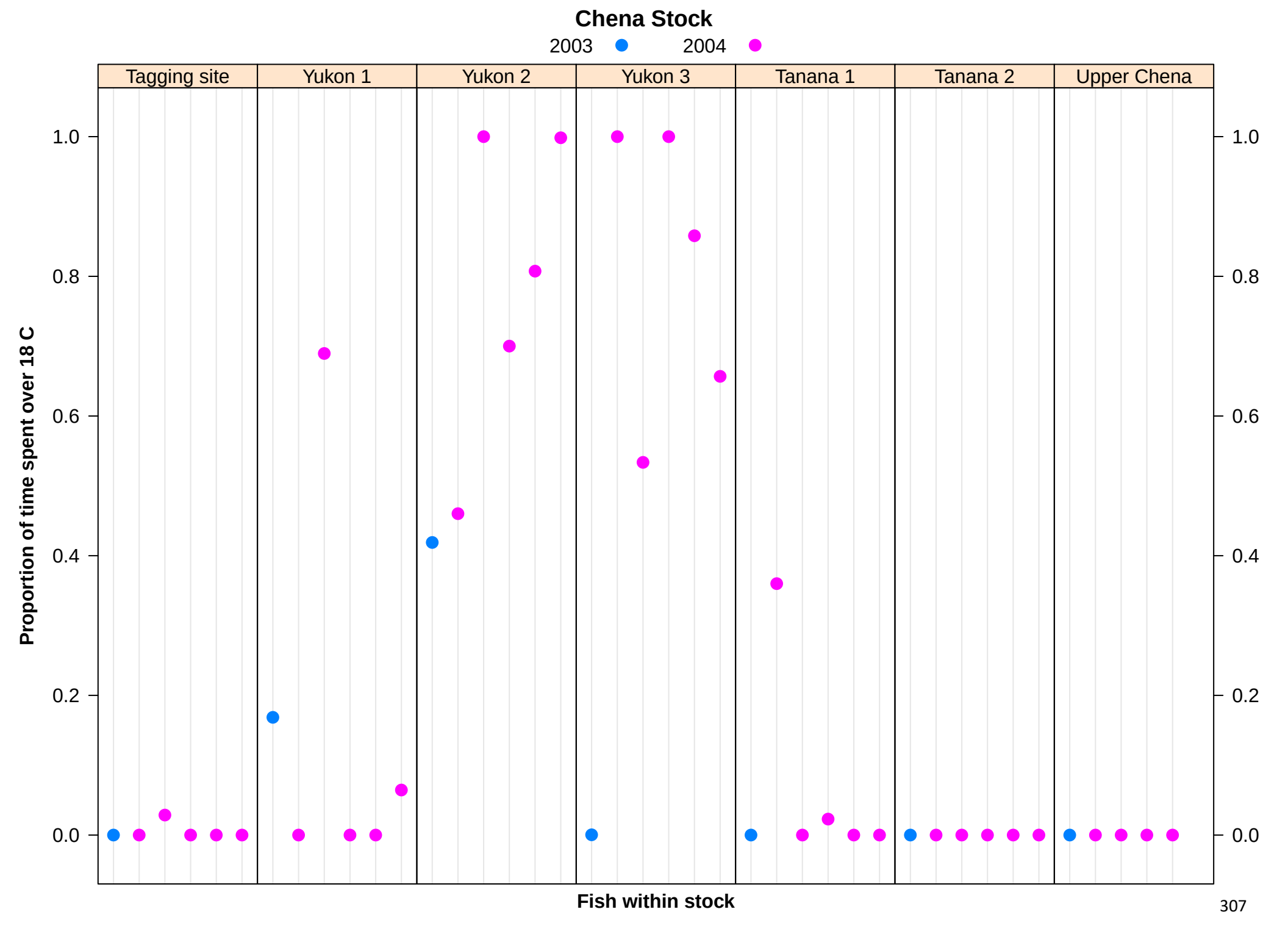

Chena Stock
2003
2004
Temperature (C)
20
15
10
5
0
200
400
600
800
1000
Hours since release

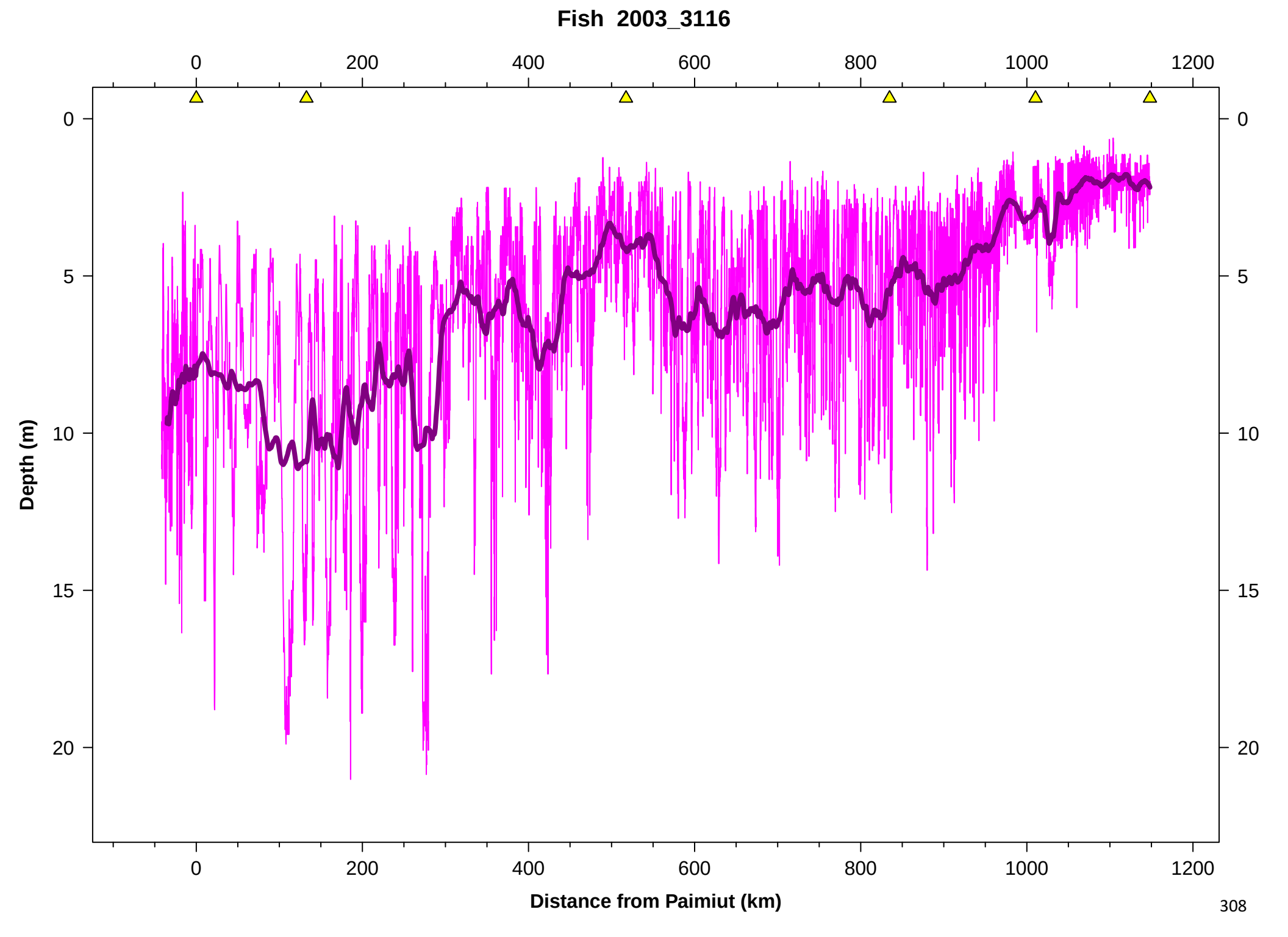

Chena Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Temperature (C)
20
15
10
5
Year

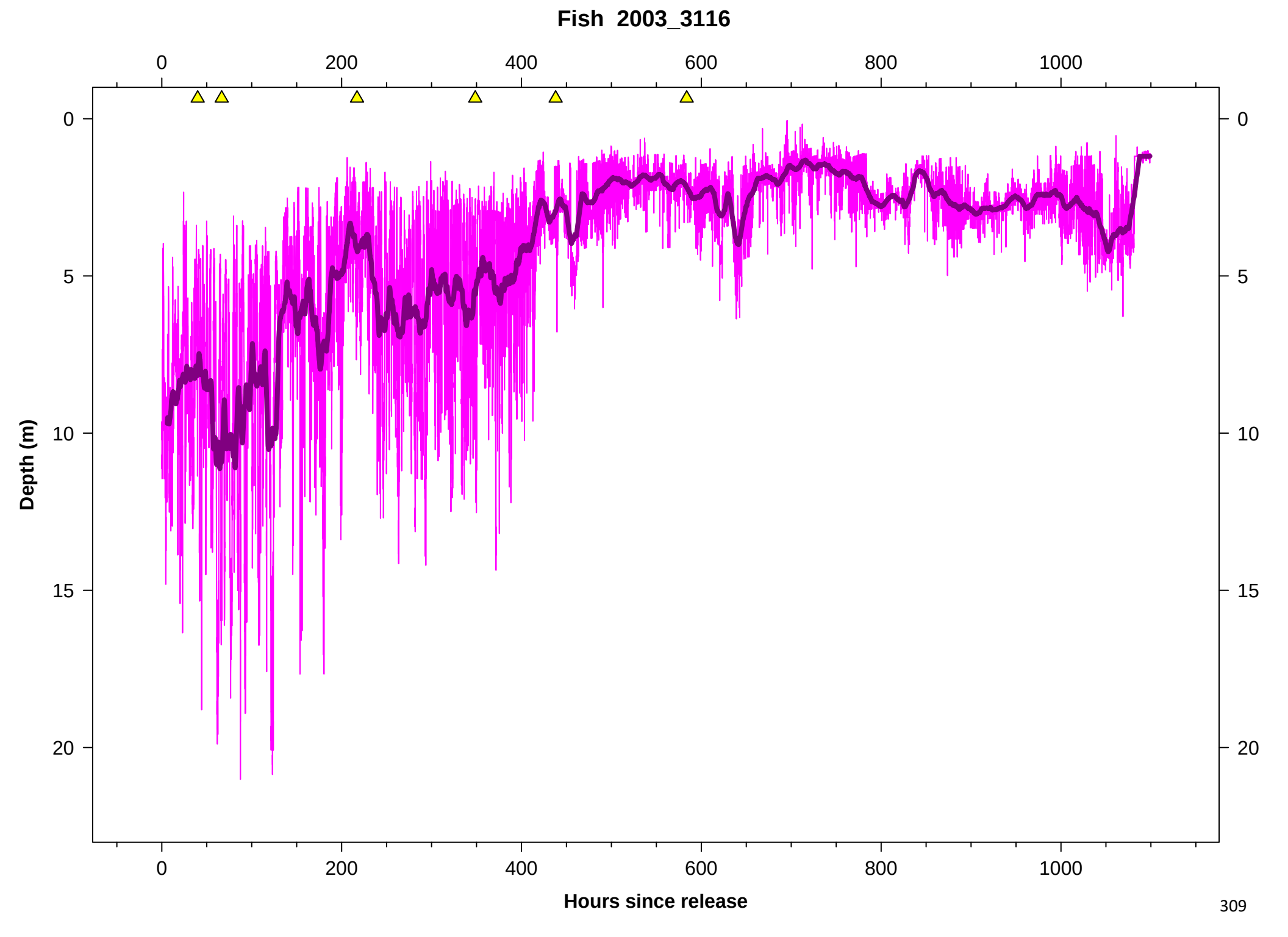

Chena Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Temperature (C)
20
15
10
5
Fish within stock

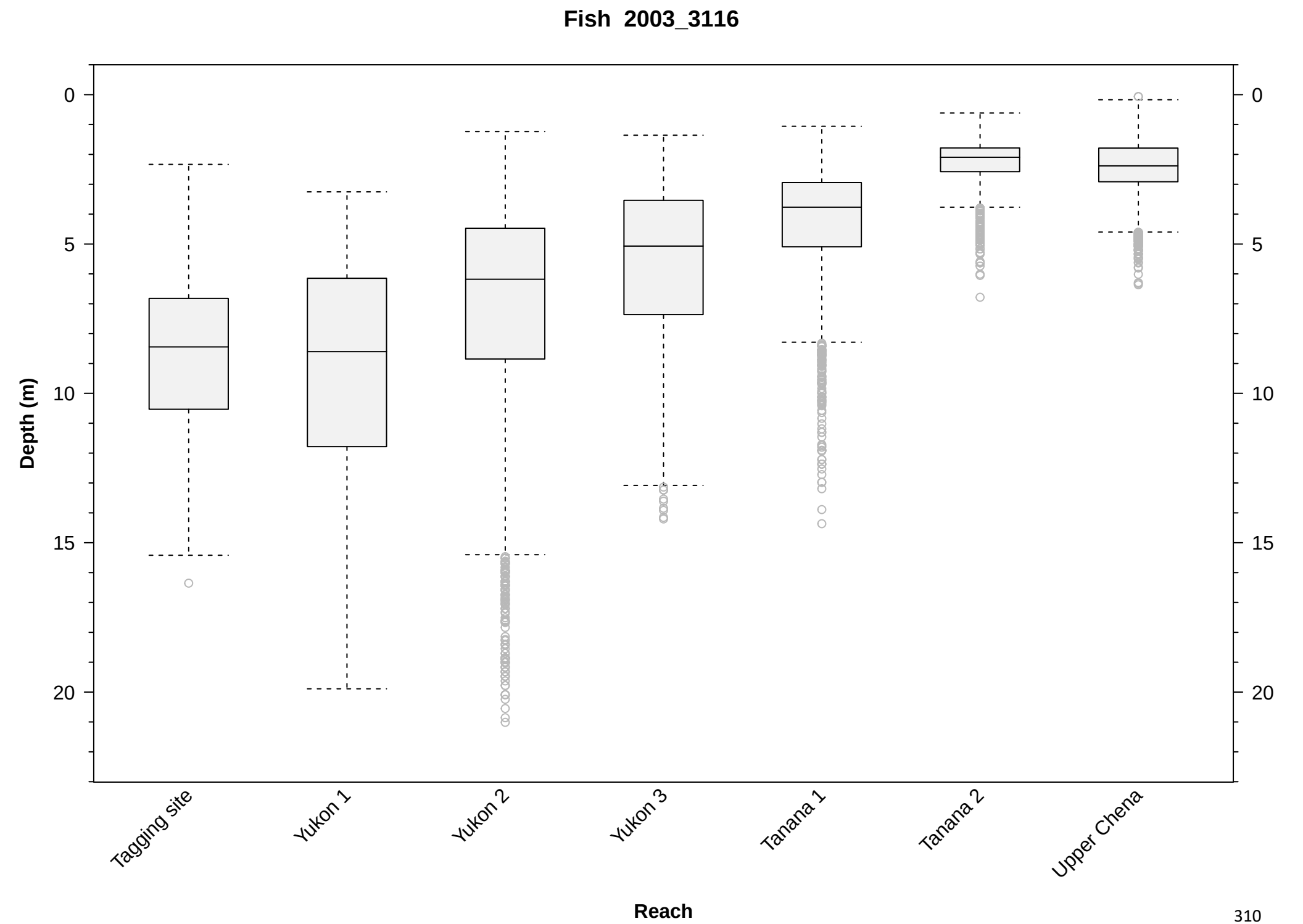

Chena Stock
2003_3116
2004_3023
2004_3032
2004_3043
2004_3052
2004_3040
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Density
Temperature (C)
0
5
10
15
20

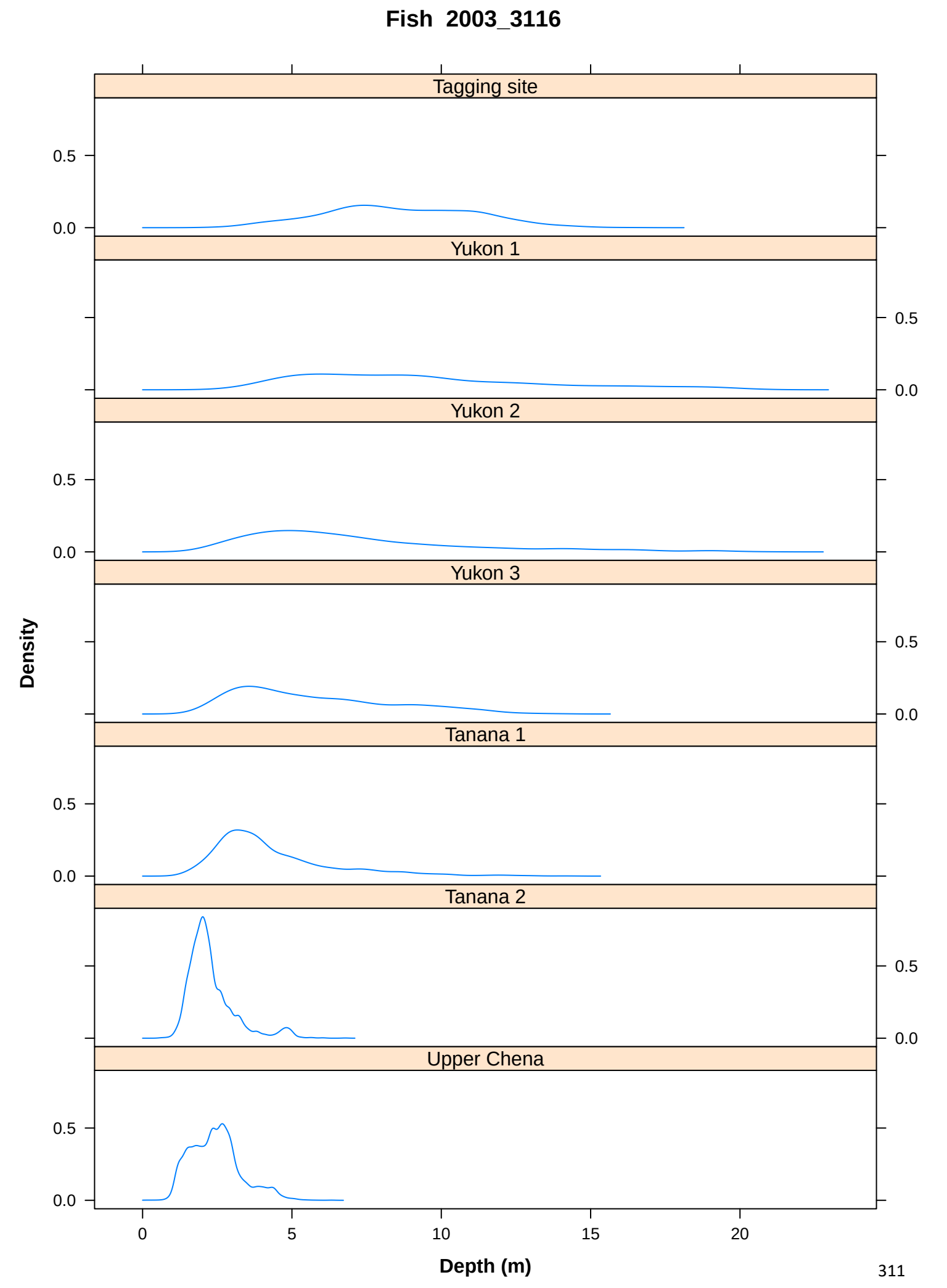

Chena Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
5
10
15
20

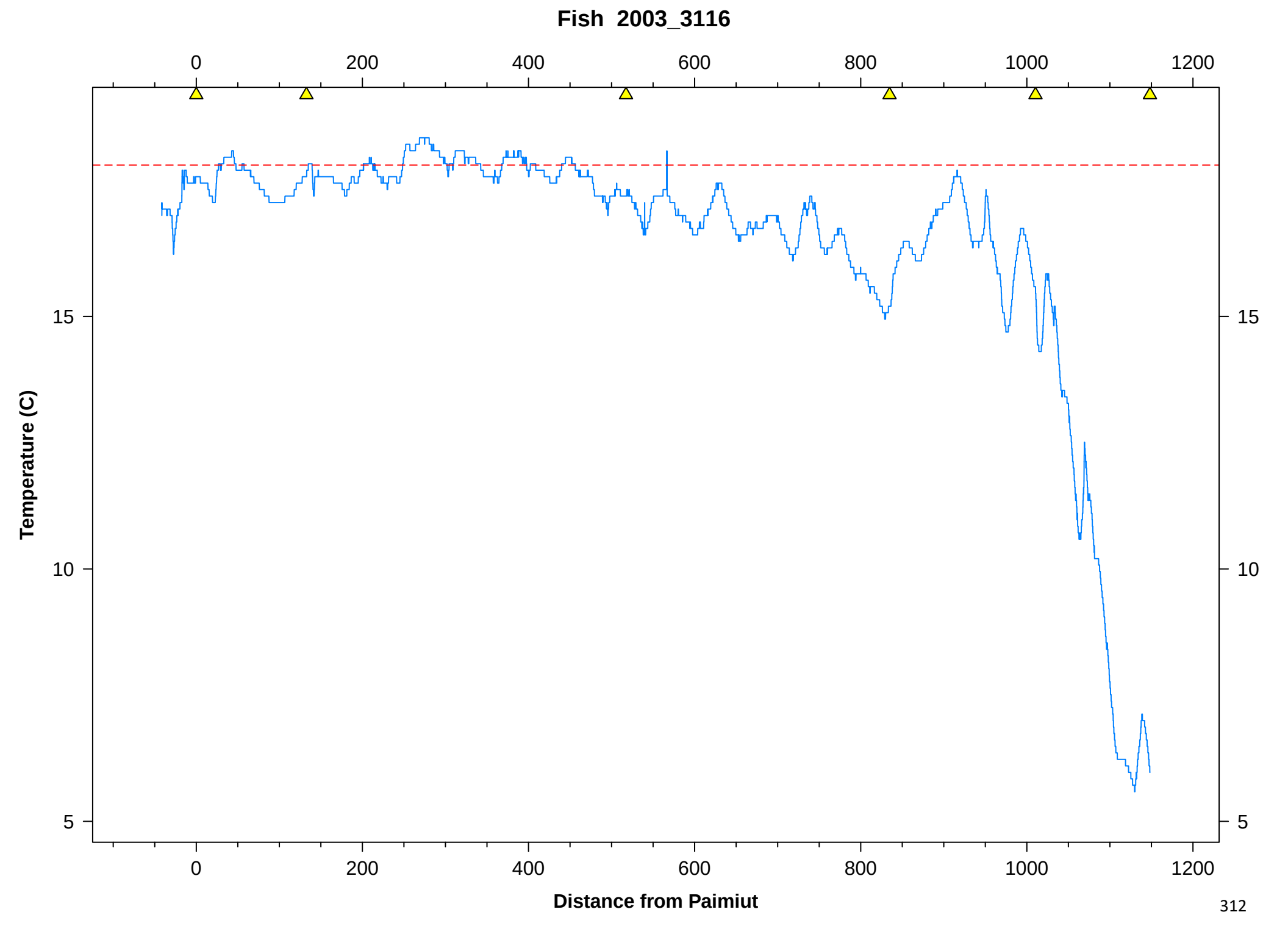

Chena Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock
307

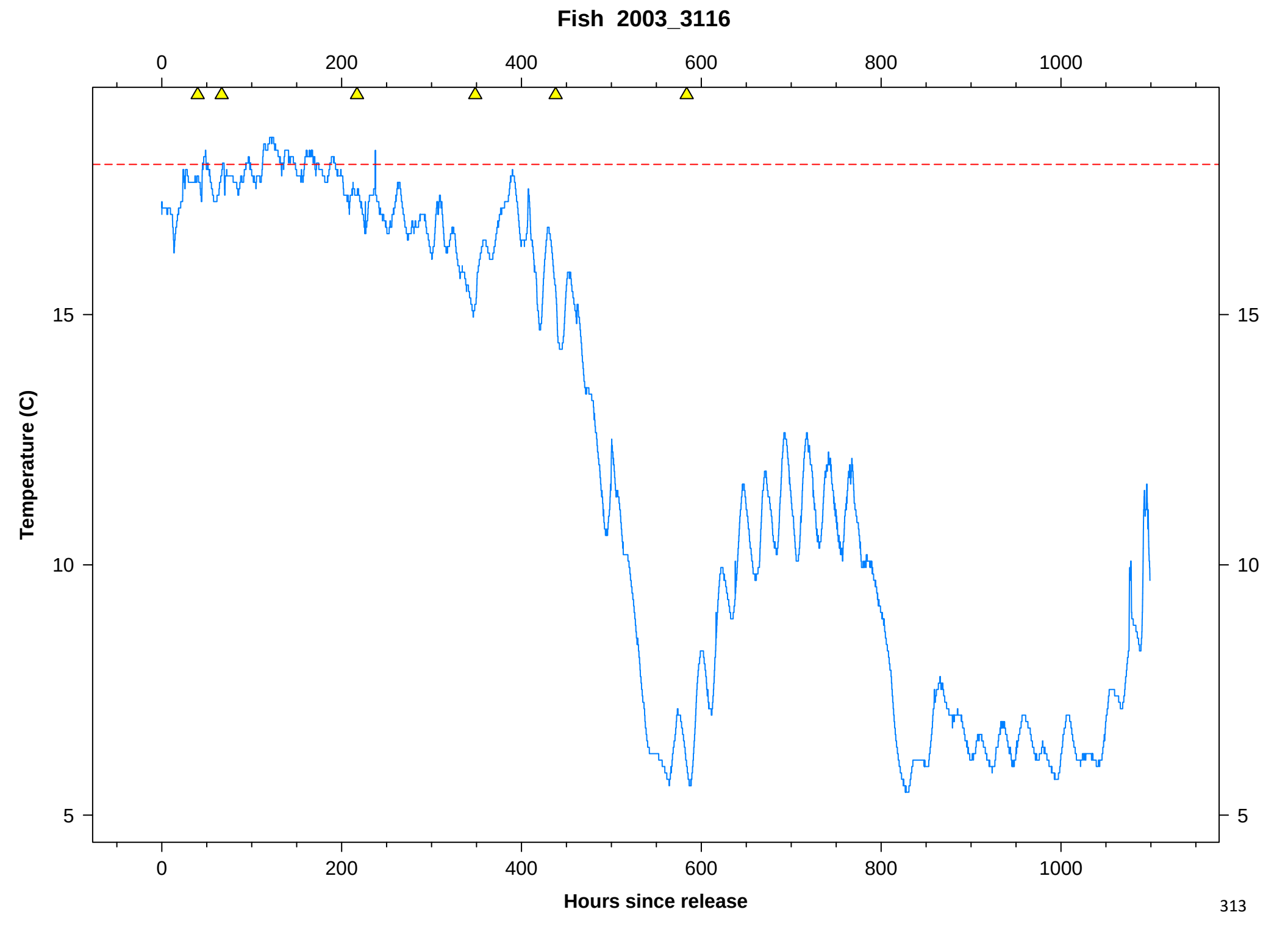

Fish 2003_3116
0
200
400
600
800
1000
1200
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

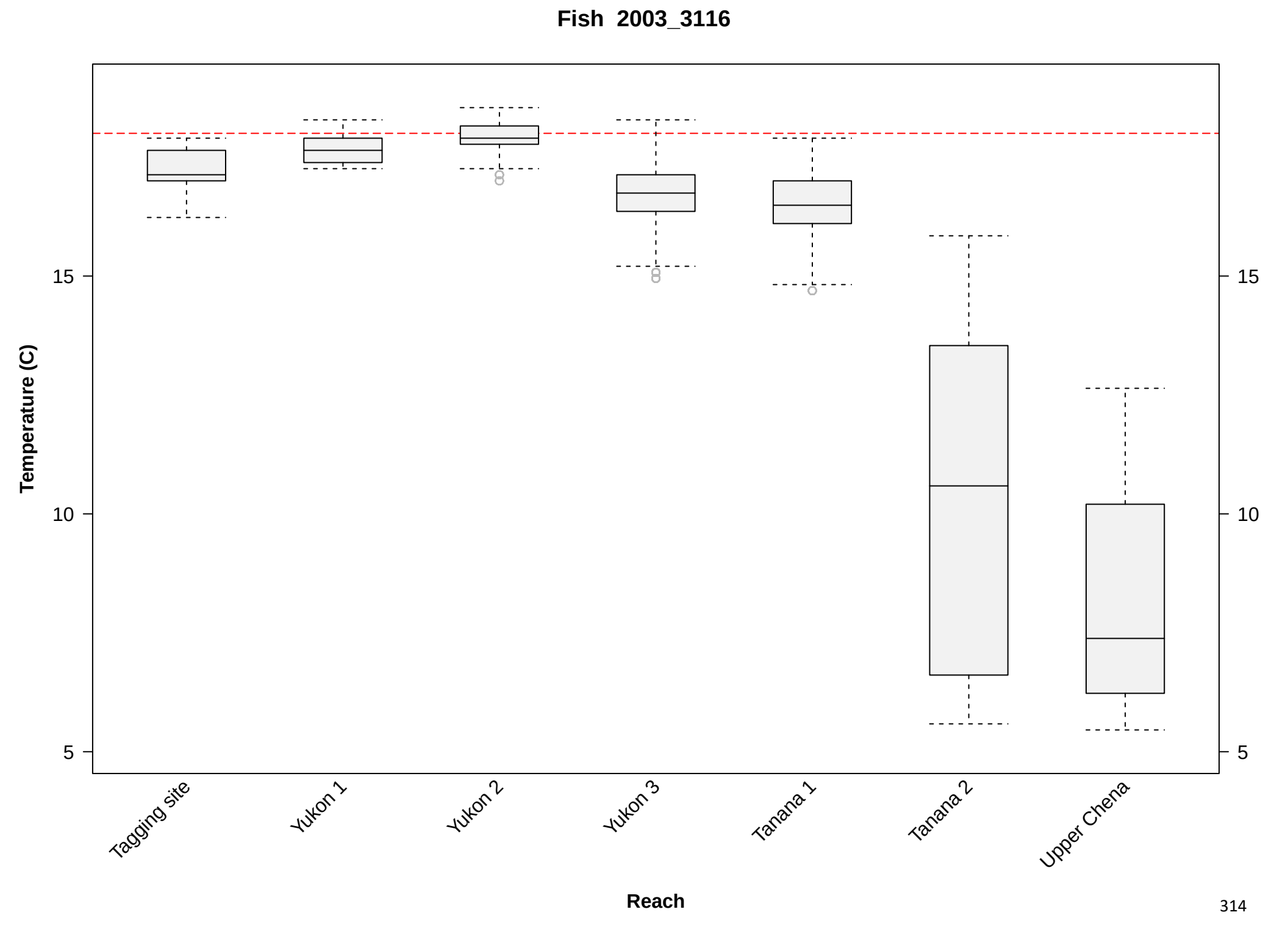

Fish 2003_3116
0
200
400
600
800
1000
0
5
10
15
20
Depth (m)
Hours since release

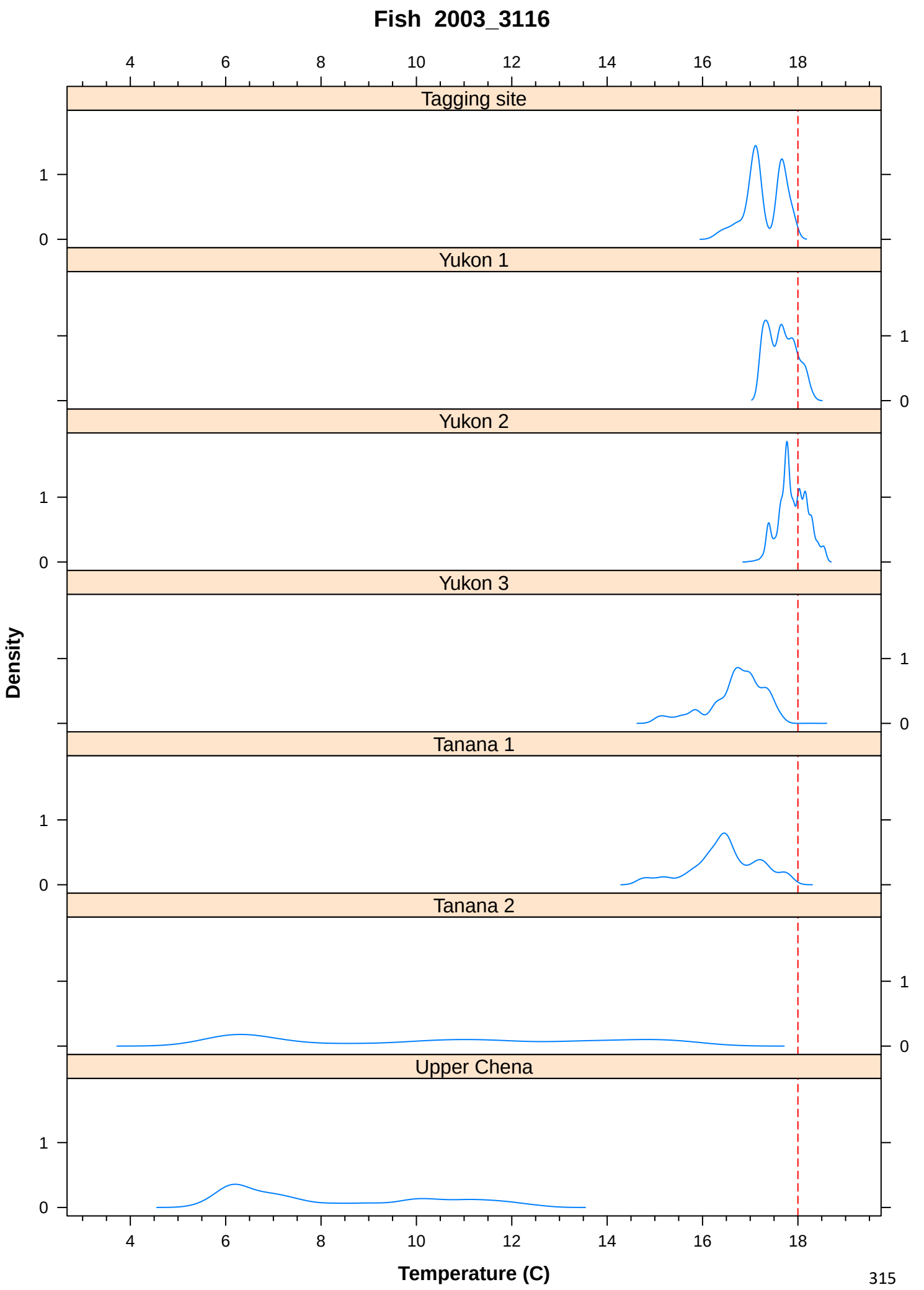

Fish 2003_3116
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Reach

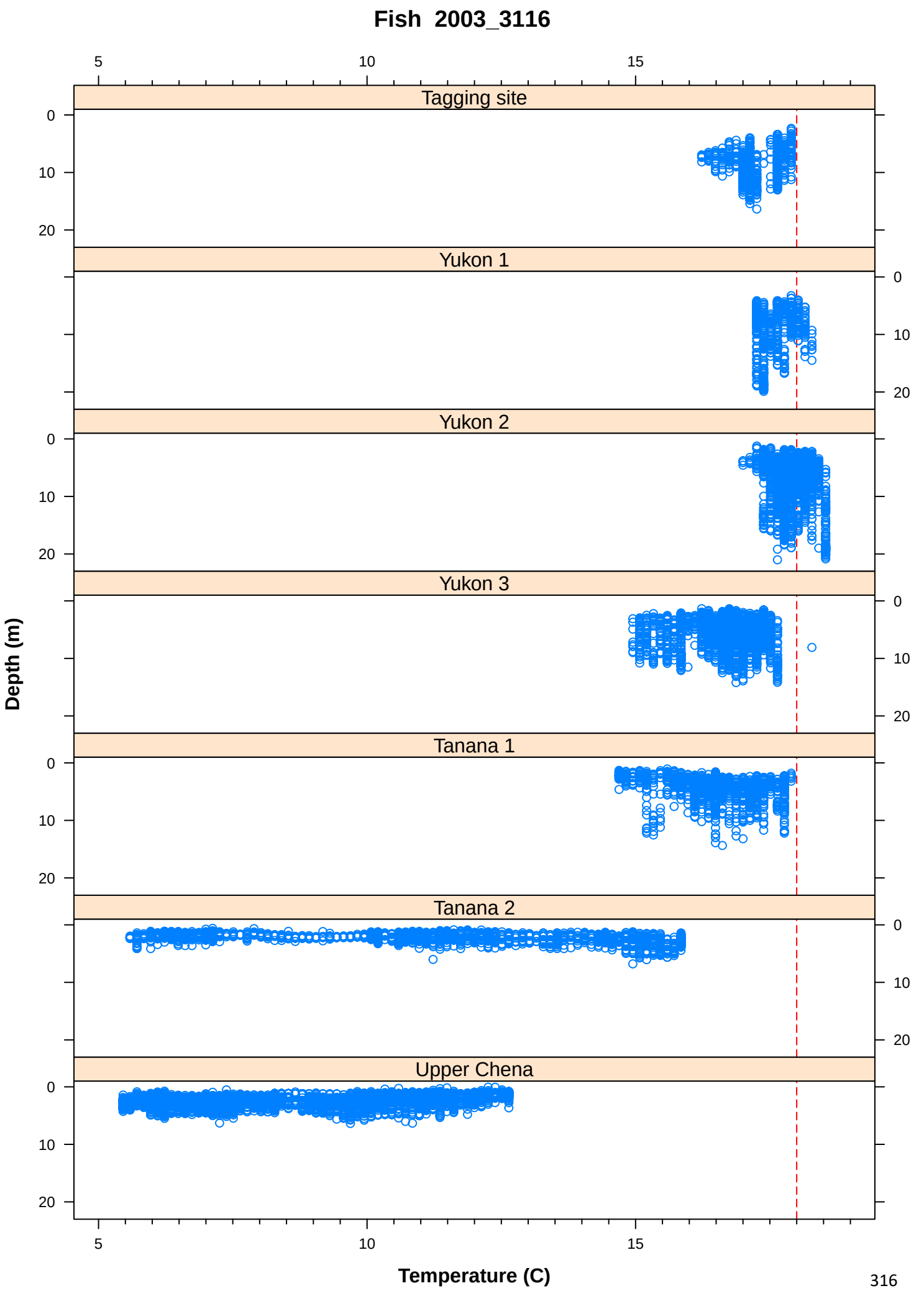

Fish 2003_3116
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Density
0.5
0.0
0
5
10
15
20
Depth (m)

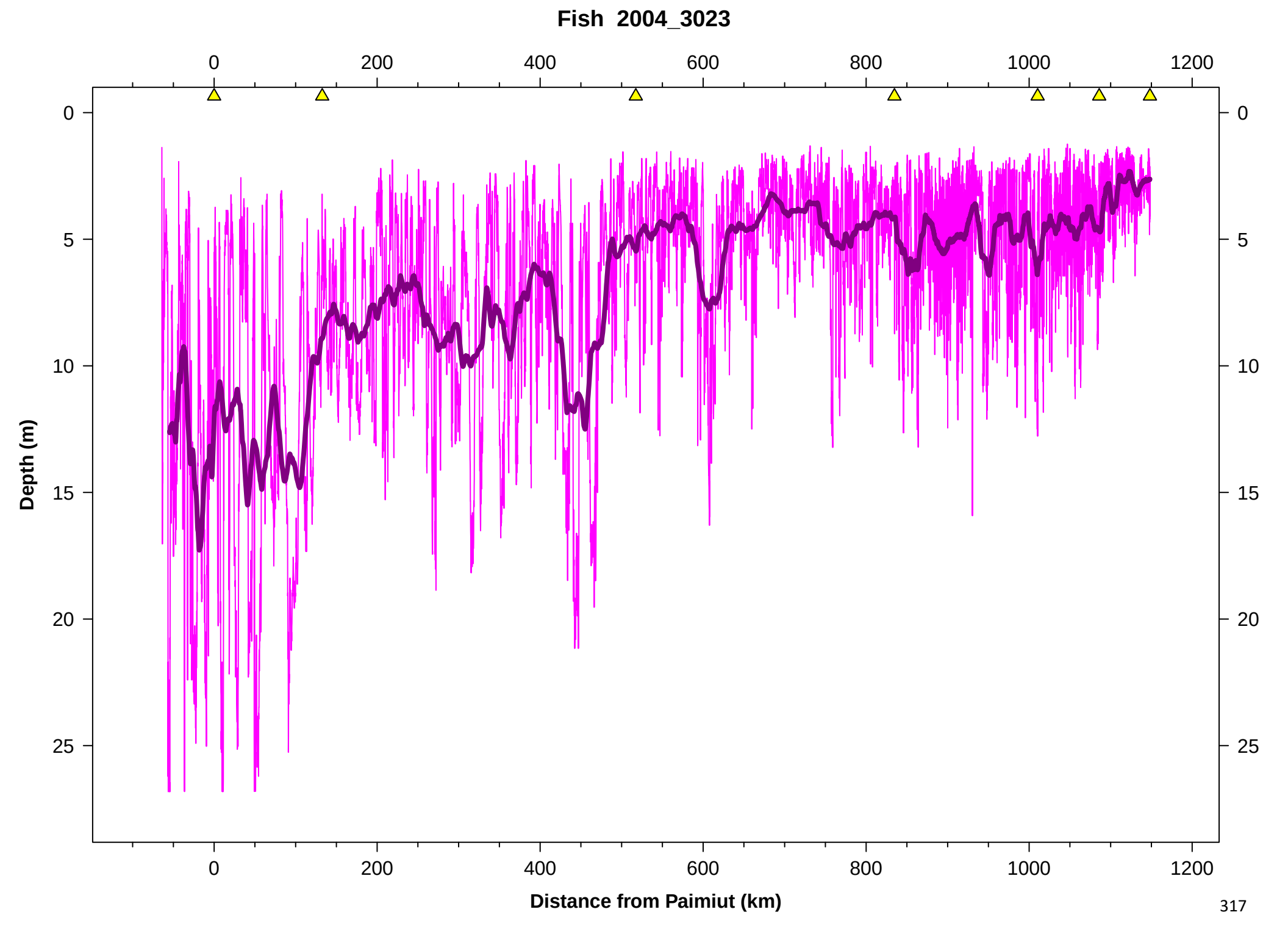

Fish 2003_3116
0
200
400
600
800
1000
1200
15
10
5
Temperature (C)
Distance from Paimiut

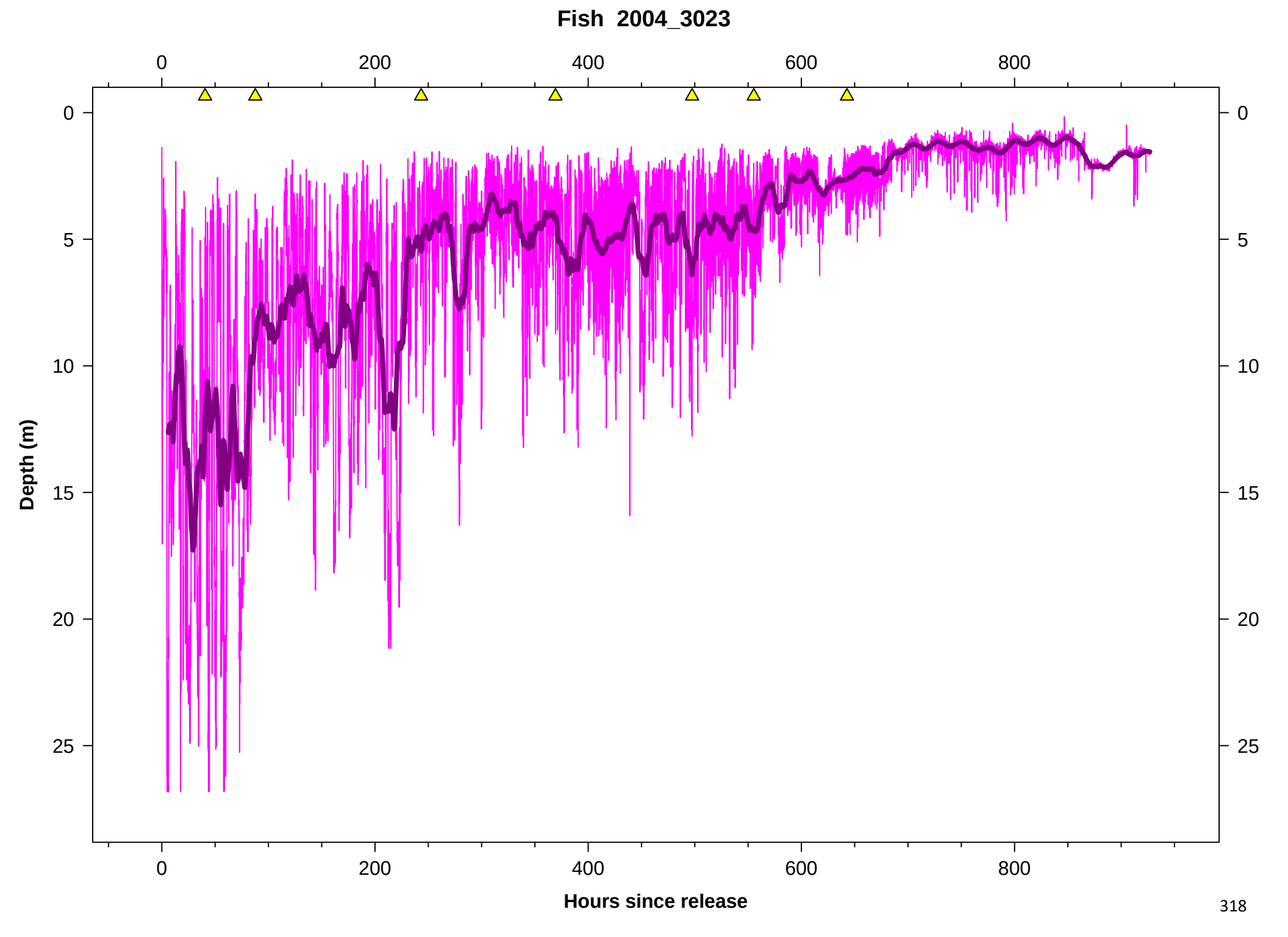

Fish 2003_3116
0
200
400
600
800
1000
15
10
5
Temperature (C)
Hours since release

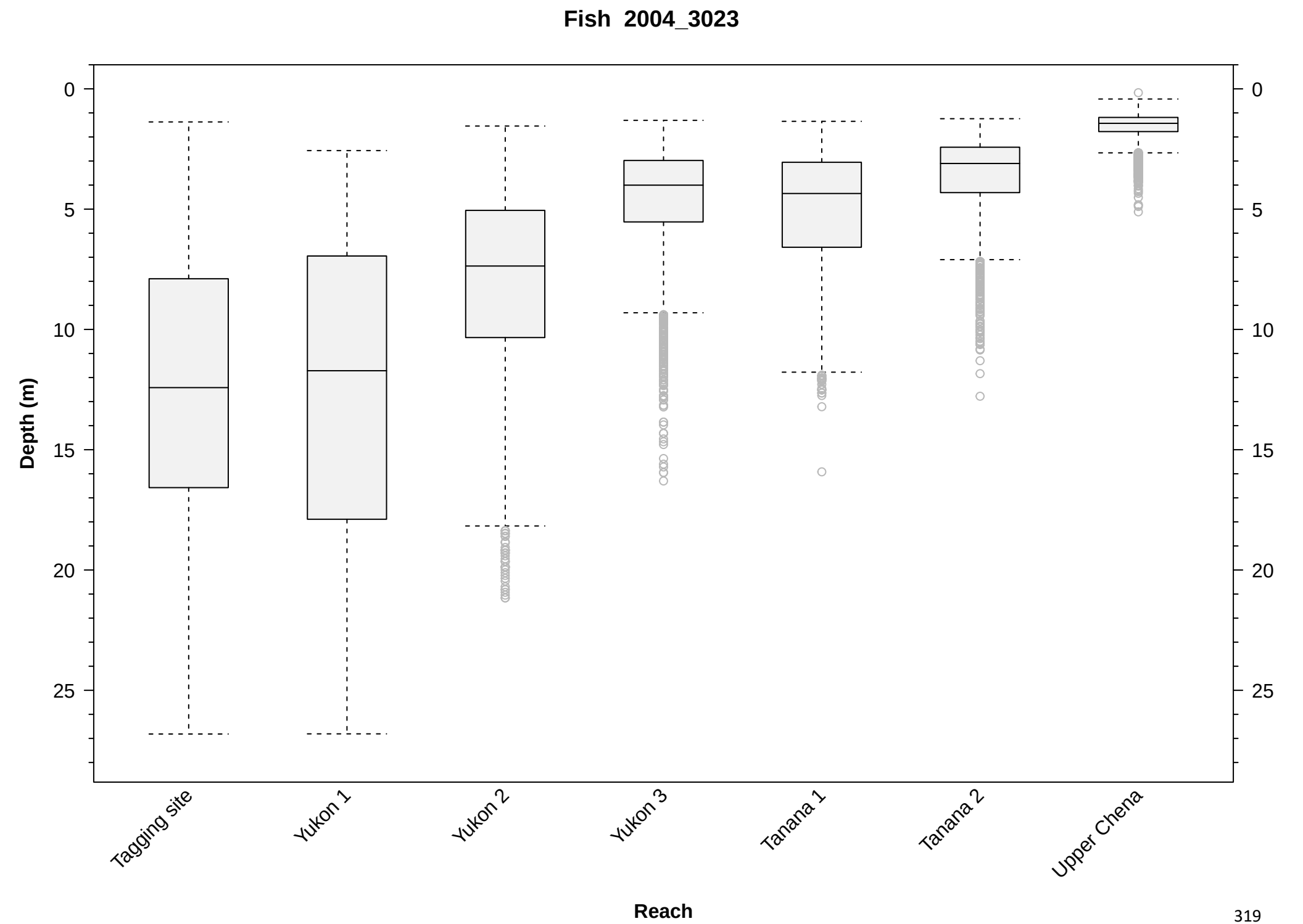

Fish 2003_3116
Temperature (C)
15
10
5
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Reach

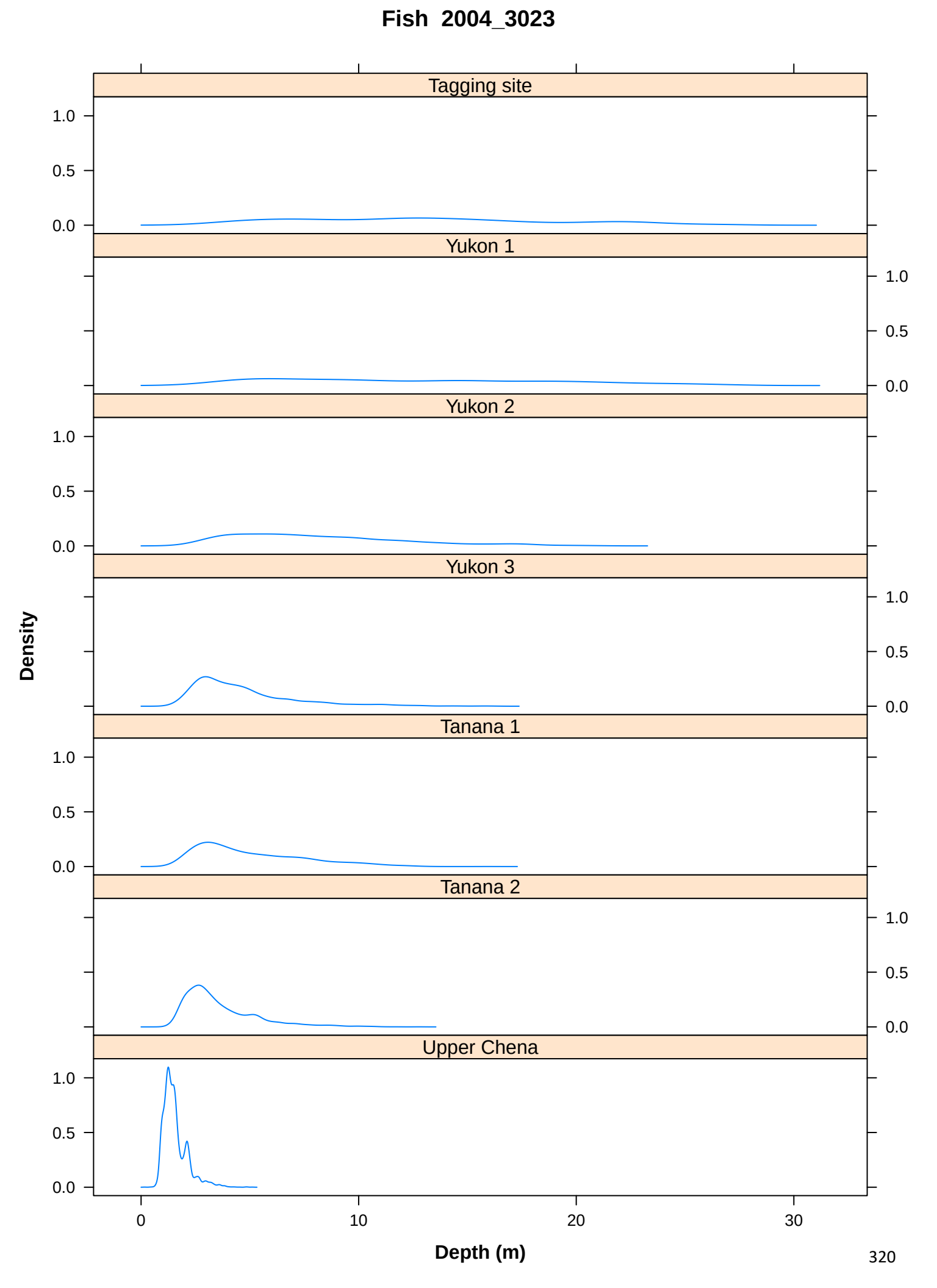

Fish 2003_3116
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Density
Temperature (C)
4
6
8
10
12
14
16
18
0
1

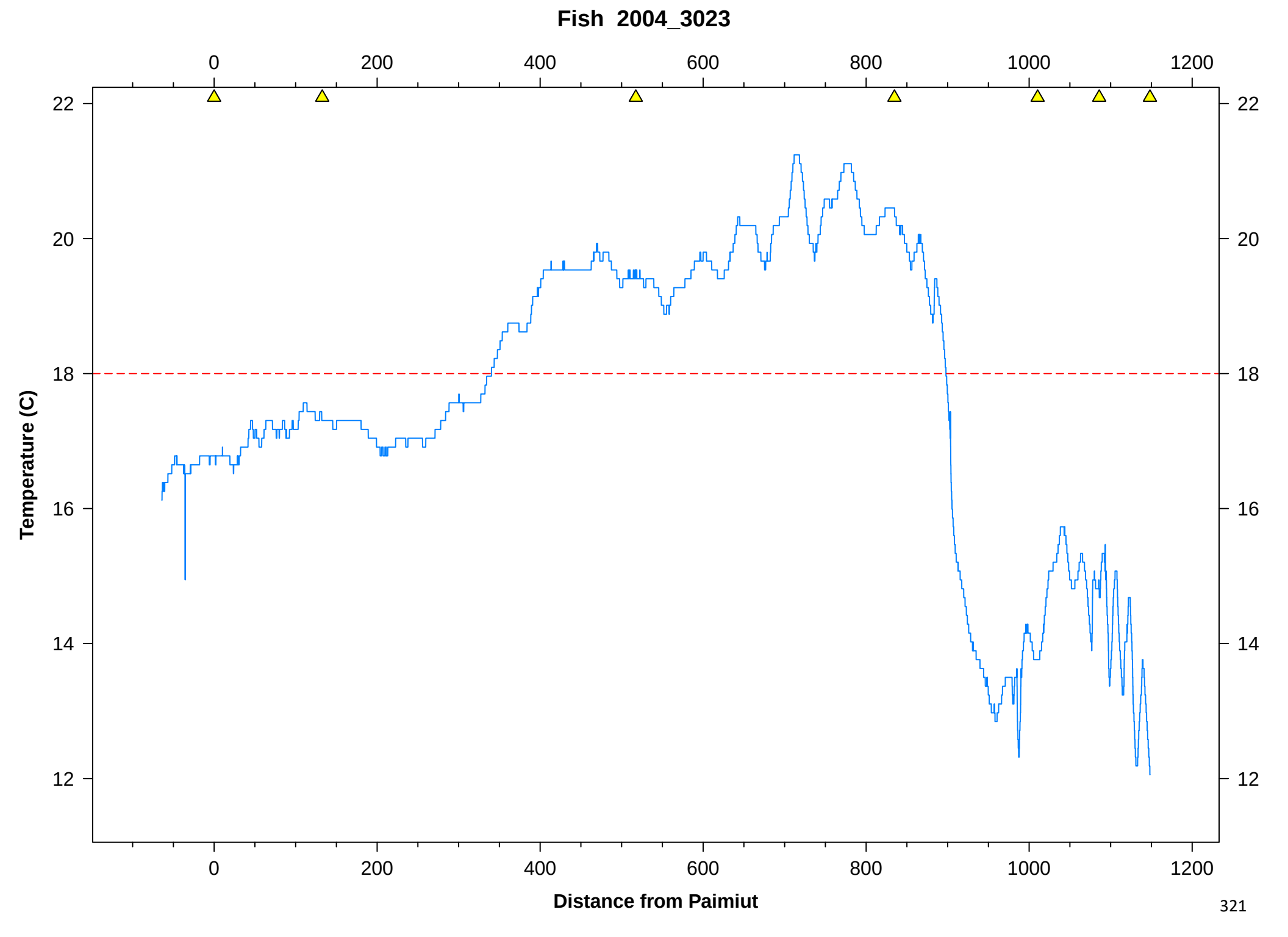

Fish 2003_3116
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Depth (m)
Temperature (C)
5
10
15
0
10
20
316

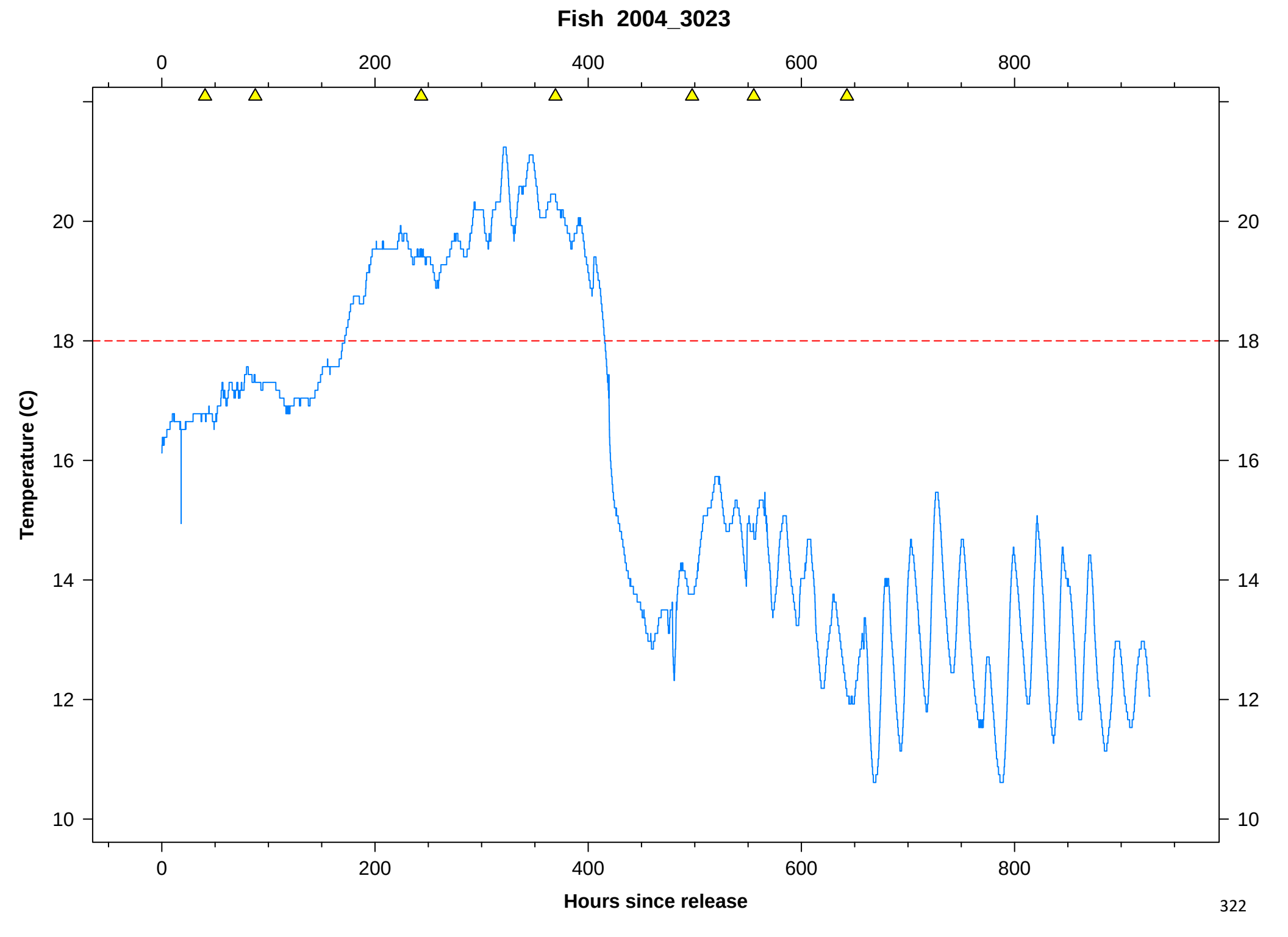

Fish 2004_3023
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

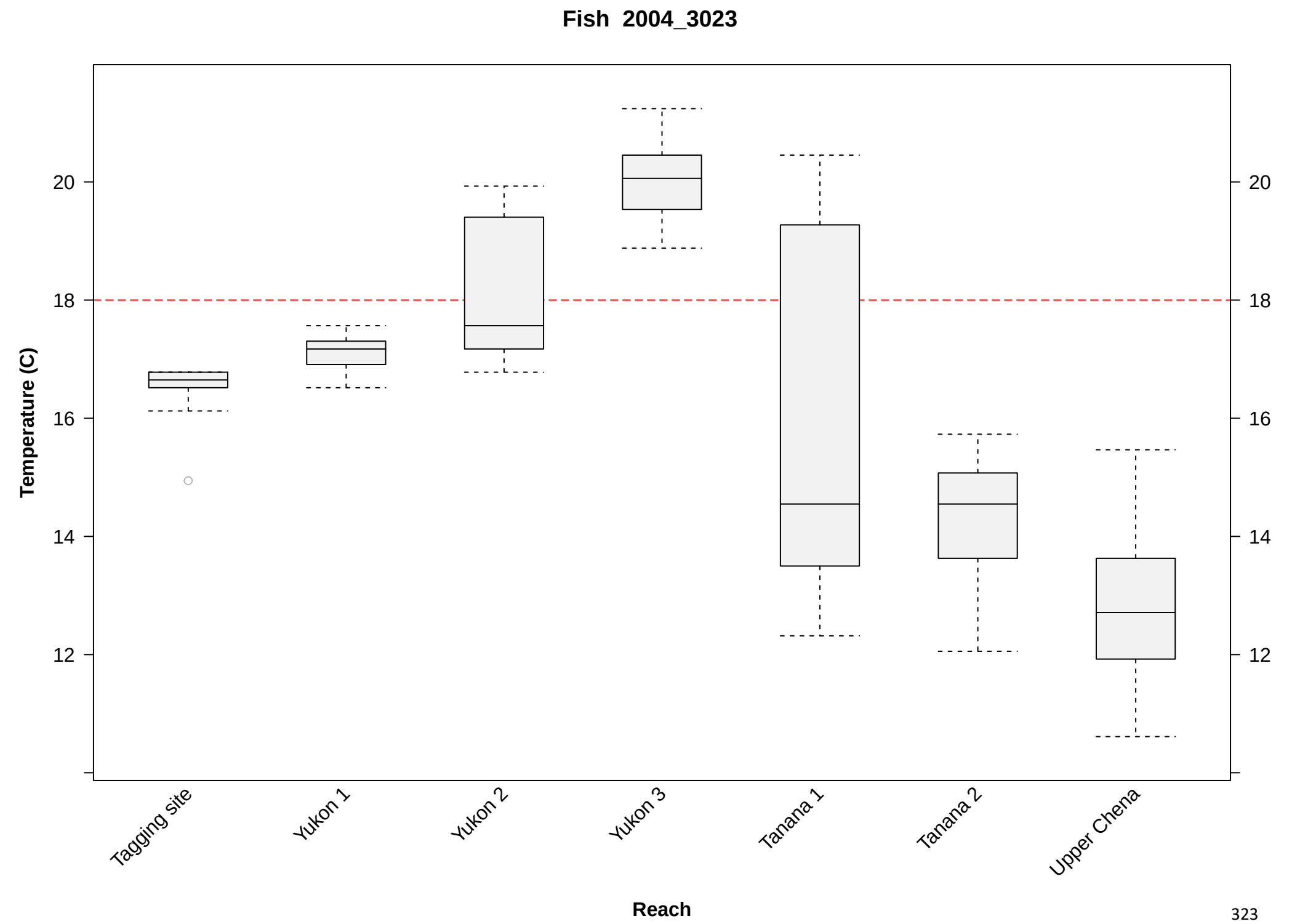

Fish 2004_3023
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Hours since release

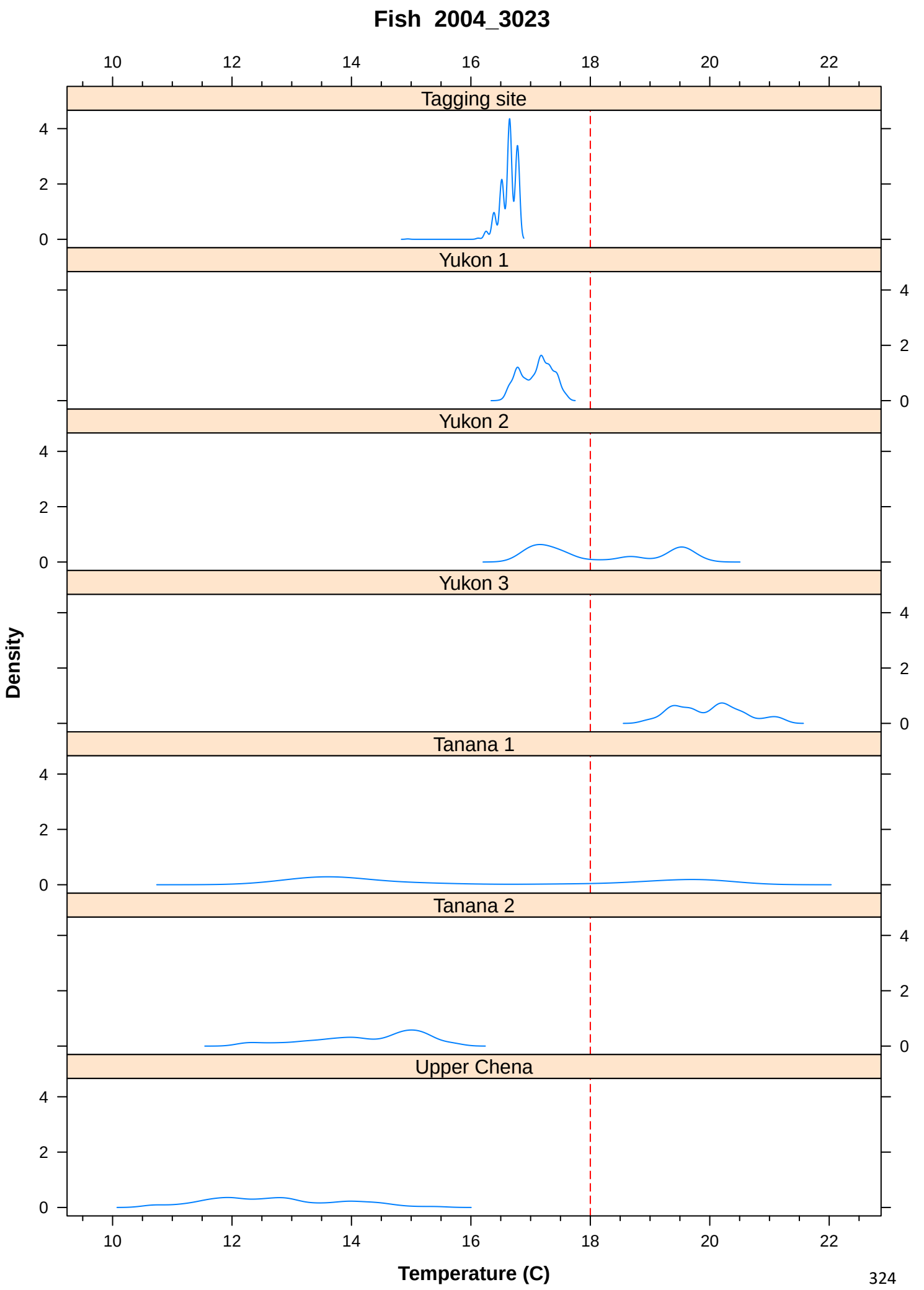

Fish 2004_3023
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Reach

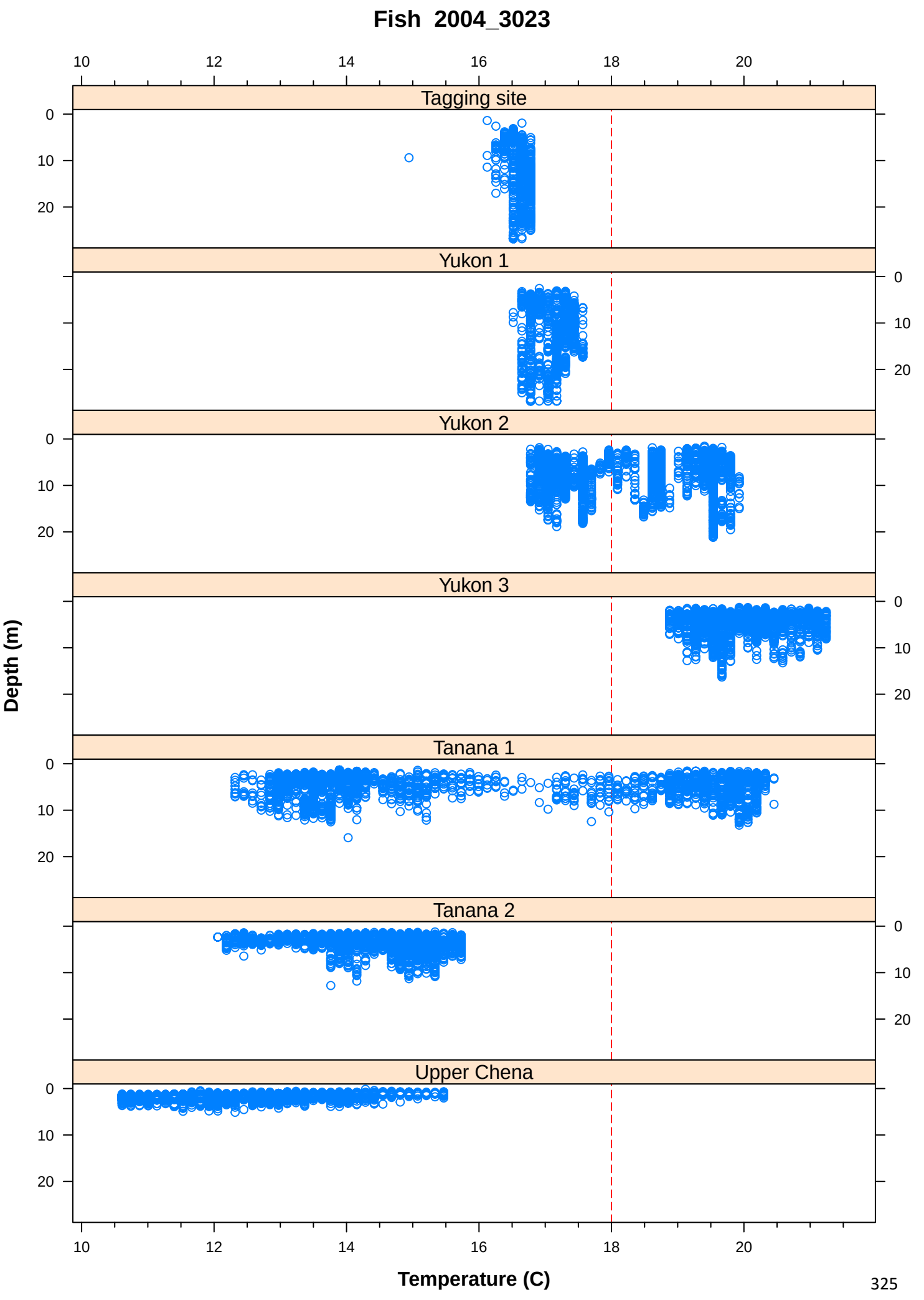

Fish 2004_3023
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Density
1.0
0.5
0.0
0
10
20
30
Depth (m)

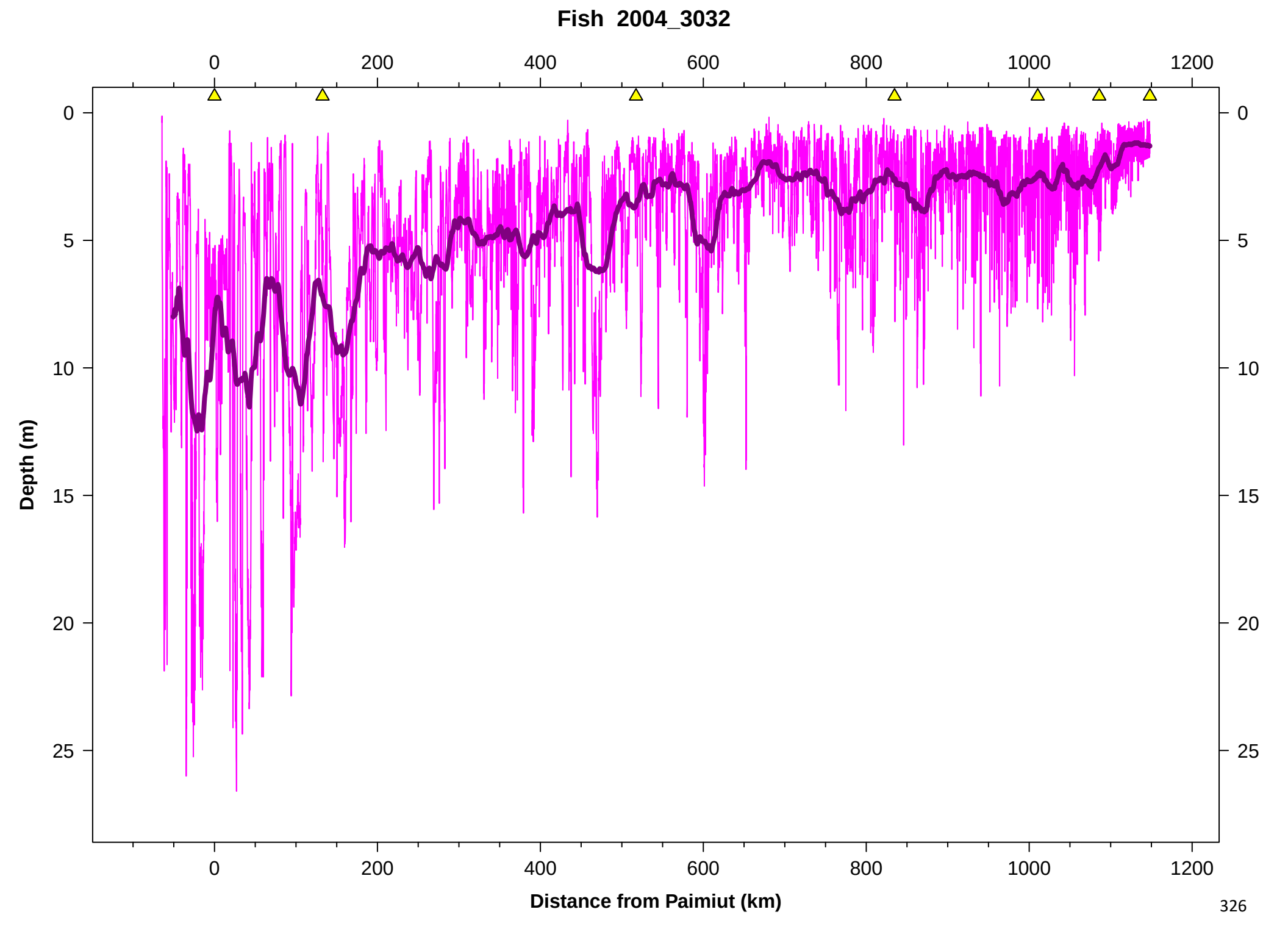

Fish 2004_3023
0
200
400
600
800
1000
1200
22
20
18
16
14
12
Temperature (C)
Distance from Paimiut

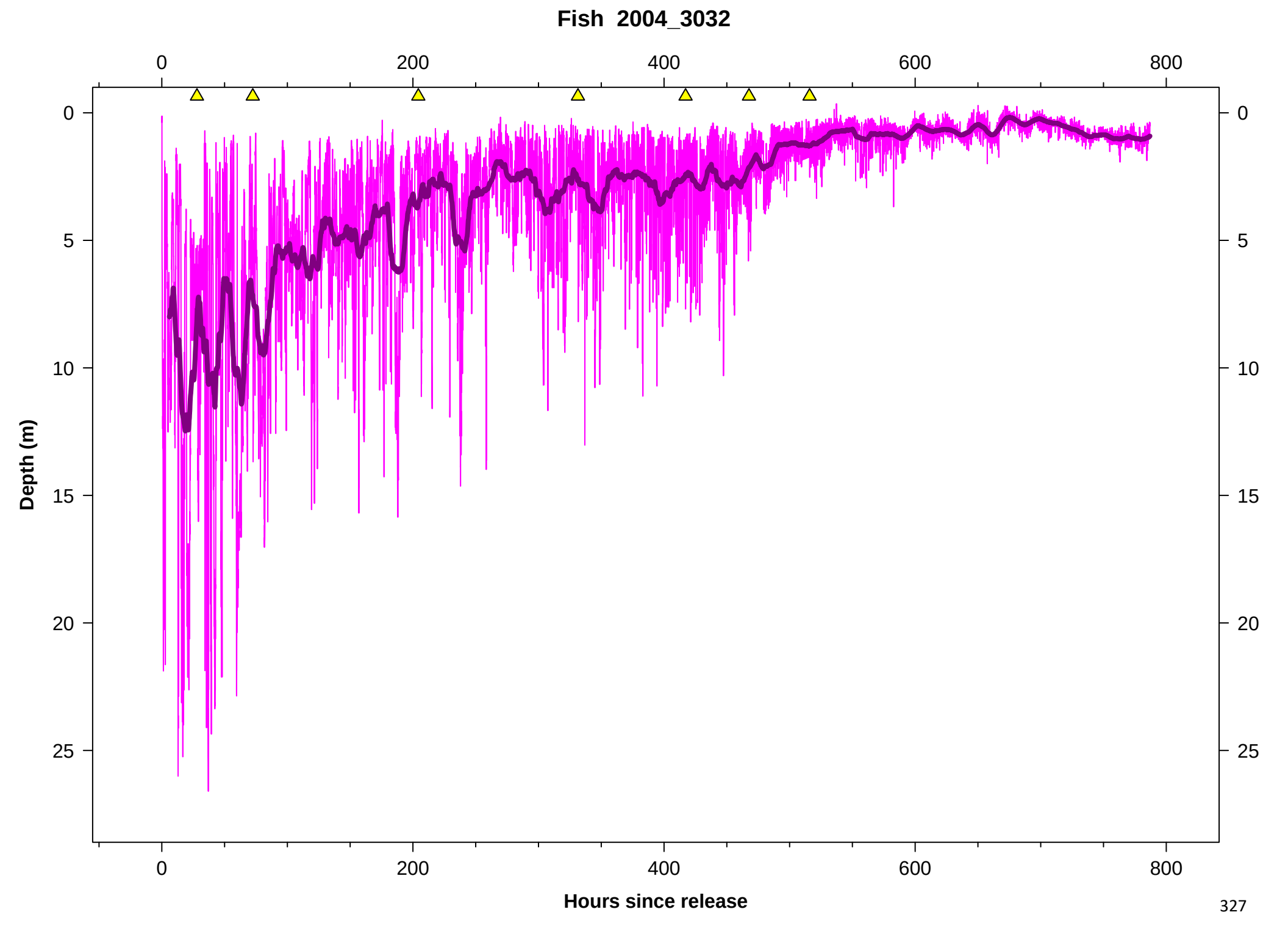

Fish 2004_3023
0
200
400
600
800
20
18
16
14
12
10
Temperature (C)
Hours since release

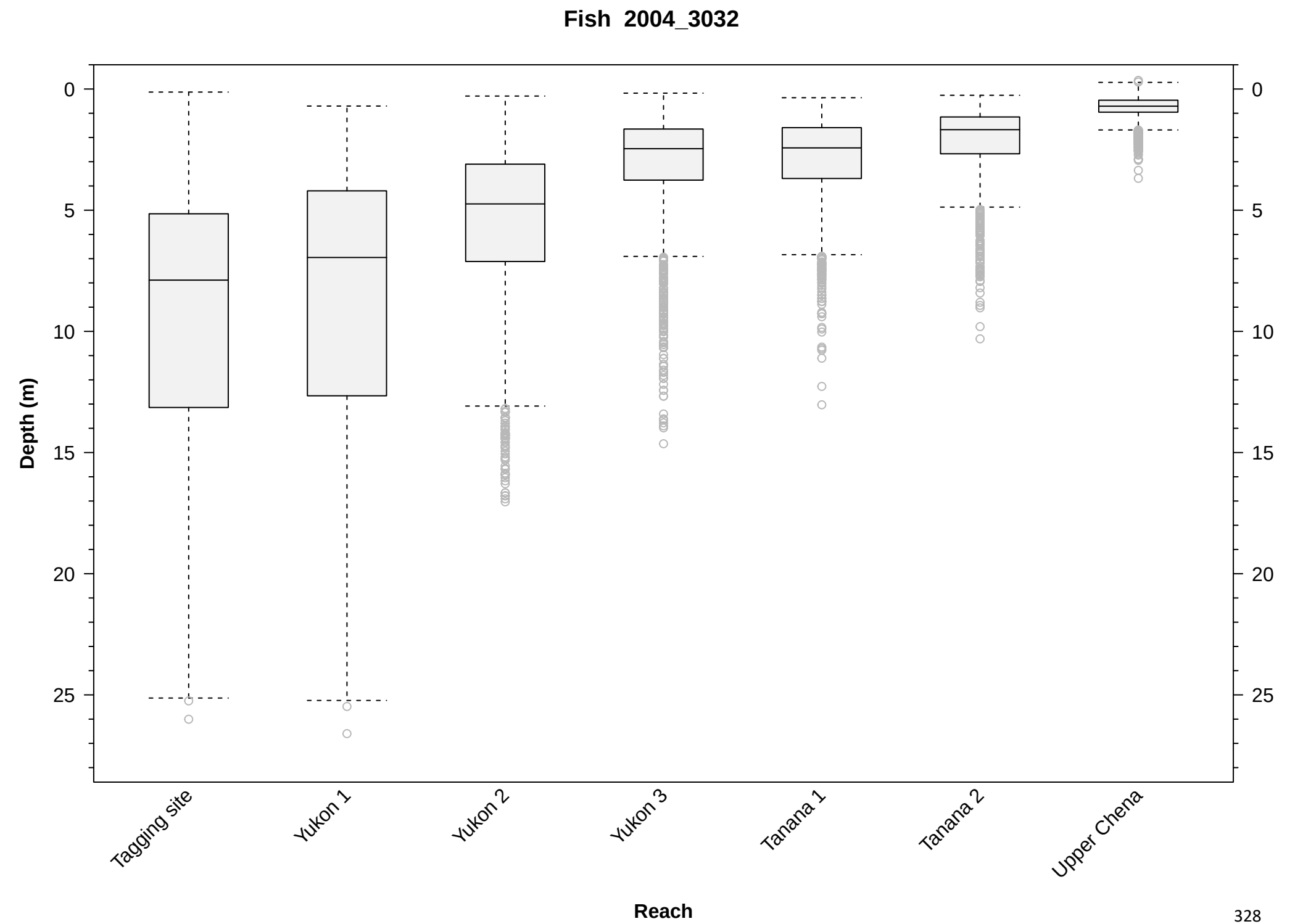

Fish 2004_3023
Temperature (C)
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Reach

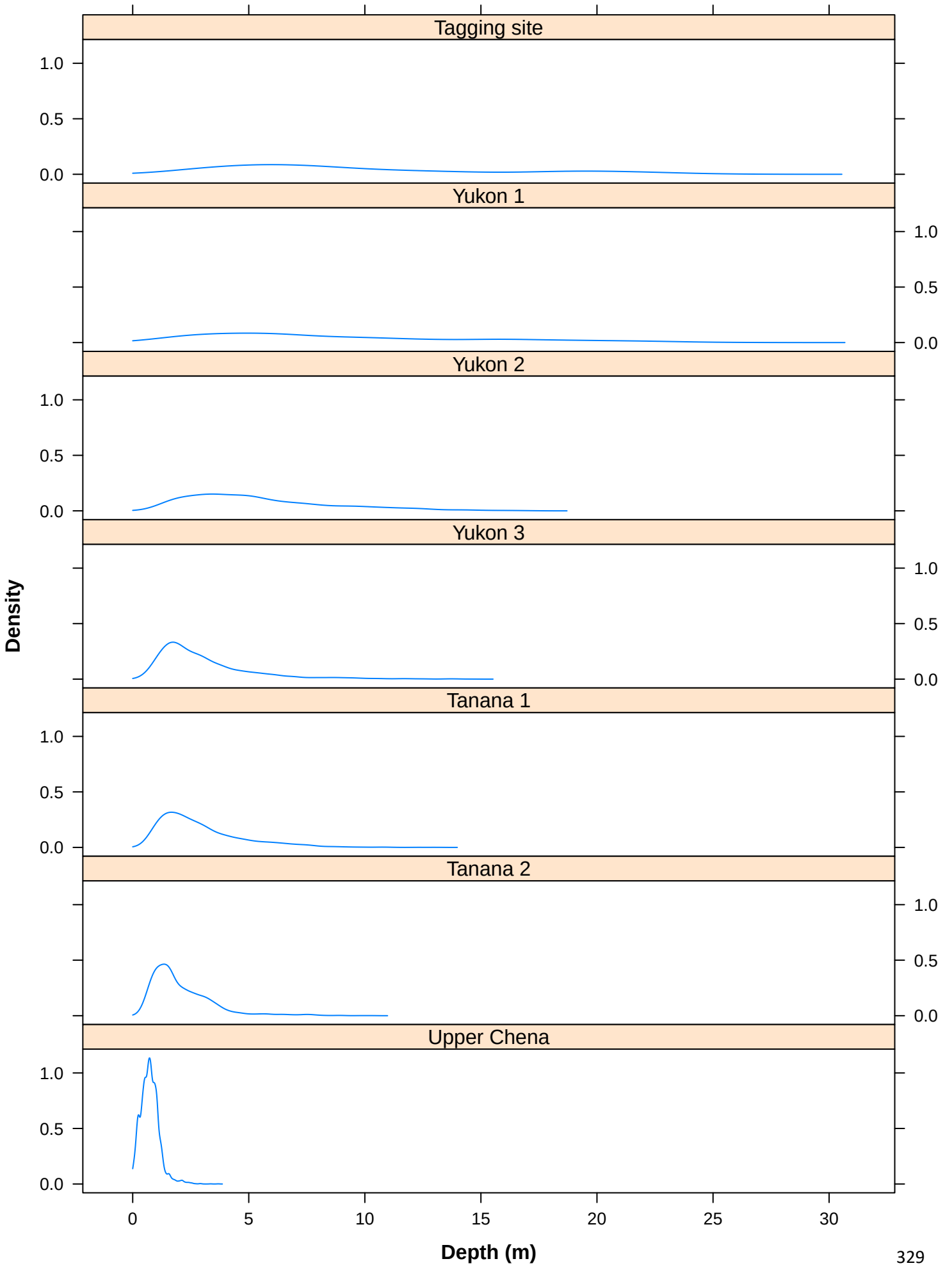

Fish 2004_3023
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Density
Temperature (C)
10
12
14
16
18
20
22
0
2
4

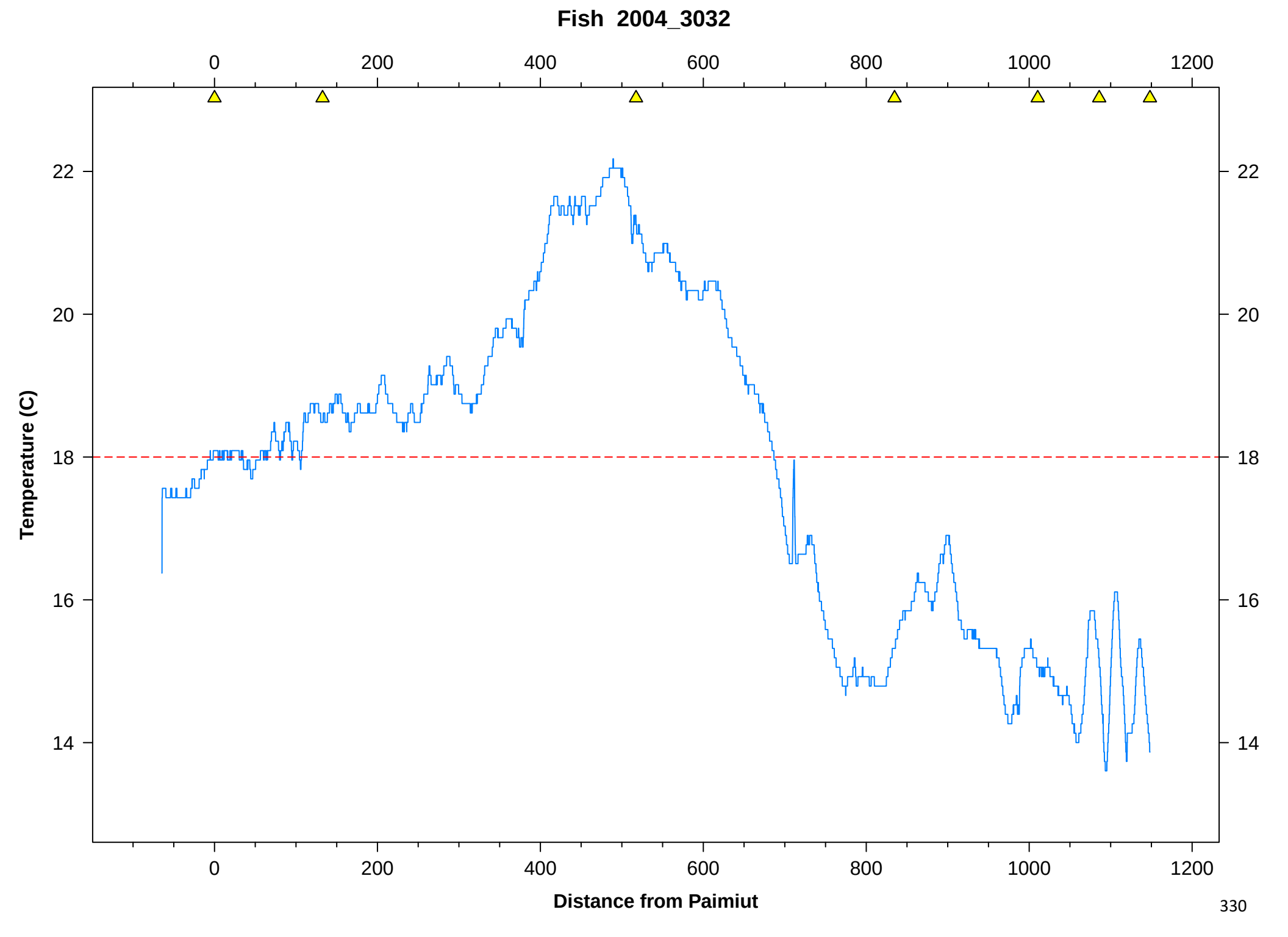

Fish 2004_3023
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Depth (m)
Temperature (C)
10
12
14
16
18
20
0
10
20

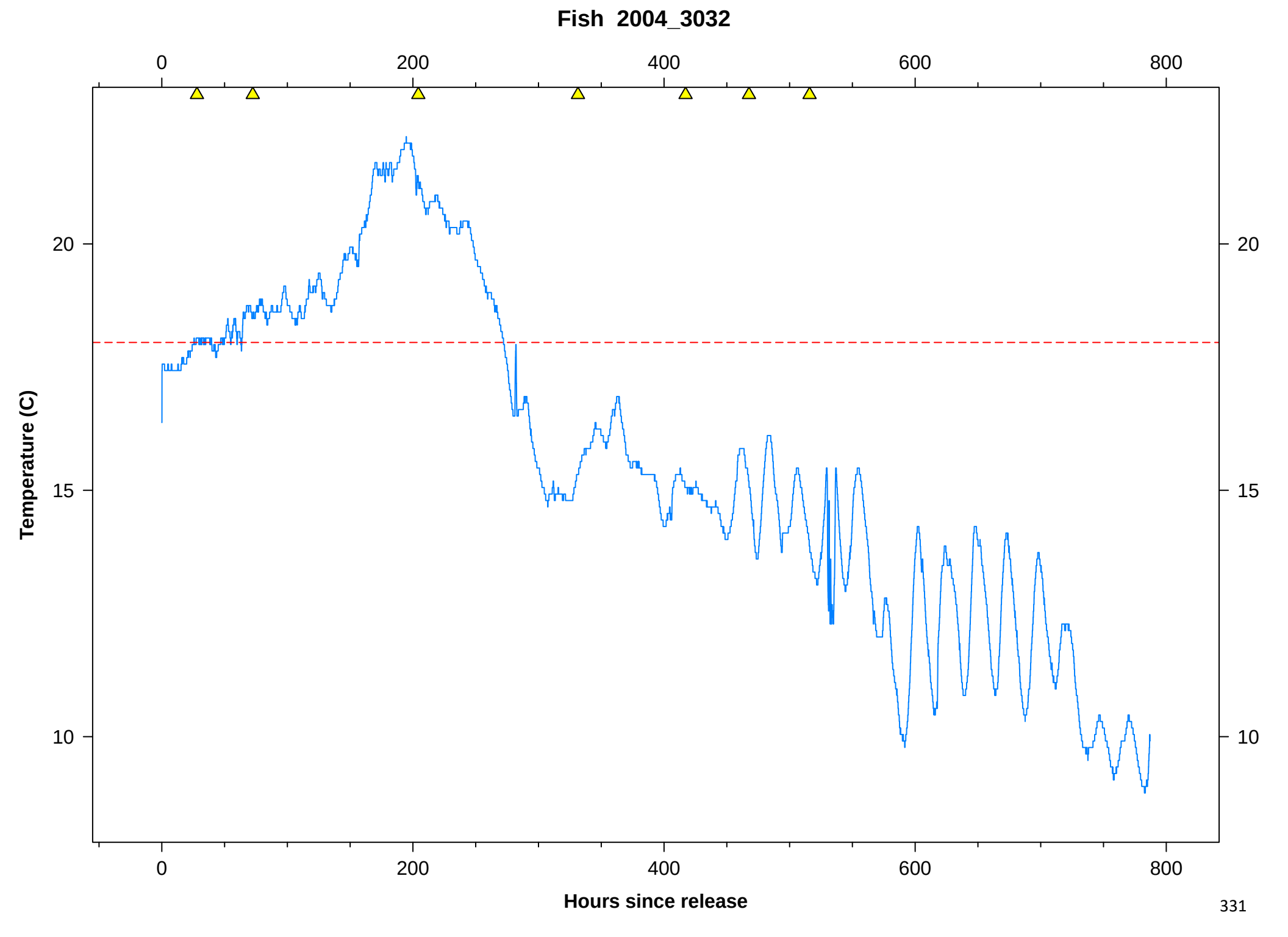

Fish 2004_3032
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

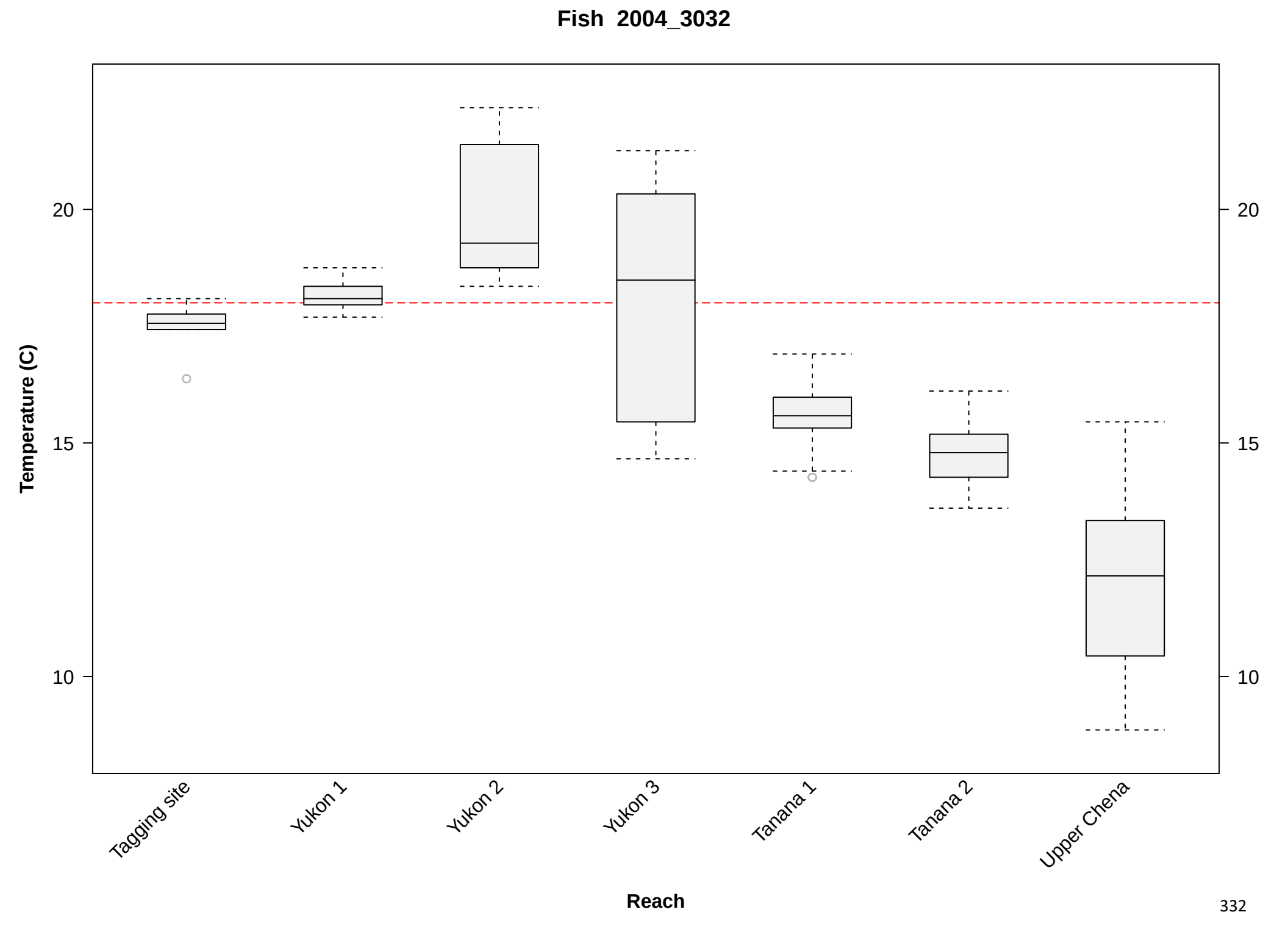

Fish 2004_3032
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Hours since release

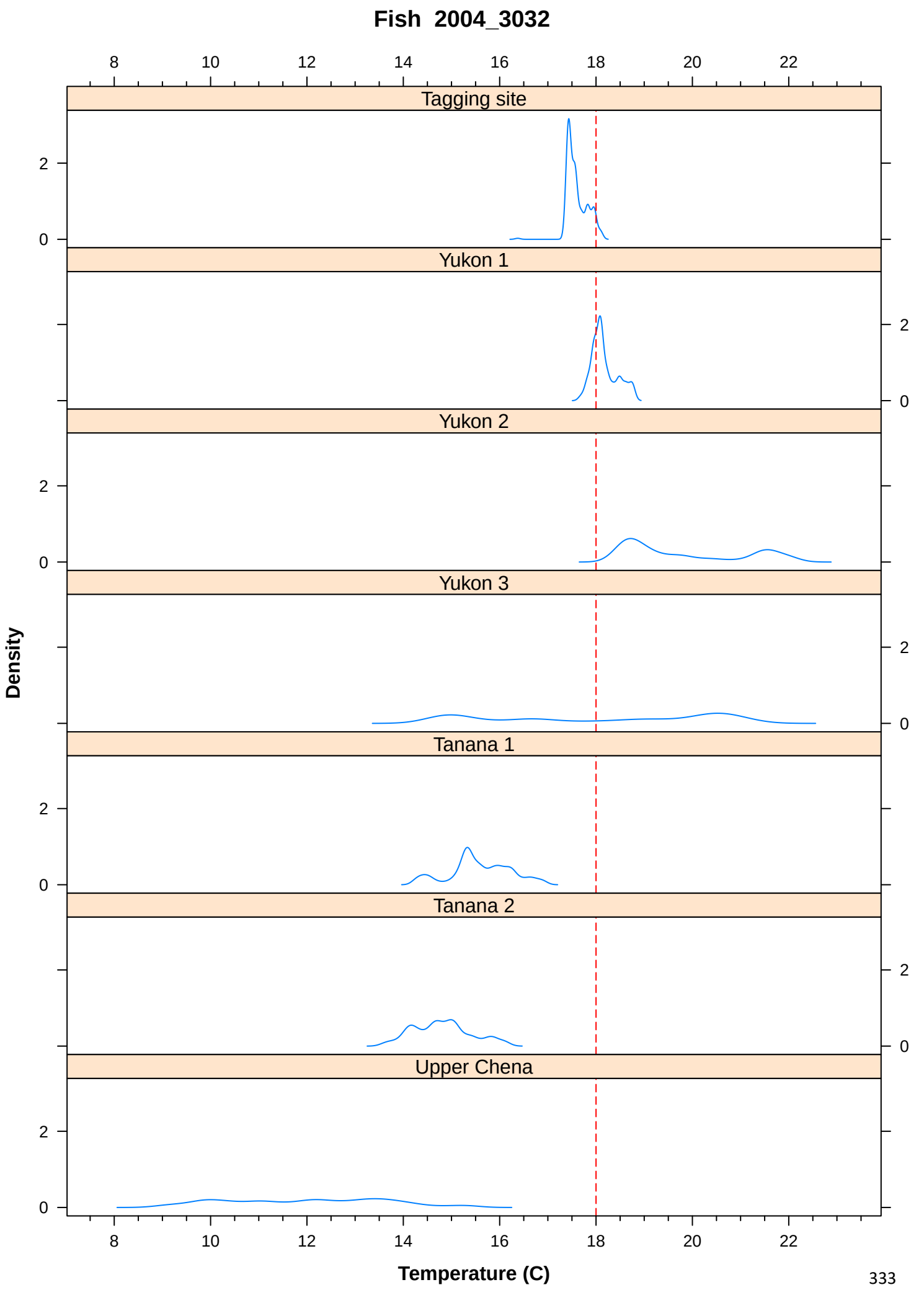

Fish 2004_3032
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Reach

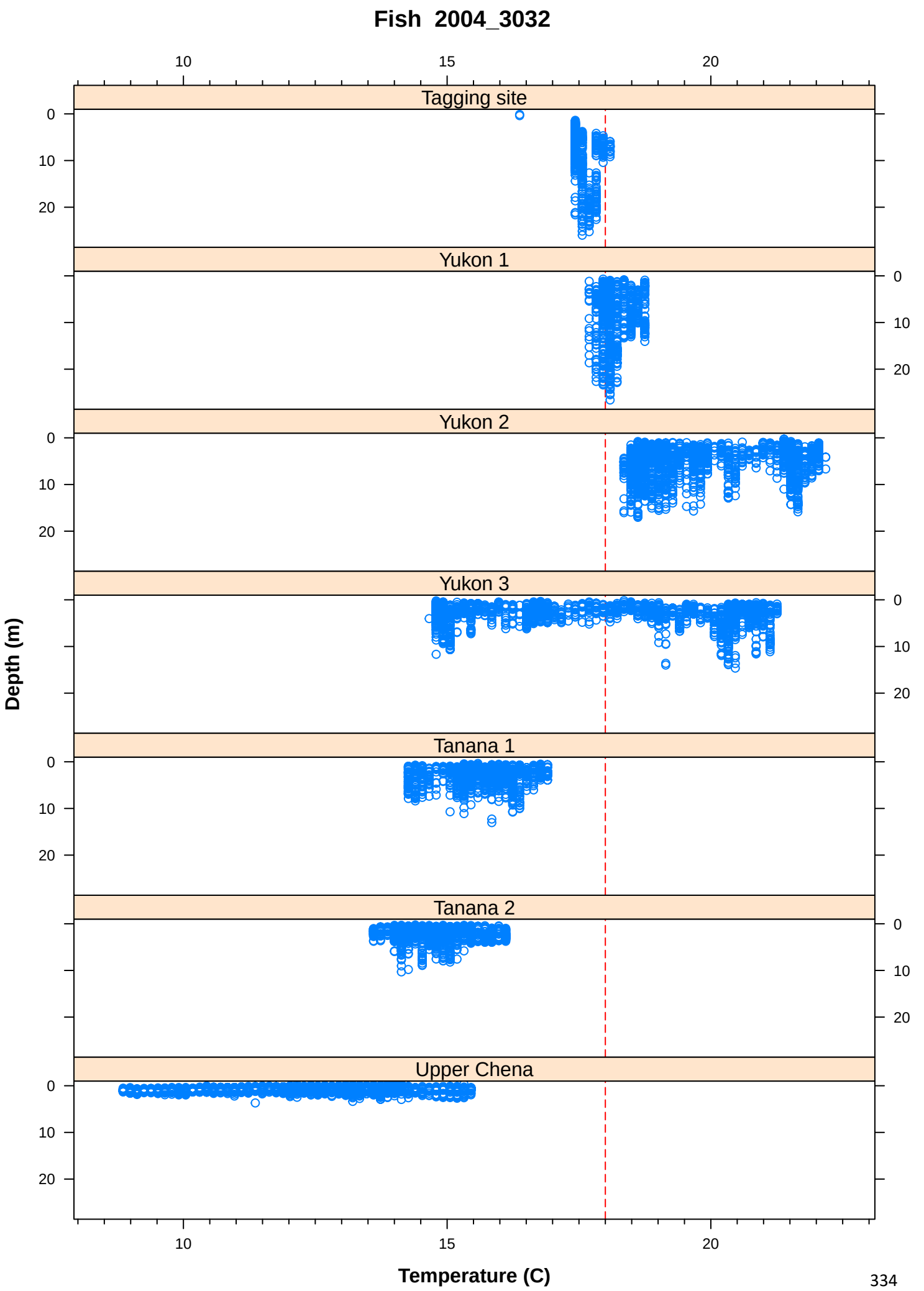

Fish 2004_3032
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Density
1.0
0.5
0.0
0
5
10
15
20
25
30
Depth (m)

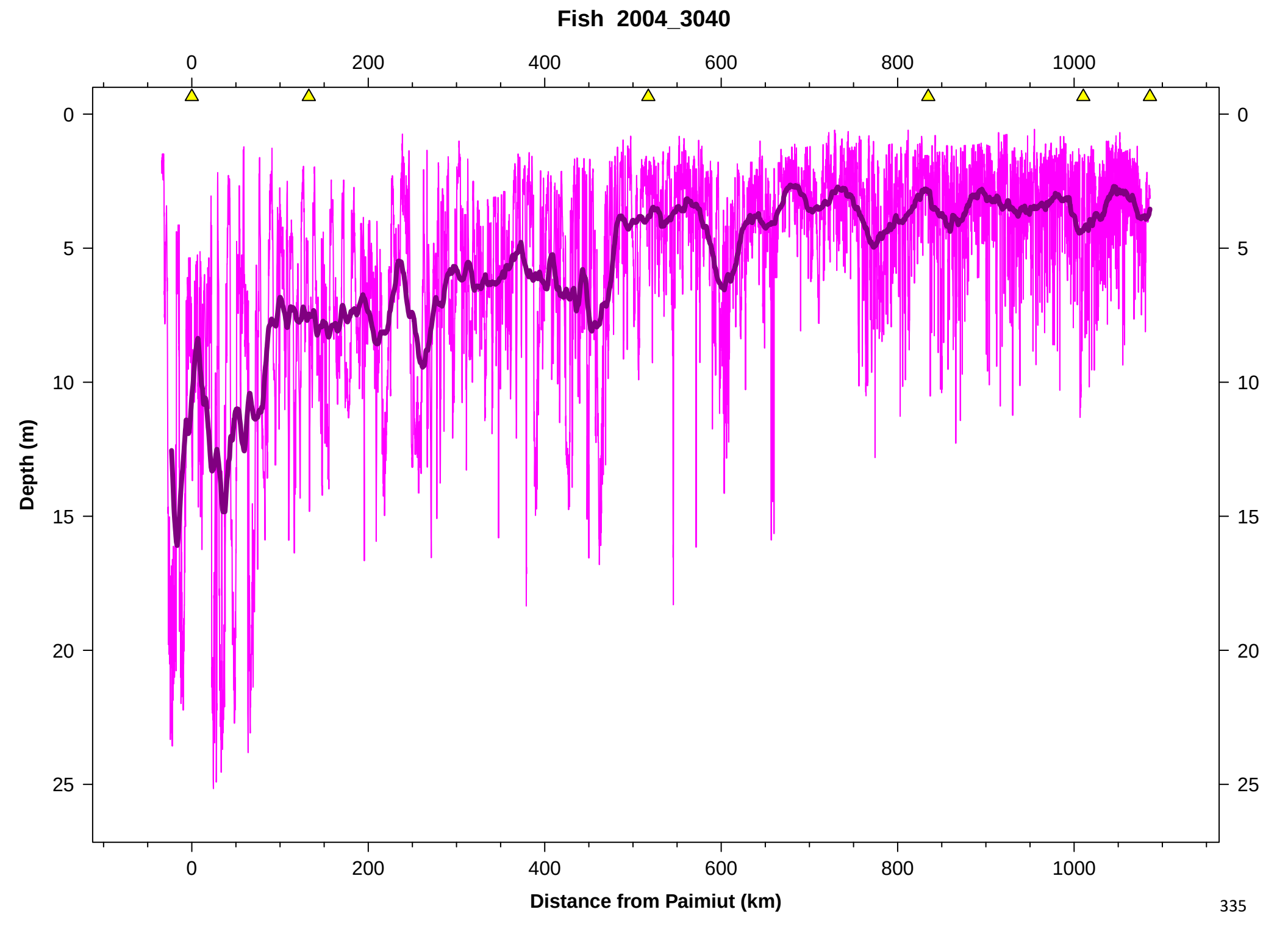

Fish 2004_3032
0
200
400
600
800
1000
1200
22
20
18
16
14
Temperature (C)
Distance from Paimiut

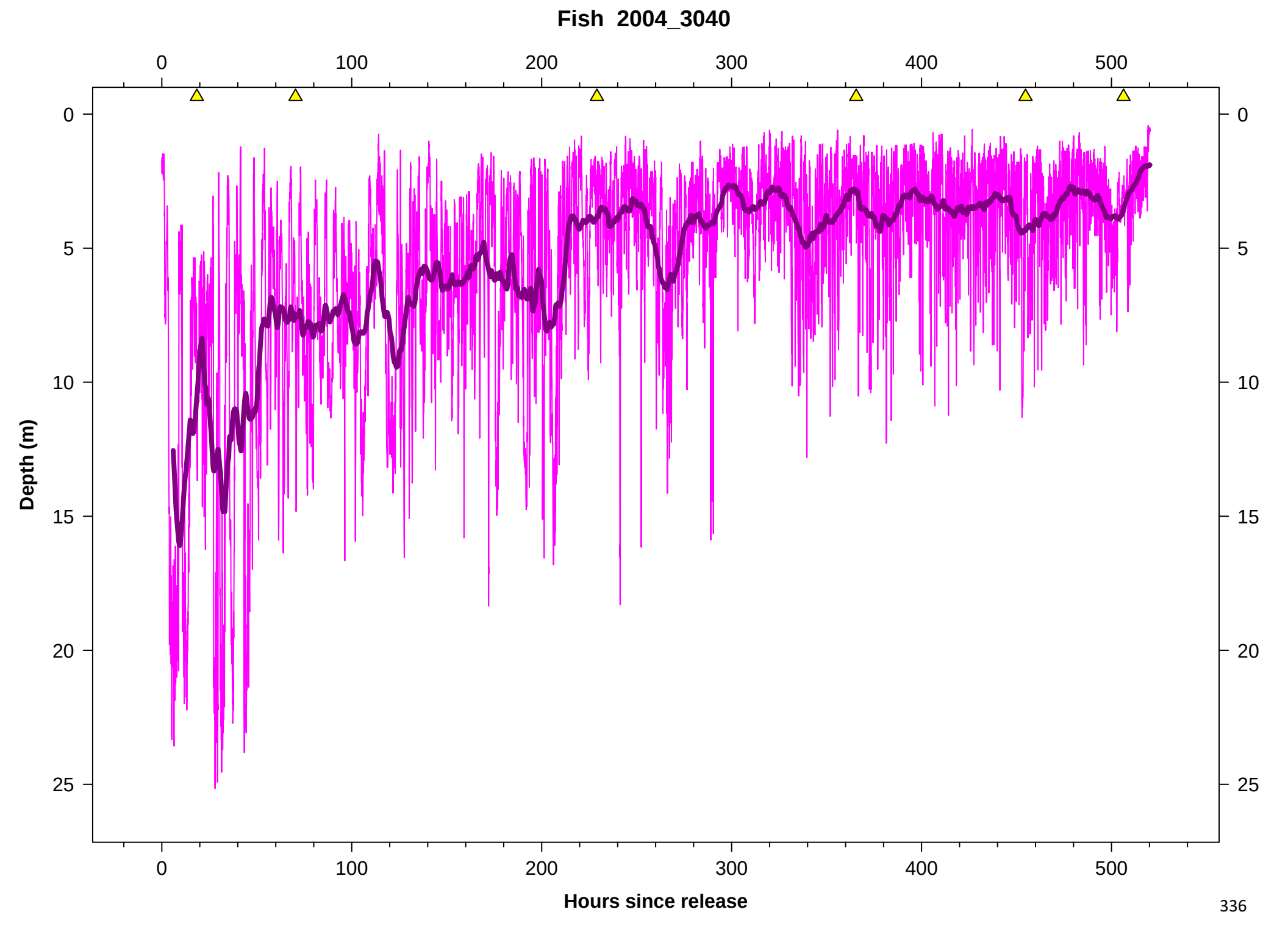

Fish 2004_3032
0
200
400
600
800
20
15
10
Temperature (C)
Hours since release

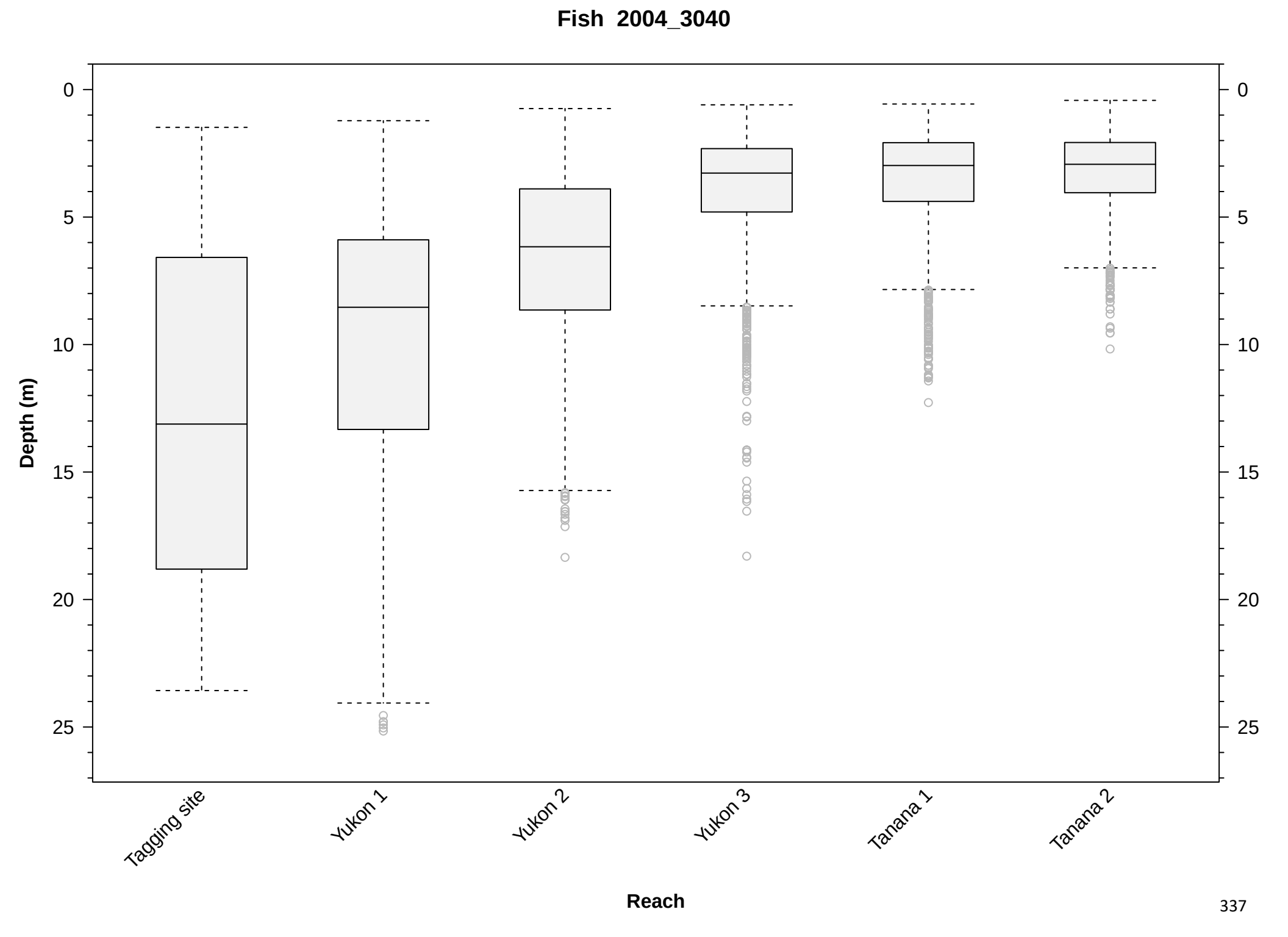

Fish 2004_3032
Temperature (C)
20
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Reach
332

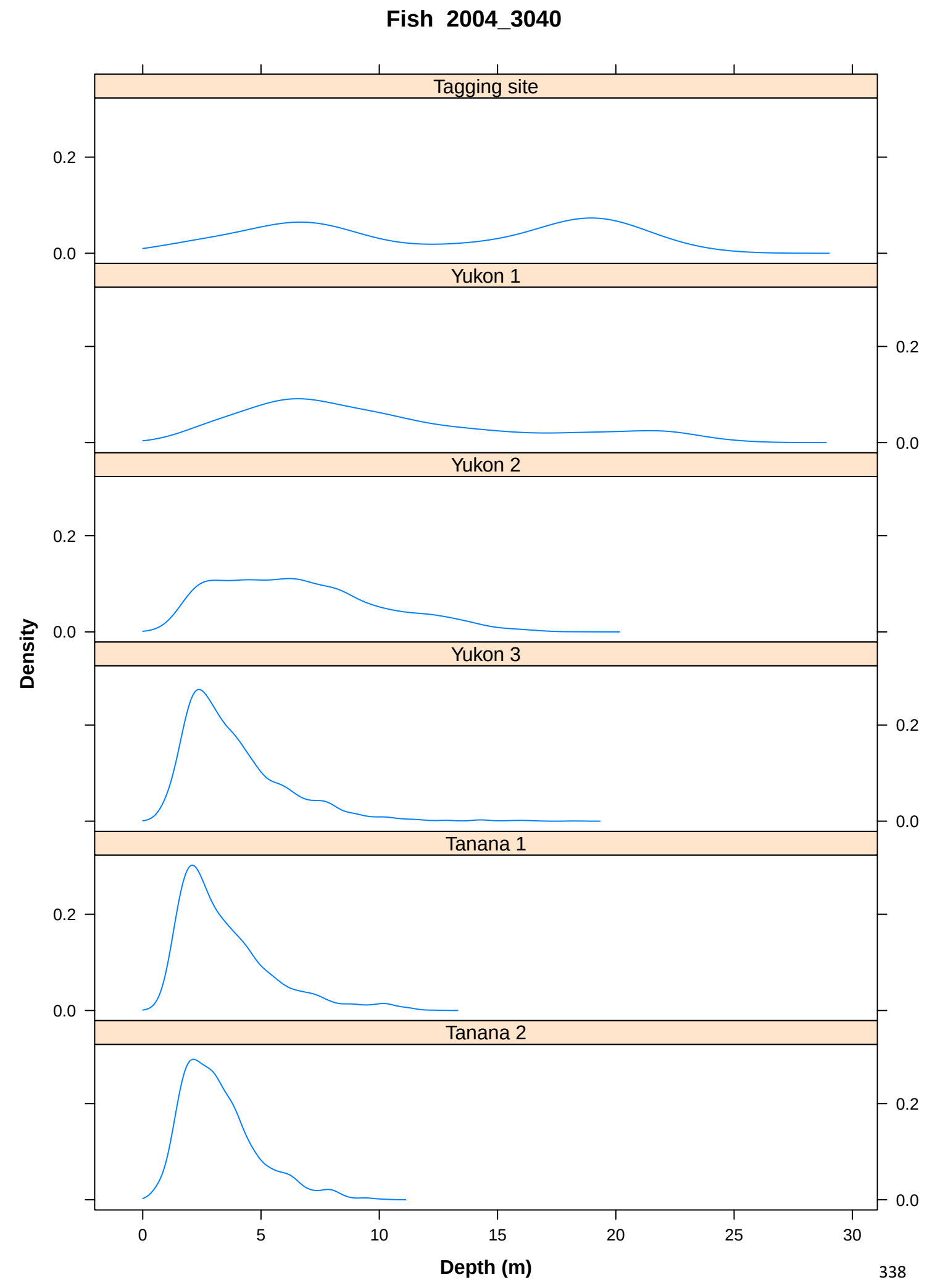

Fish 2004_3032
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Density
Temperature (C)
8
10
12
14
16
18
20
22
0
2

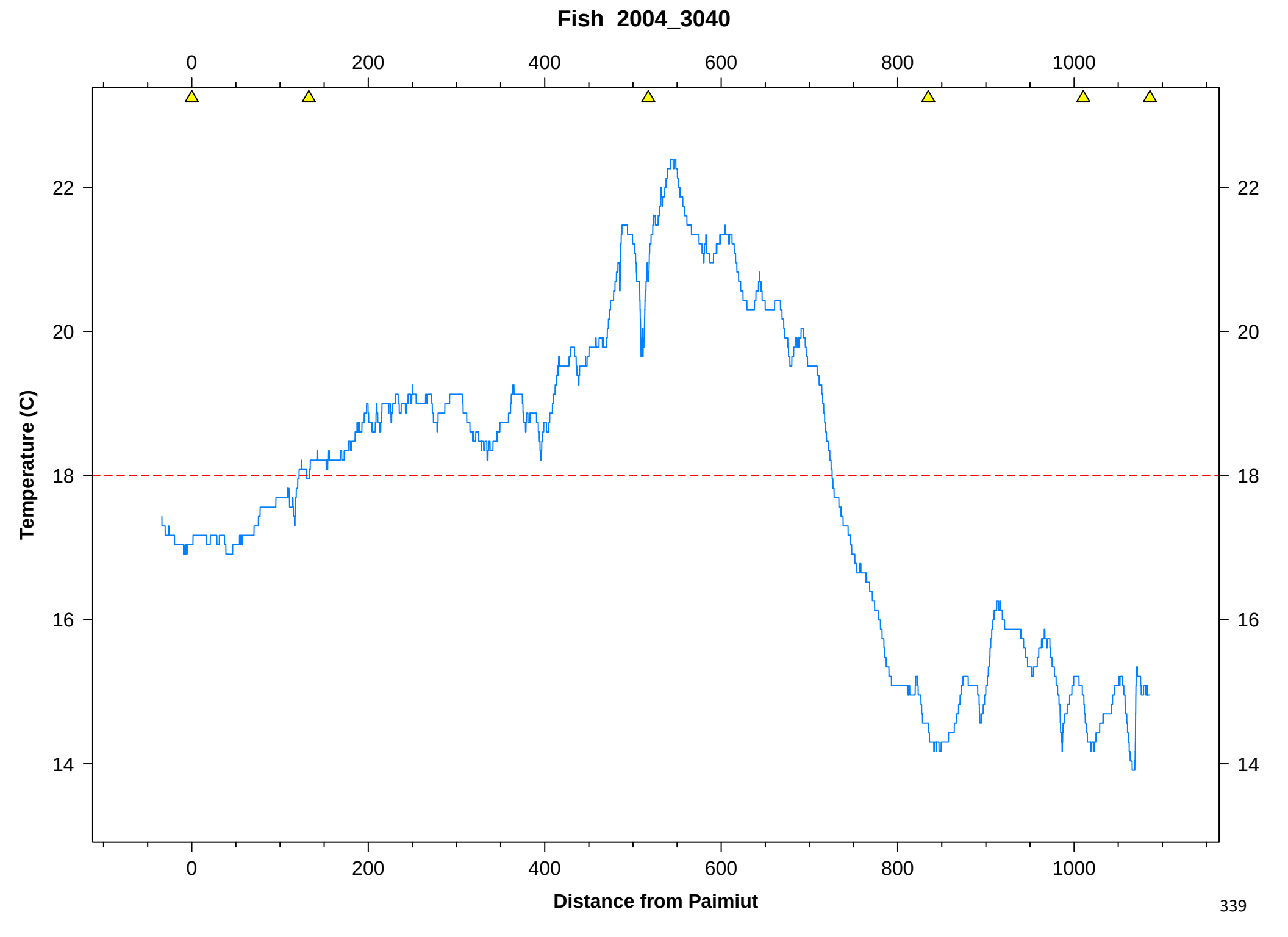

Fish 2004_3032
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Depth (m)
Temperature (C)
10
15
20
0
10
20

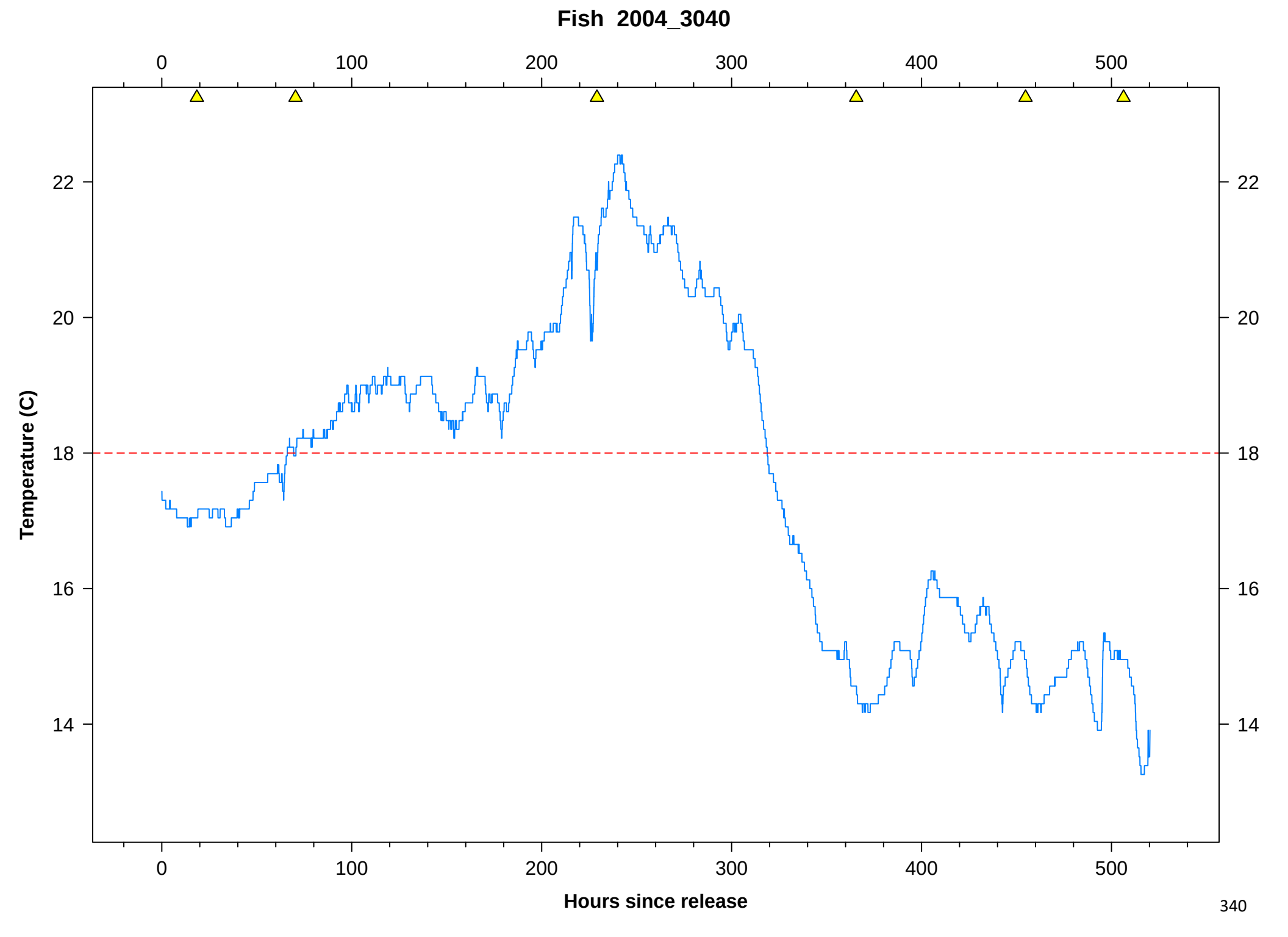

Fish 2004_3040
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

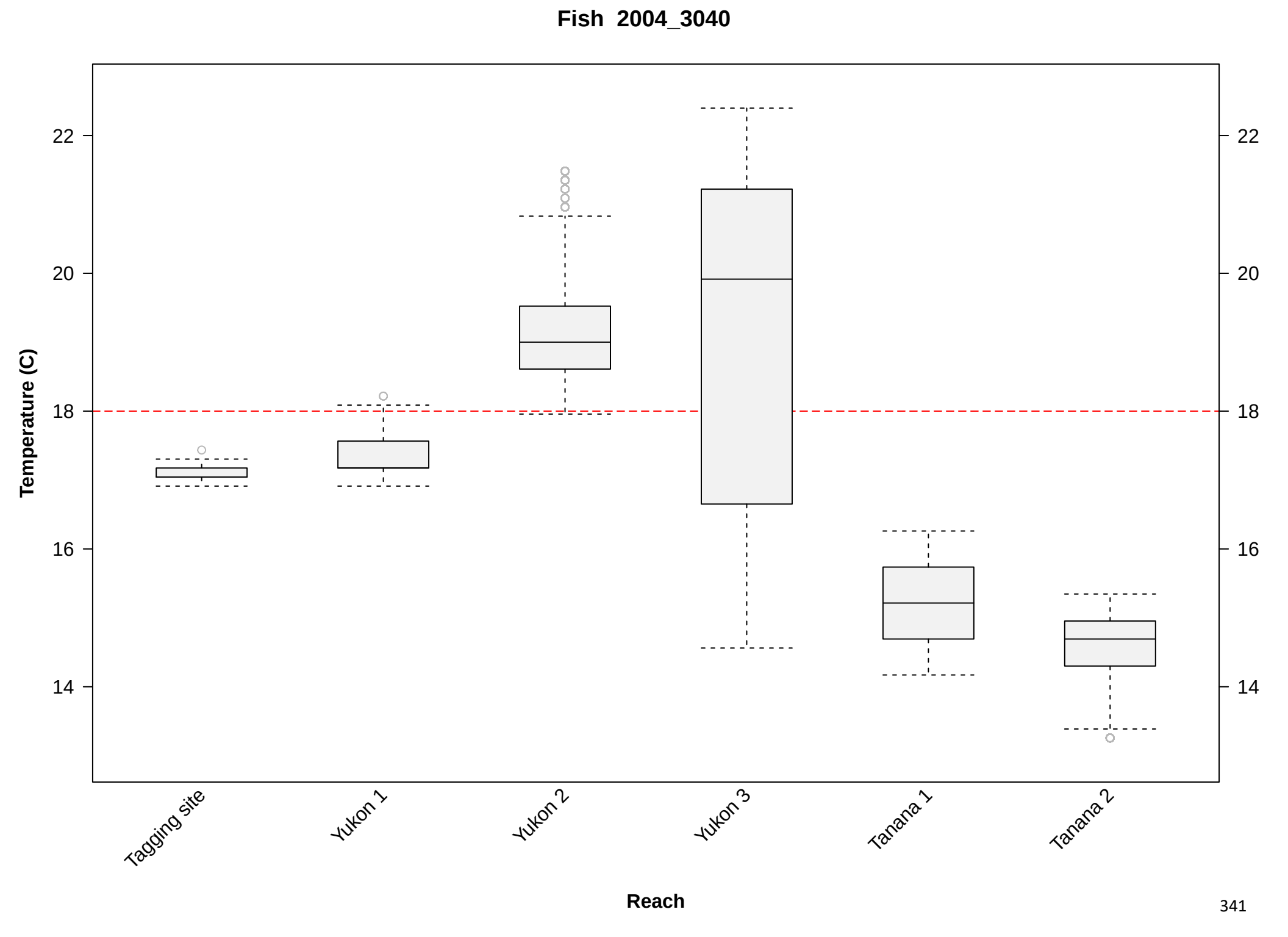

Fish 2004_3040
0
100
200
300
400
500
0
5
10
15
20
25
Depth (m)
Hours since release

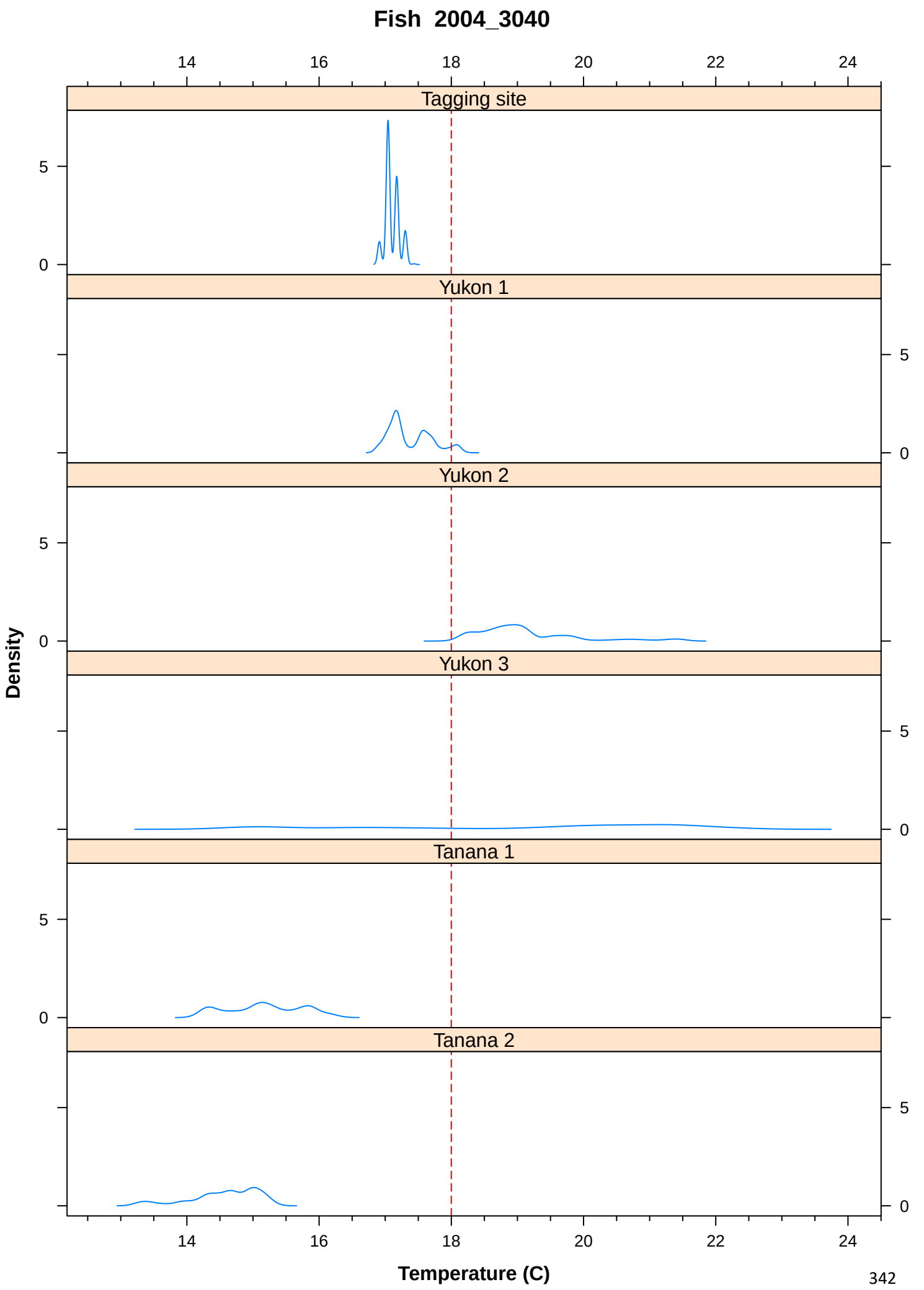

Fish 2004_3040
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Reach

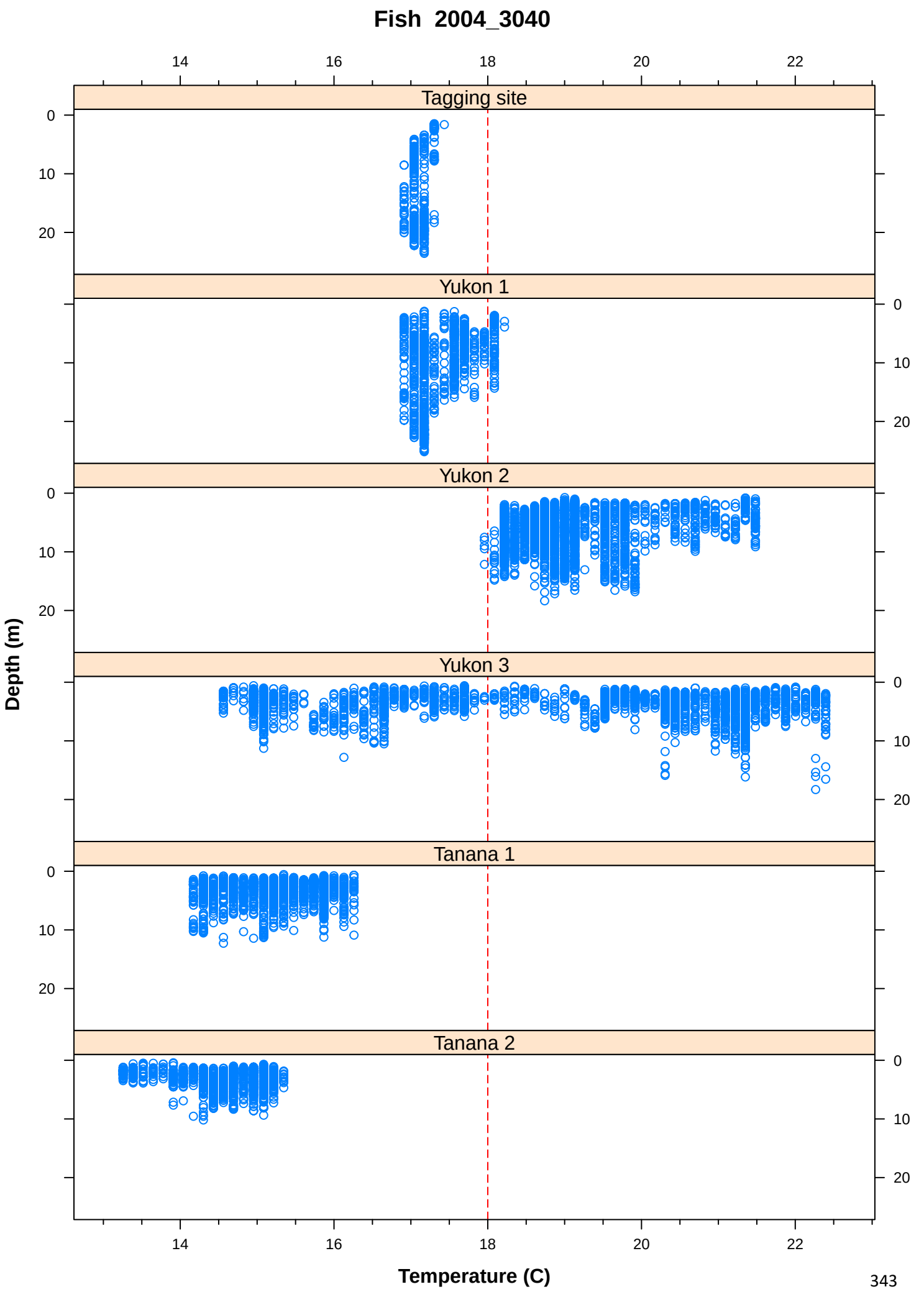

Fish 2004_3040
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Density
0.0
0.2
0
5
10
15
20
25
30
Depth (m)

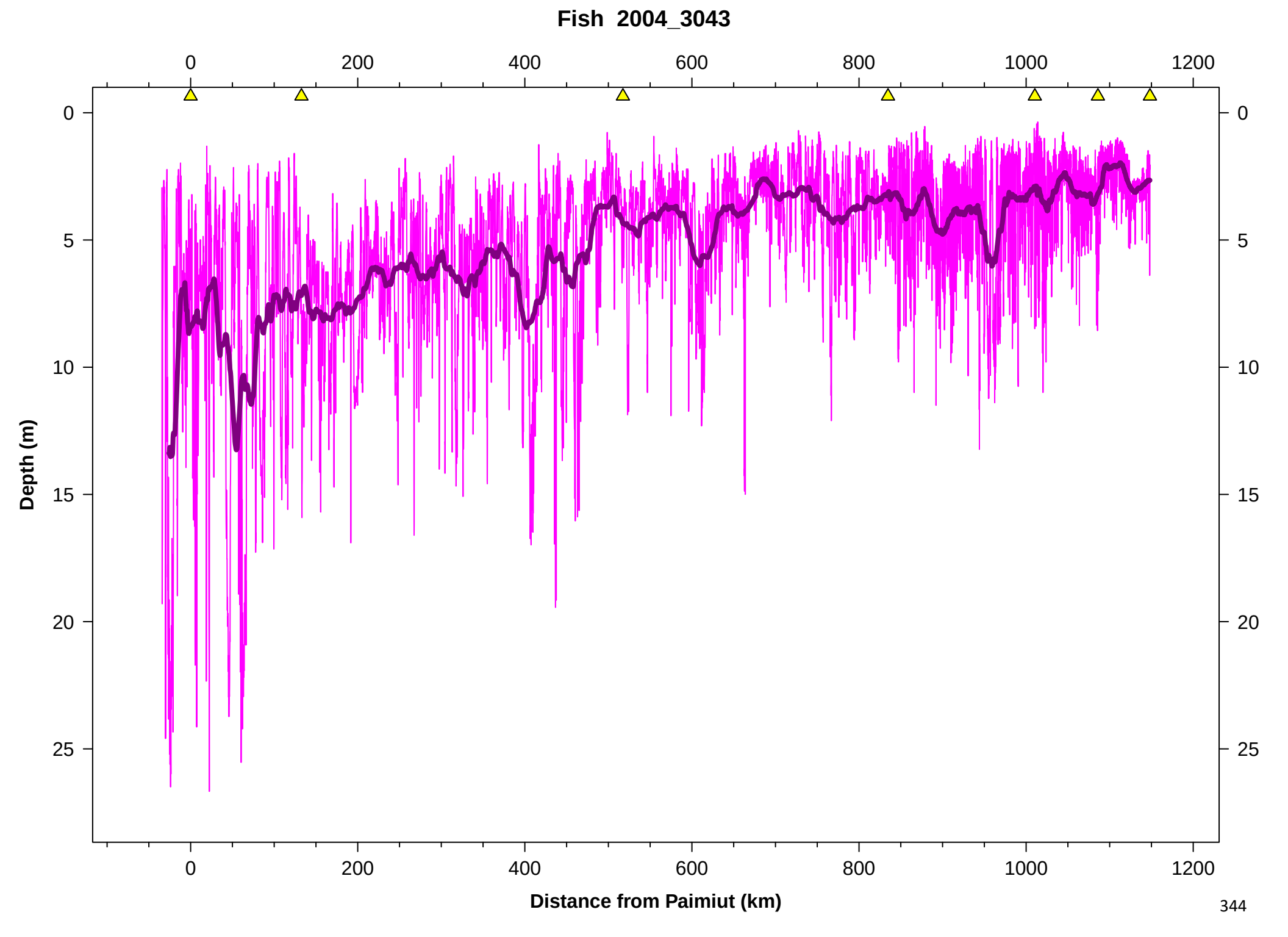

Fish 2004_3040
0
200
400
600
800
1000
22
20
18
16
14
Temperature (C)
Distance from Paimiut

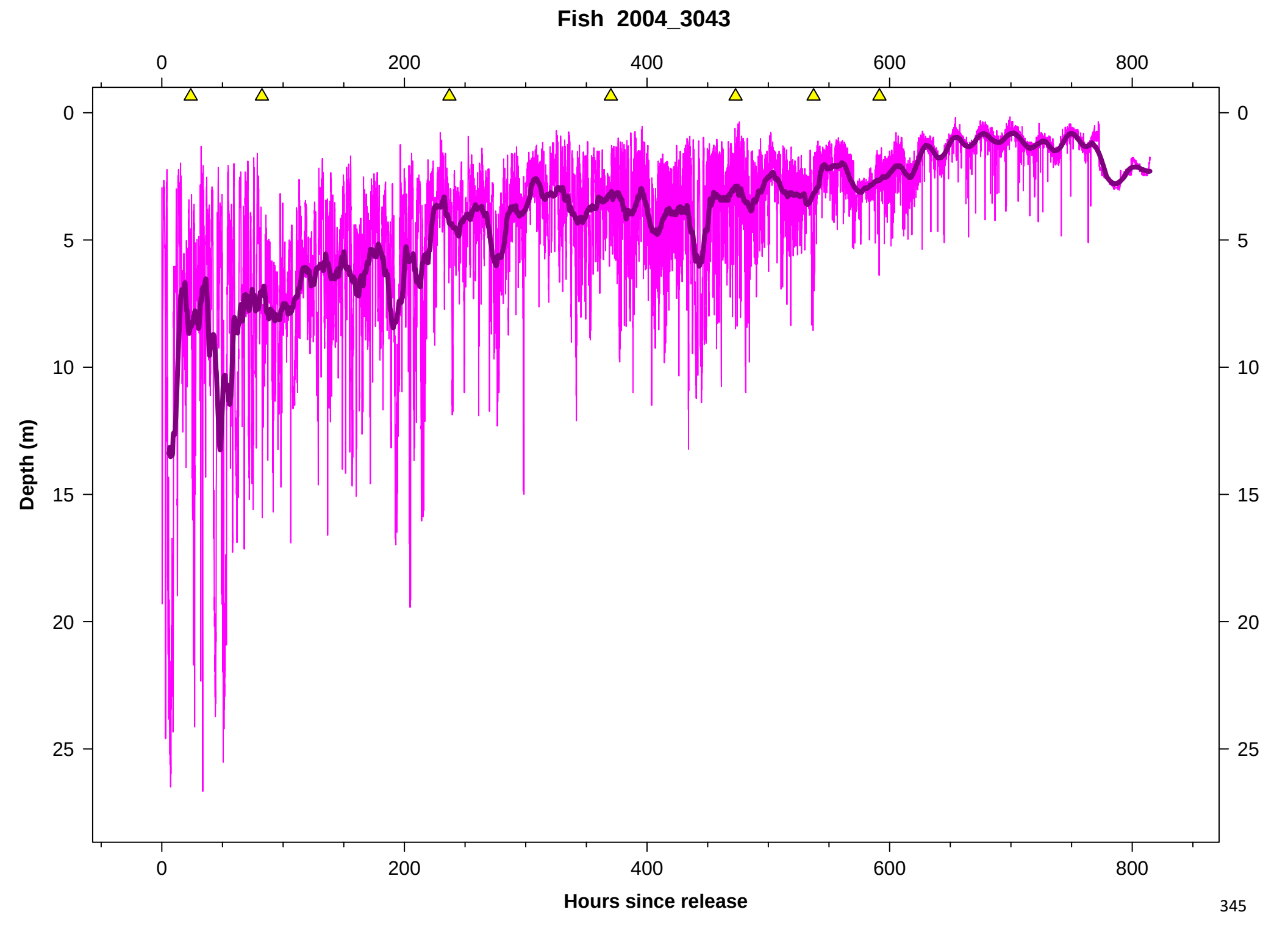

Fish 2004_3040
0
100
200
300
400
500
22
20
18
16
14
Temperature (C)
Hours since release
340

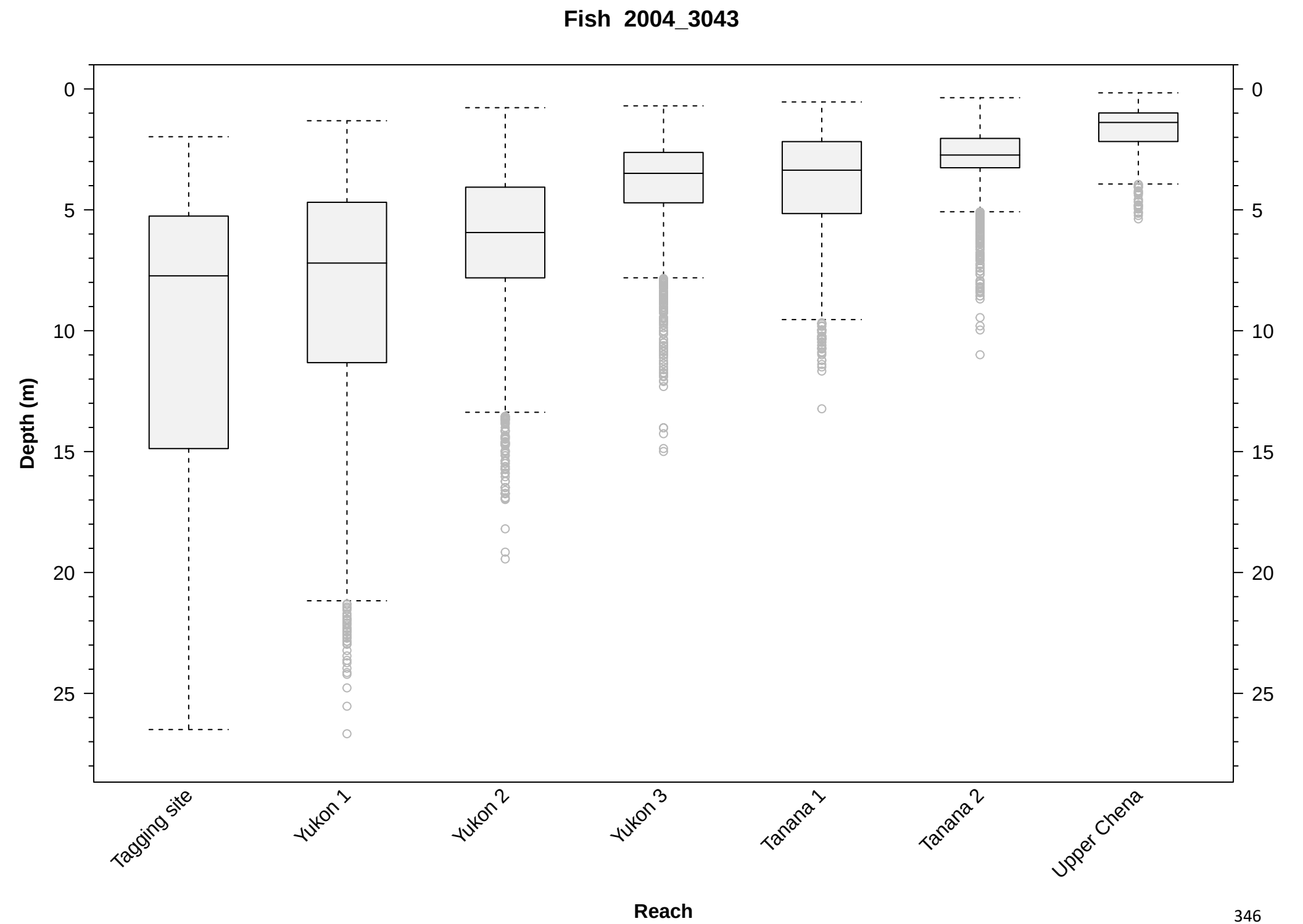

Fish 2004_3040
Temperature (C)
22
20
18
16
14
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Reach

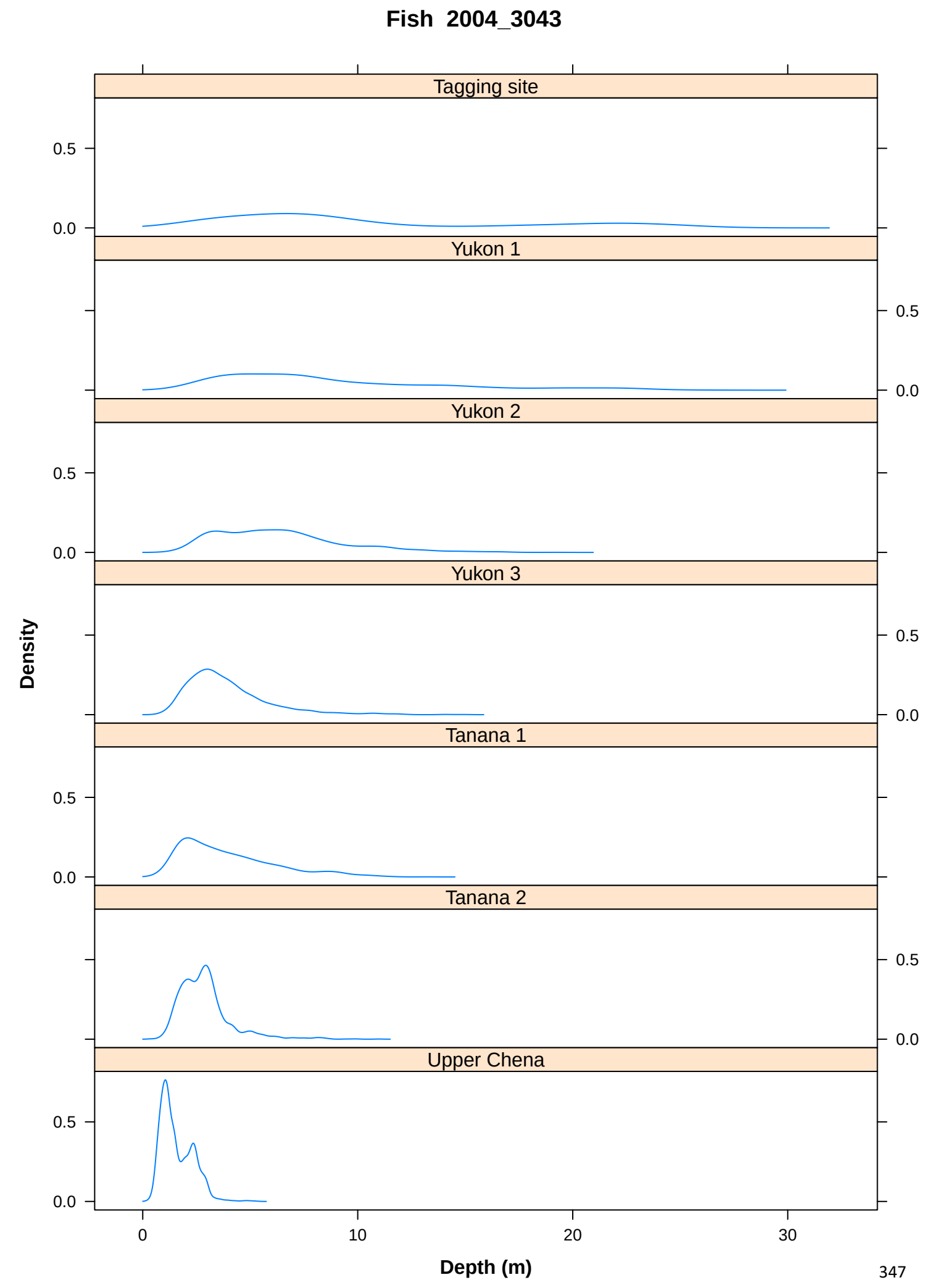

Fish 2004_3040
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Density
Temperature (C)
14
16
18
20
22
24
0
5

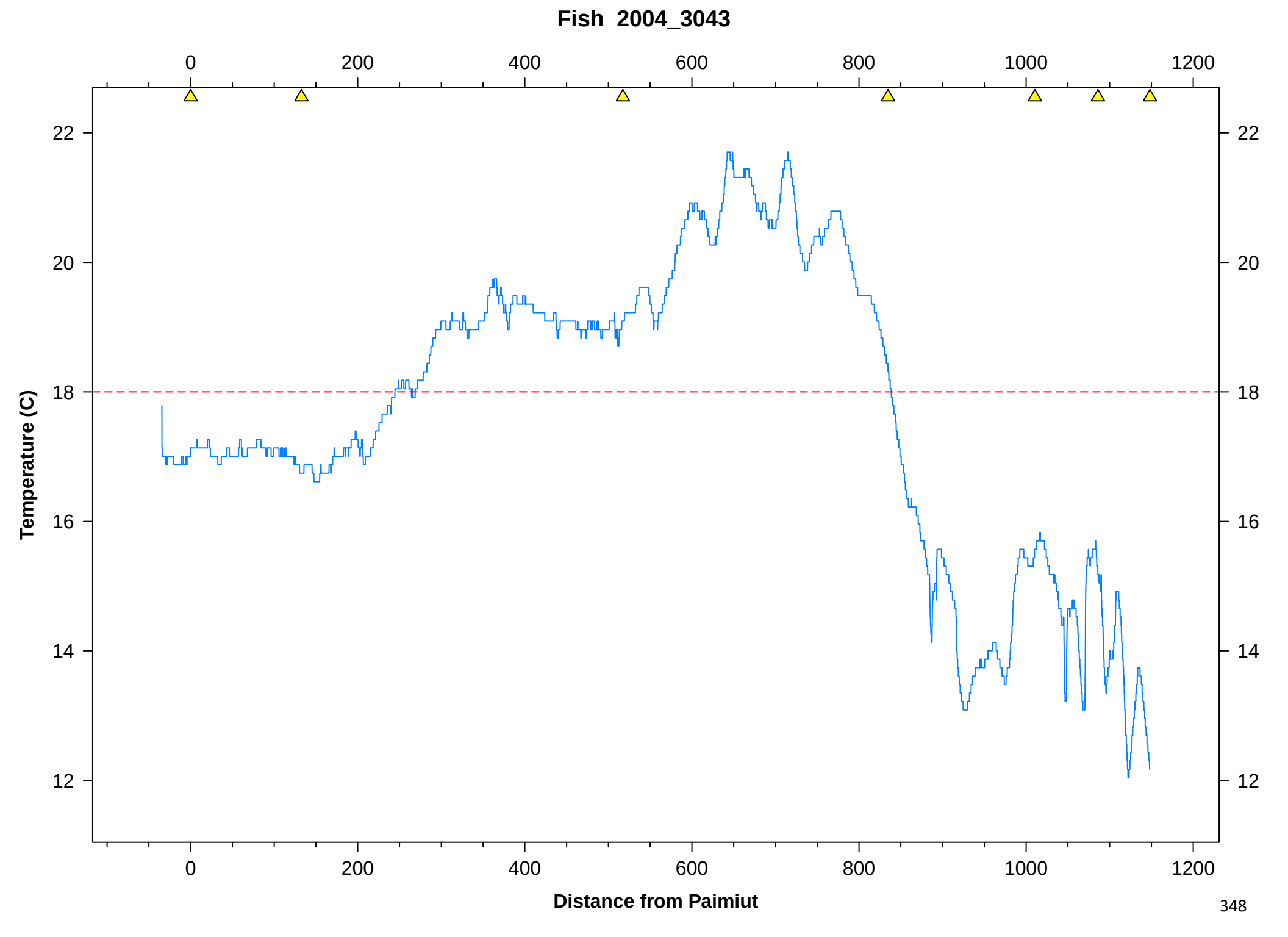

Fish 2004_3040
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Depth (m)
Temperature (C)
14
16
18
20
22
0
10
20

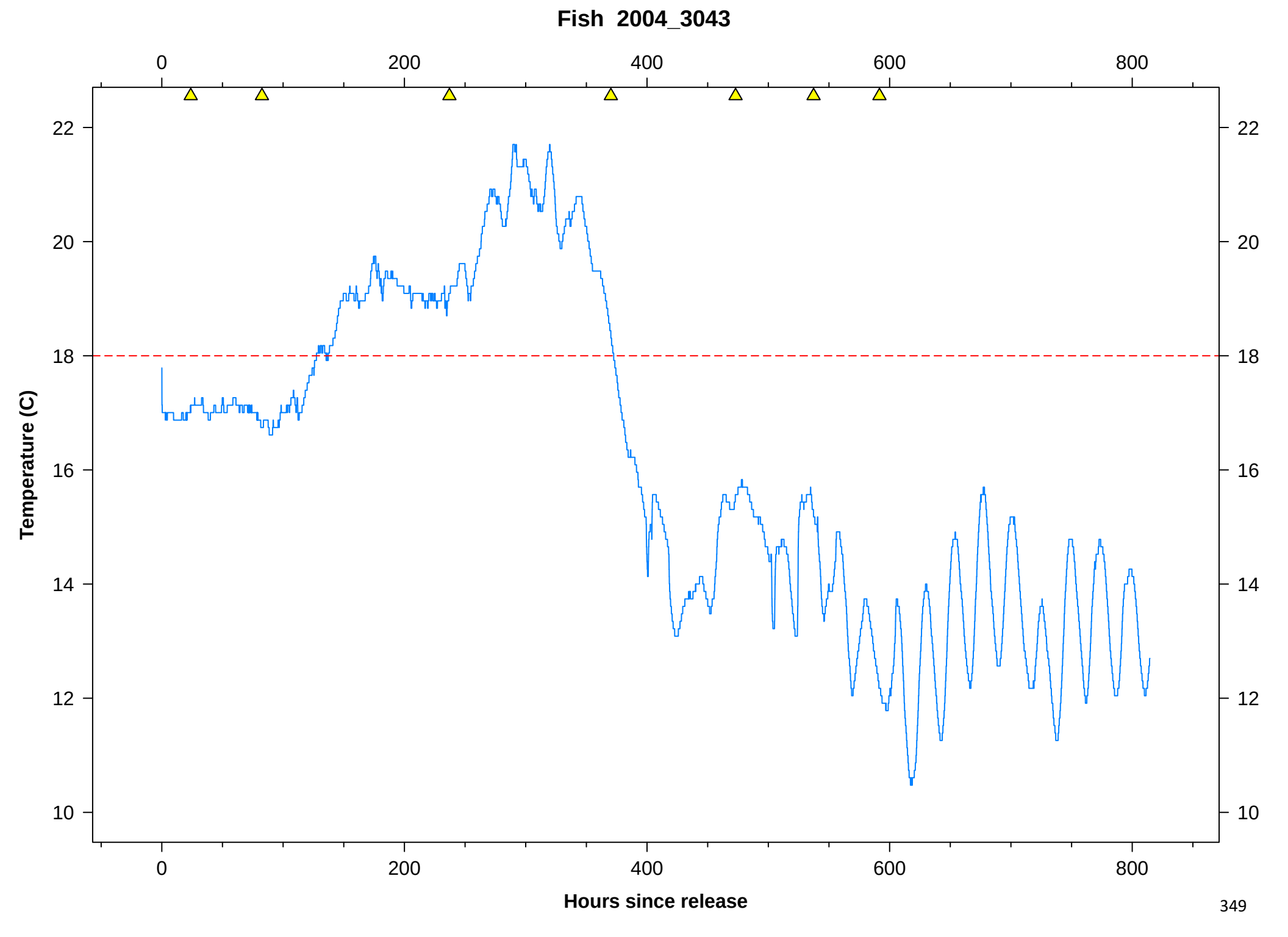

Fish 2004_3043
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

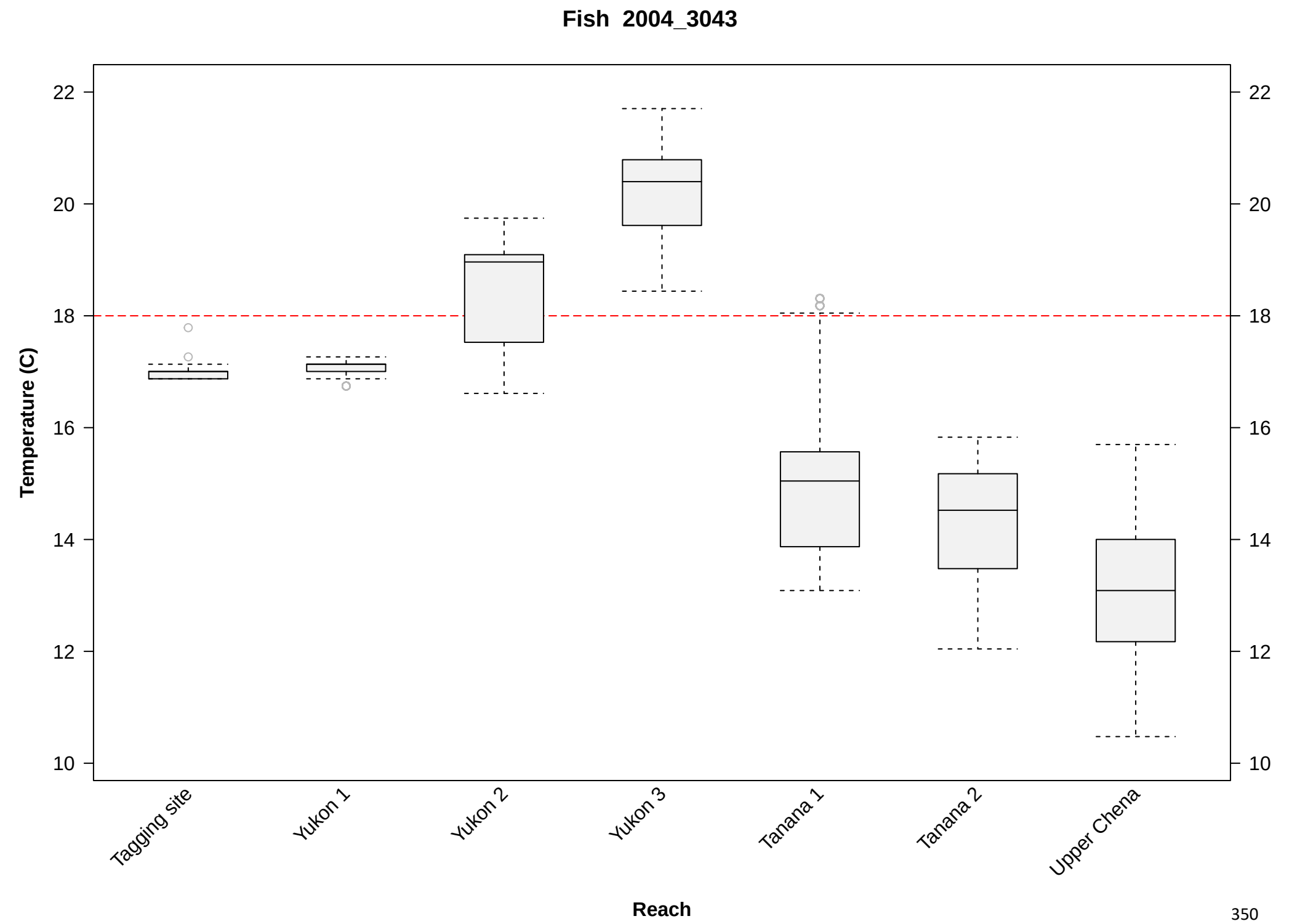

Fish 2004_3043
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Hours since release

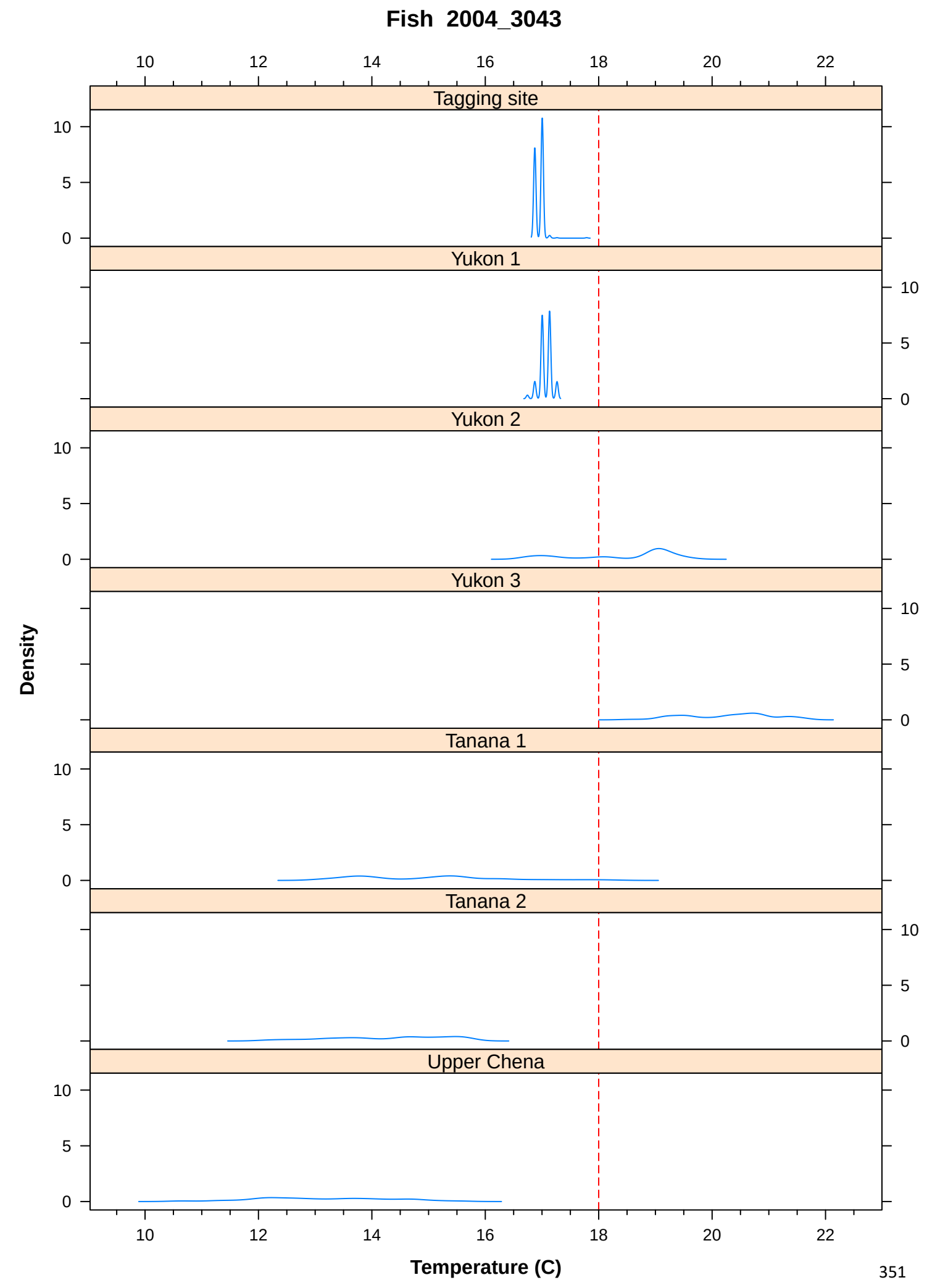

Fish 2004_3043
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Reach

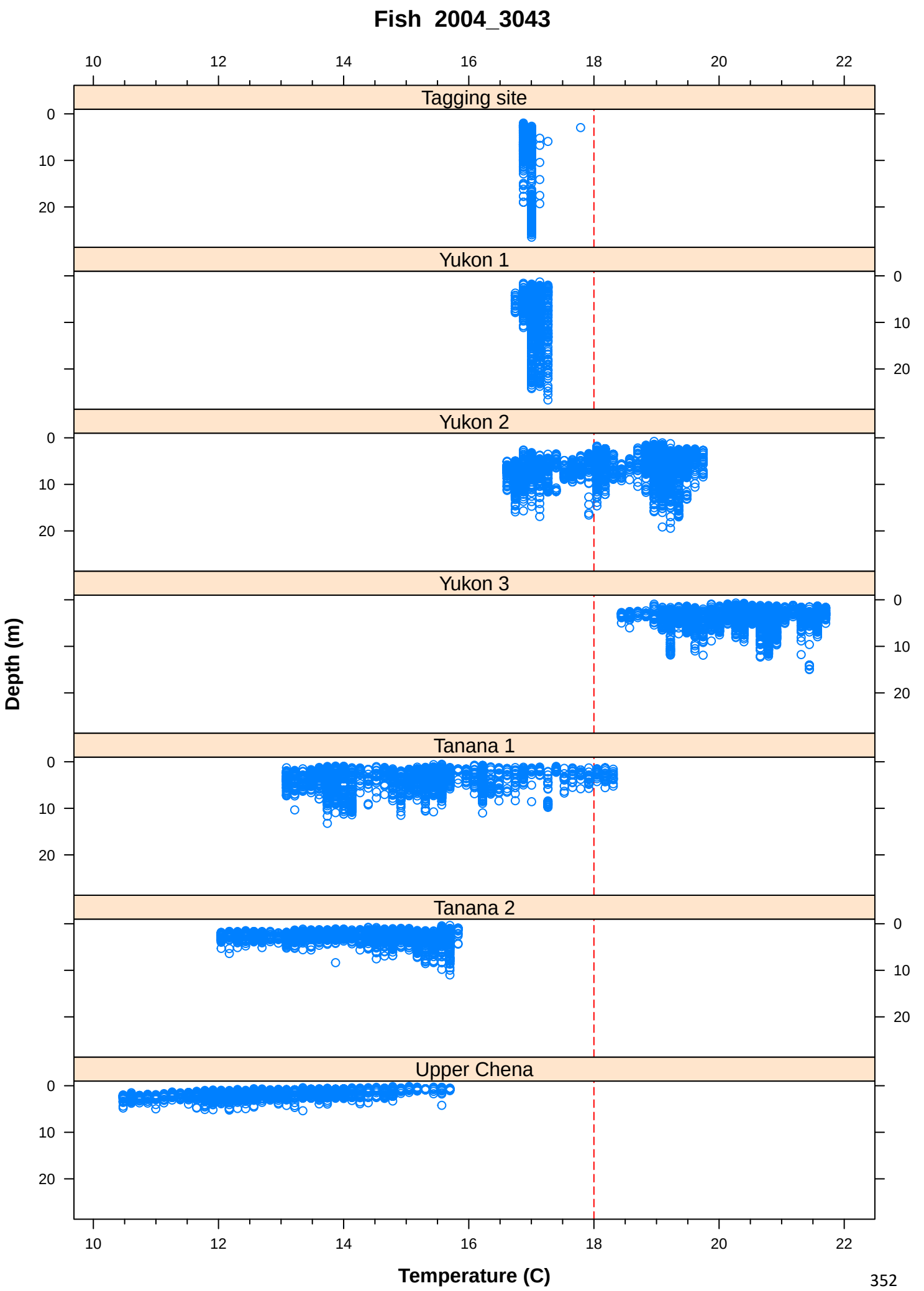

Fish 2004_3043
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Density
0.5
0.0
0
10
20
30
Depth (m)

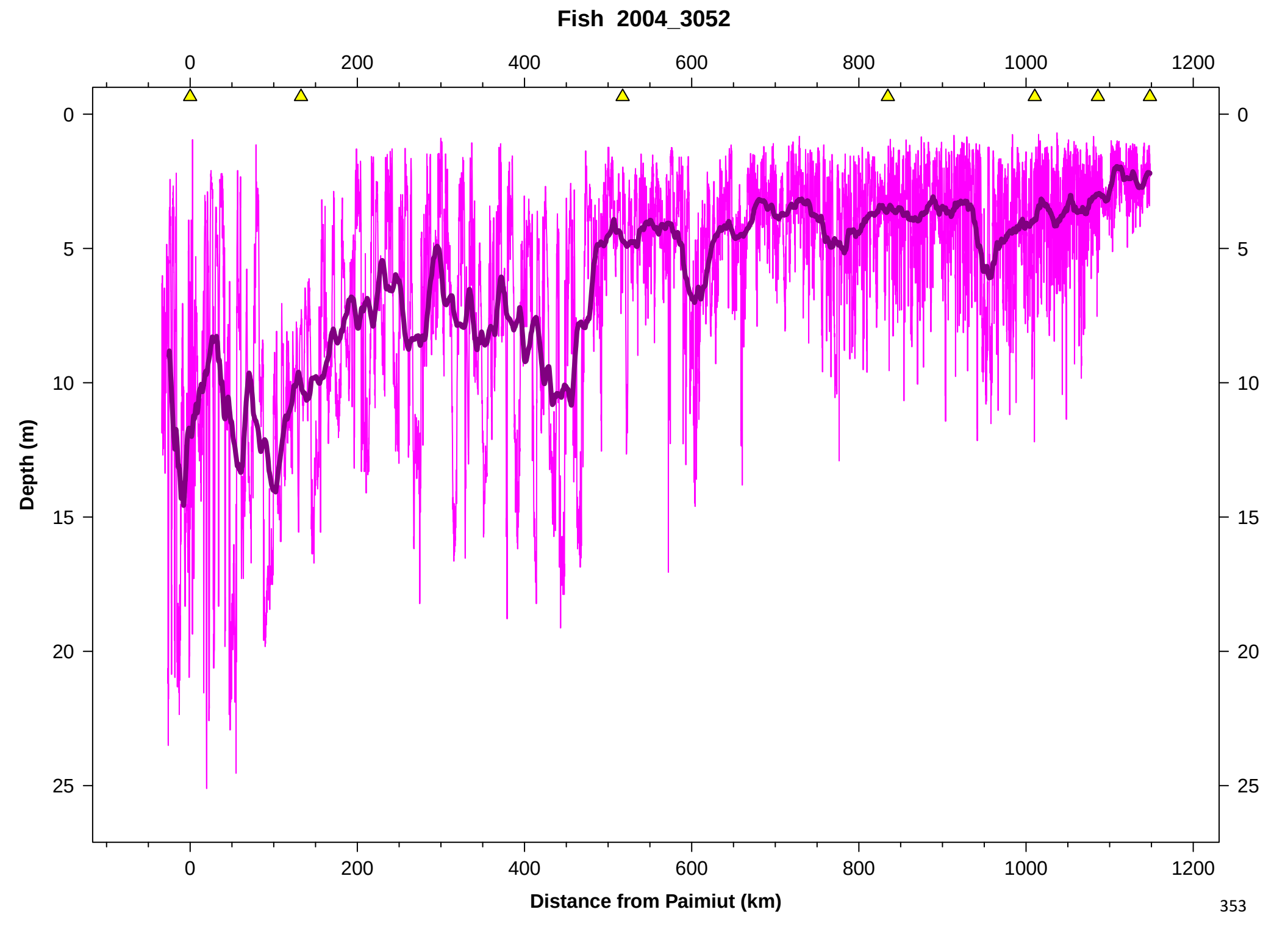

Fish 2004_3043
0
200
400
600
800
1000
1200
22
20
18
16
14
12
Temperature (C)
Distance from Paimiut

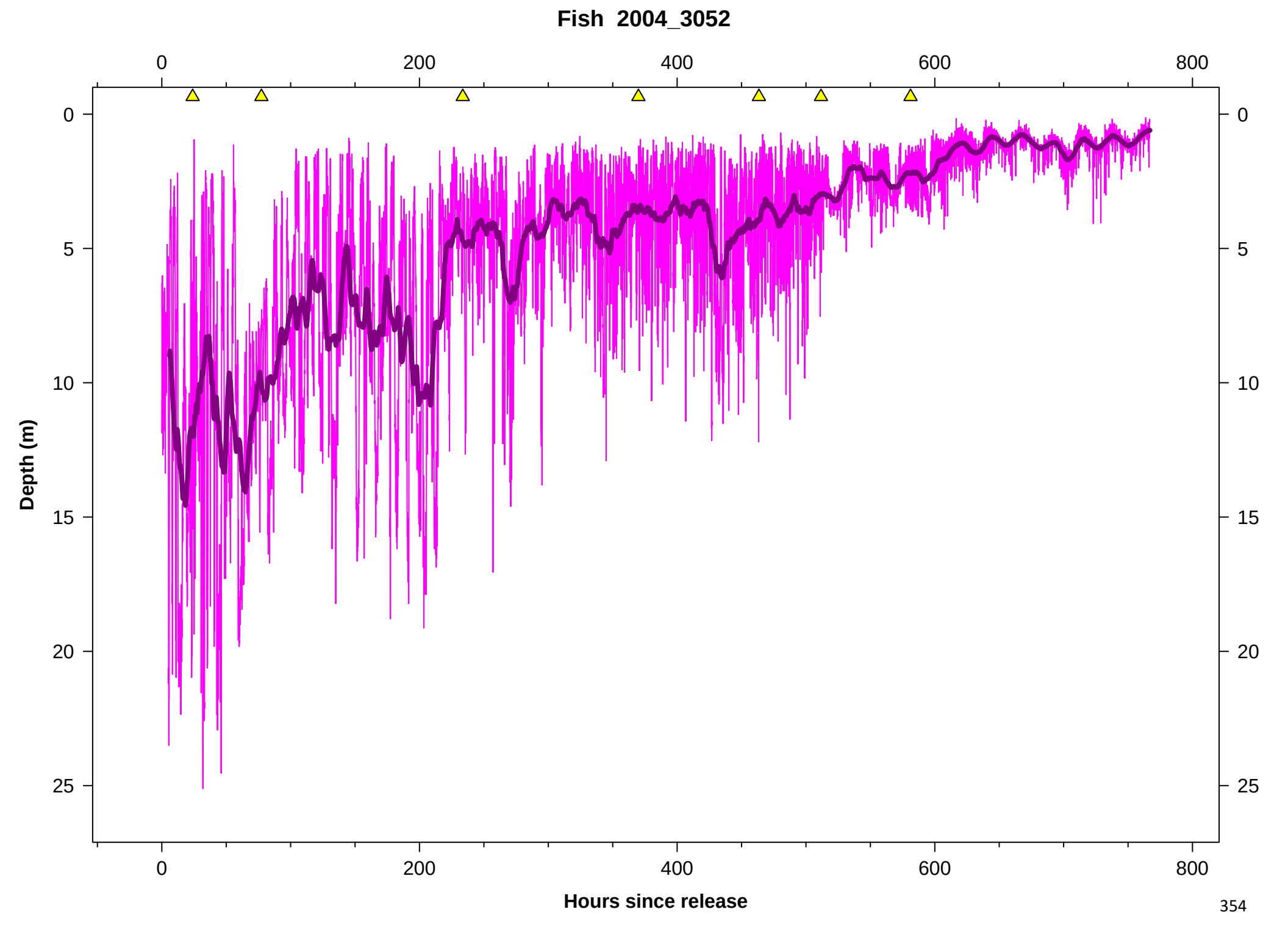

Fish 2004_3043
0
200
400
600
800
22
20
18
16
14
12
10
Temperature (C)
Hours since release

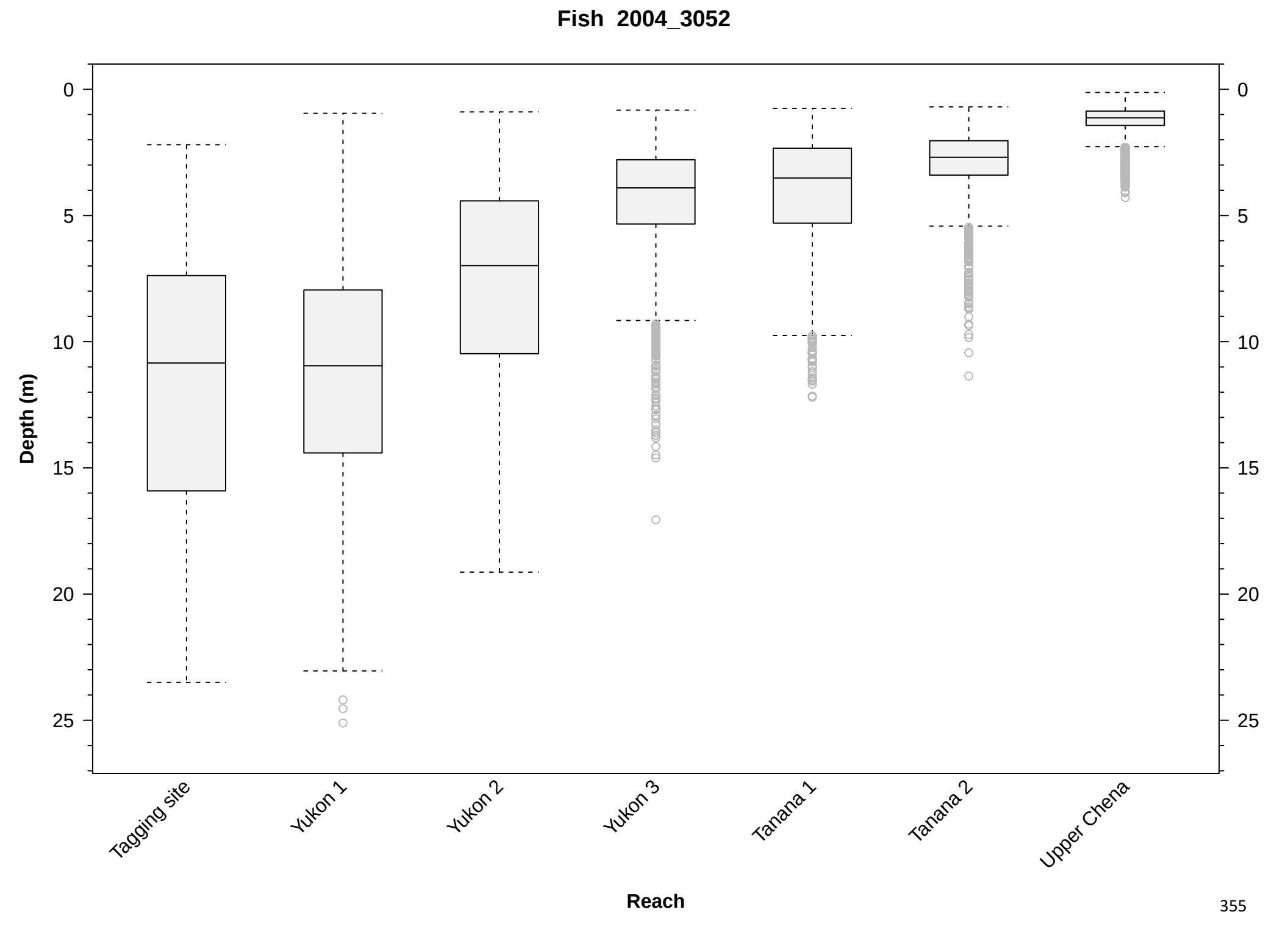

Fish 2004_3043
Temperature (C)
22
20
18
16
14
12
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Reach


Fish 2004_3043
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Density
Temperature (C)
10
12
14
16
18
20
22
0
5
10

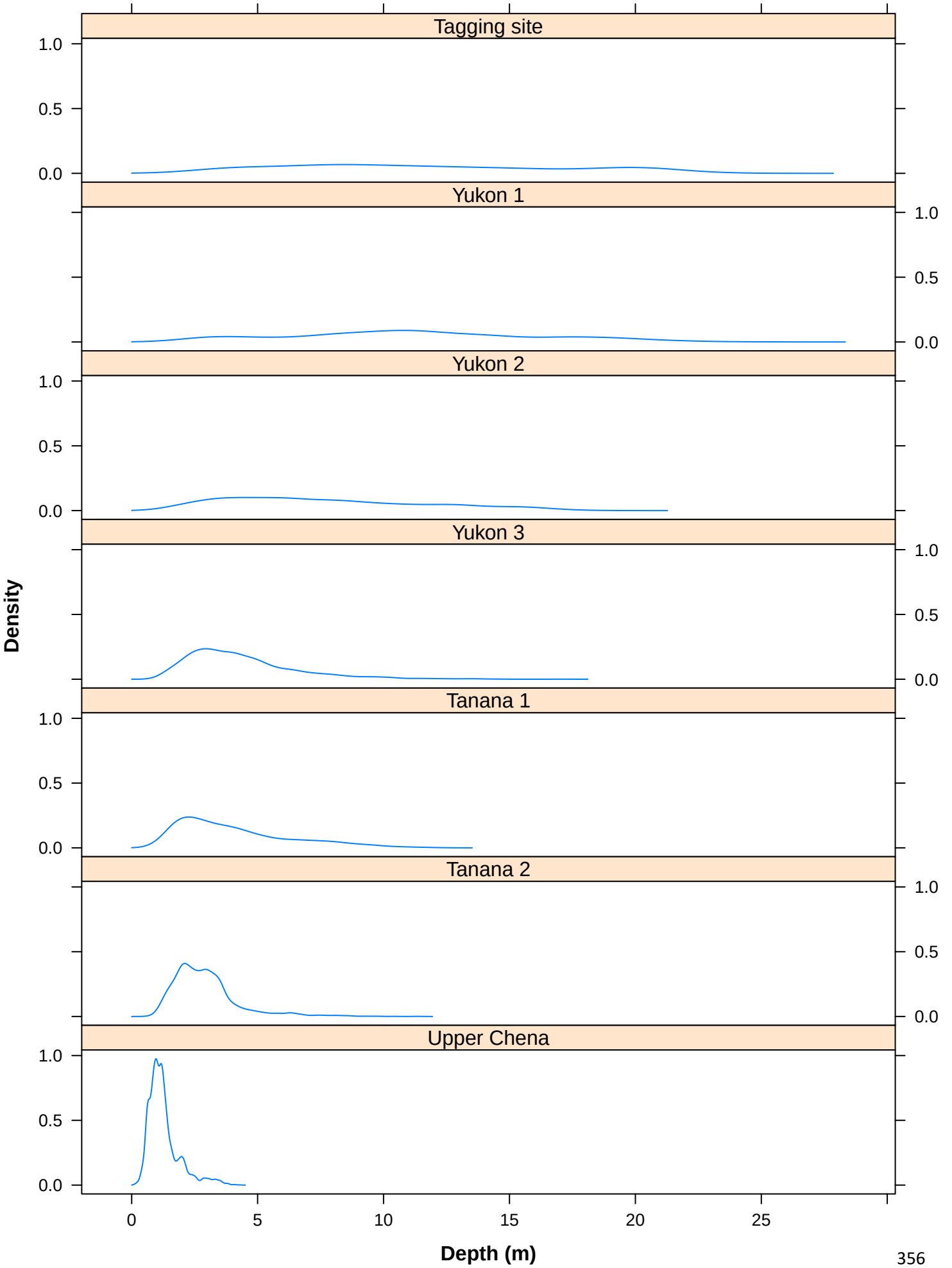

Fish 2004_3043
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Depth (m)
Temperature (C)
10
12
14
16
18
20
22
0
10
20

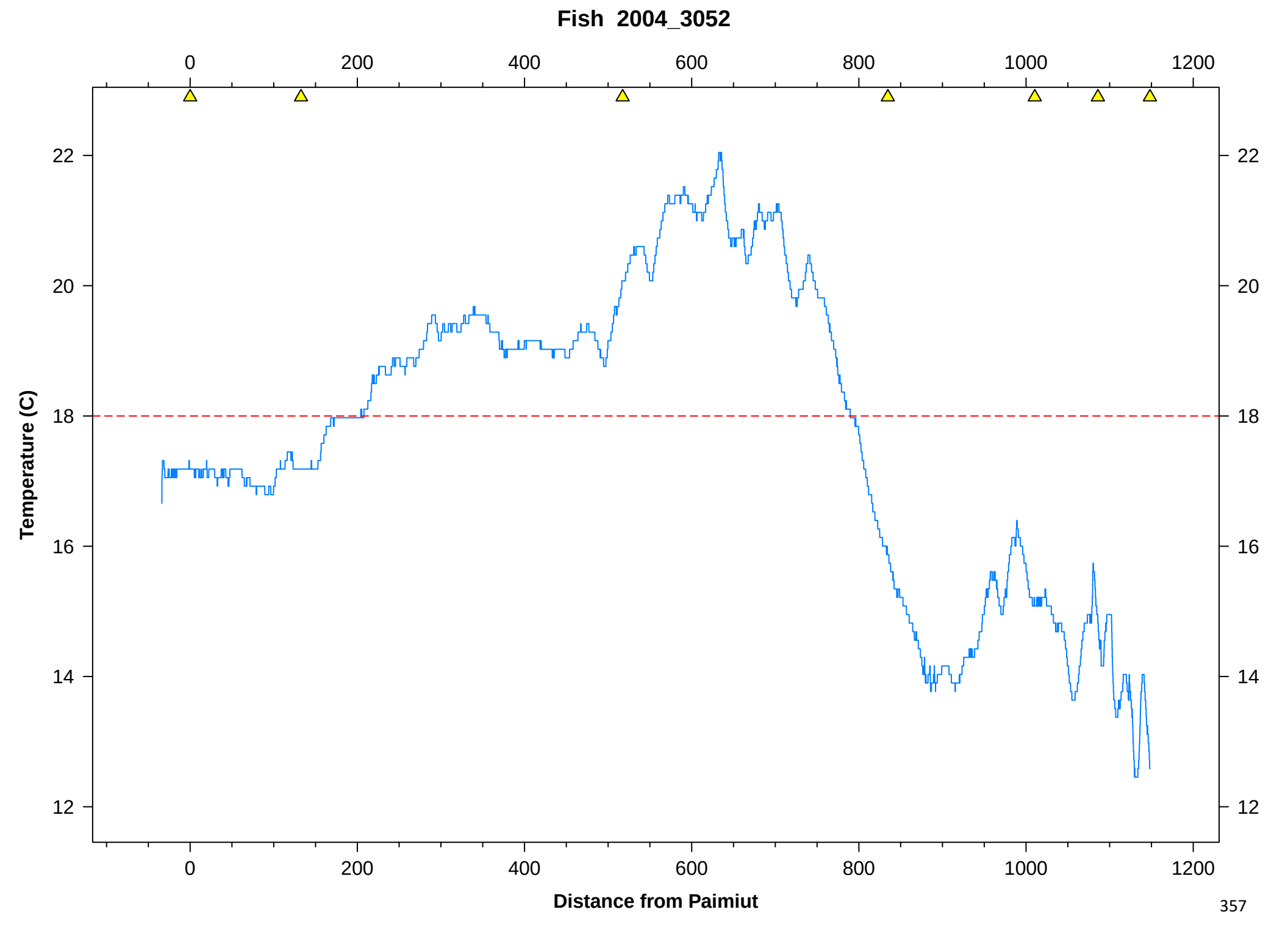

Fish 2004_3052
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

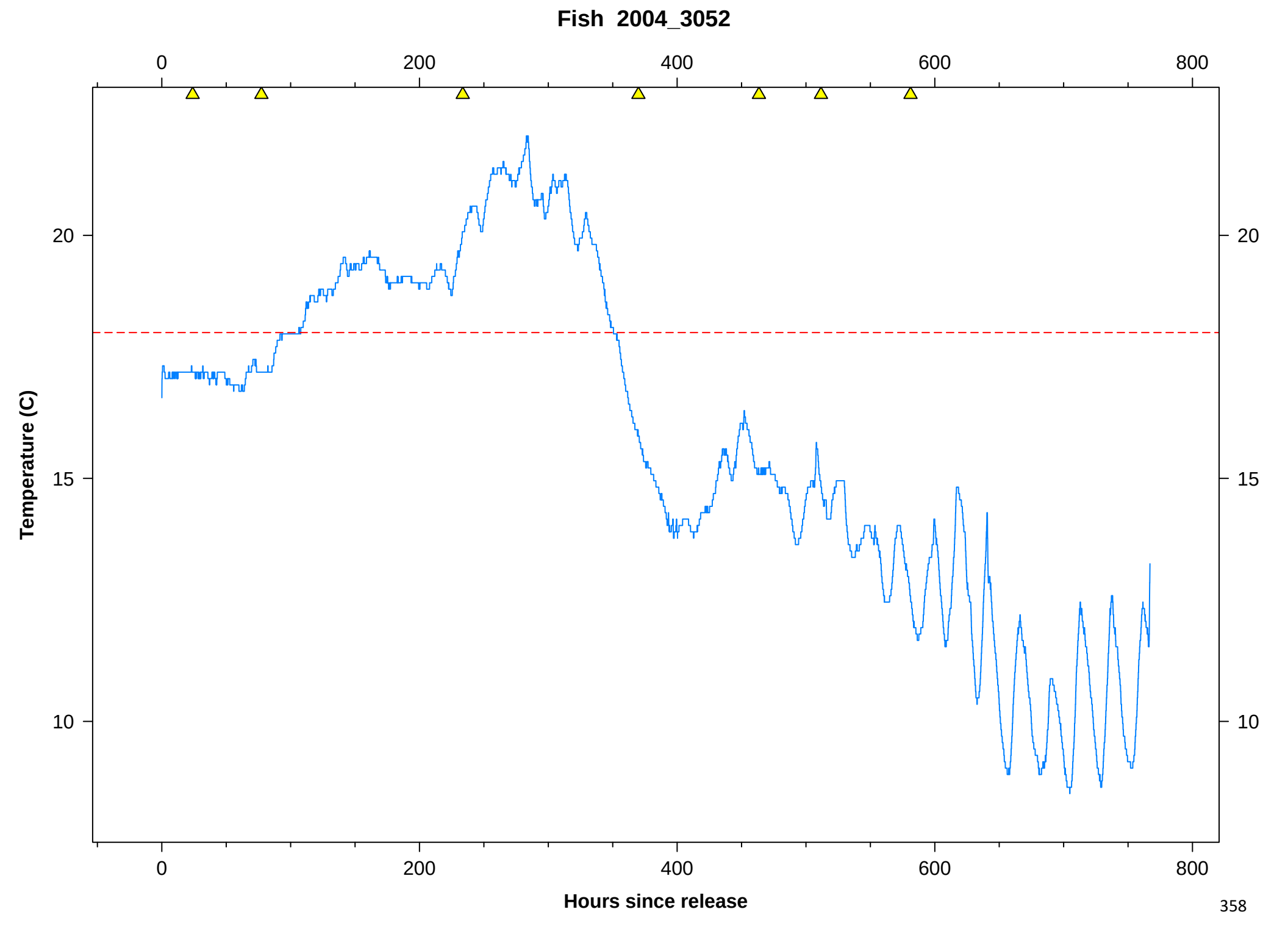

Fish 2004_3052
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Hours since release

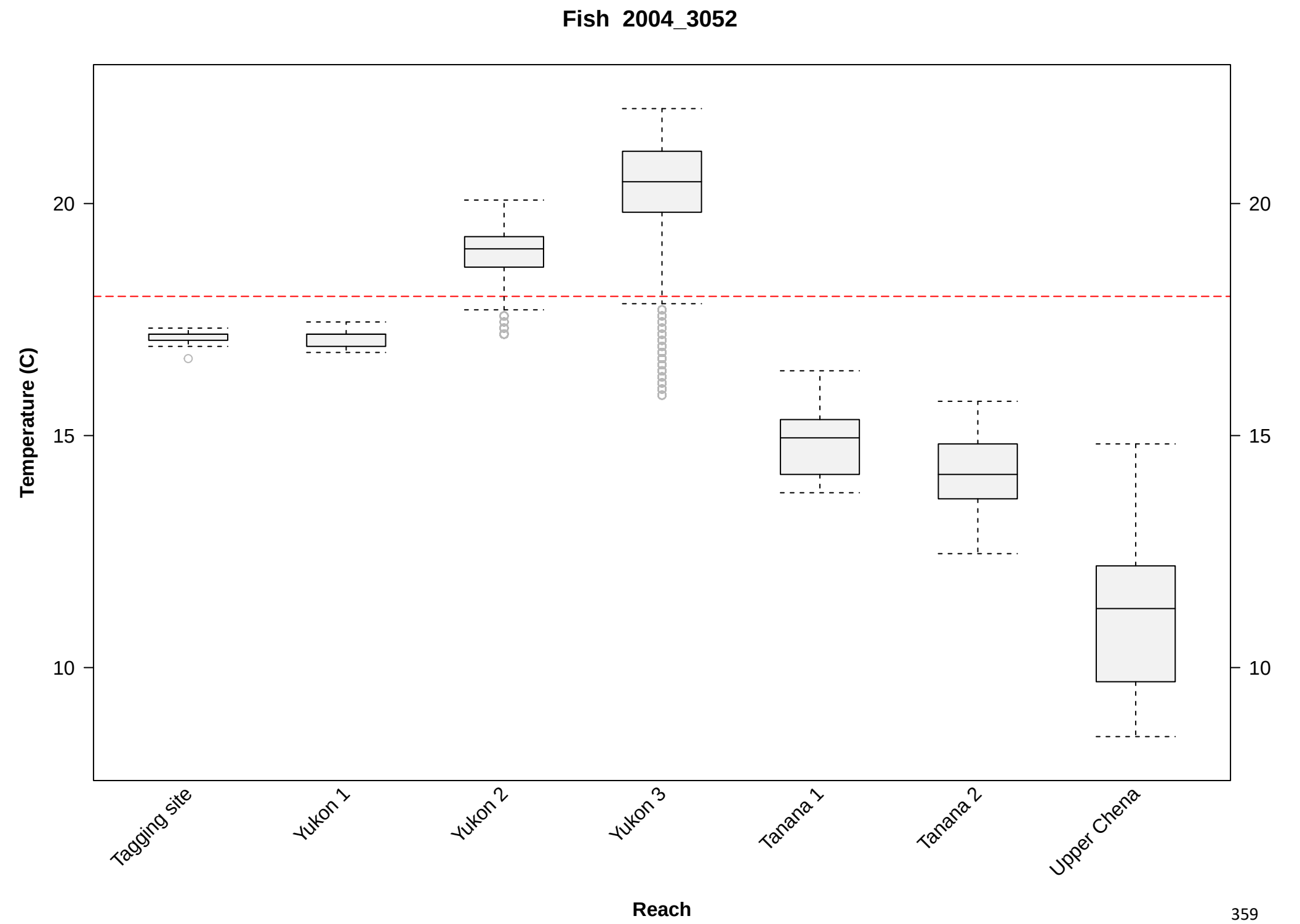

Fish 2004_3052
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Reach

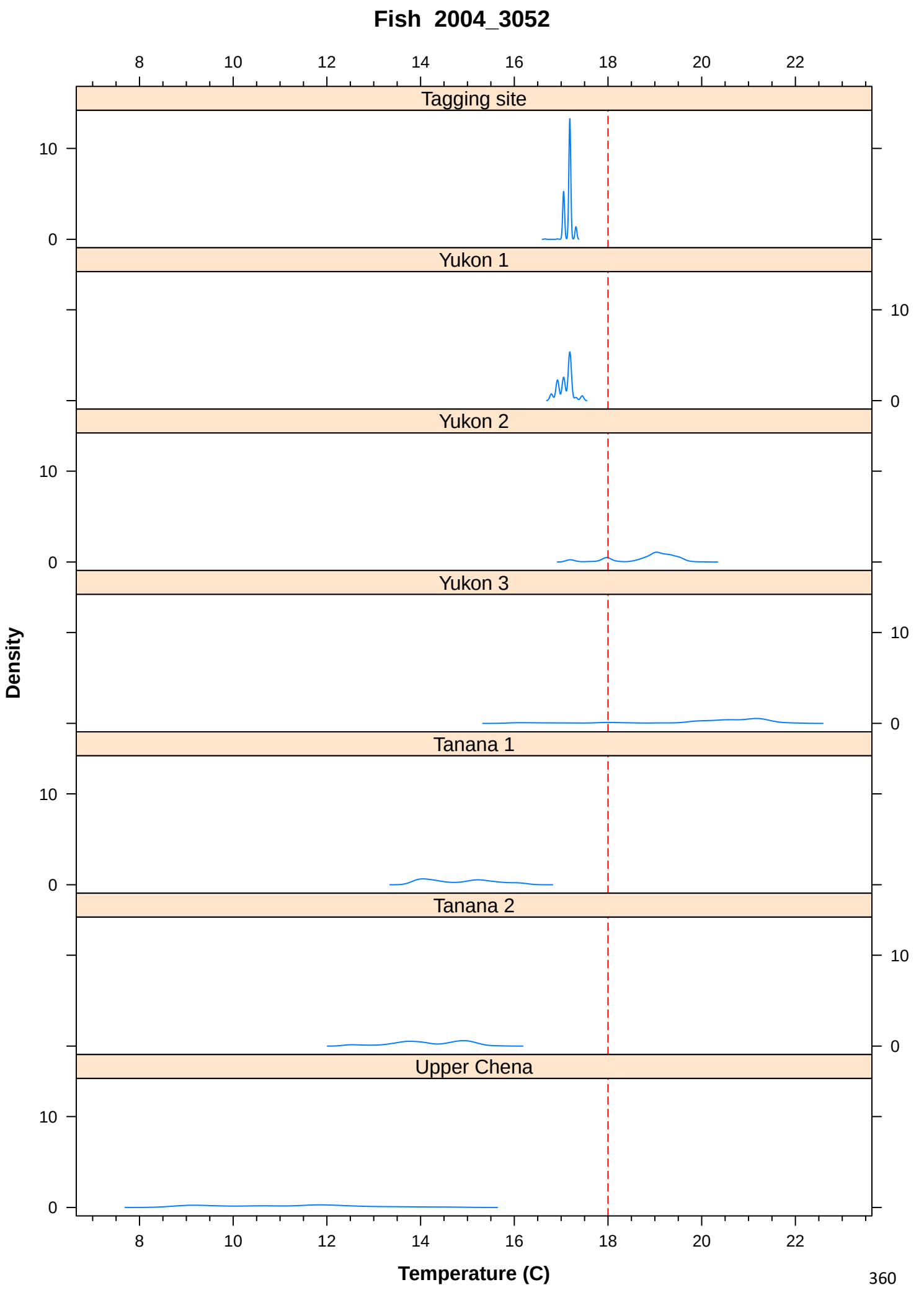
Fish 2004_3052

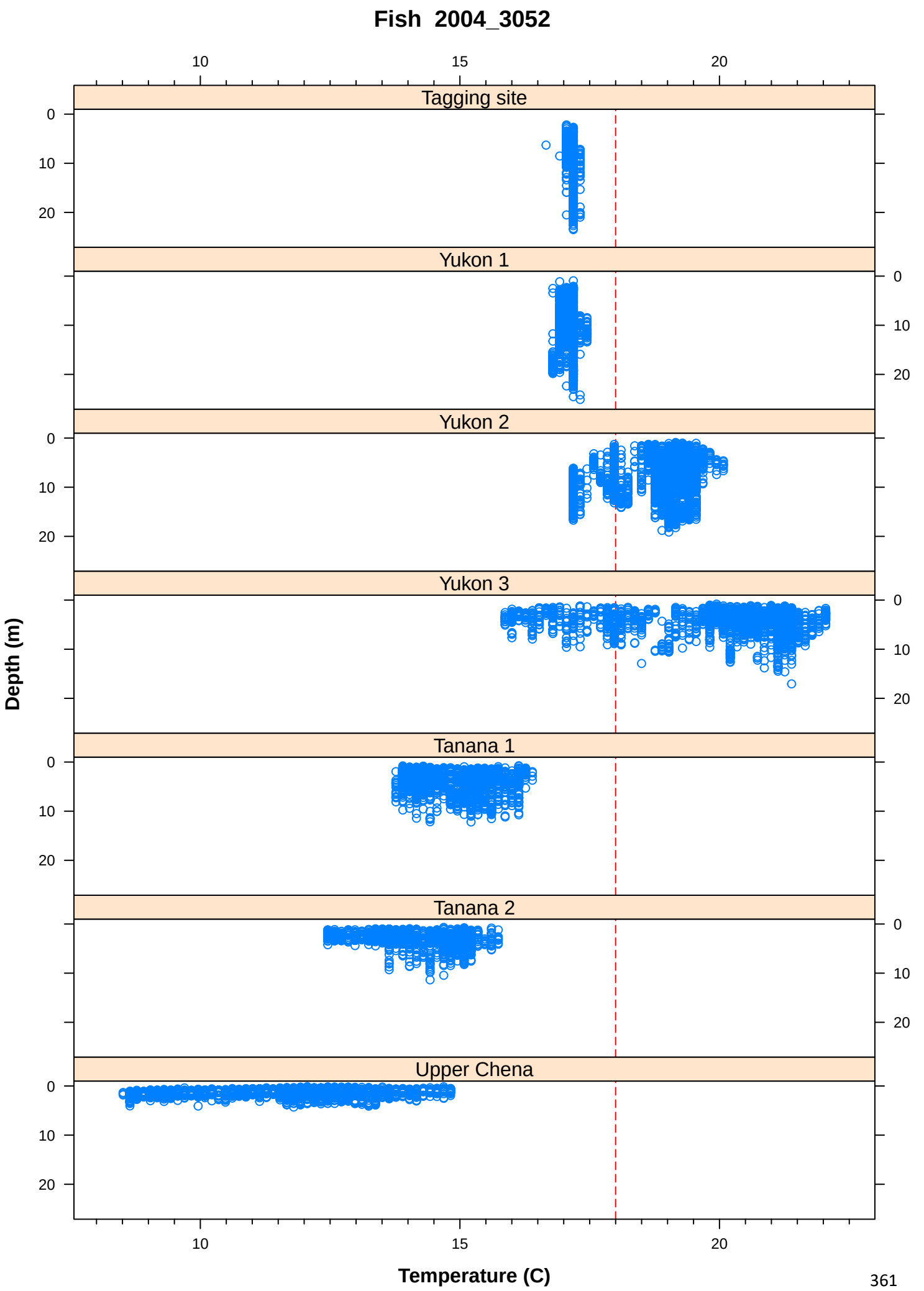



Fish 2004_3052
0
200
400
600
800
1000
1200
22
20
18
16
14
12
Temperature (C)
Distance from Paimiut

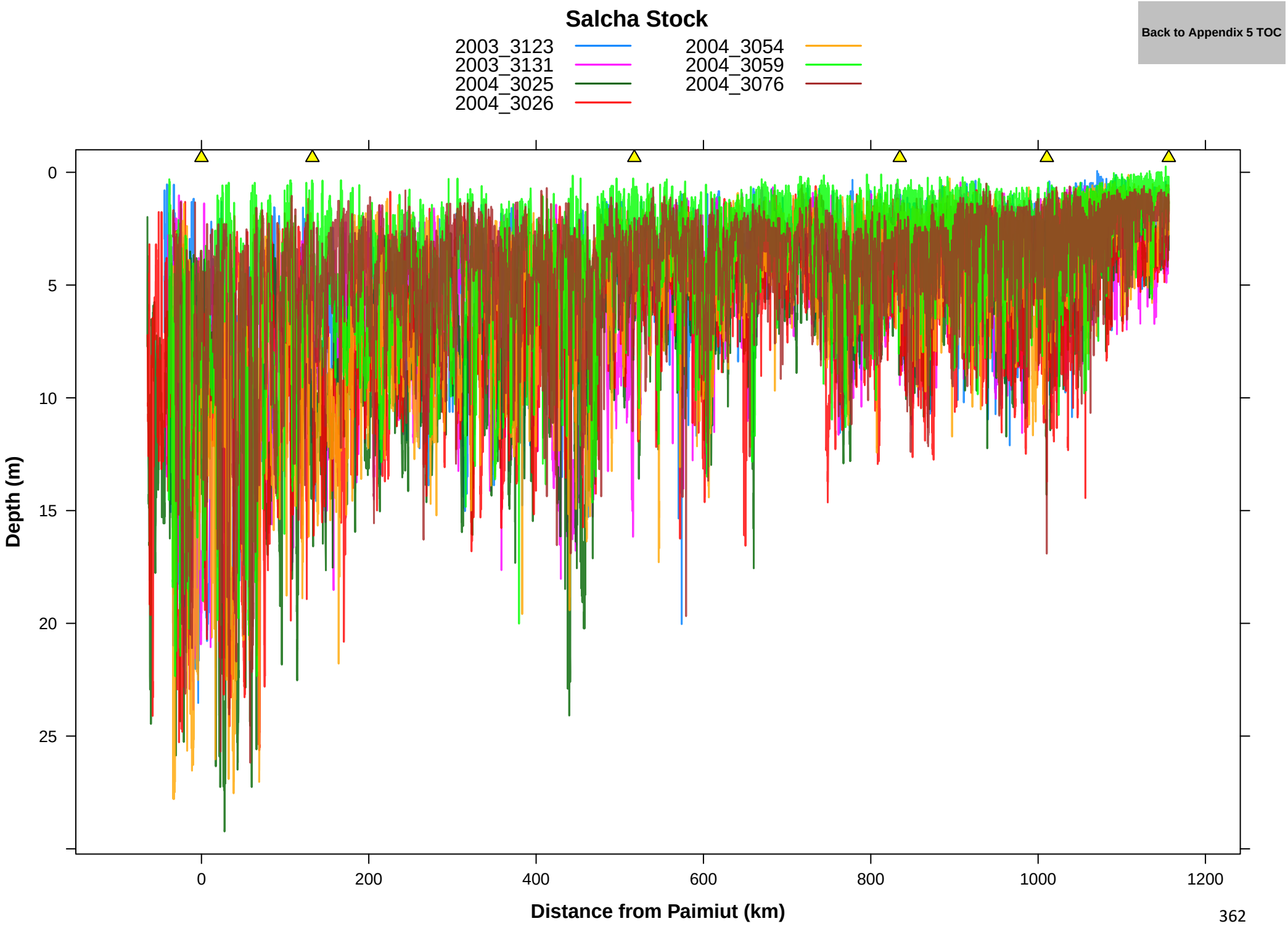

Fish 2004_3052
0
200
400
600
800
20
15
10
Temperature (C)
Hours since release

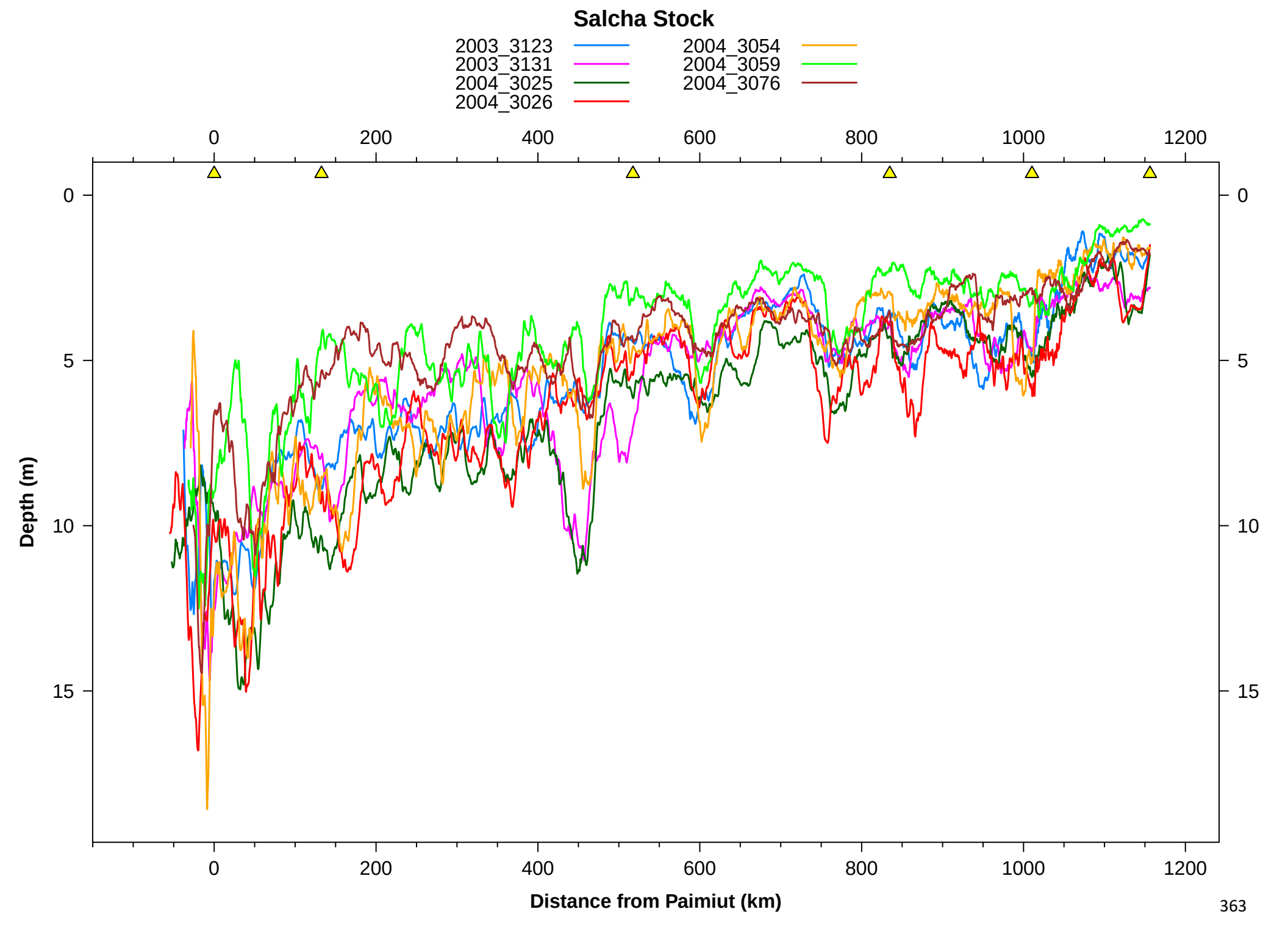

Fish 2004_3052
Temperature (C)
20
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Reach

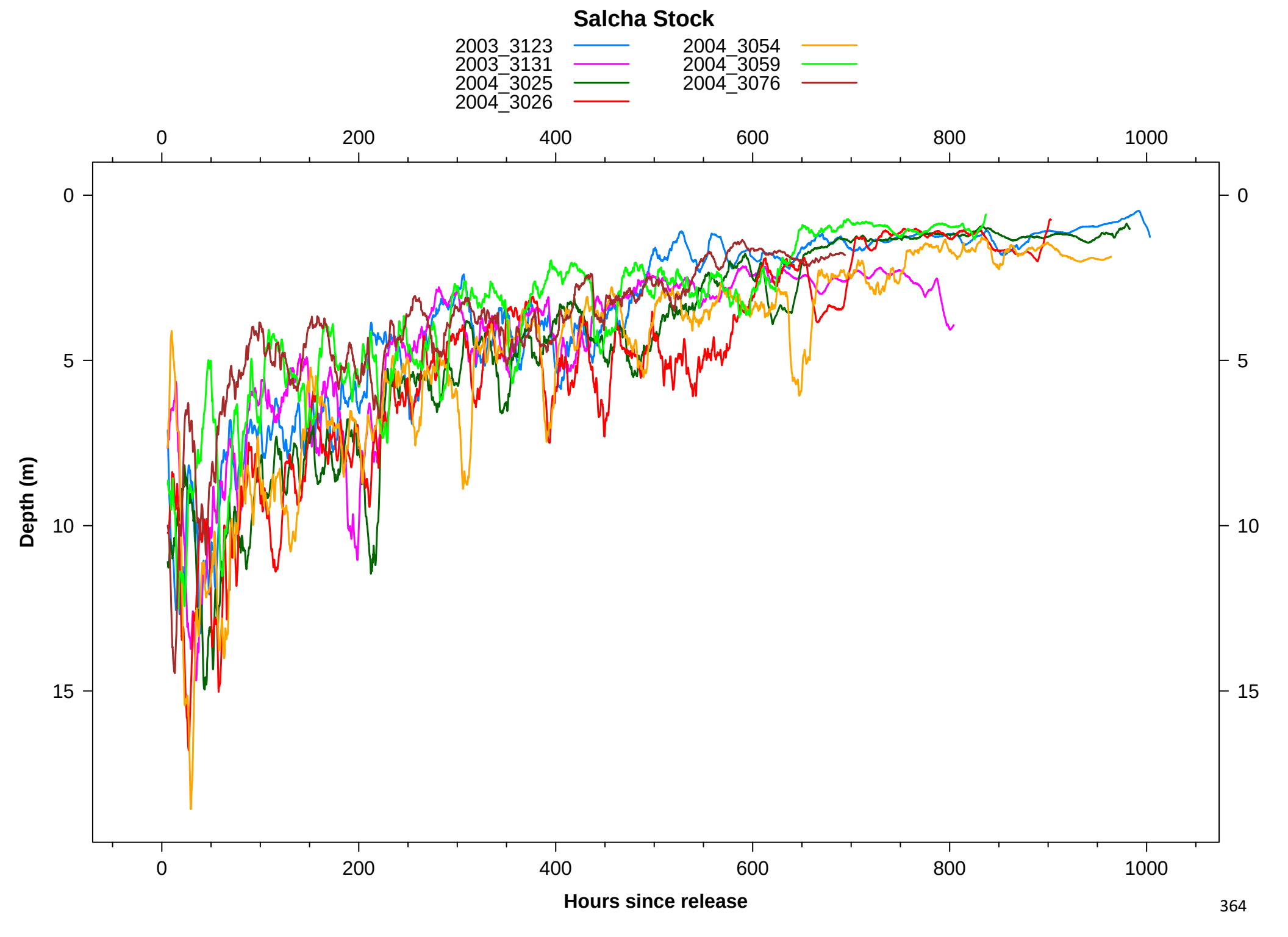

Fish 2004_3052
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Density
Temperature (C)
8
10
12
14
16
18
20
22
0
10

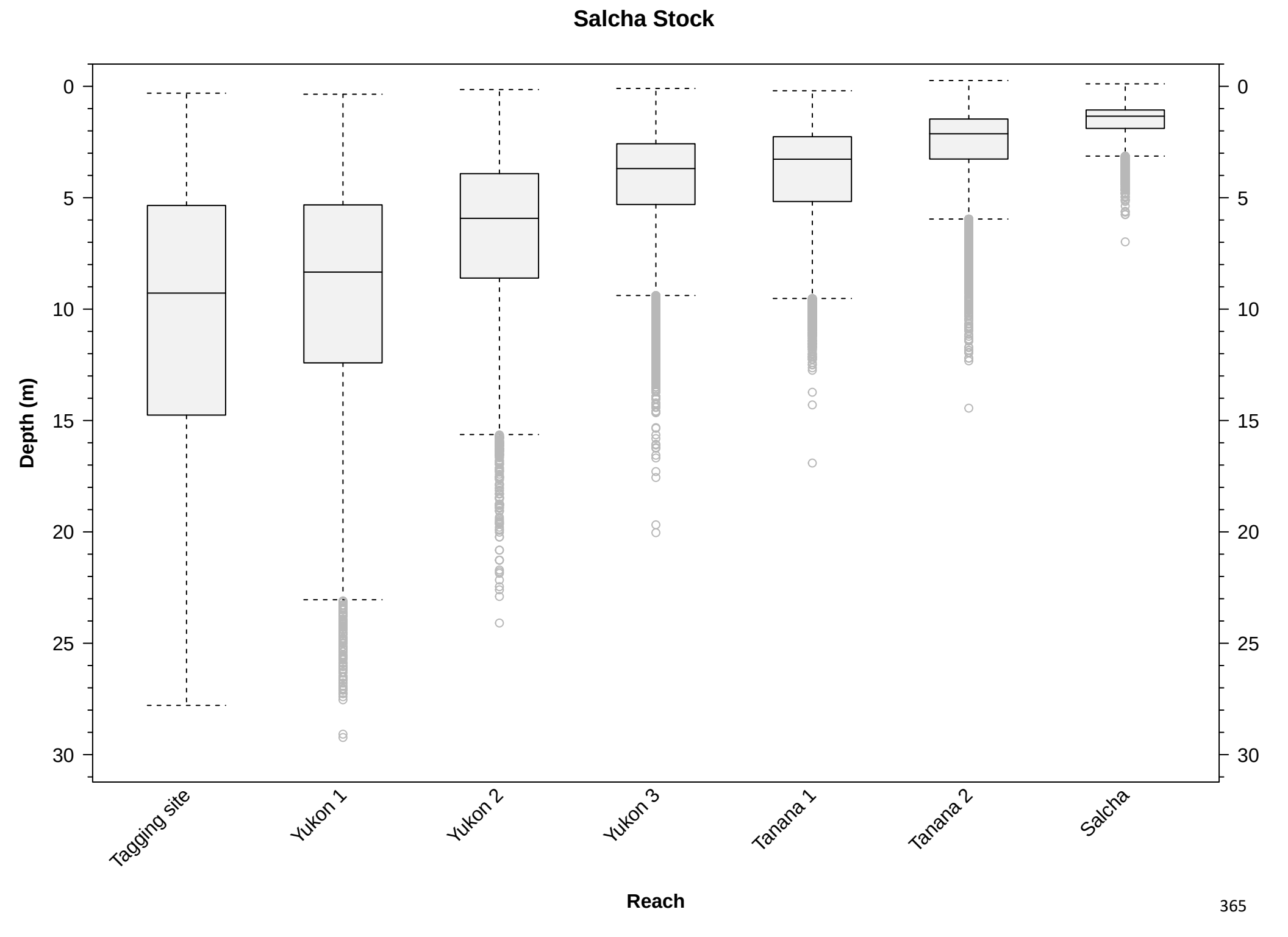

Fish 2004_3052
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Upper Chena
Depth (m)
Temperature (C)
10
15
20
0
10
20

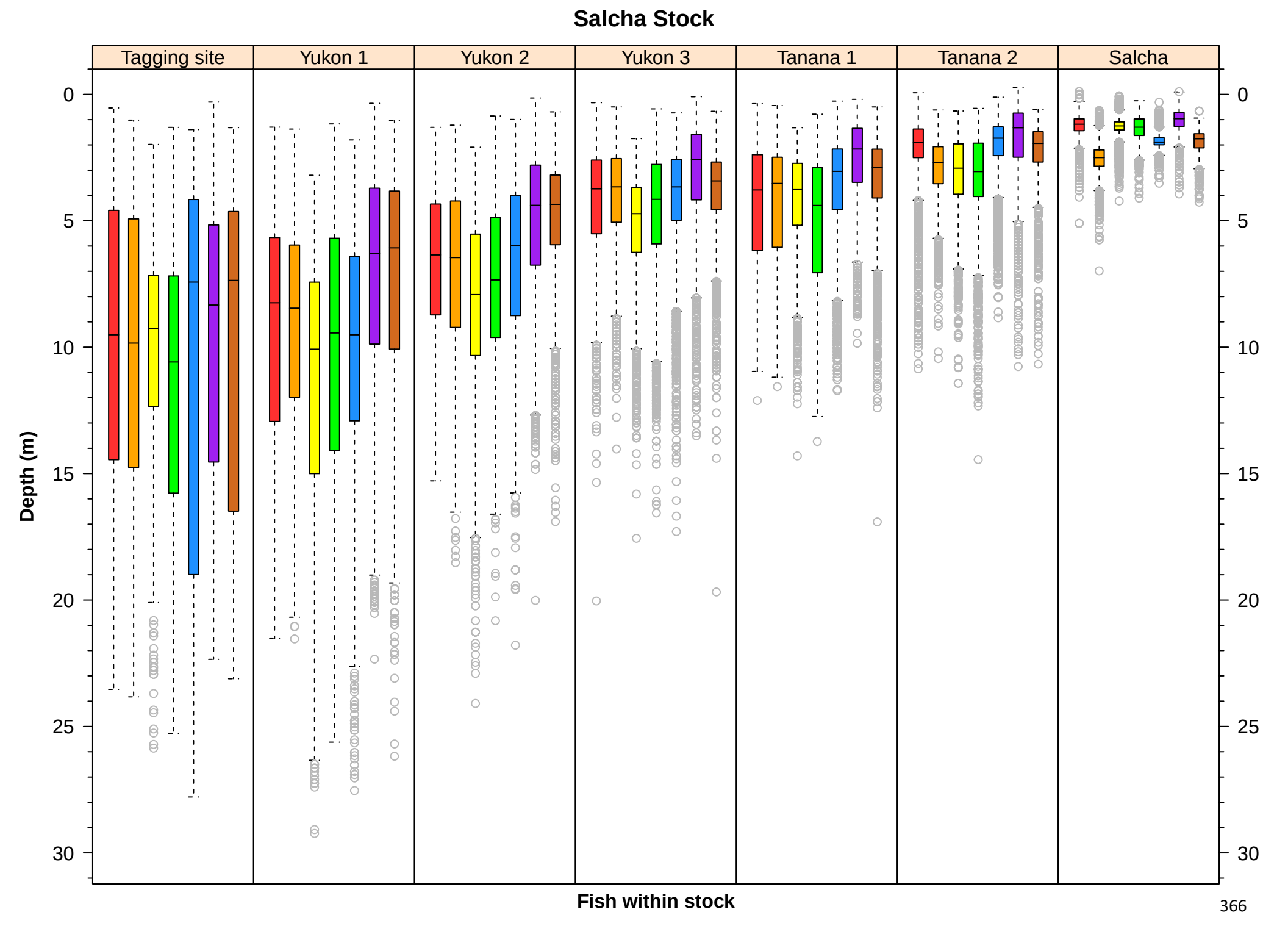
Back to Appendix 5 TOC

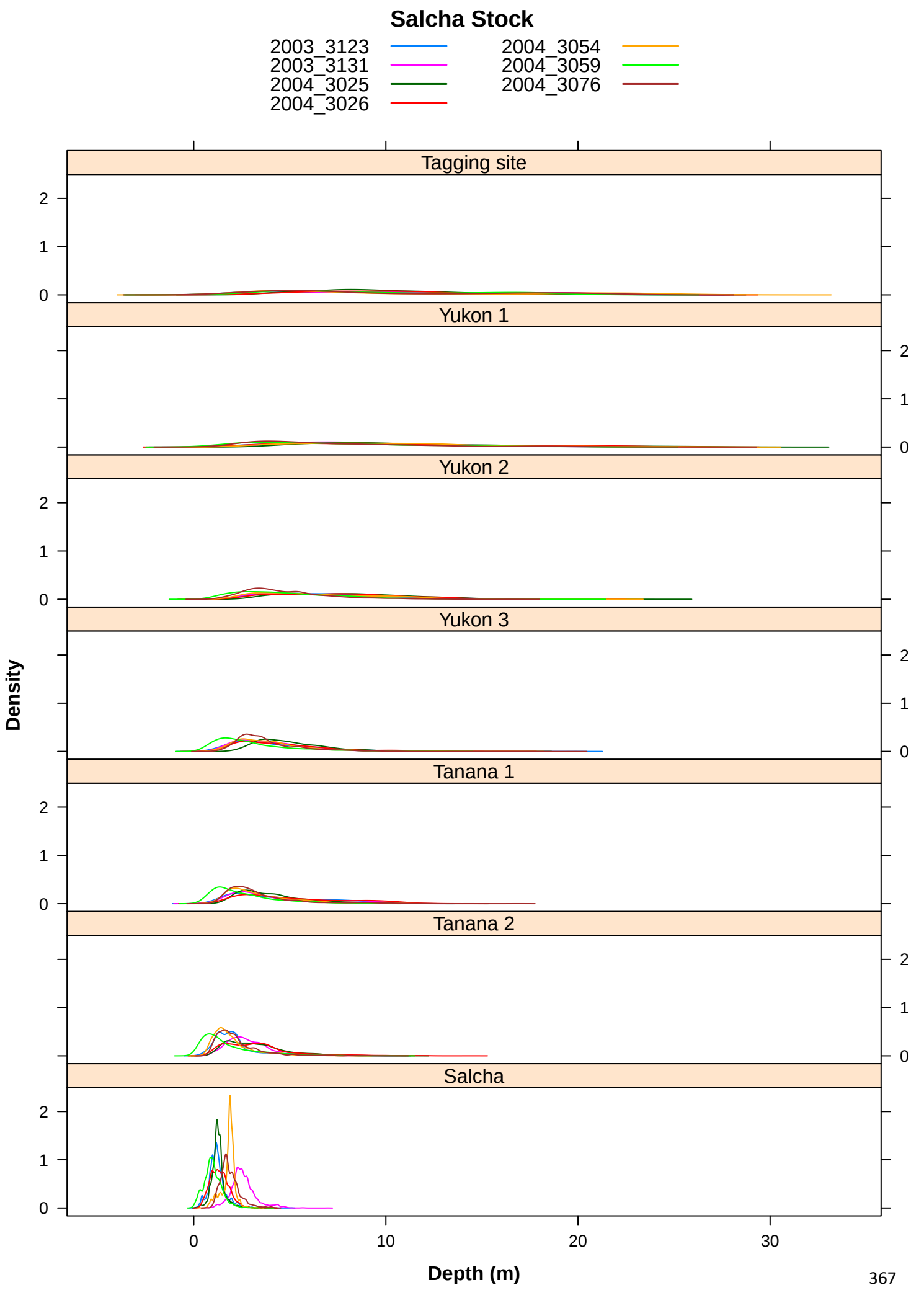


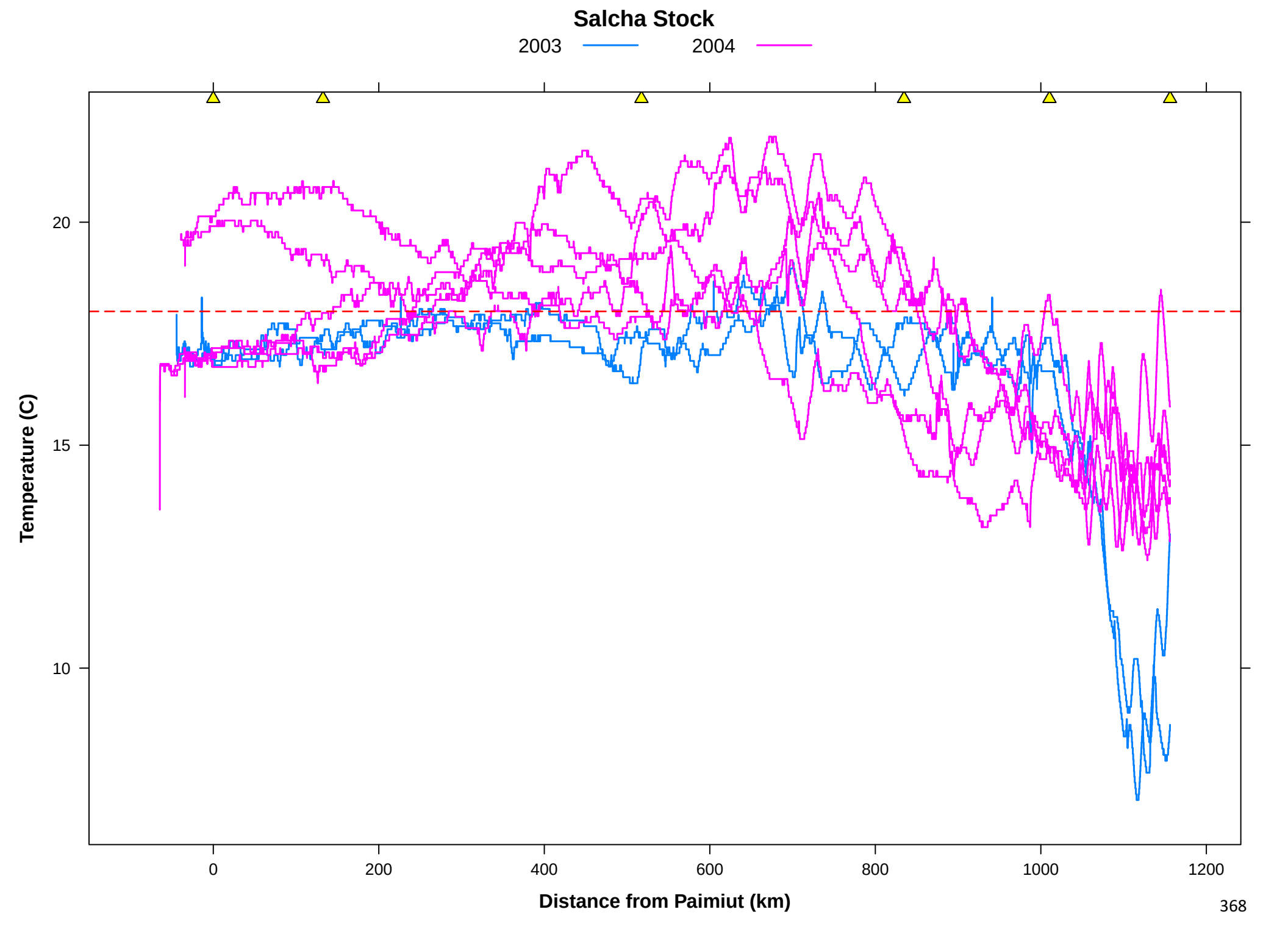

Salcha Stock
2003_3123
2003_3131
2004_3025
2004_3026
2004_3054
2004_3059
2004_3076
0
200
400
600
800
1000
1200
0
5
10
15
Depth (m)
Distance from Paimiut (km)

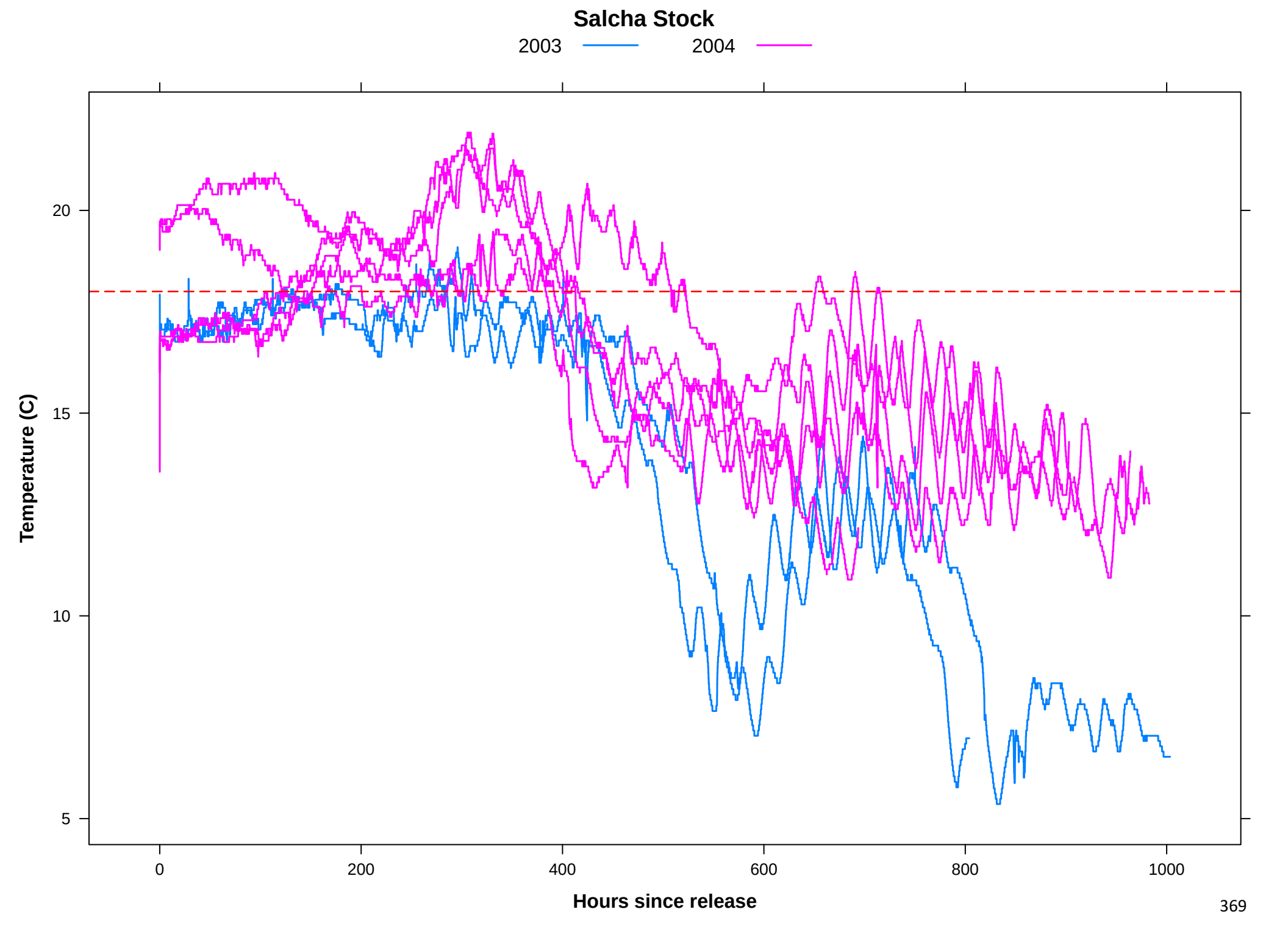

Salcha Stock
2003_3123
2003_3131
2004_3025
2004_3026
2004_3054
2004_3059
2004_3076
0
200
400
600
800
1000
0
5
10
15
Depth (m)
Hours since release

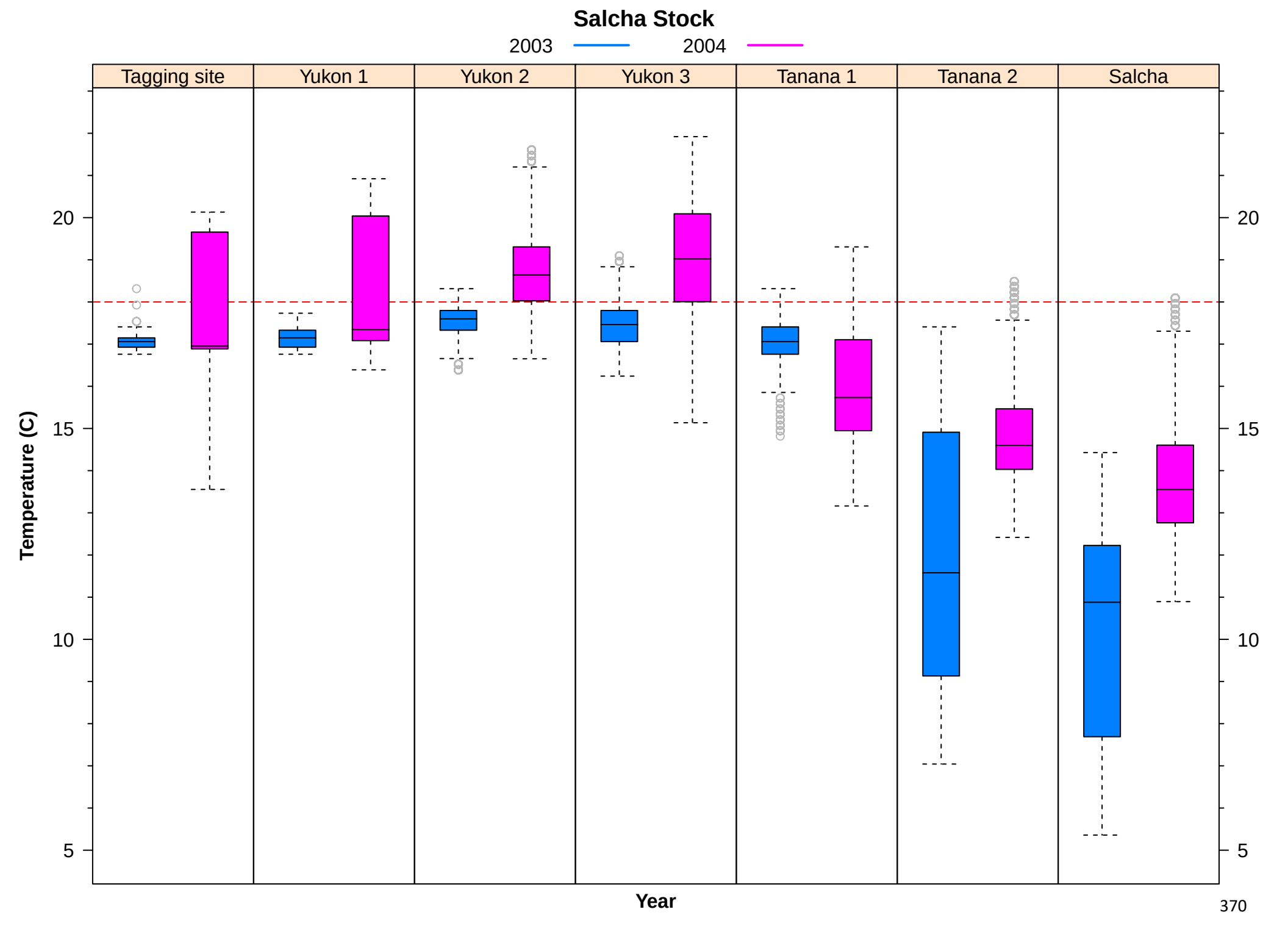

Salcha Stock
Depth (m)
0
5
10
15
20
25
30
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

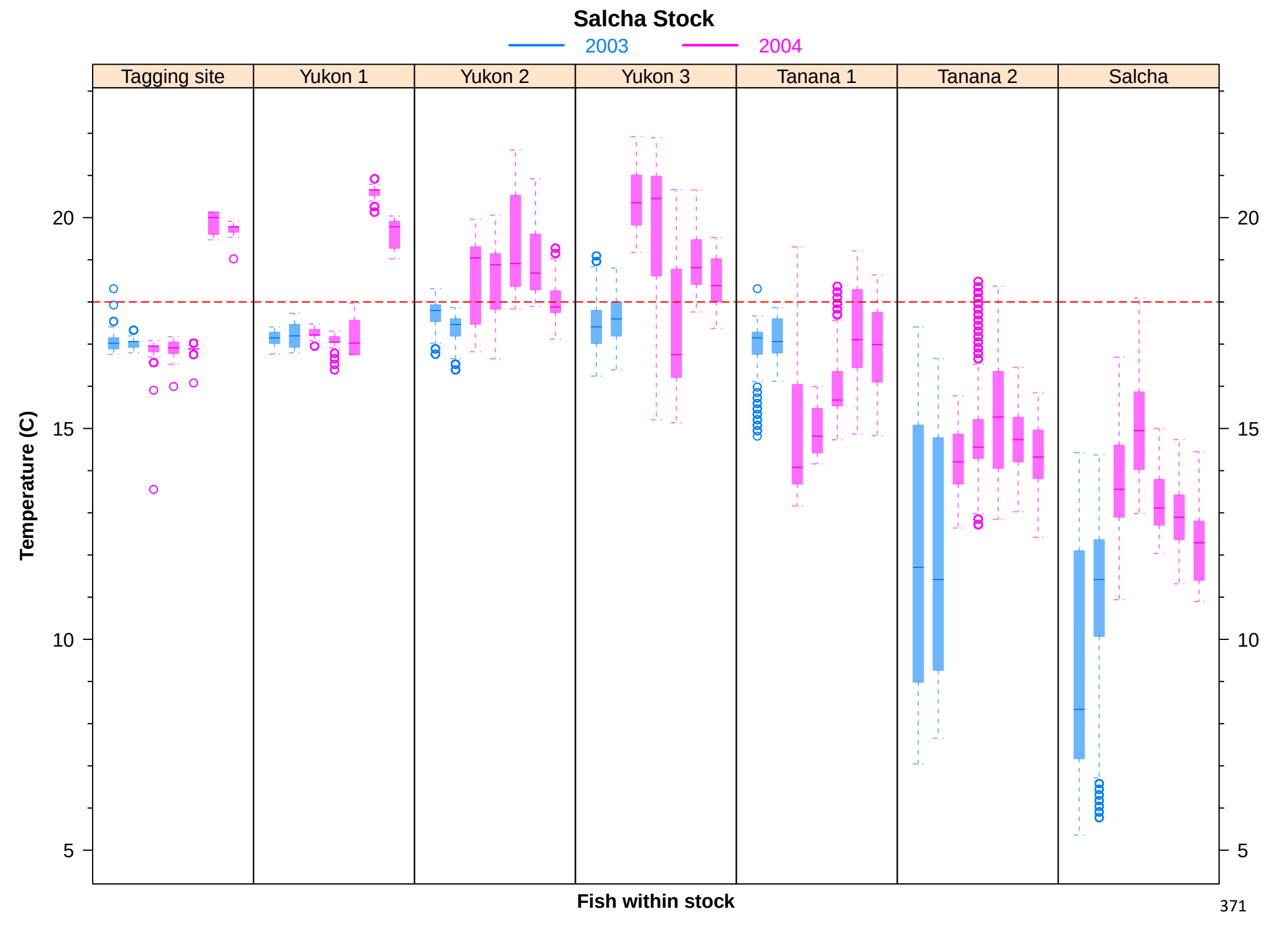

Salcha Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Depth (m)
0
5
10
15
20
25
30
Fish within stock
366

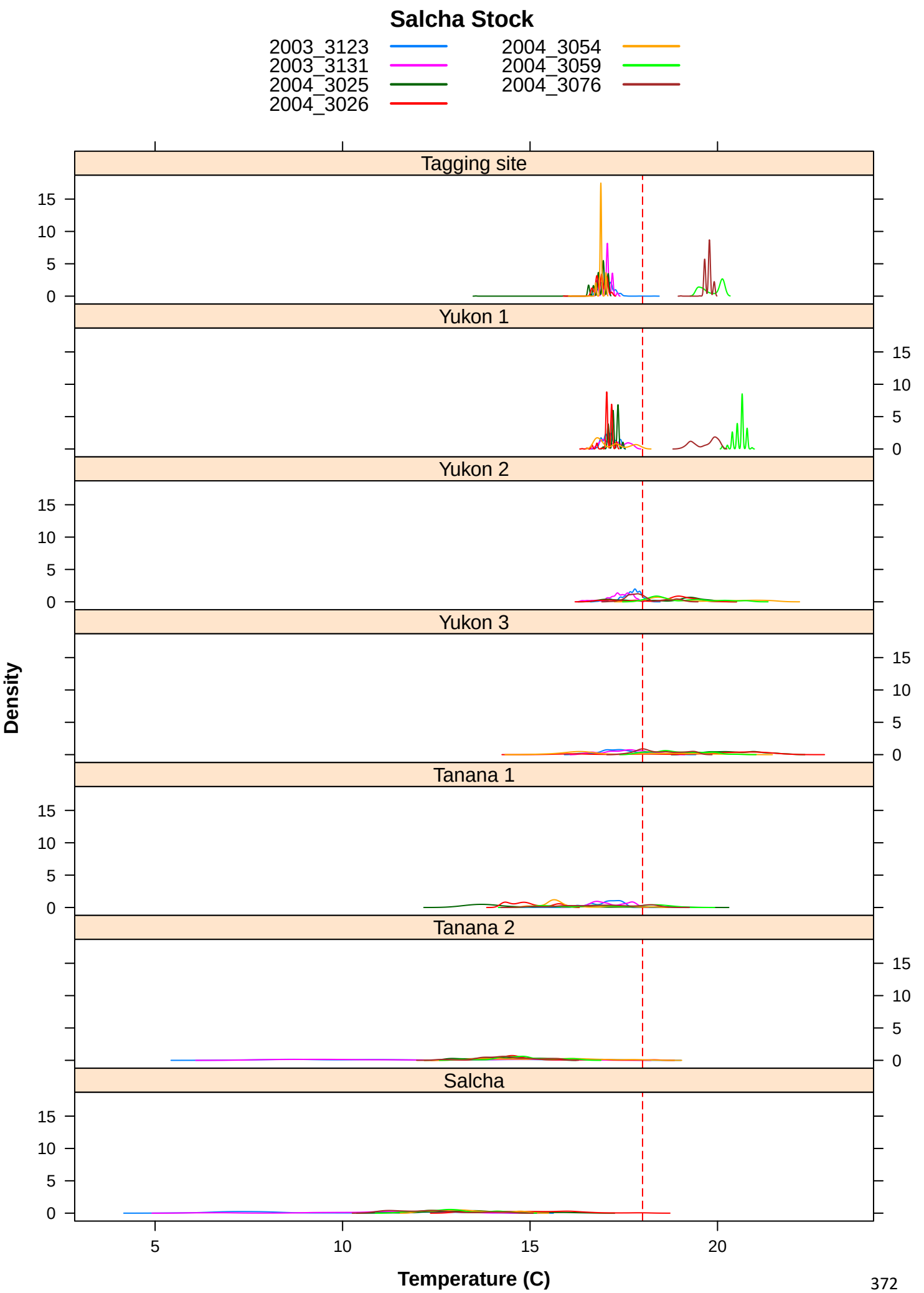

Salcha Stock
2003_3123
2003_3131
2004_3025
2004_3026
2004_3054
2004_3059
2004_3076
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
Depth (m)
0
10
20
30
0
1
2

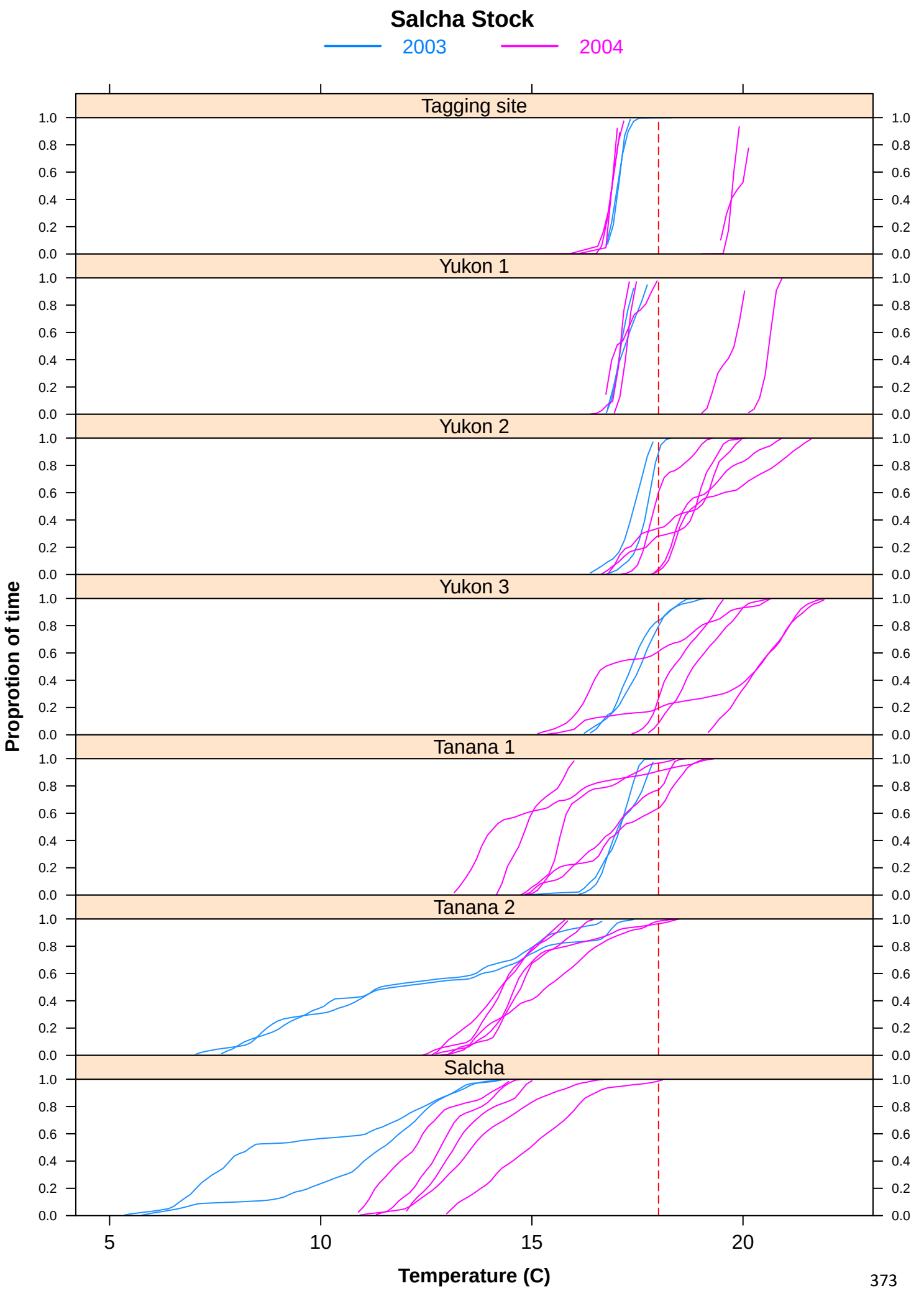

Salcha Stock
2003
2004
Temperature (C)
20
15
10
0
200
400
600
800
1000
1200
Distance from Paimiut (km)

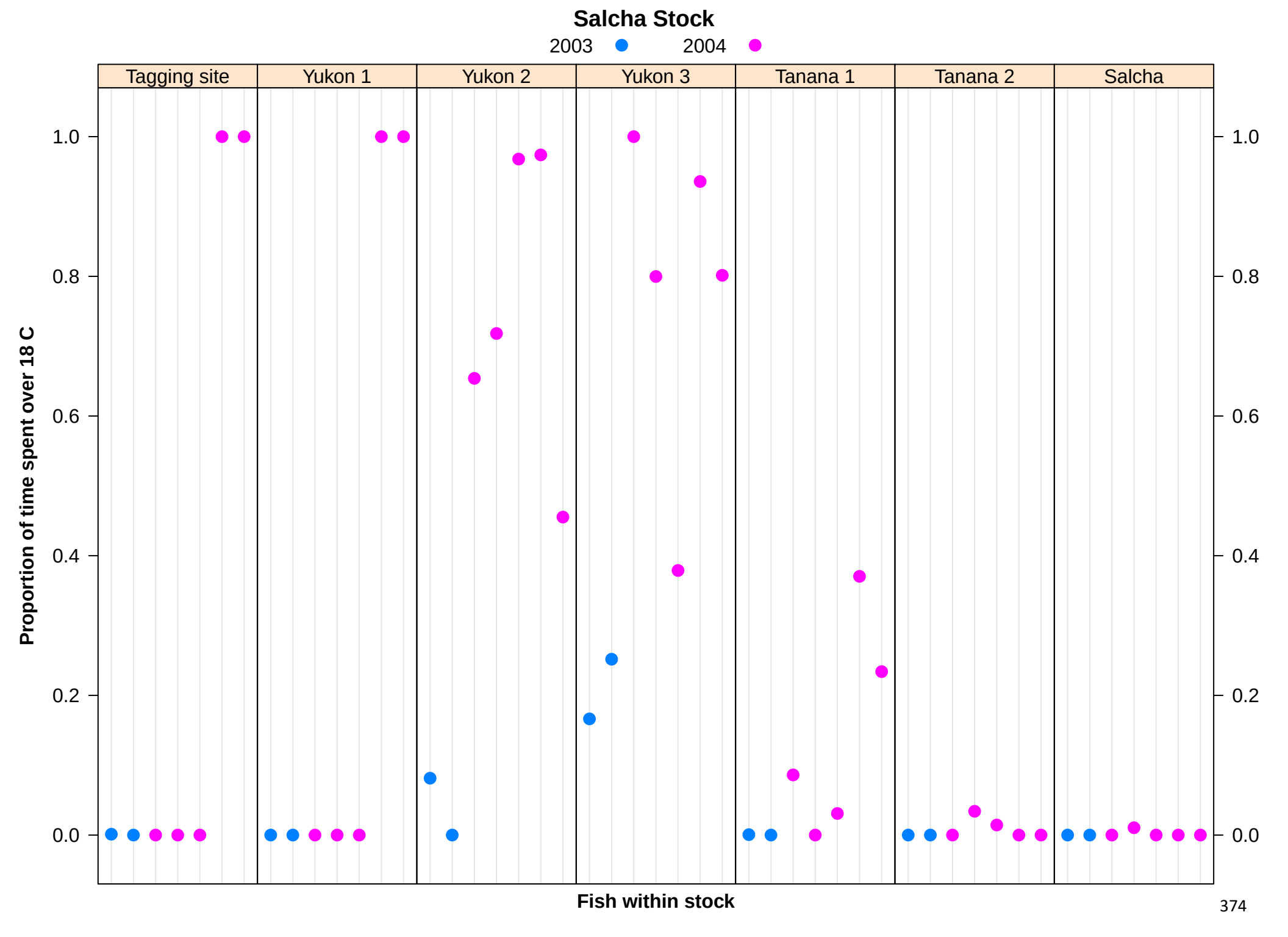

Salcha Stock
2003
2004
Temperature (C)
20
15
10
5
0
200
400
600
800
1000
Hours since release

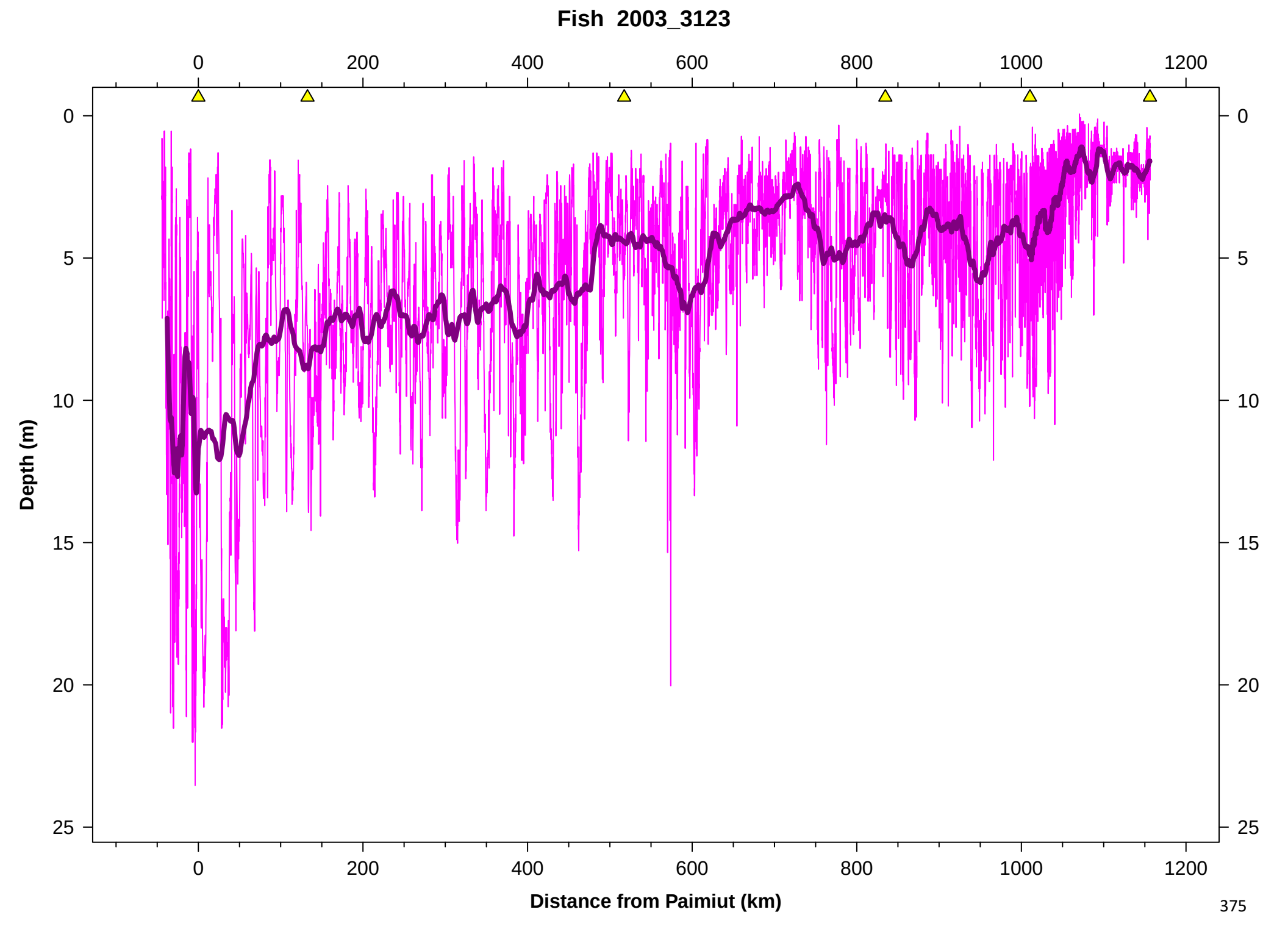

Salcha Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Temperature (C)
20
15
10
5
Year

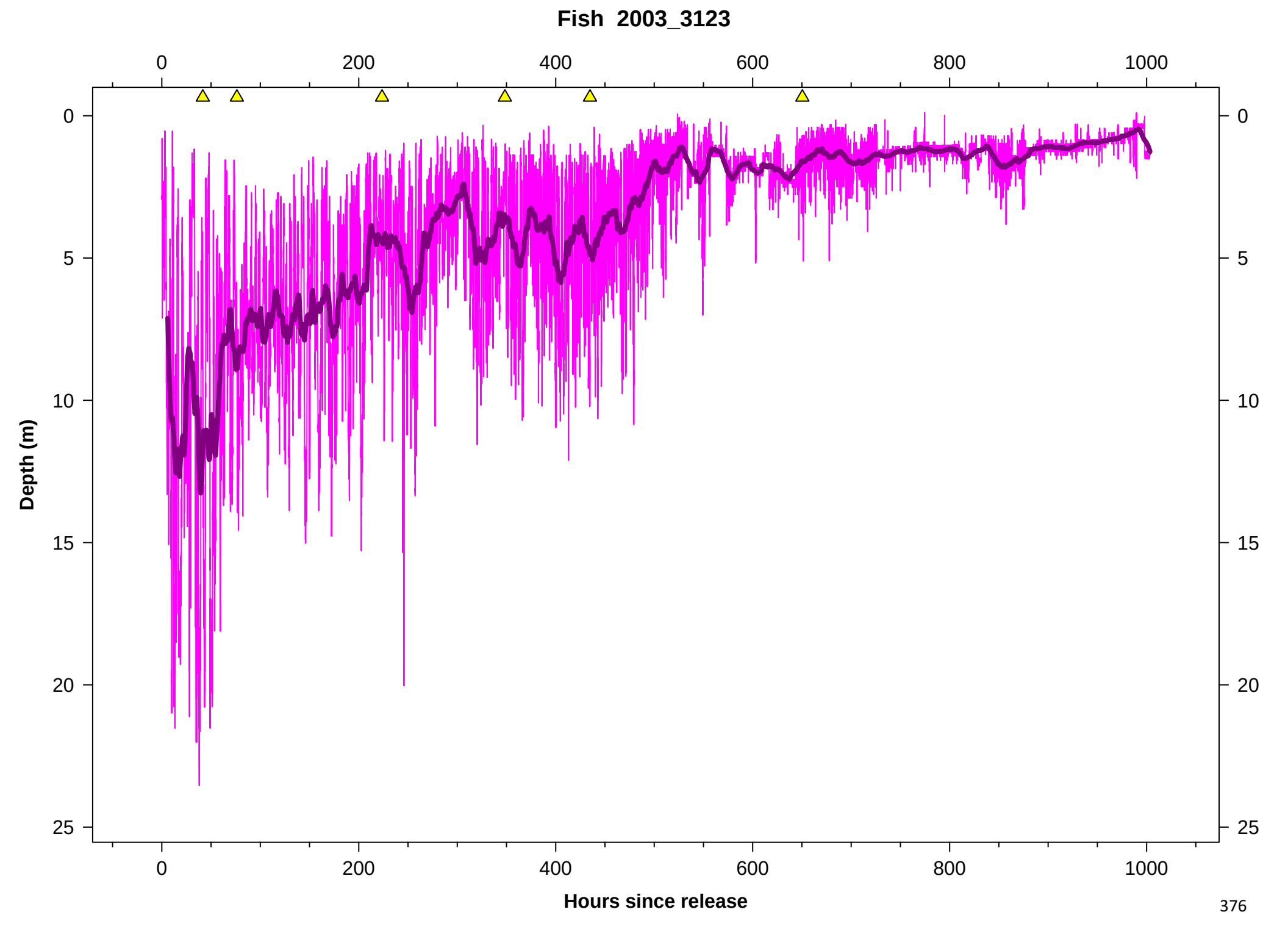

Salcha Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Temperature (C)
20
15
10
5
Fish within stock
371

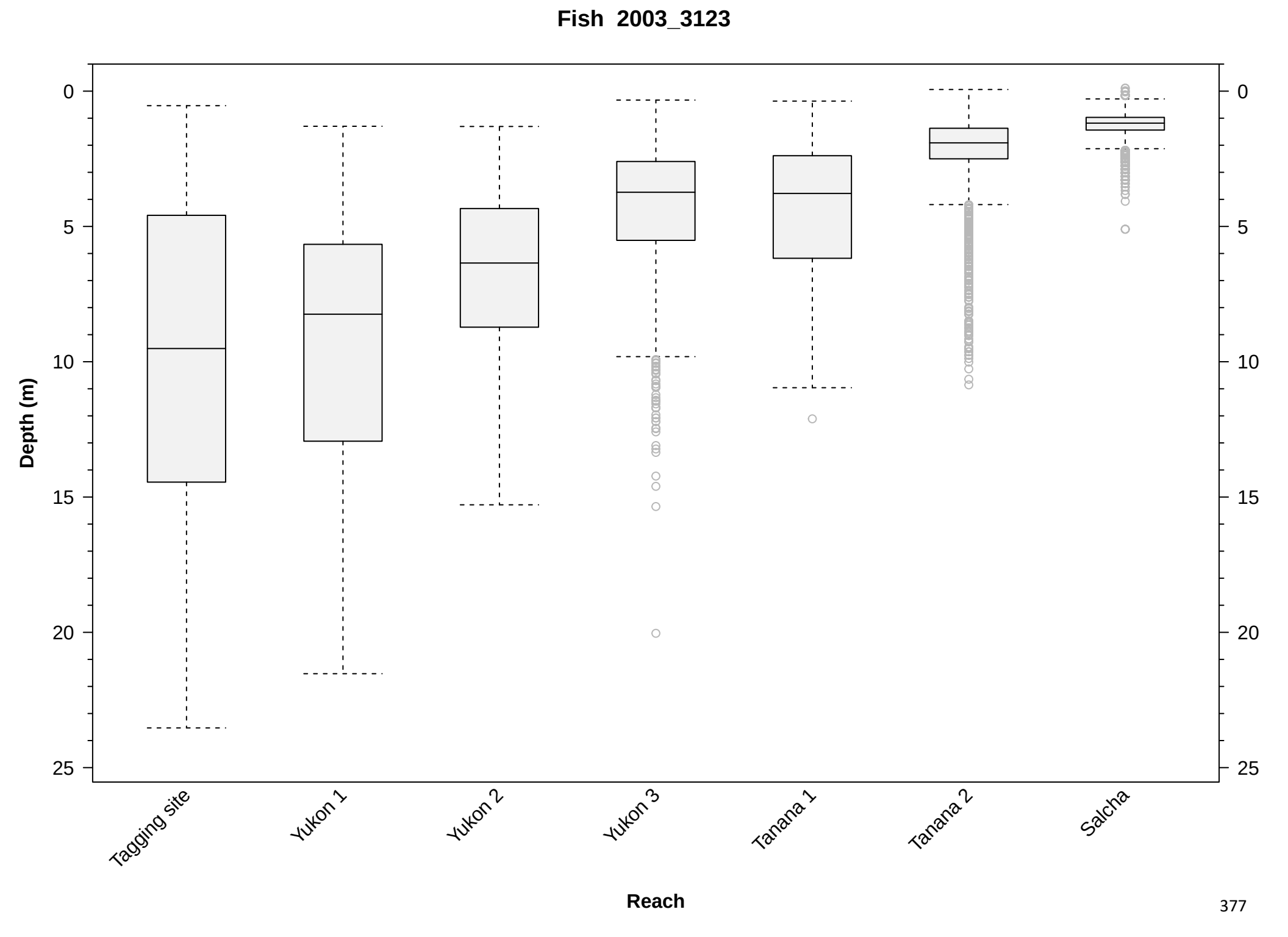

Salcha Stock
2003_3123
2003_3131
2004_3025
2004_3026
2004_3054
2004_3059
2004_3076
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
Temperature (C)
0
5
10
15
20

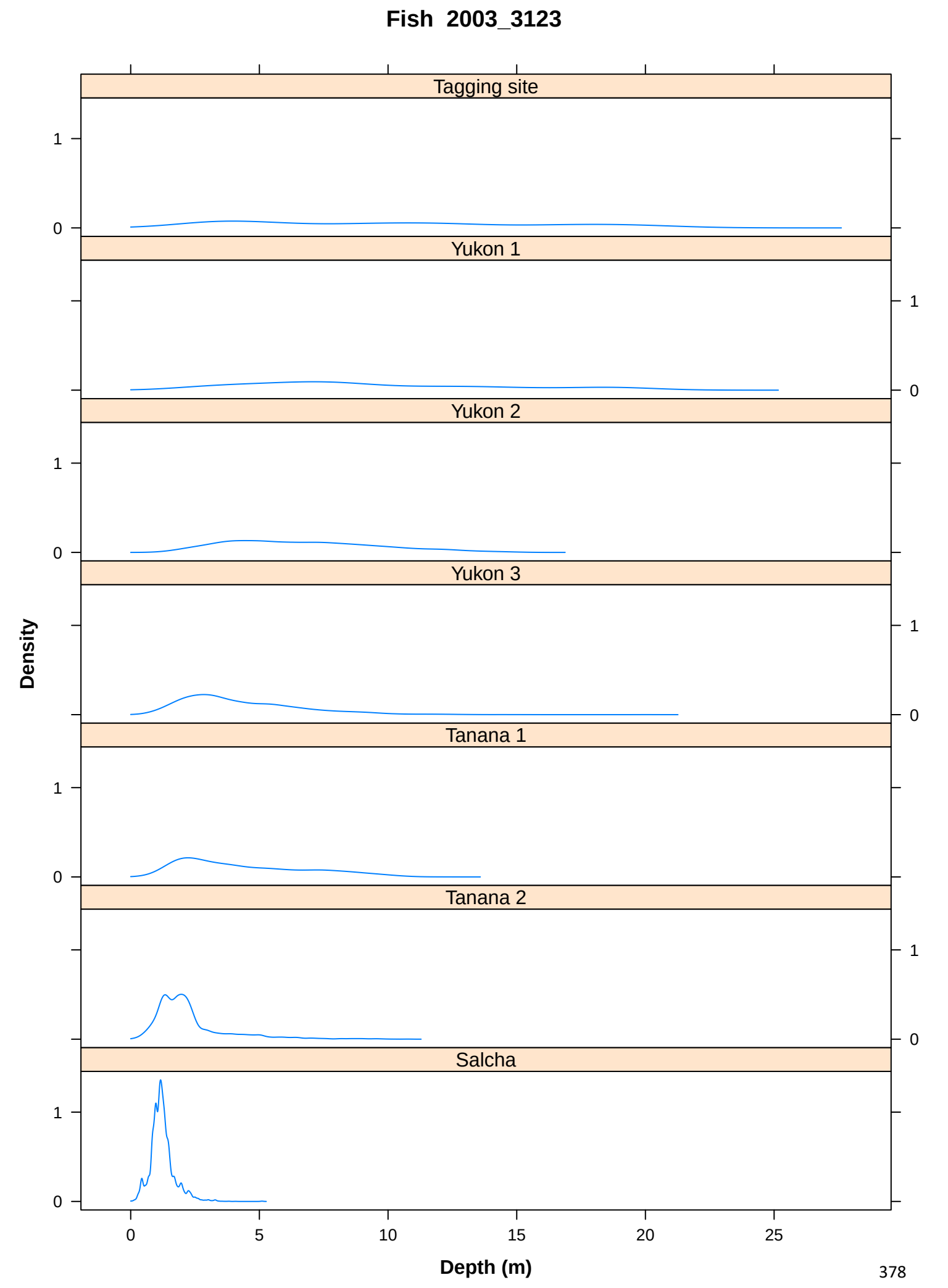

Salcha Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
5
10
15
20

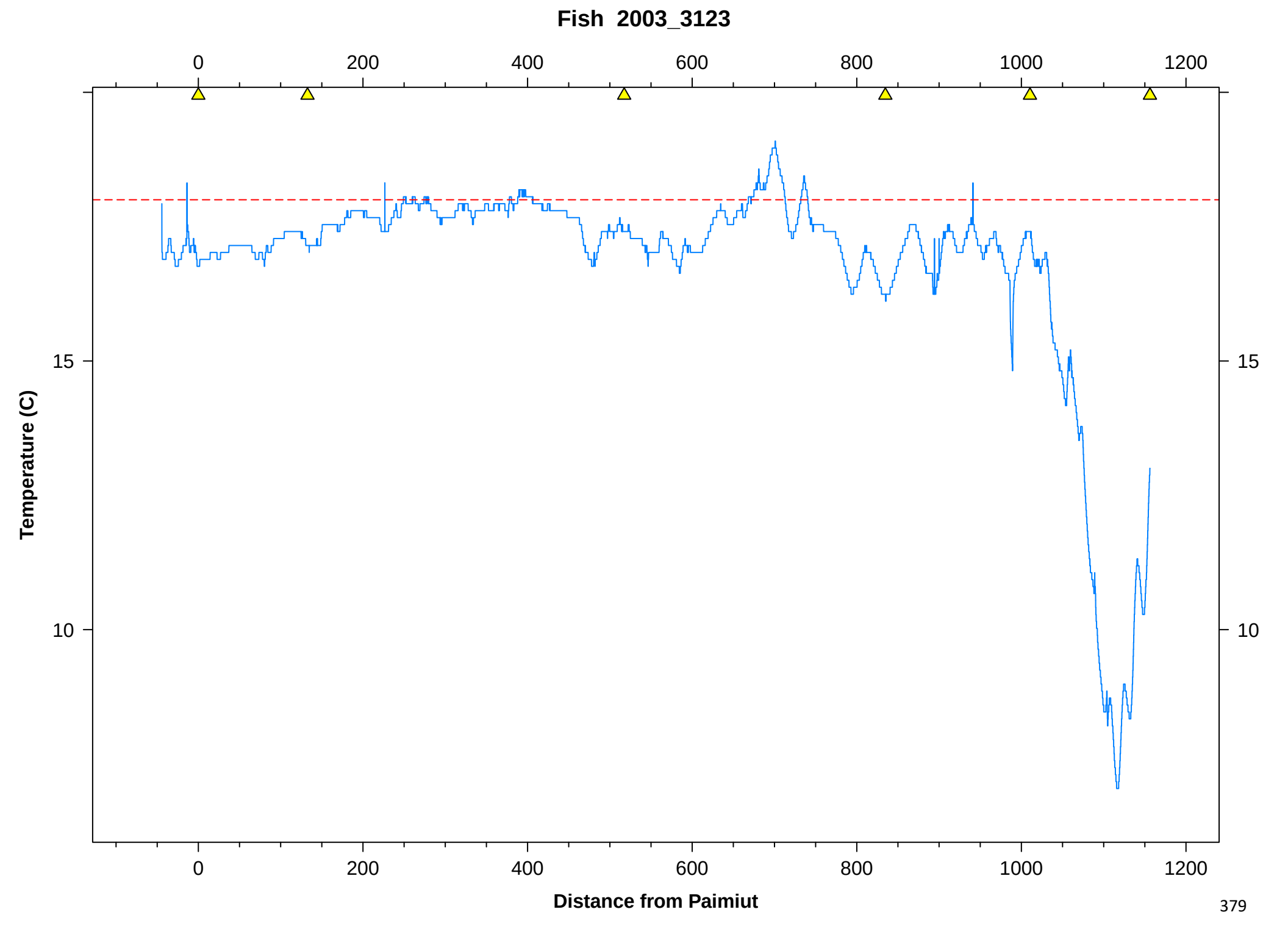

Salcha Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock
374

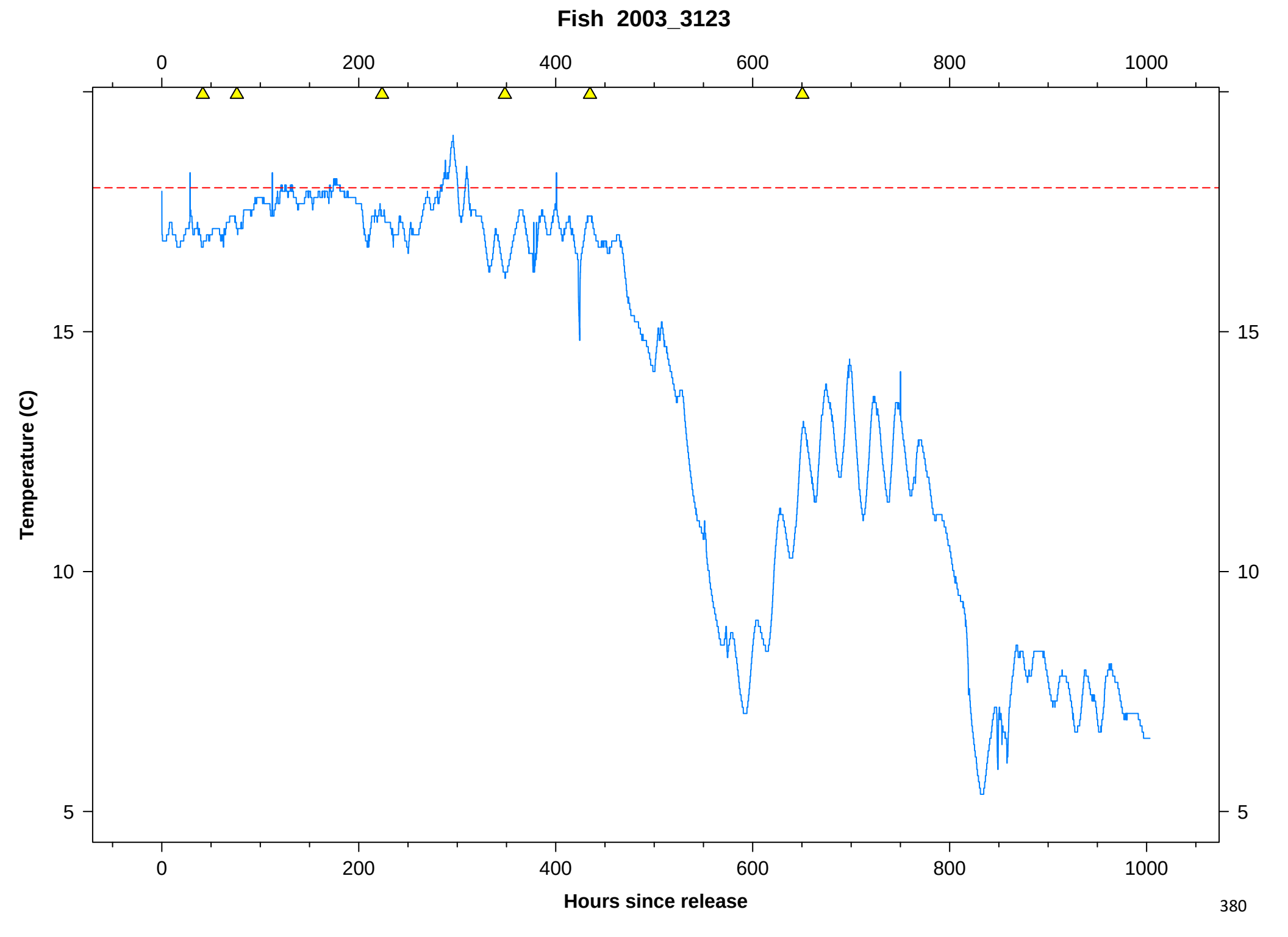

Fish 2003_3123
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

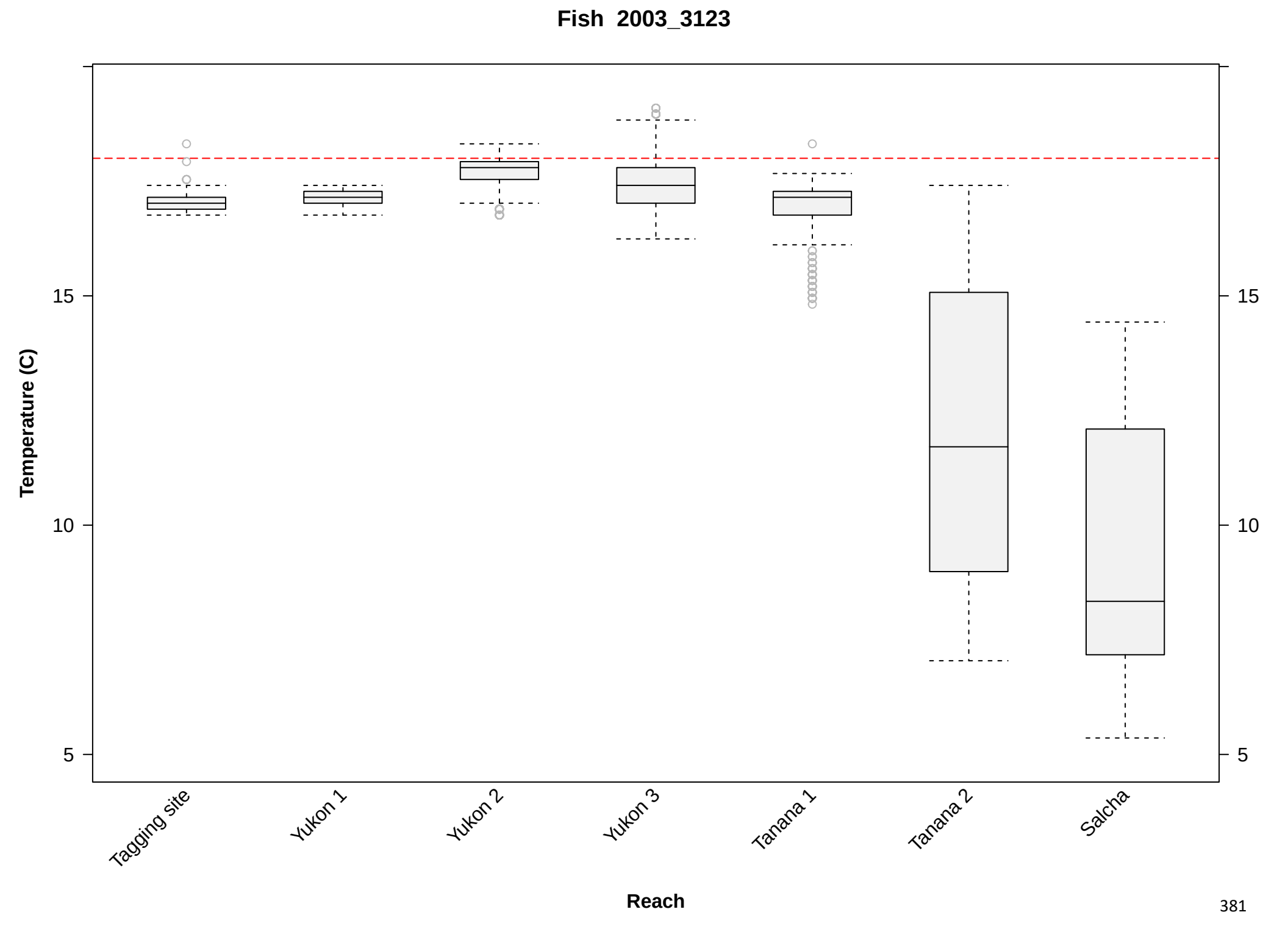

Fish 2003_3123
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release

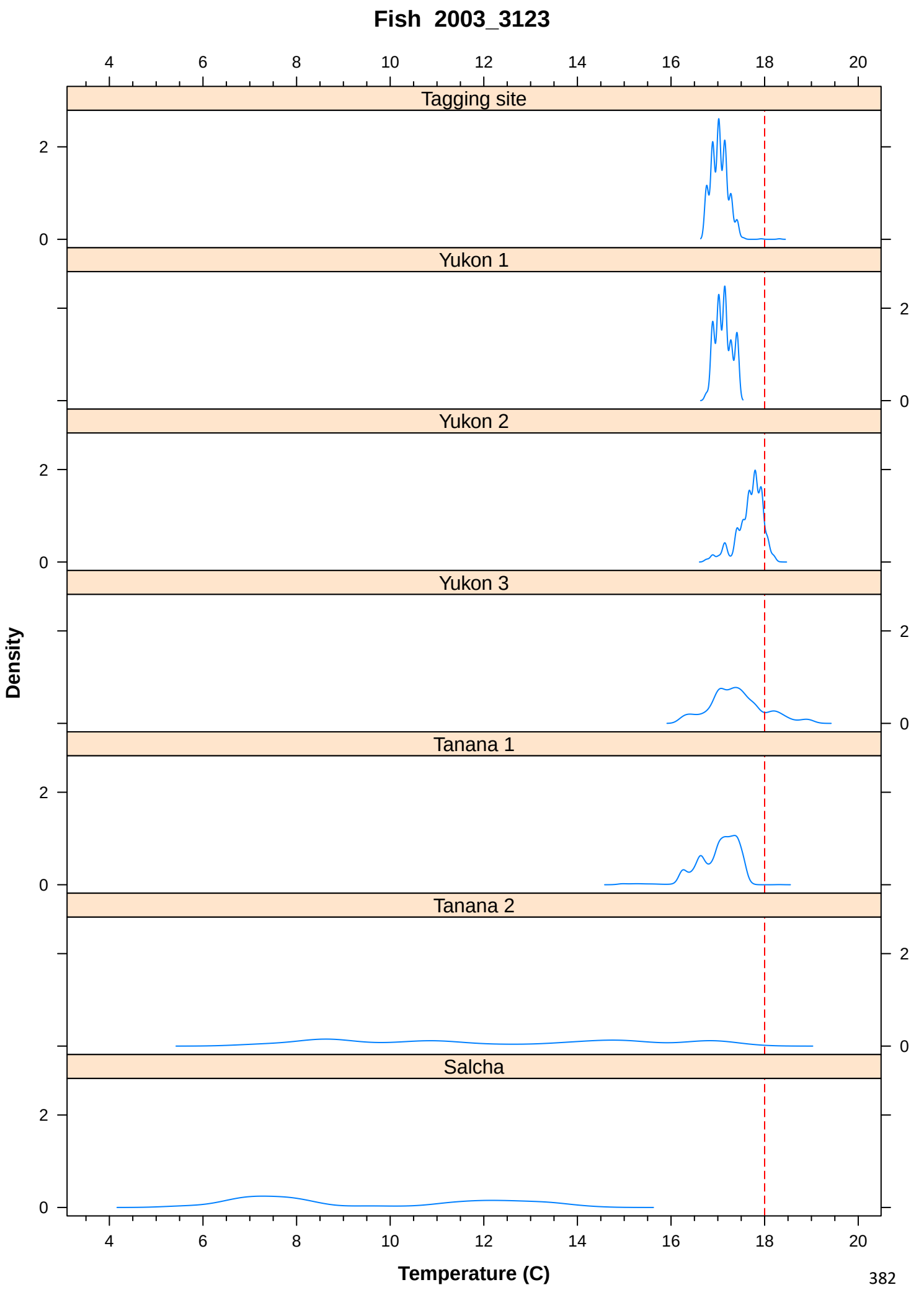

Fish 2003_3123
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

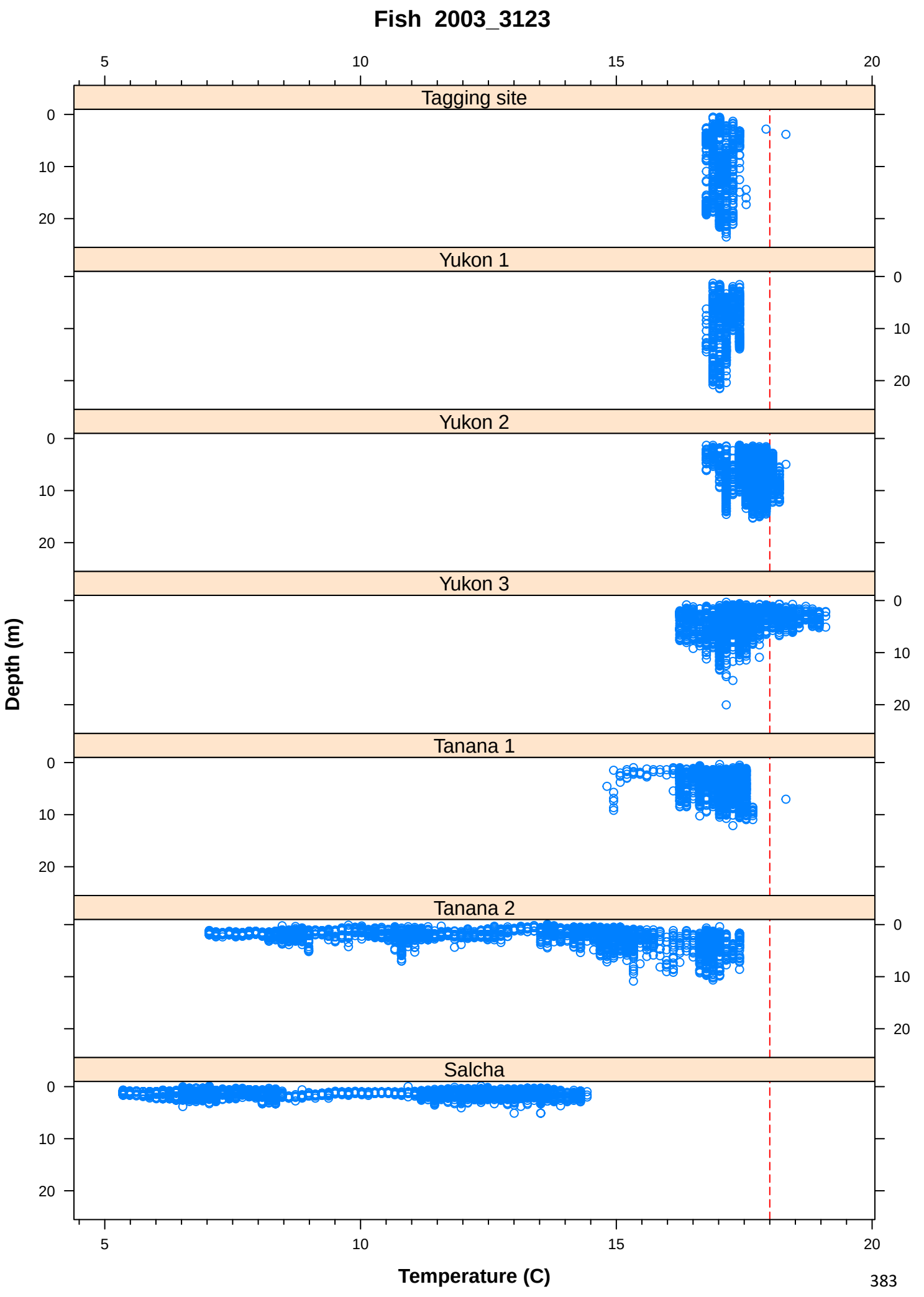

Fish 2003_3123
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
0
1
0
5
10
15
20
25
Depth (m)

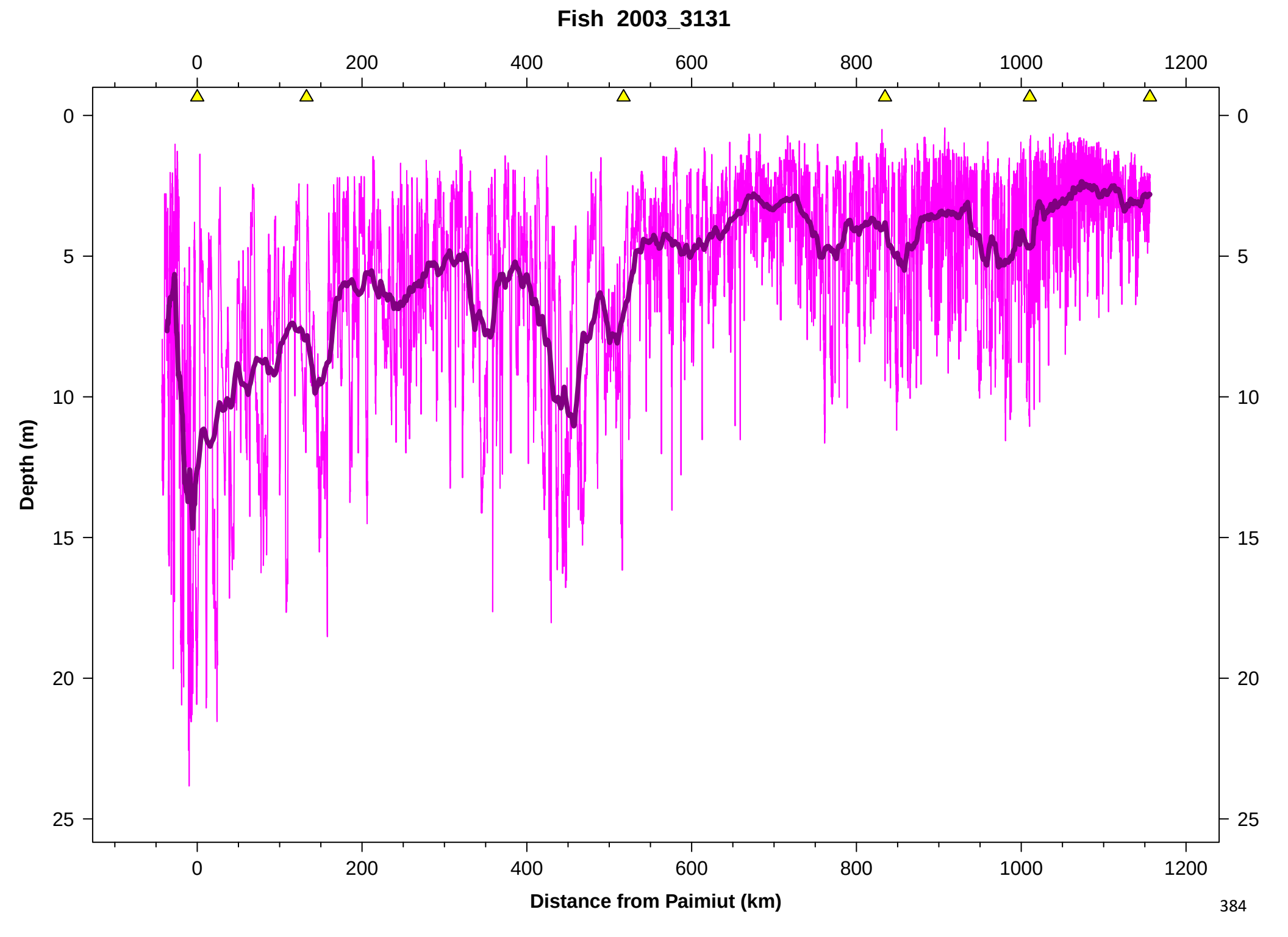

Fish 2003_3123
0
200
400
600
800
1000
1200
15
10
Temperature (C)
Distance from Paimiut

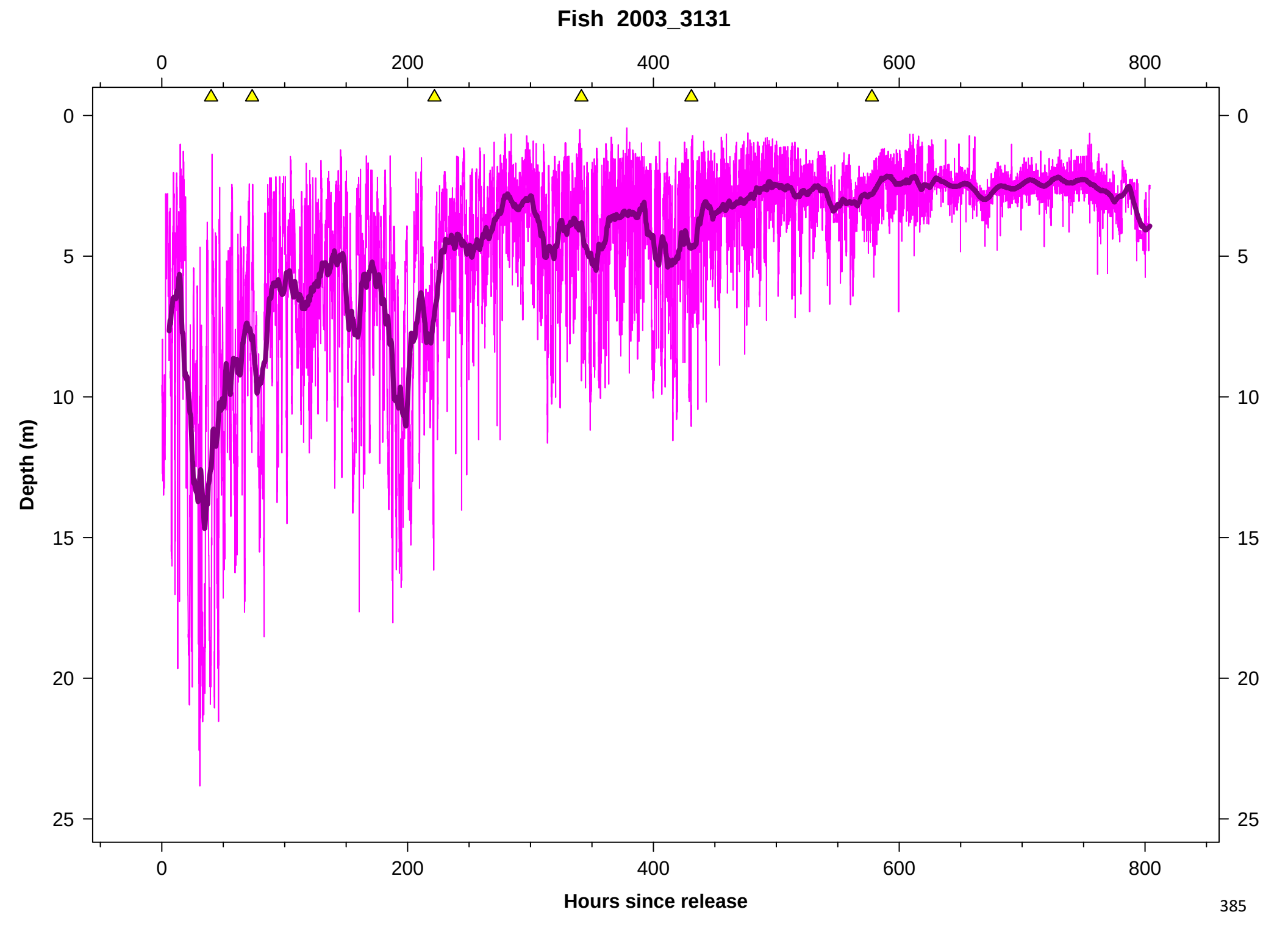

Fish 2003_3123
0
200
400
600
800
1000
15
10
5
Temperature (C)
Hours since release

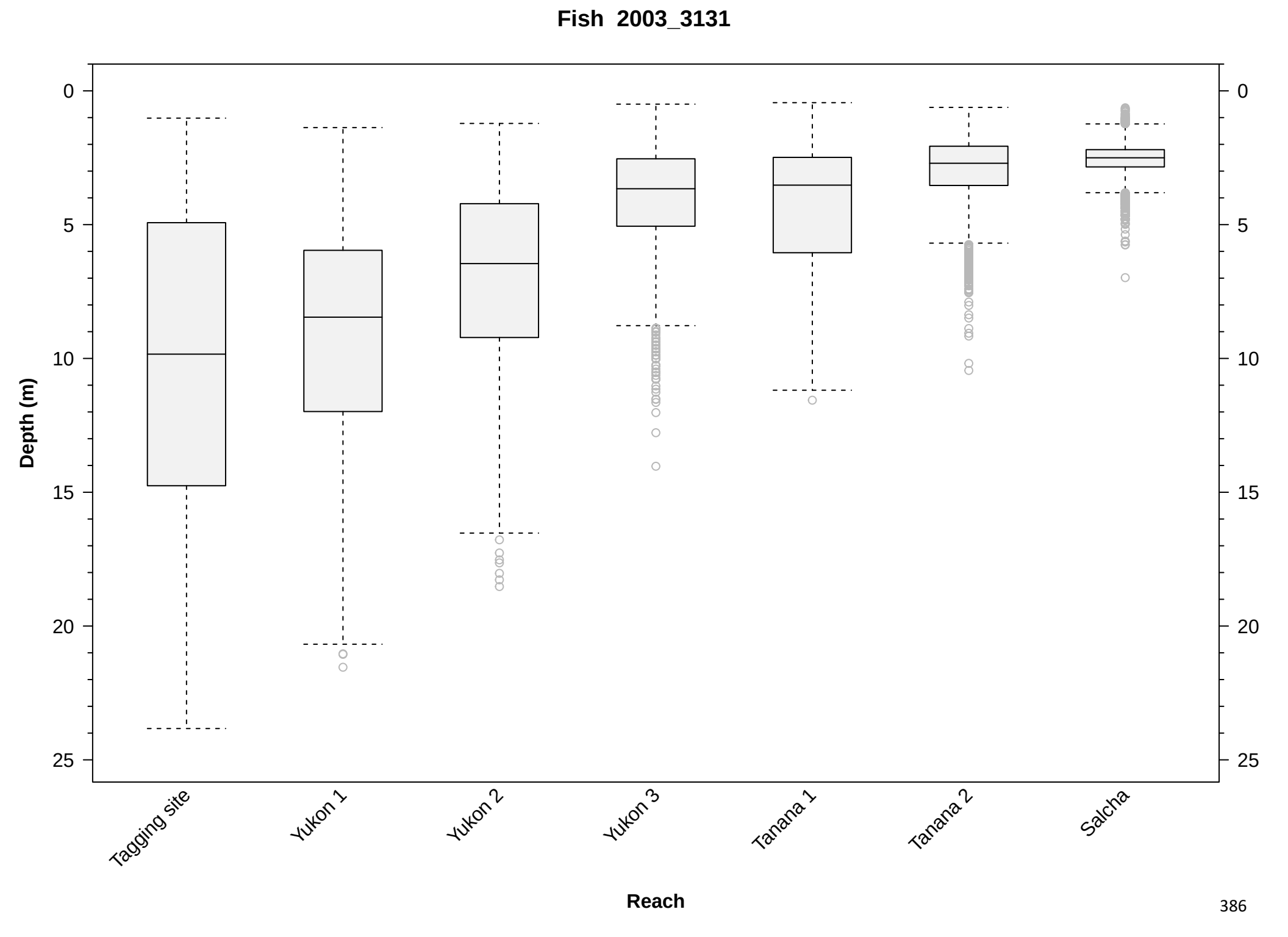

Fish 2003_3123
Temperature (C)
15
10
5
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

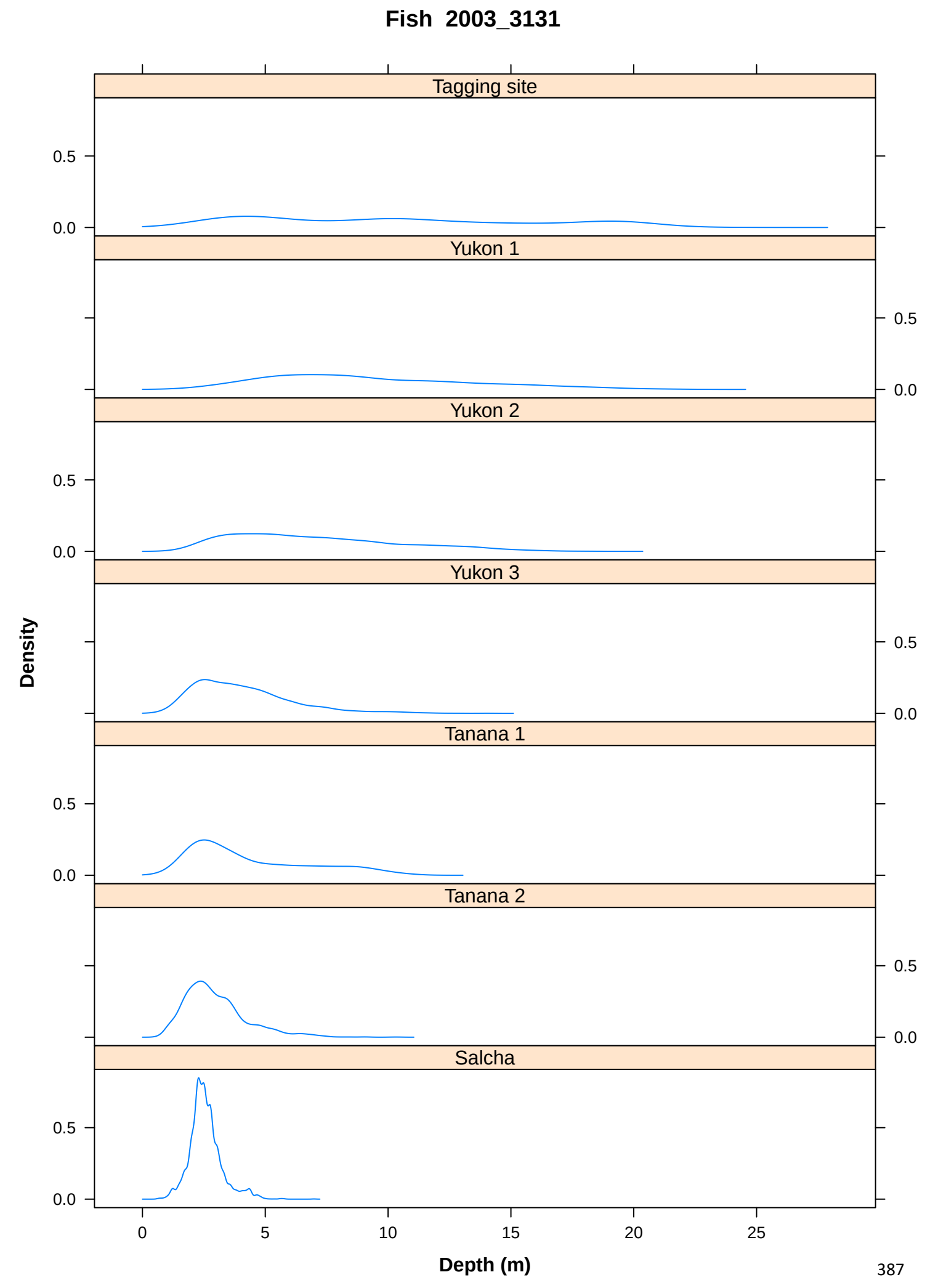

Fish 2003_3123
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
Temperature (C)
4
6
8
10
12
14
16
18
20
0
2

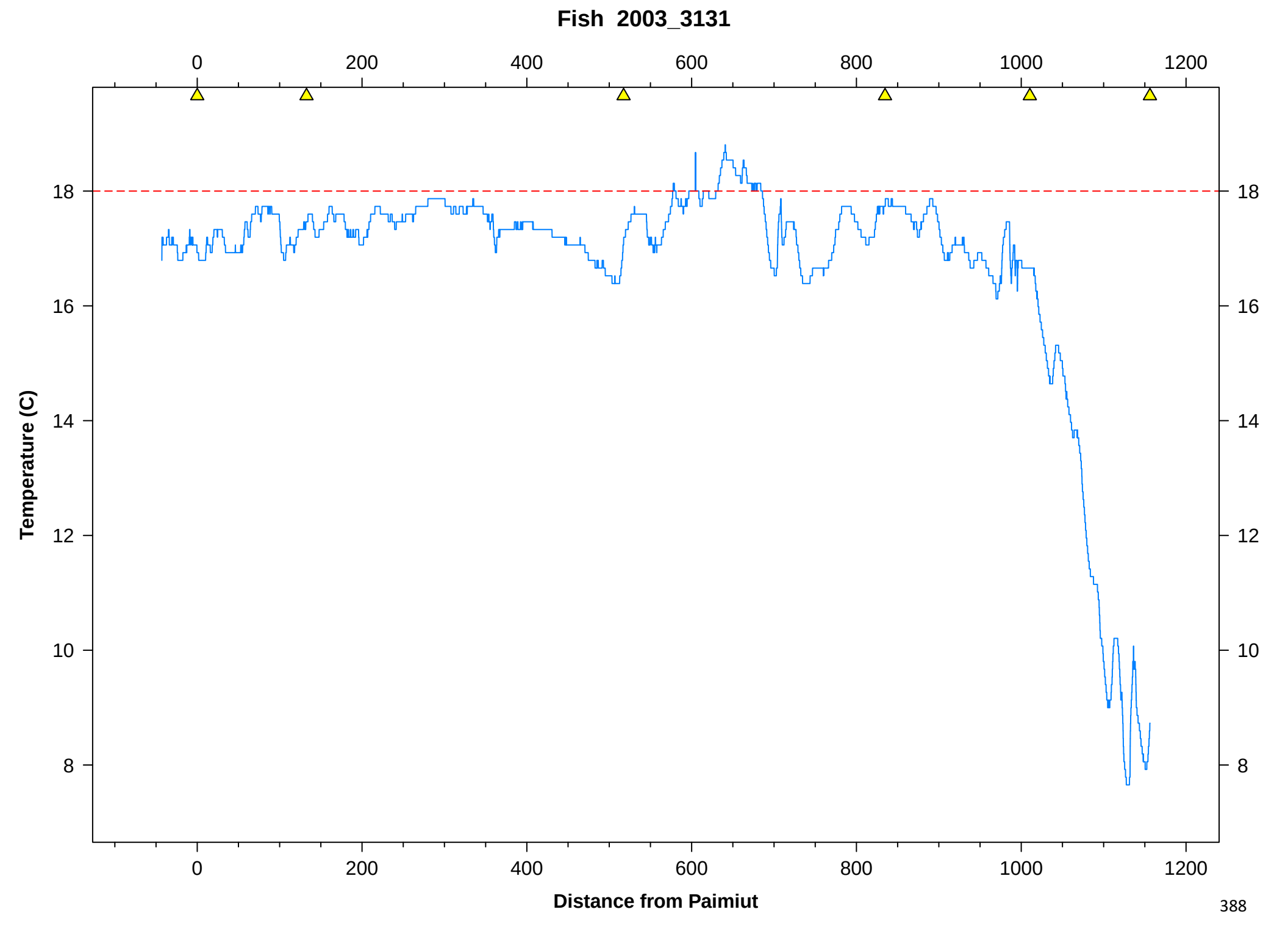

Fish 2003_3123
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Depth (m)
Temperature (C)
5
10
15
20
0
10
20

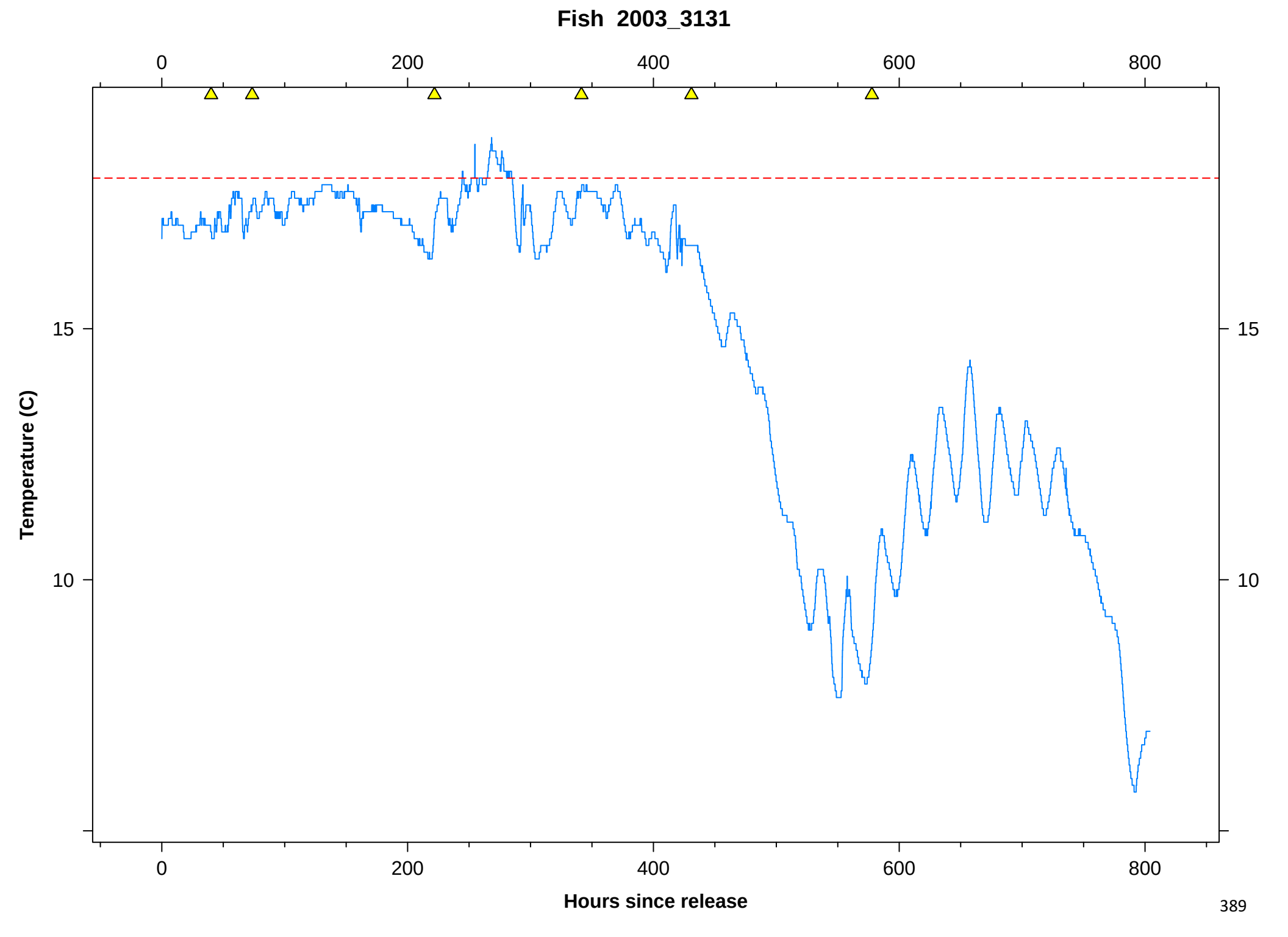

Fish 2003_3131
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

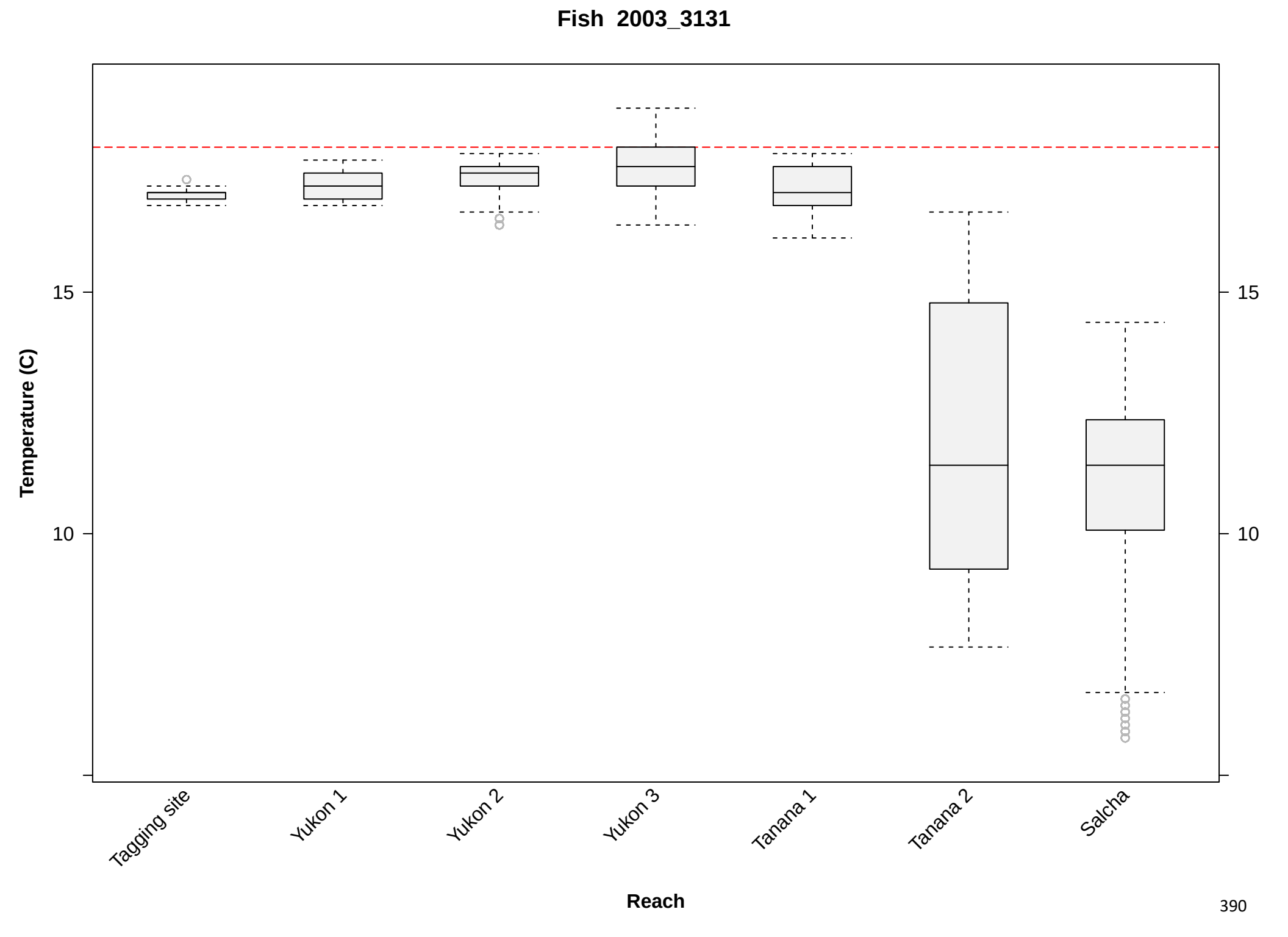

Fish 2003_3131
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Hours since release

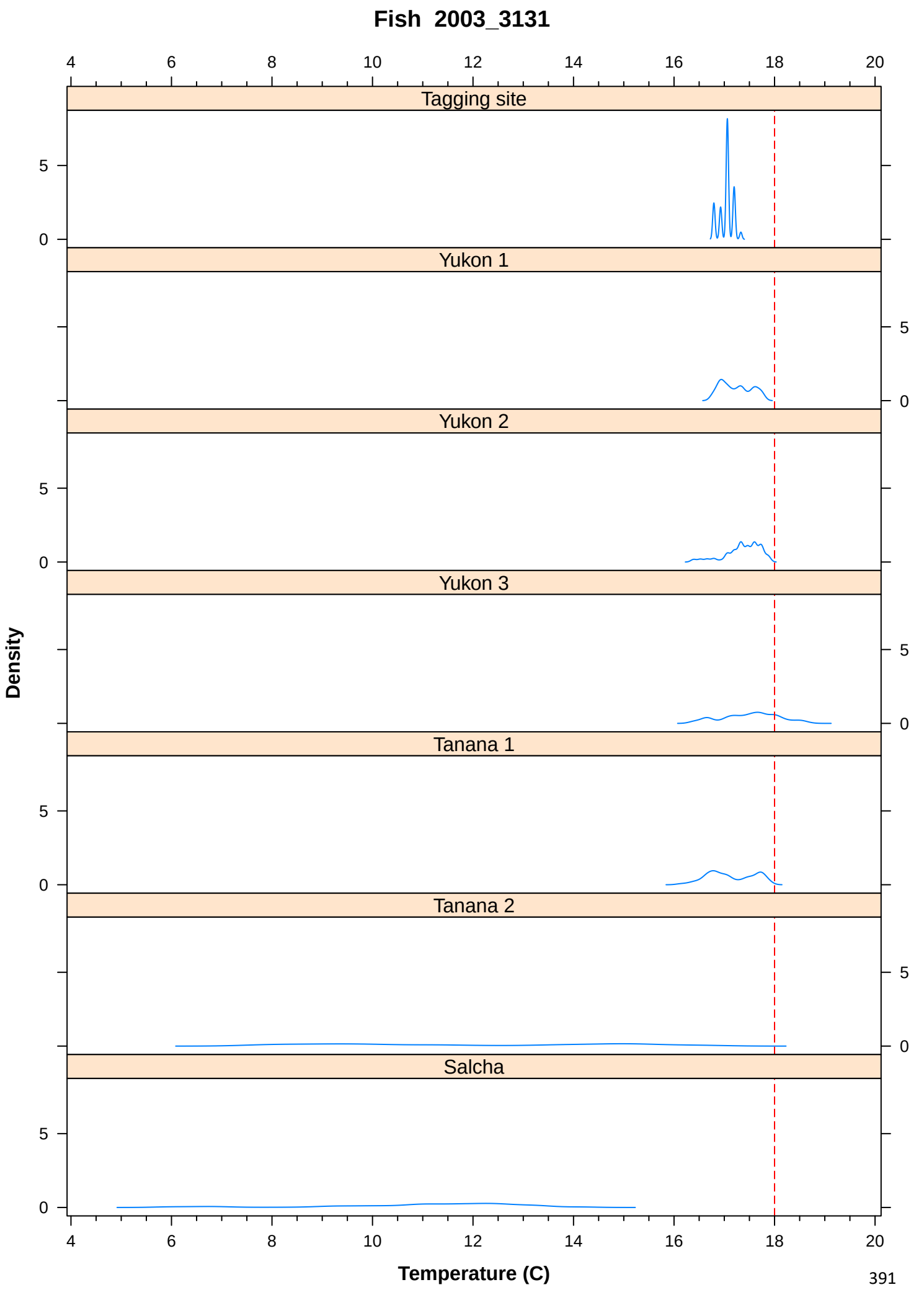

Fish 2003_3131
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

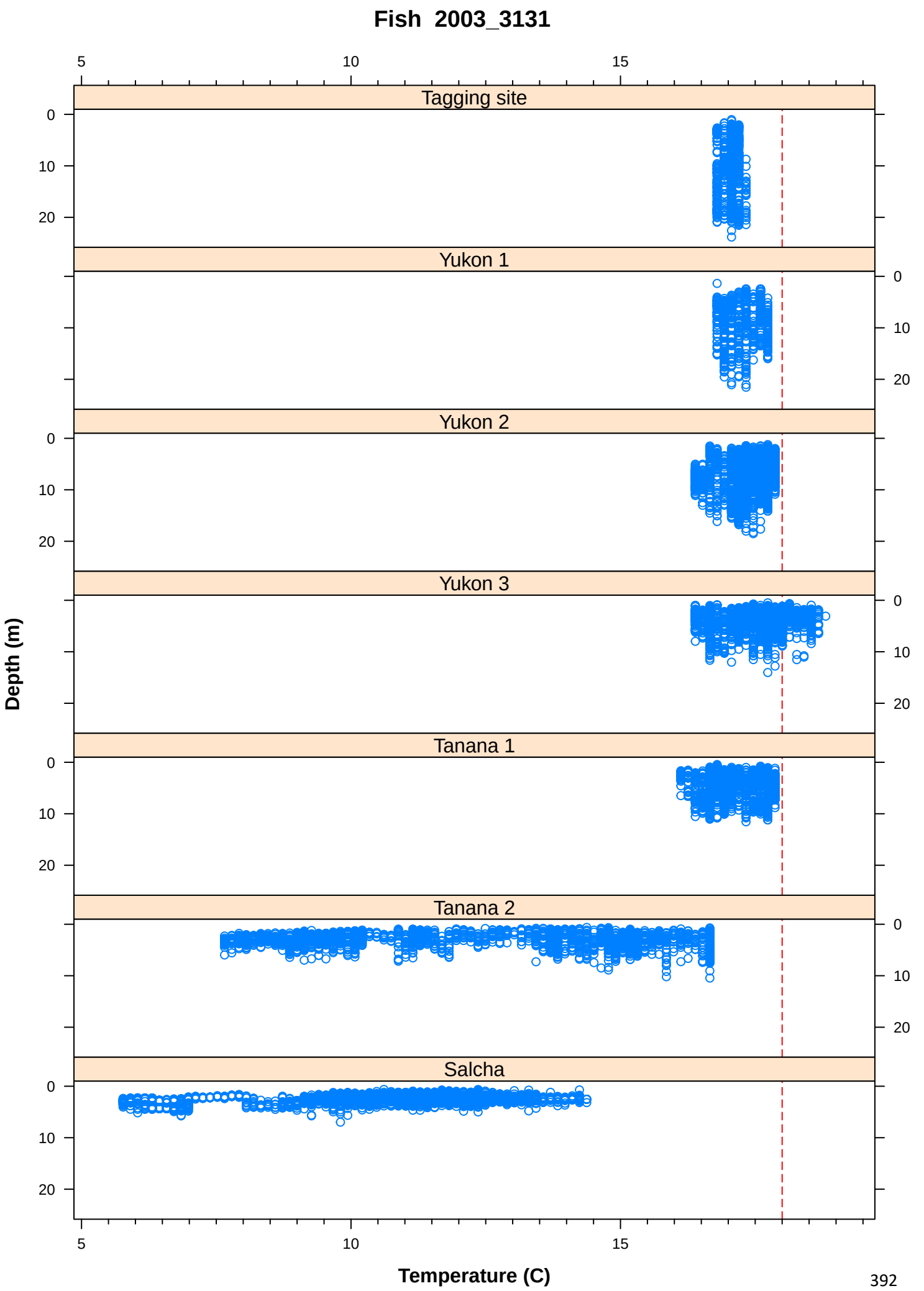

Fish 2003_3131
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
0.5
0.0
0
5
10
15
20
25
Depth (m)

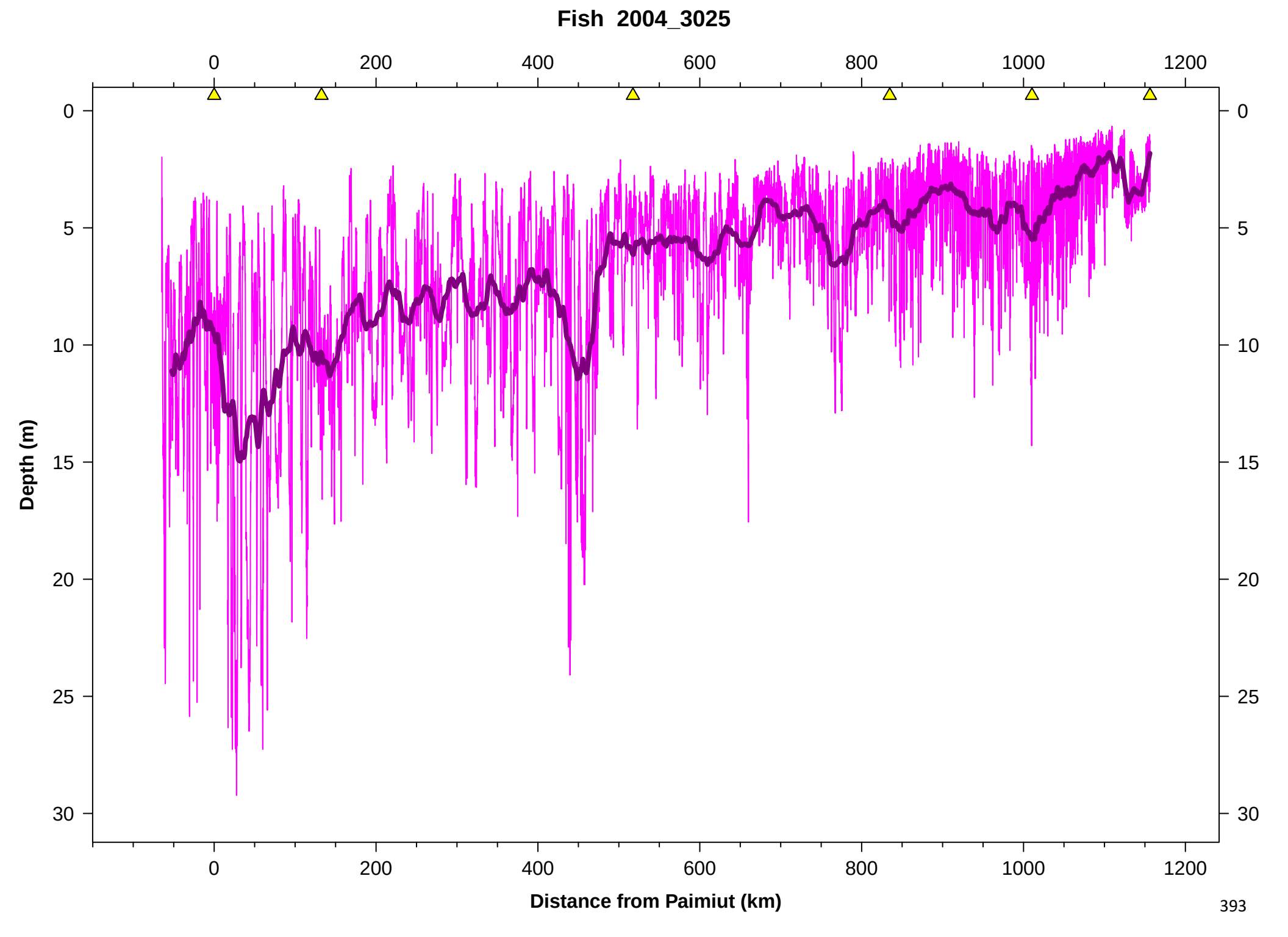

Fish 2003_3131
0
200
400
600
800
1000
1200
18
16
14
12
10
8
Temperature (C)
Distance from Paimiut

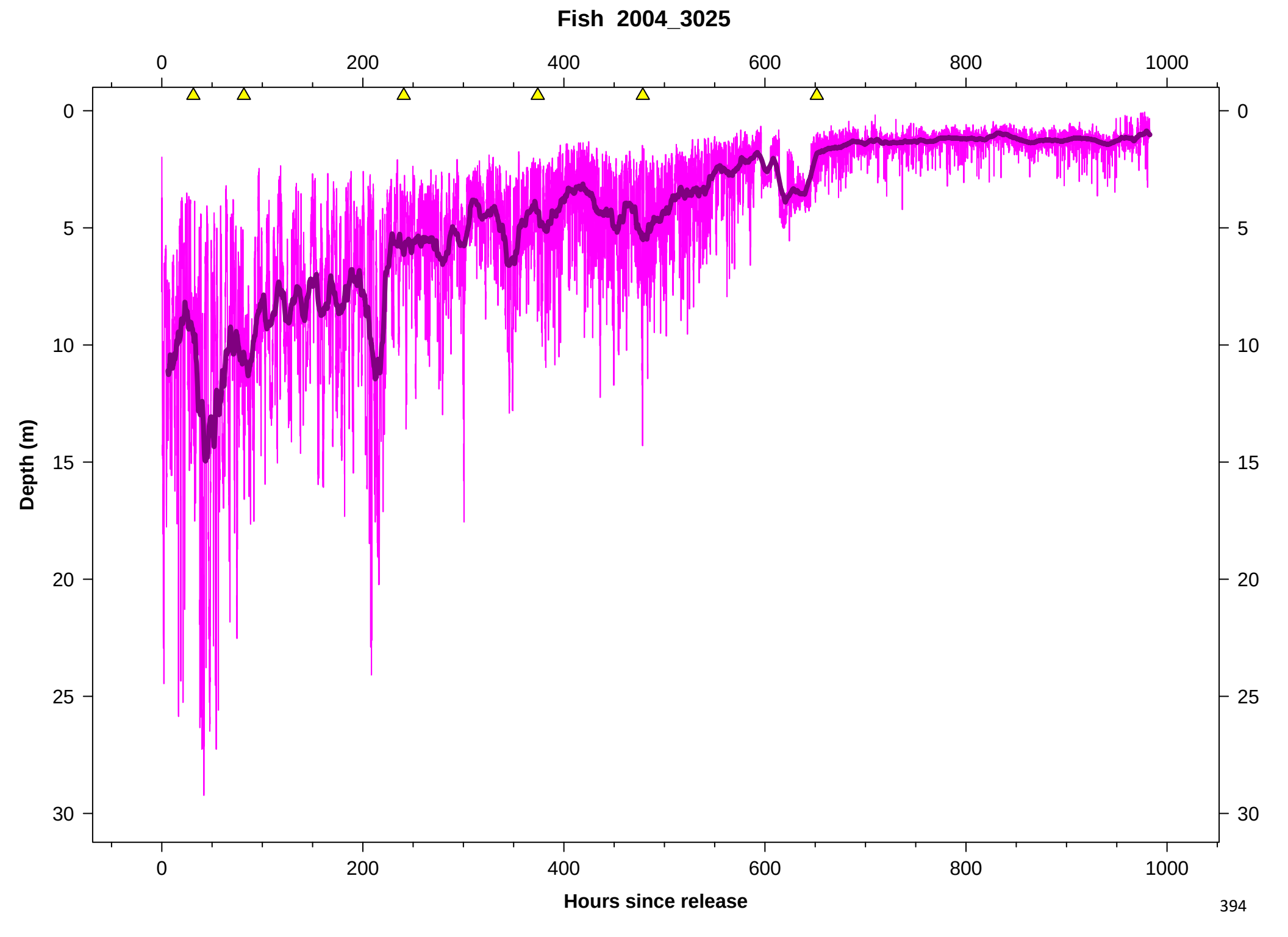

Fish 2003_3131
0
200
400
600
800
15
10
Temperature (C)
Hours since release

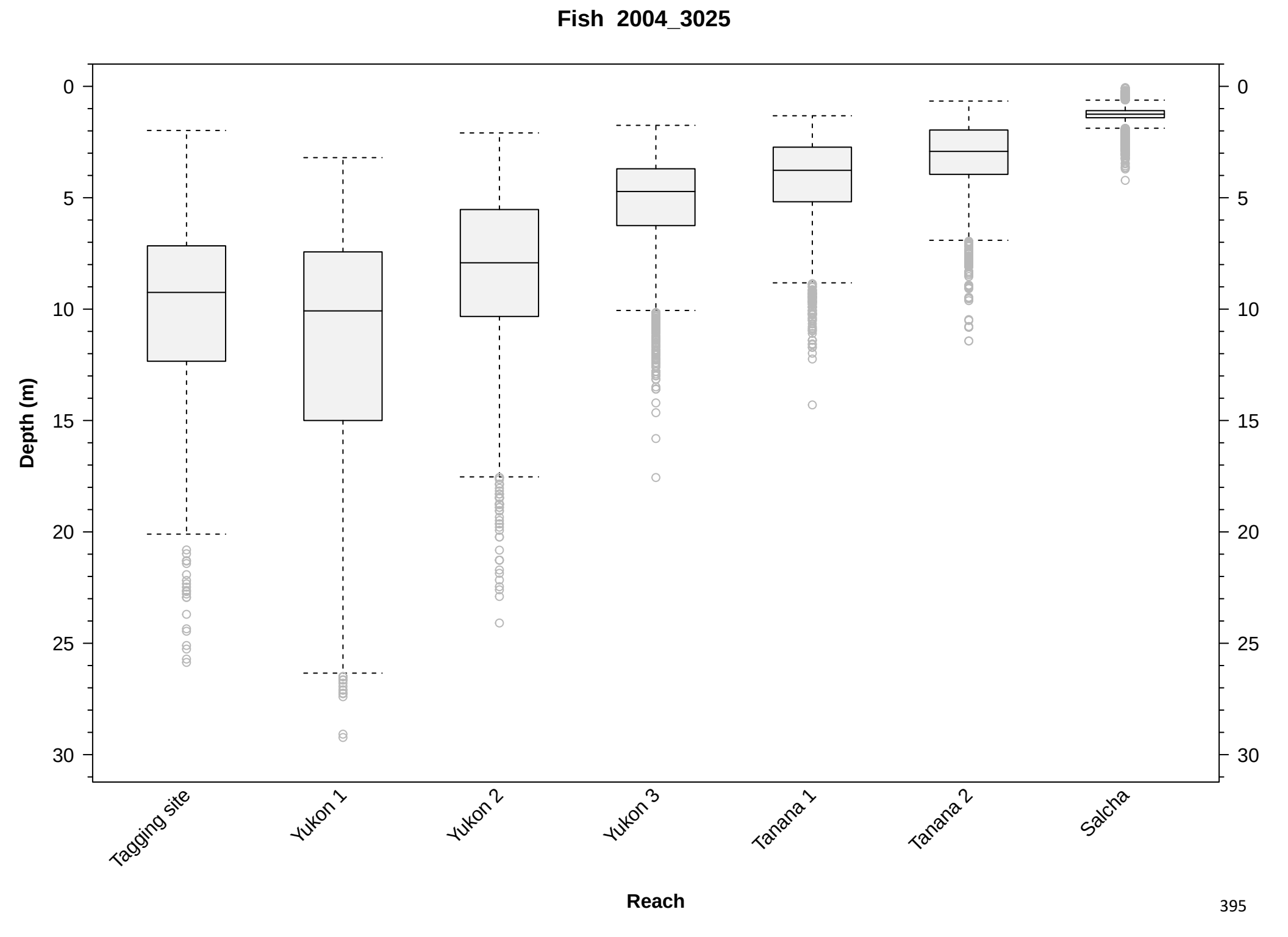

Fish 2003_3131
Temperature (C)
15
10
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

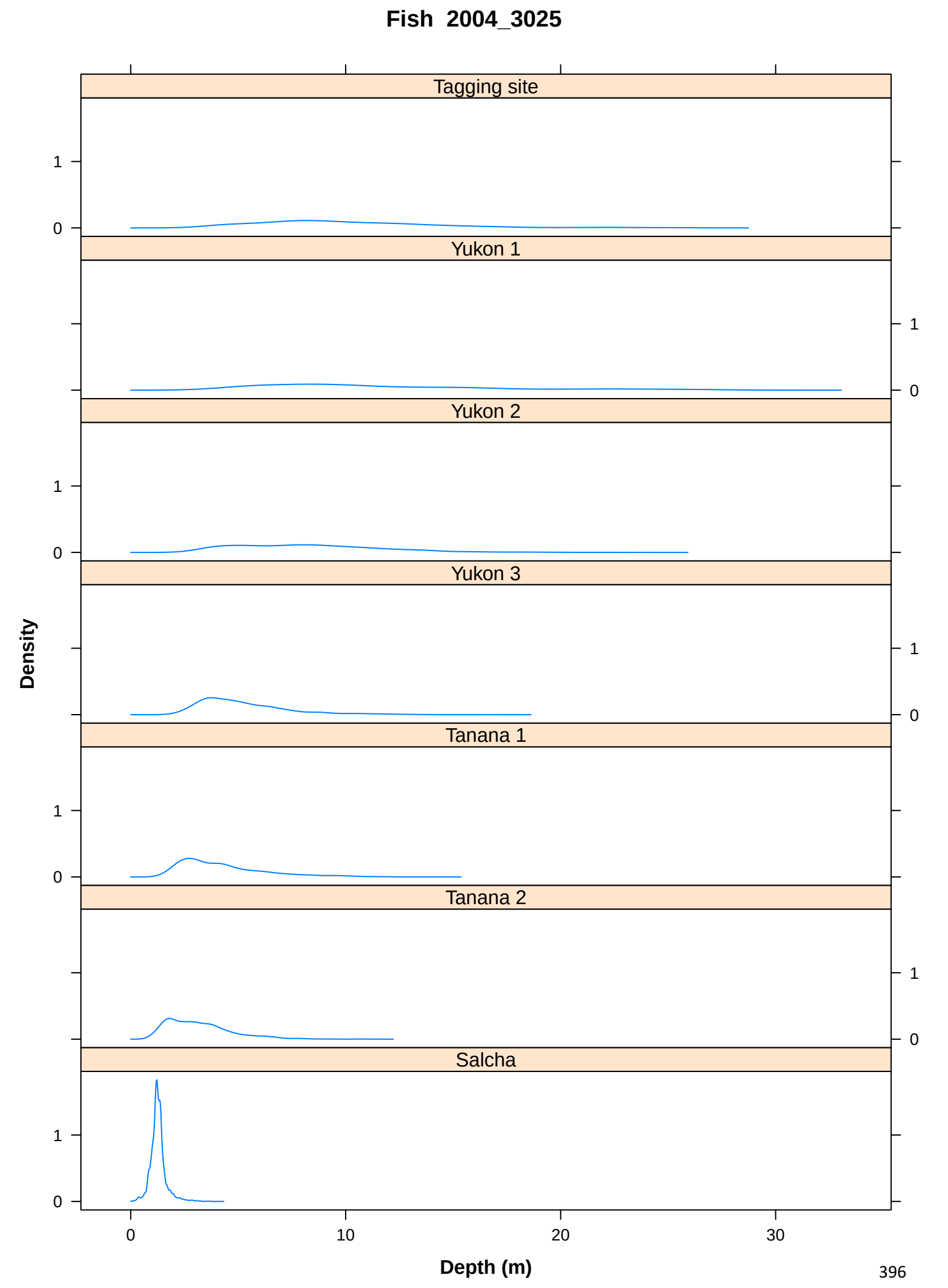

Fish 2003_3131
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
Temperature (C)
4
6
8
10
12
14
16
18
20
0
5

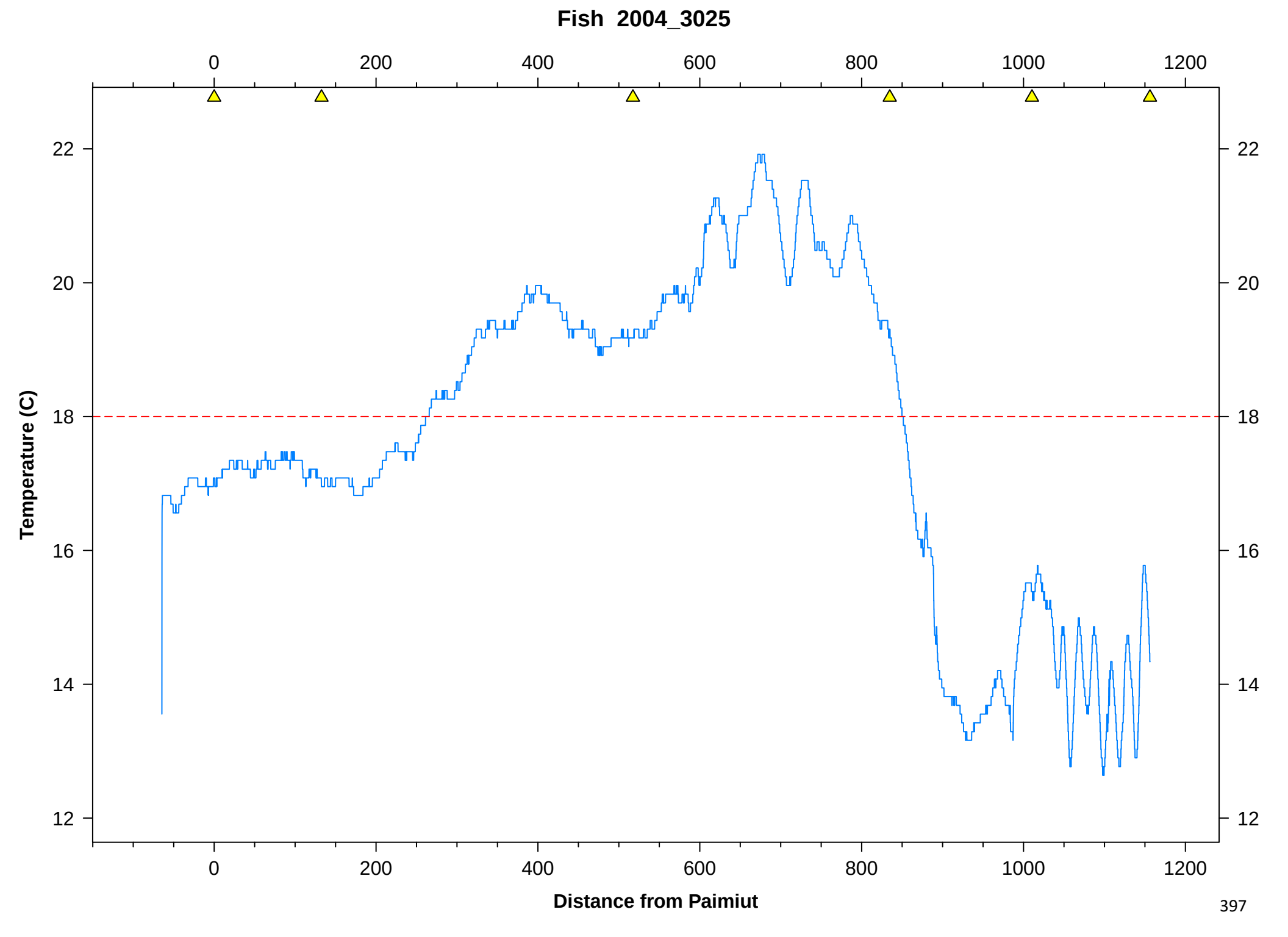

Fish 2003_3131
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Depth (m)
Temperature (C)
5
10
15
0
10
20

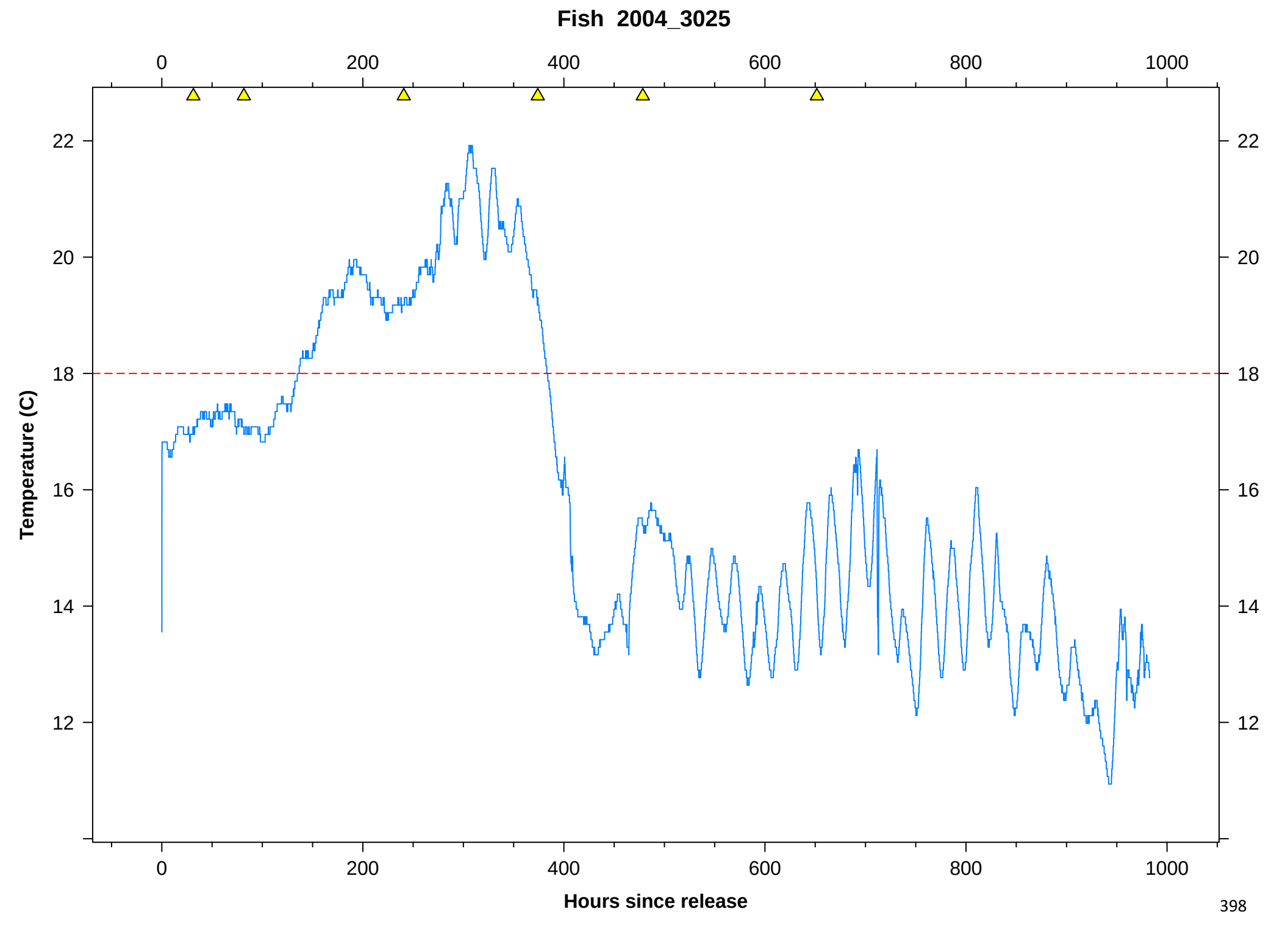

Fish 2004_3025
0
200
400
600
800
1000
1200
0
5
10
15
20
25
30
Depth (m)
Distance from Paimiut (km)

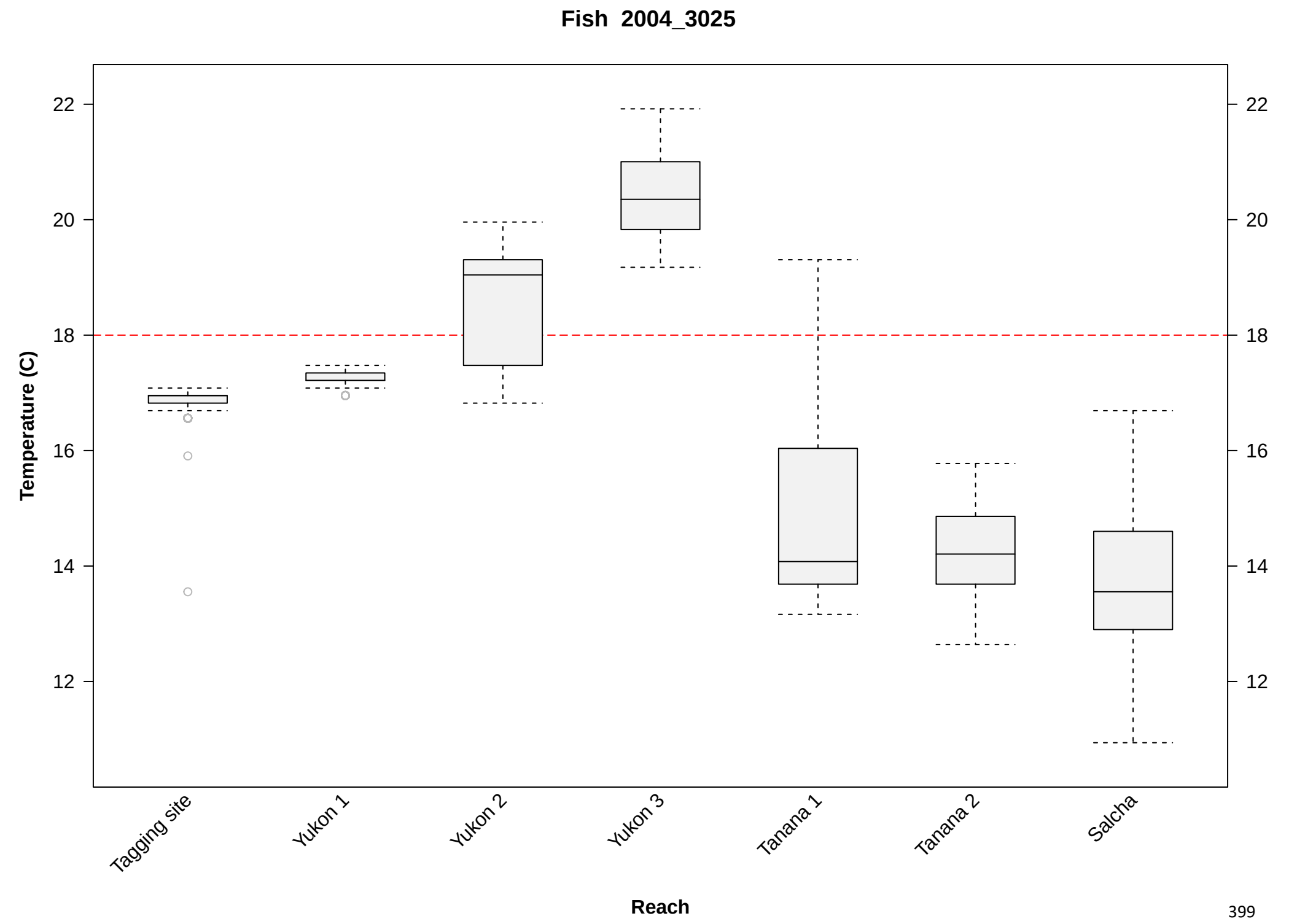

Fish 2004_3025
0
200
400
600
800
1000
0
5
10
15
20
25
30
Depth (m)
Hours since release

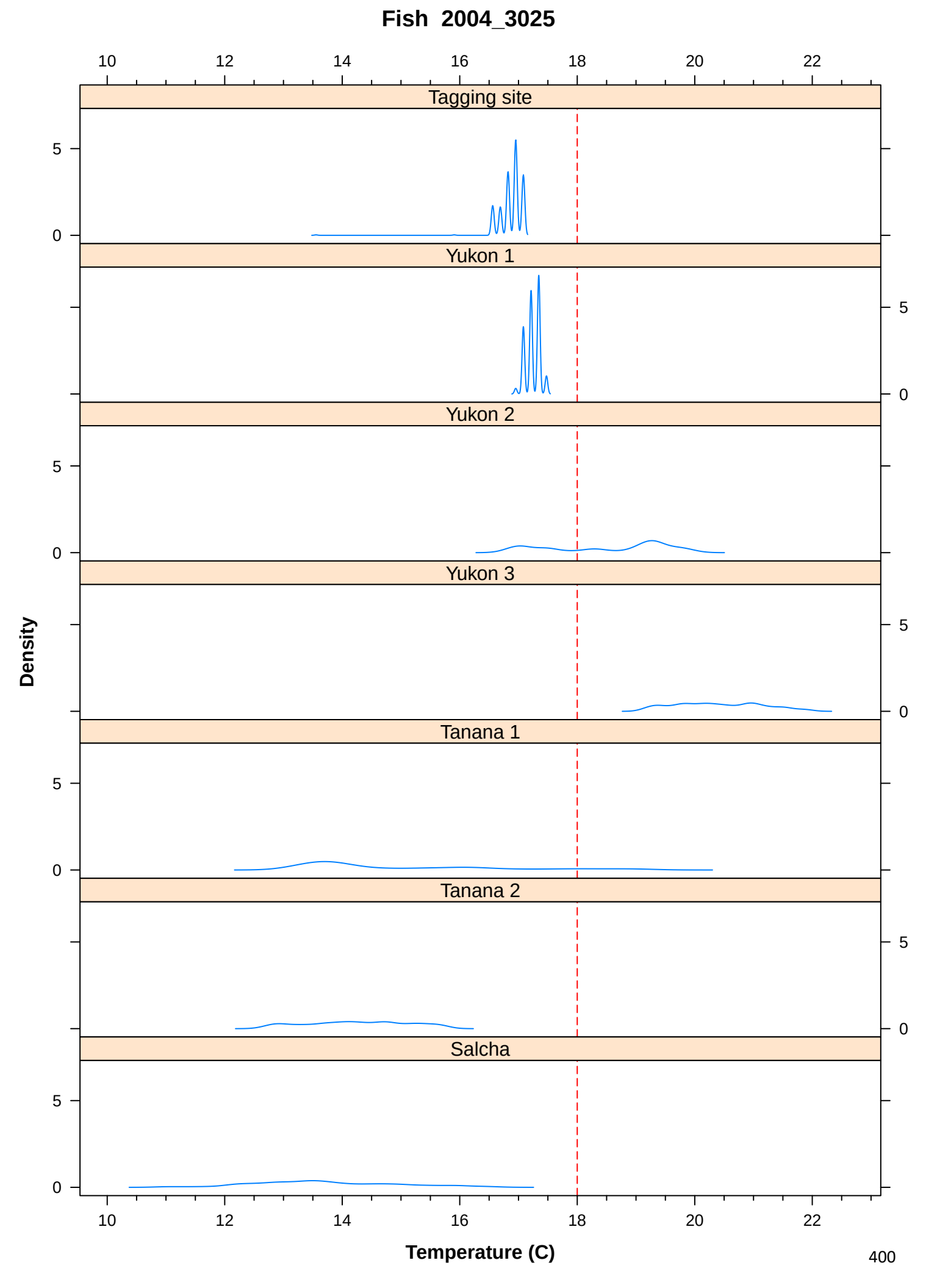

Fish 2004_3025
Depth (m)
0
5
10
15
20
25
30
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

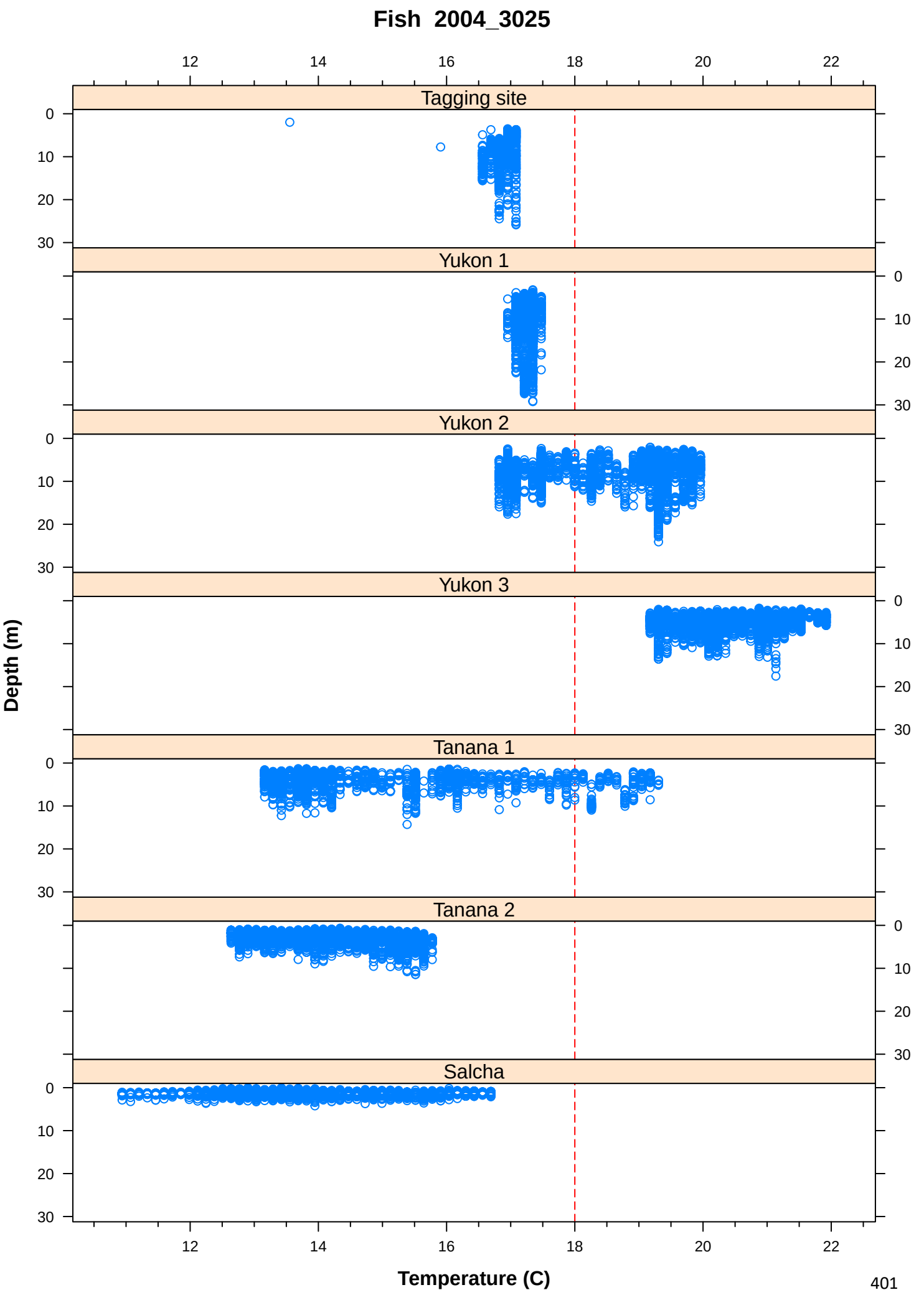

Fish 2004_3025
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
Depth (m)
0
10
20
30
1
0

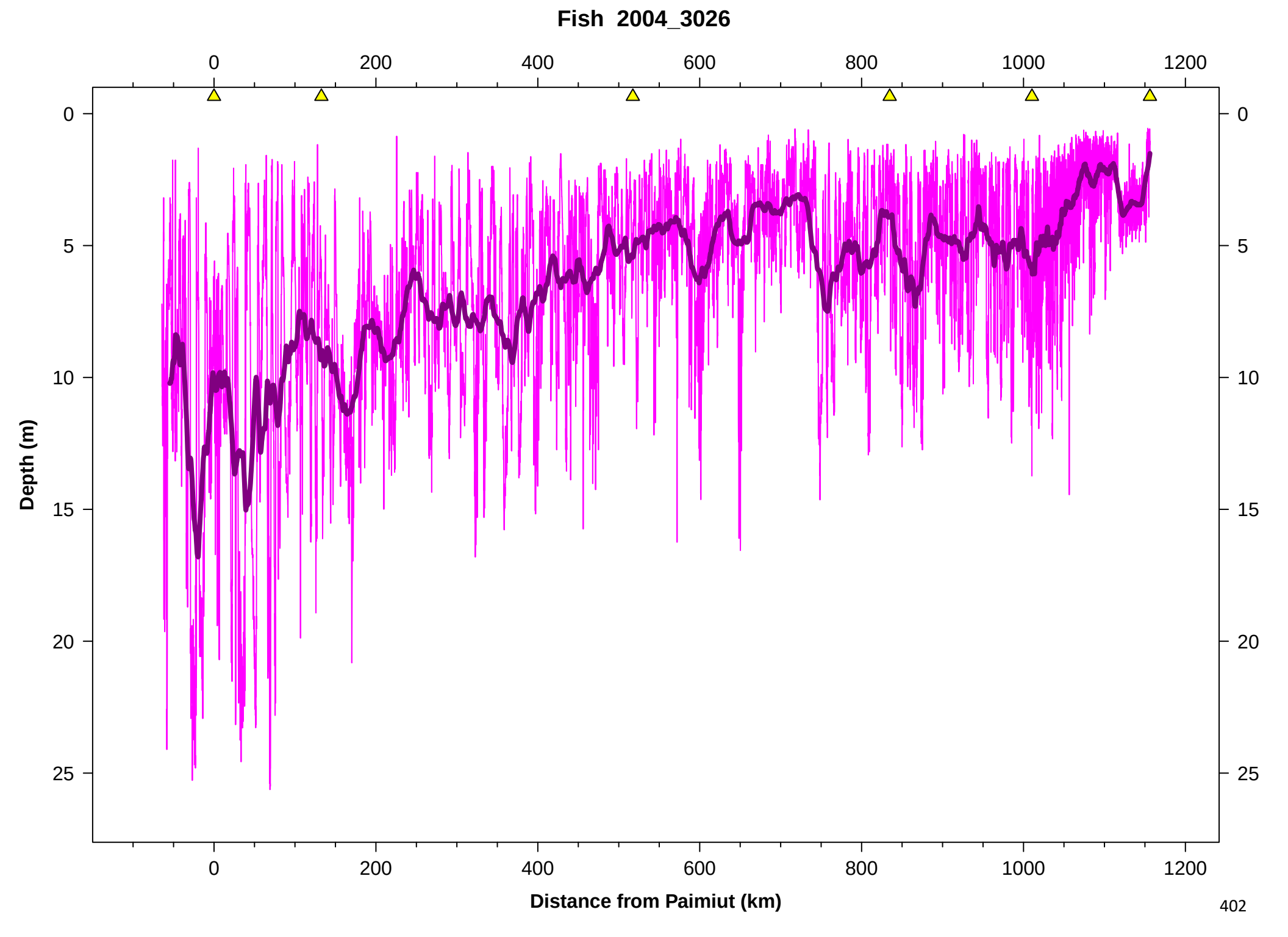

Fish 2004_3025
0
200
400
600
800
1000
1200
22
20
18
16
14
12
Temperature (C)
Distance from Paimiut

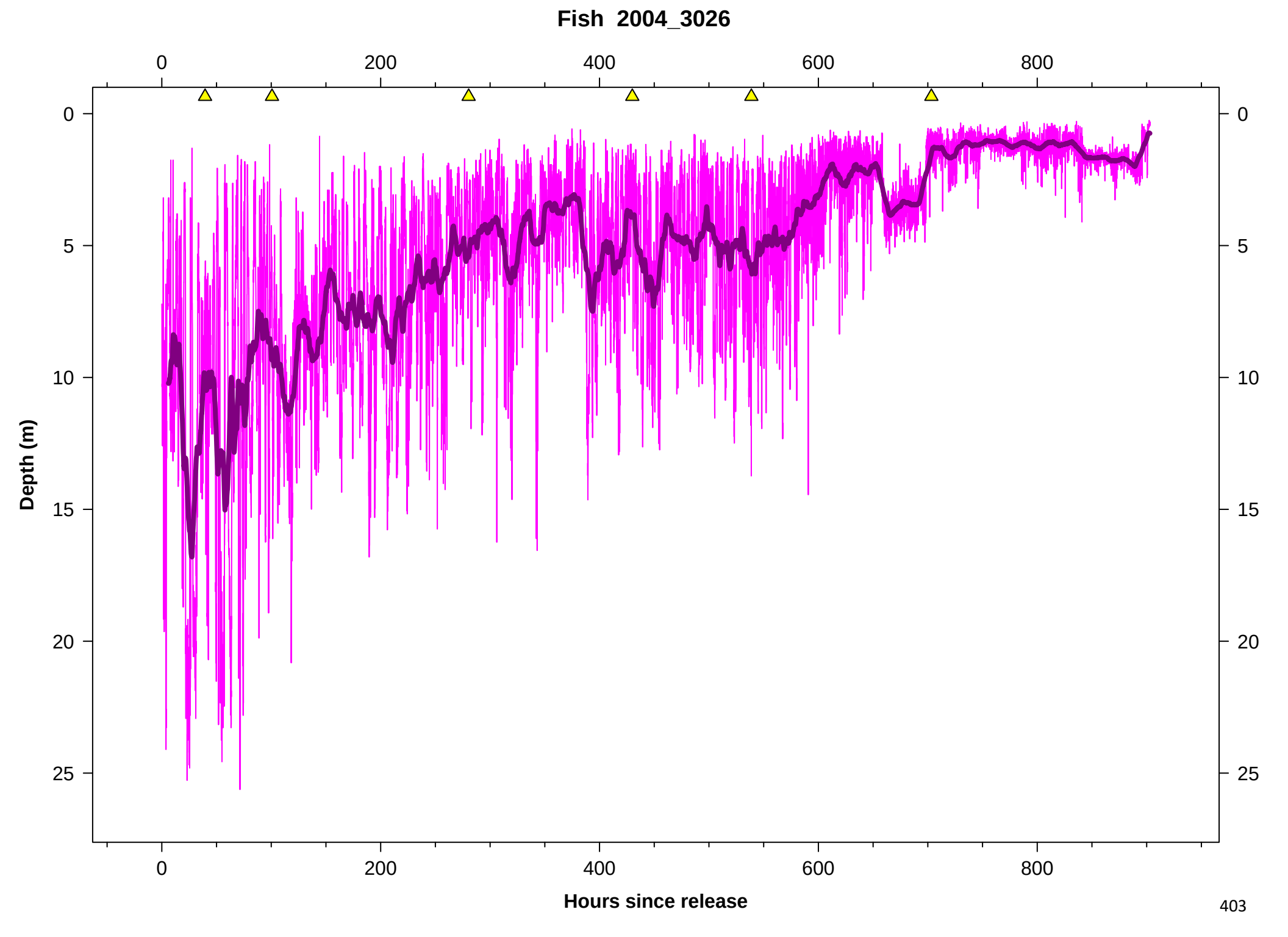

Fish 2004_3025
0
200
400
600
800
1000
22
20
18
16
14
12
Temperature (C)
Hours since release

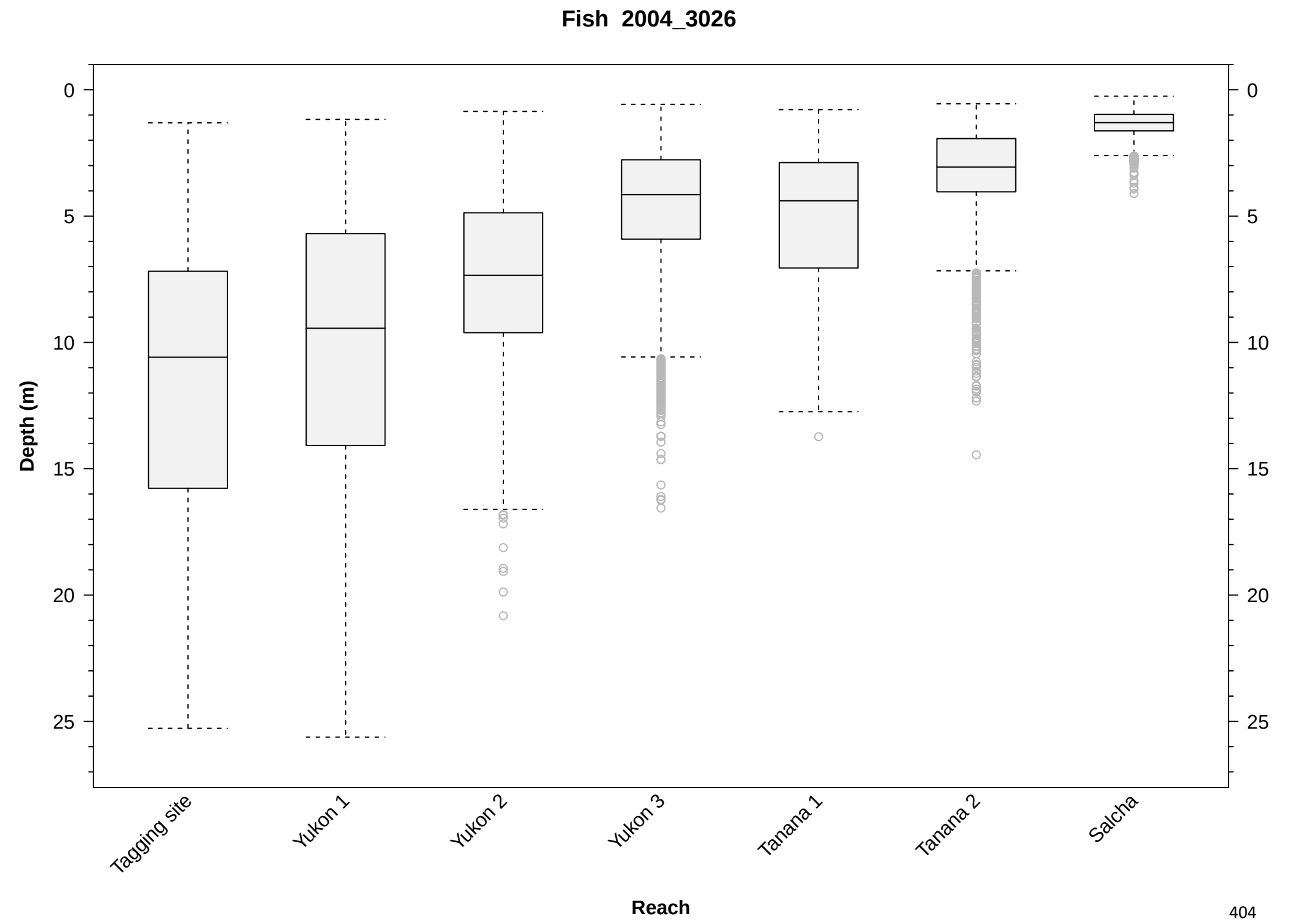

Fish 2004_3025
Temperature (C)
22
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

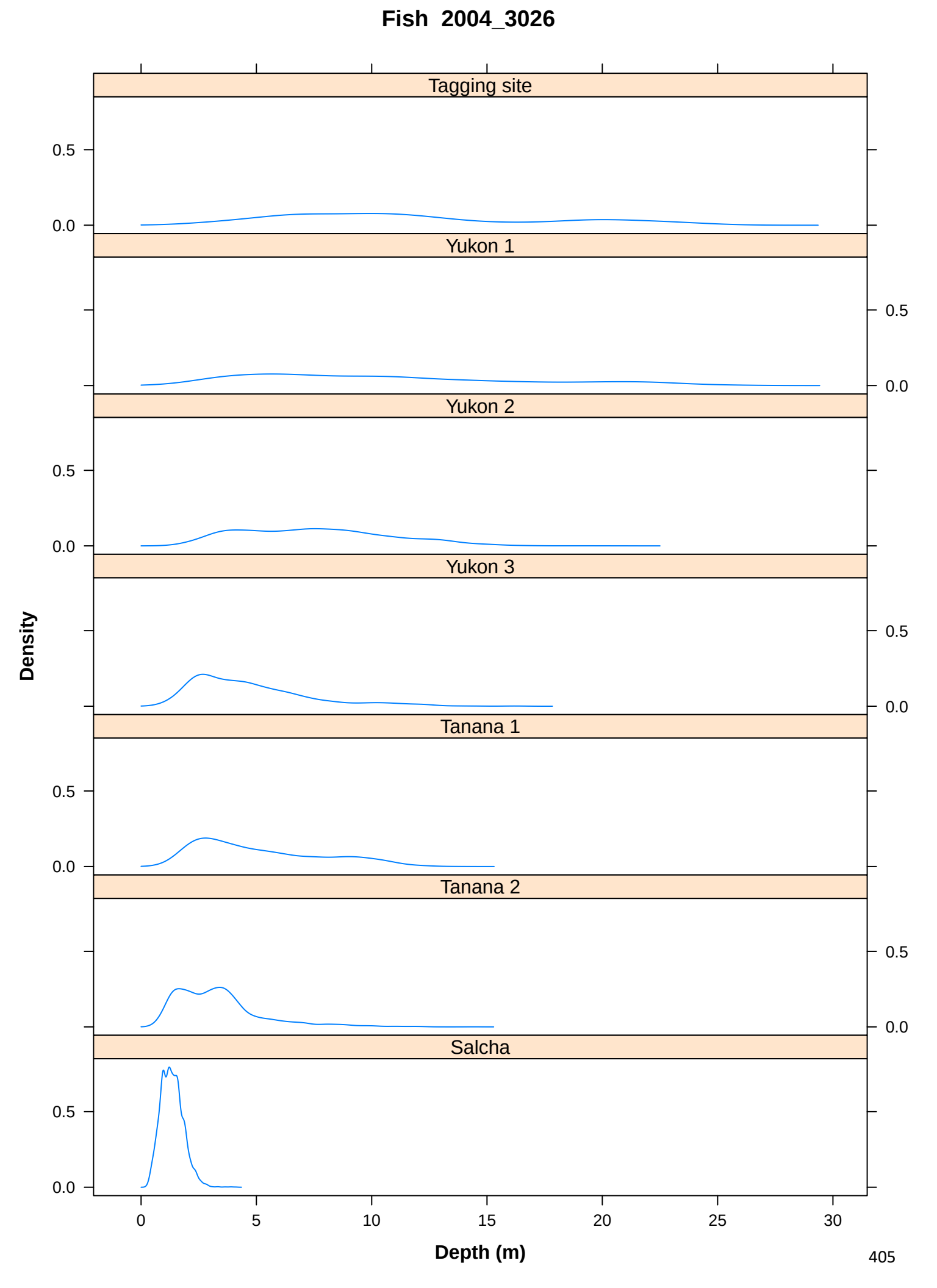

Fish 2004_3025
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
Temperature (C)
10
12
14
16
18
20
22
0
5
400

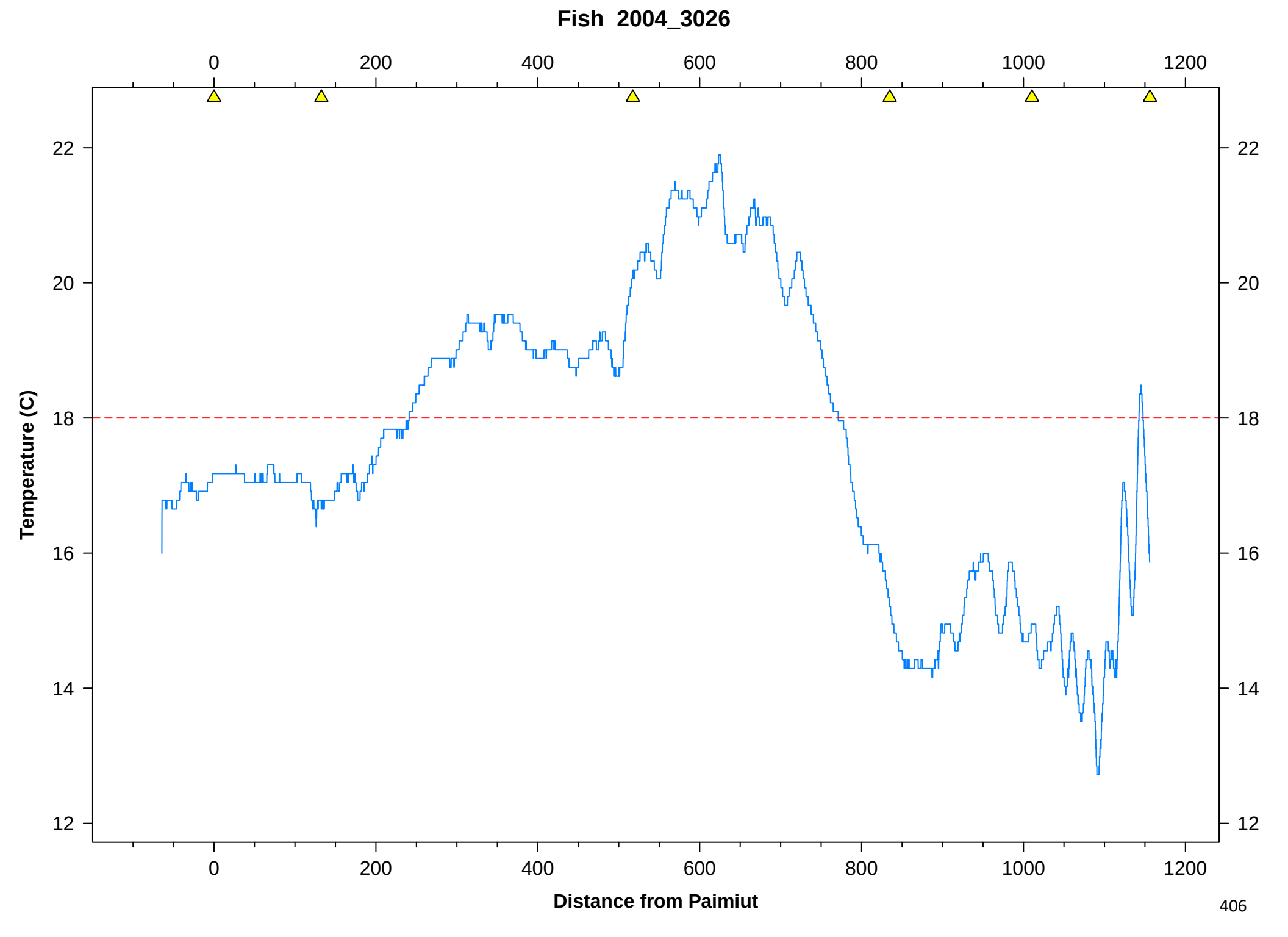

Fish 2004_3025
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Depth (m)
Temperature (C)
12
14
16
18
20
22
0
10
20
30
401

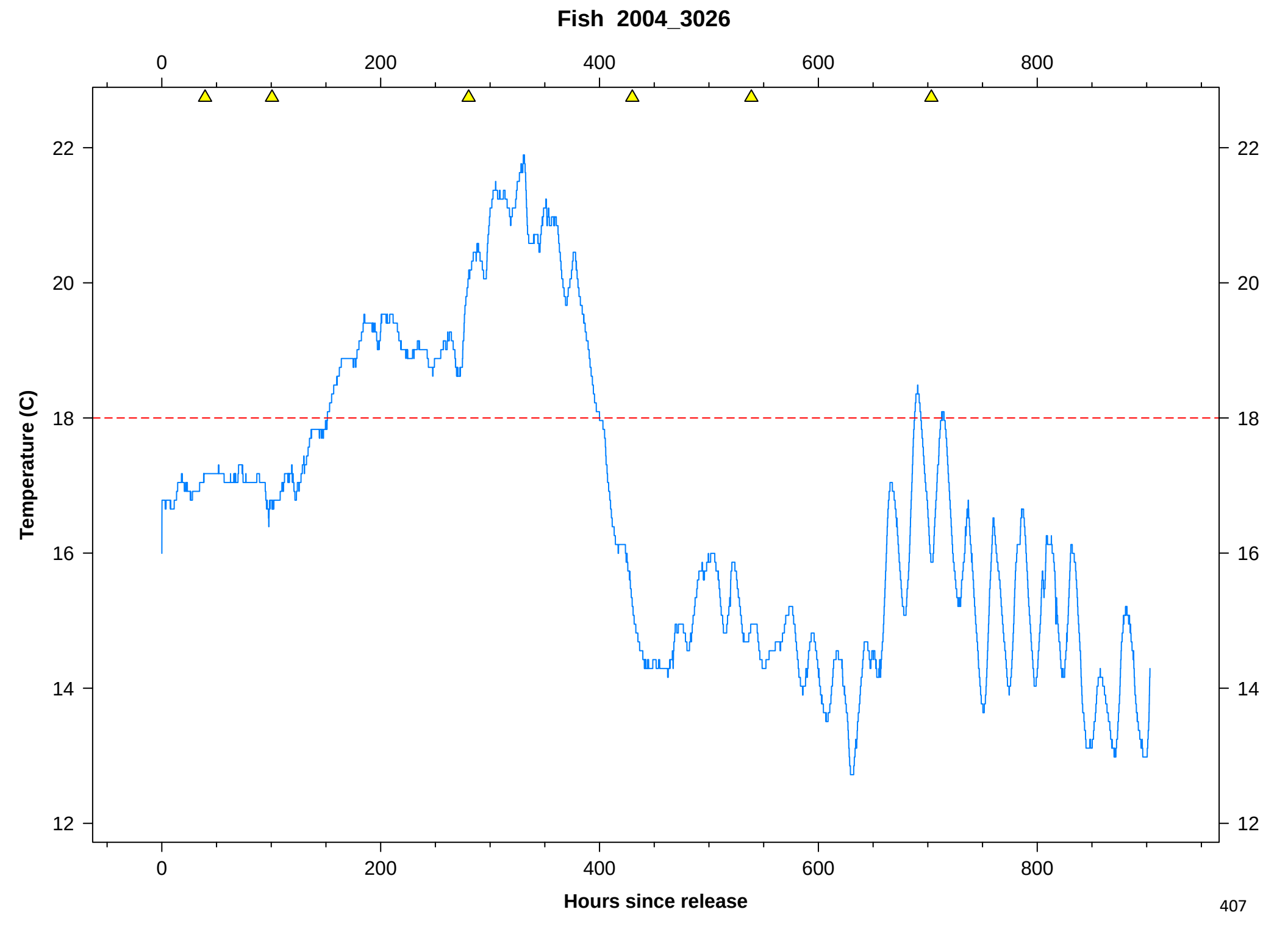

Fish 2004_3026
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

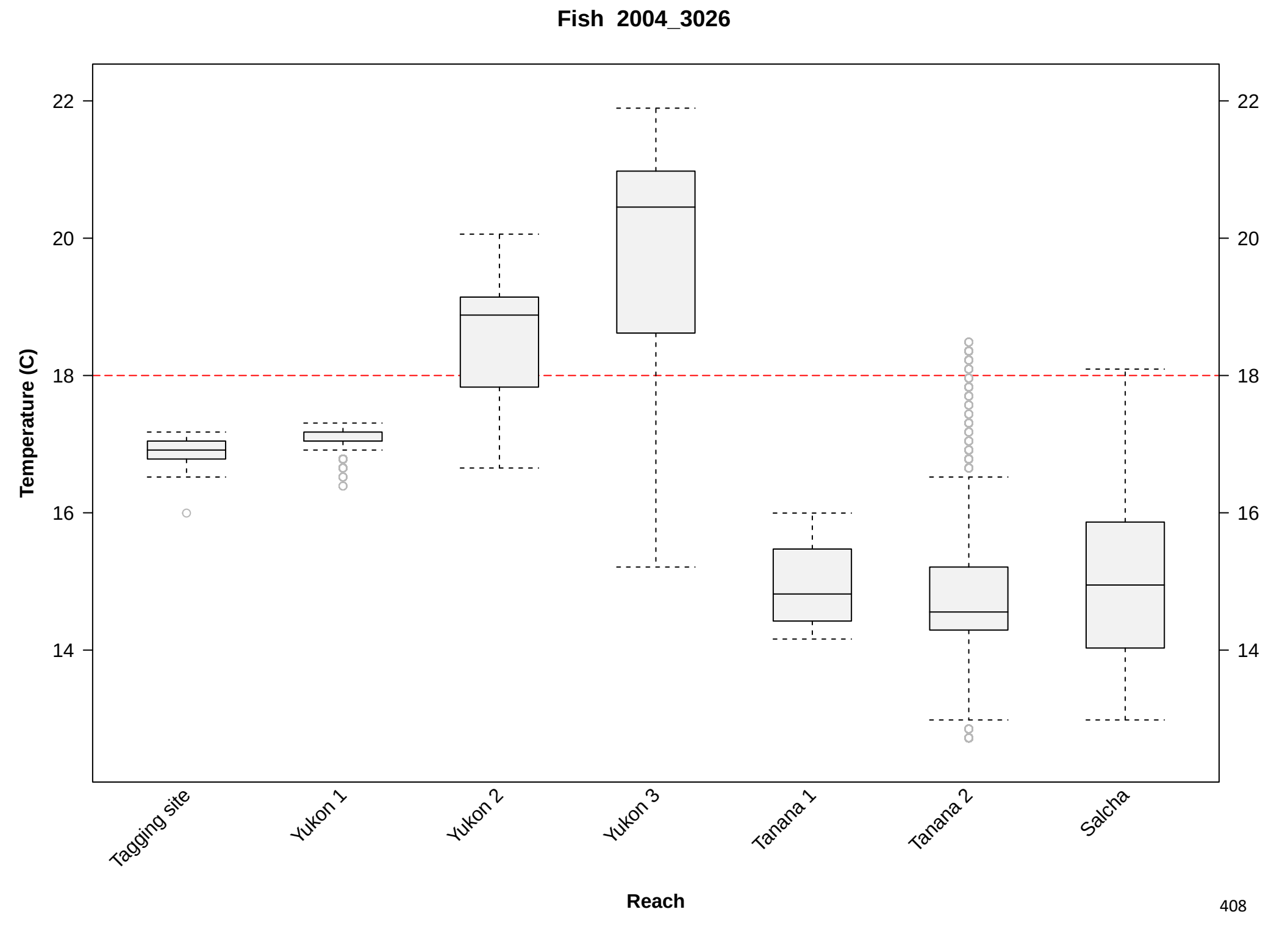

Fish 2004_3026
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Hours since release

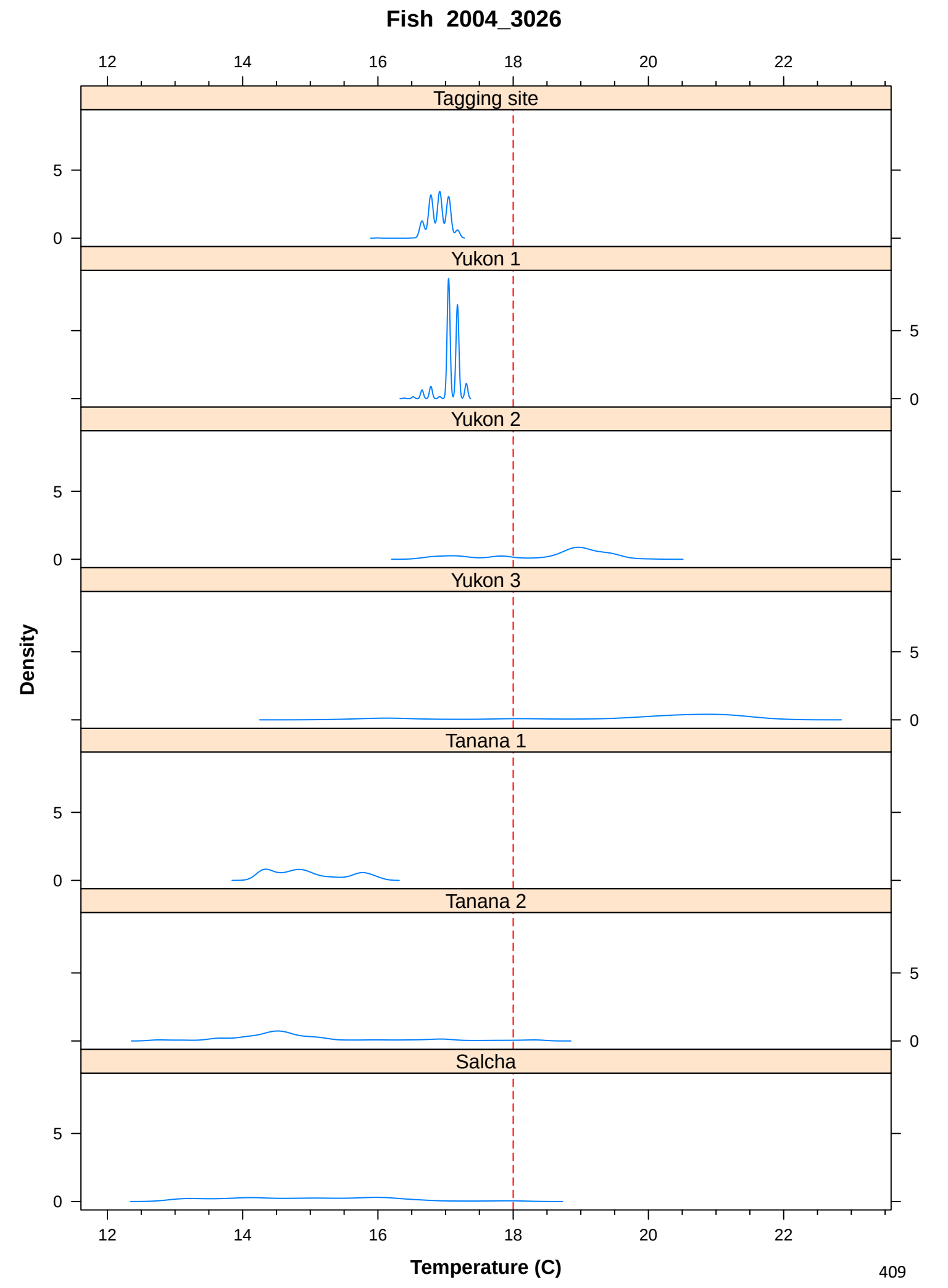

Fish 2004_3026
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

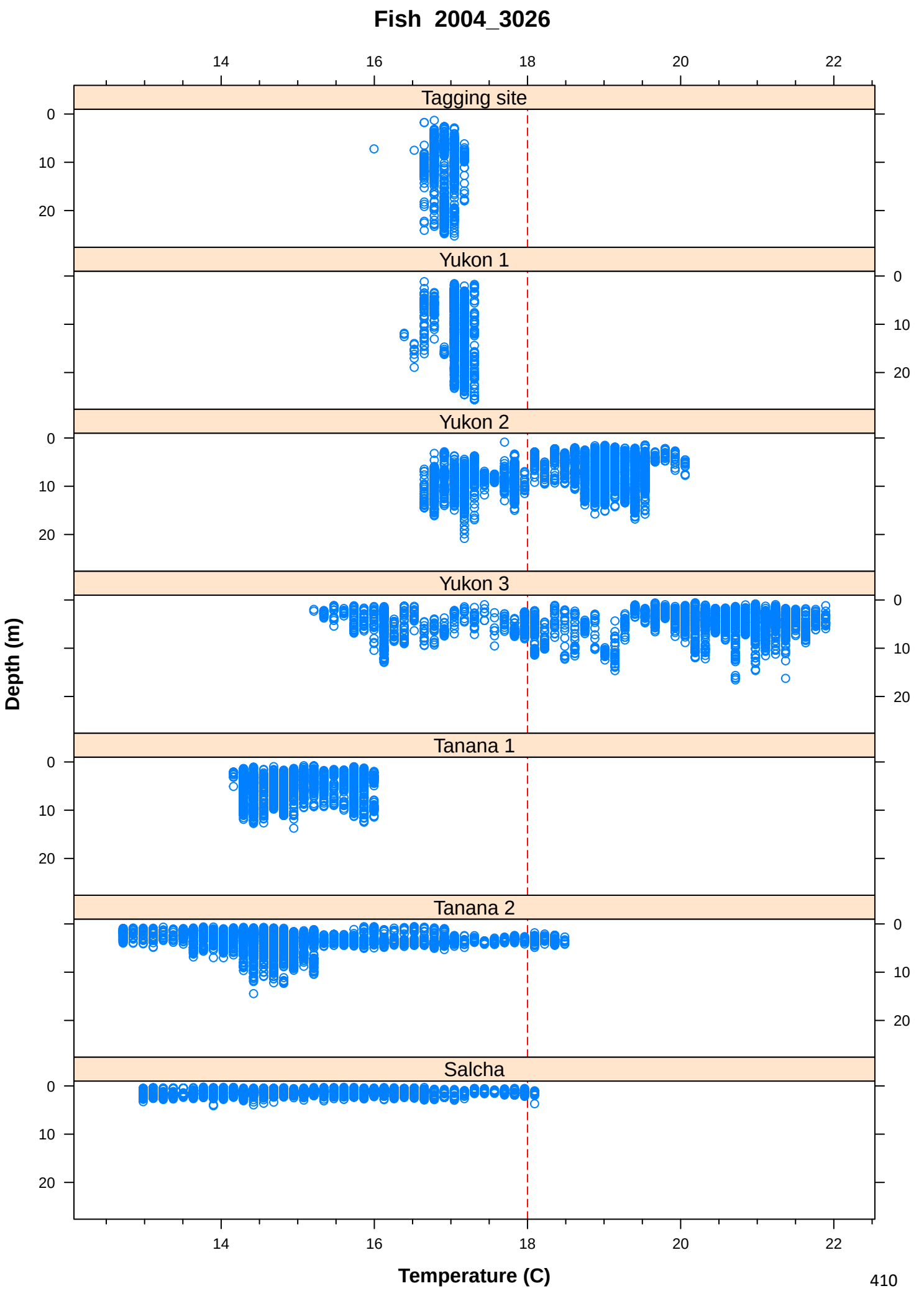

Fish 2004_3026
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
0.0
0.5
0
5
10
15
20
25
30
Depth (m)

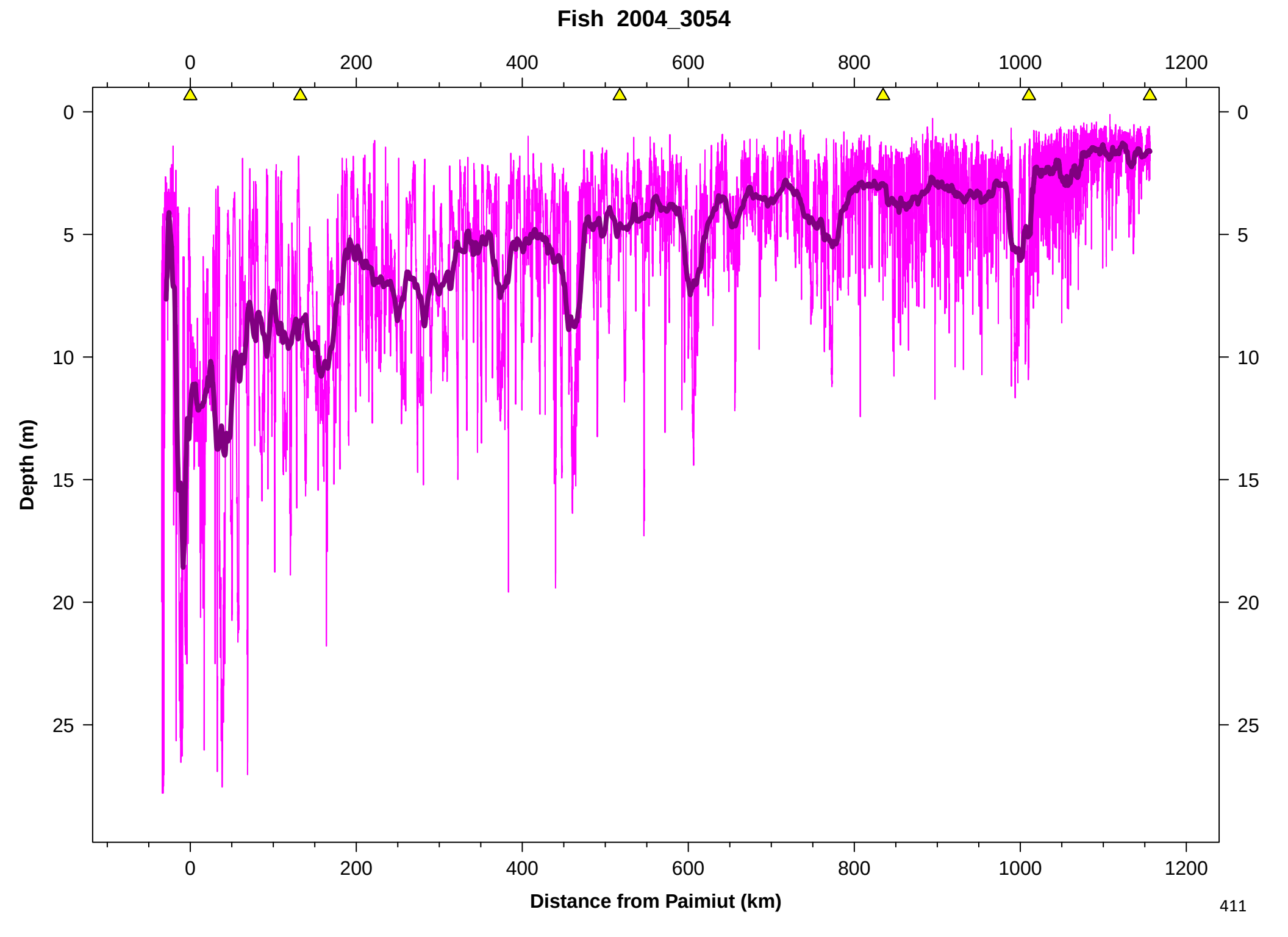

Fish 2004_3026
0
200
400
600
800
1000
1200
22
20
18
16
14
12
Temperature (C)
Distance from Paimiut
406

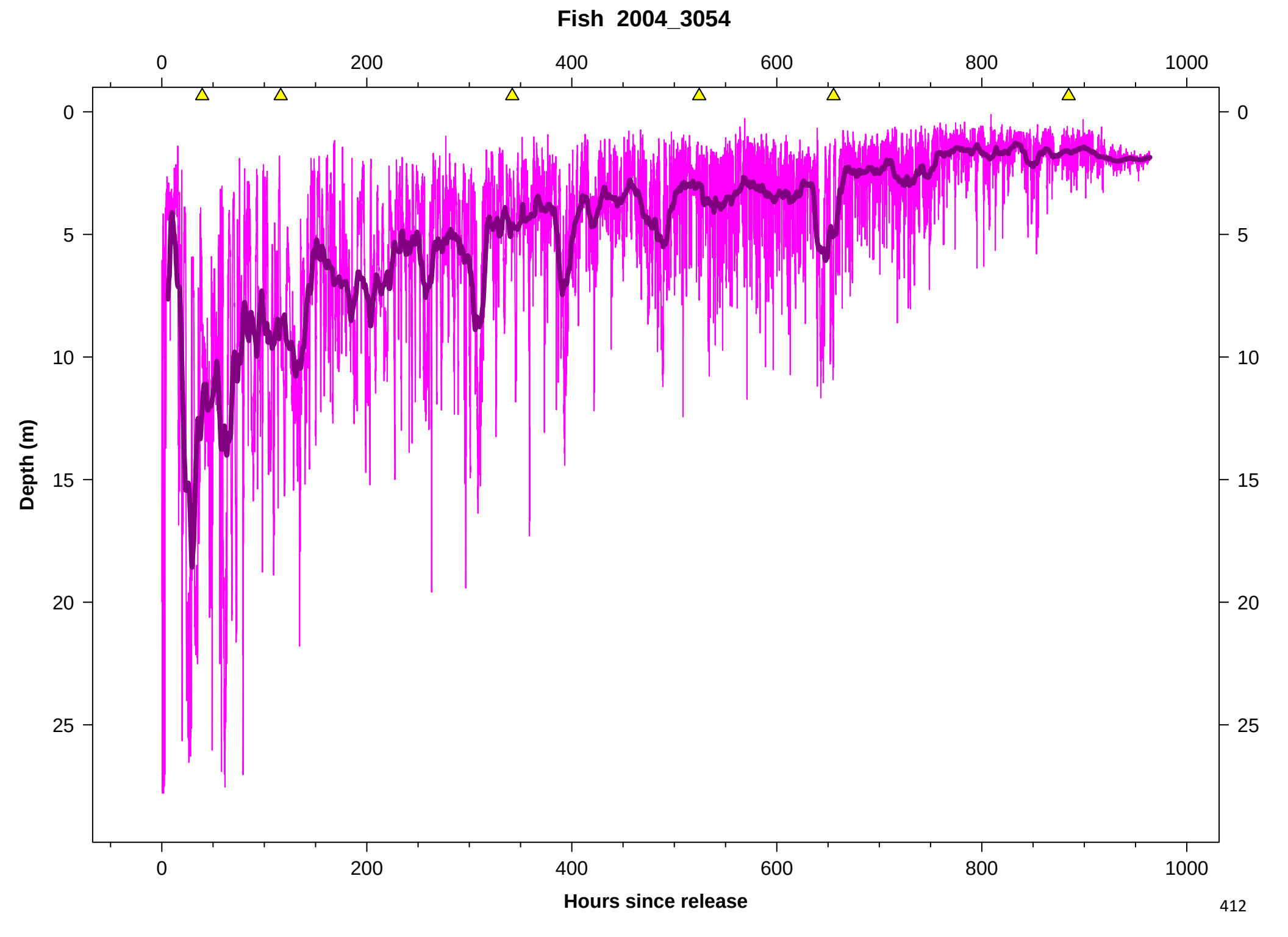

Fish 2004_3026
0
200
400
600
800
22
20
18
16
14
12
Temperature (C)
Hours since release

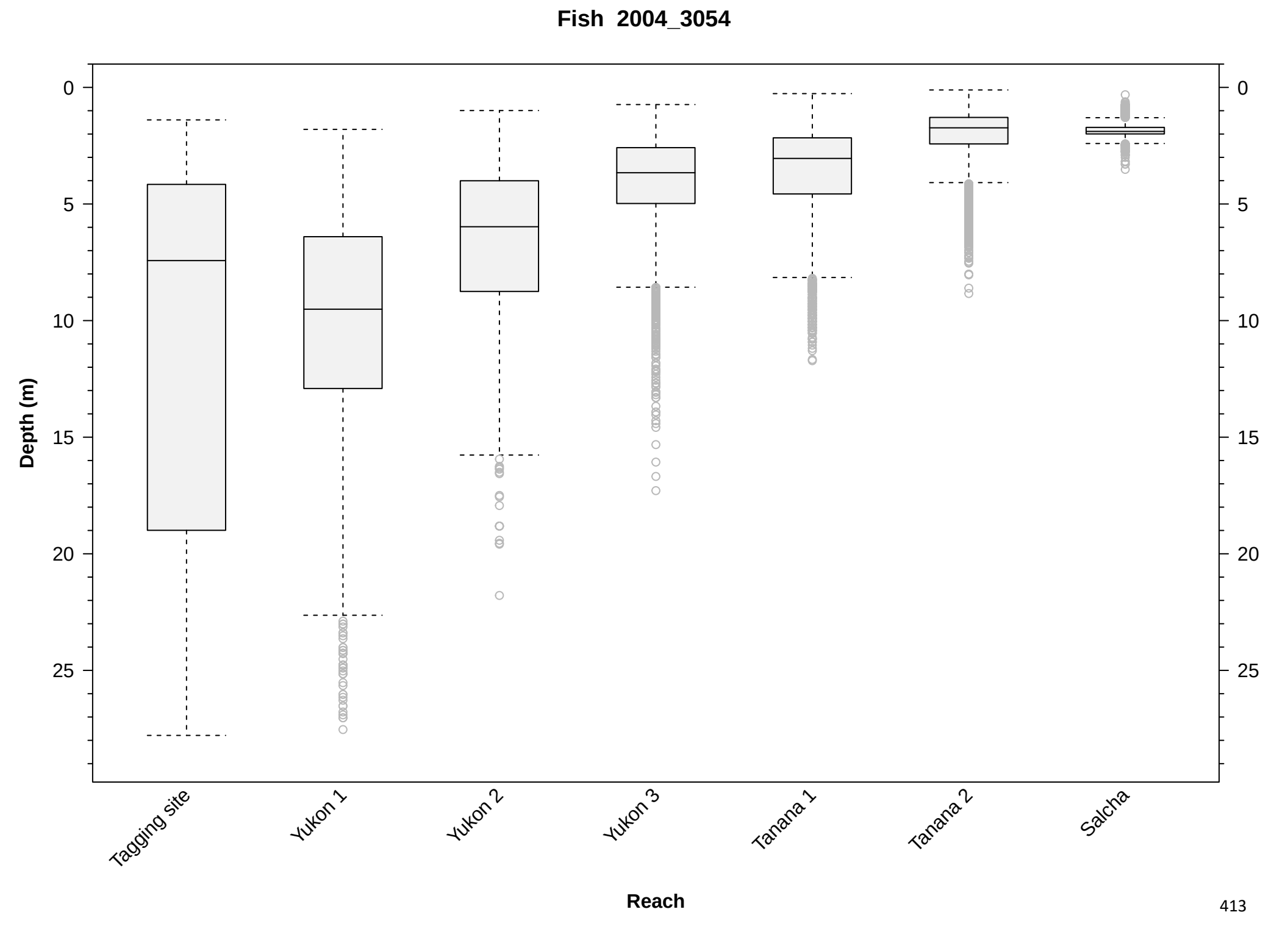

Fish 2004_3026
Temperature (C)
22
20
18
16
14
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach
408

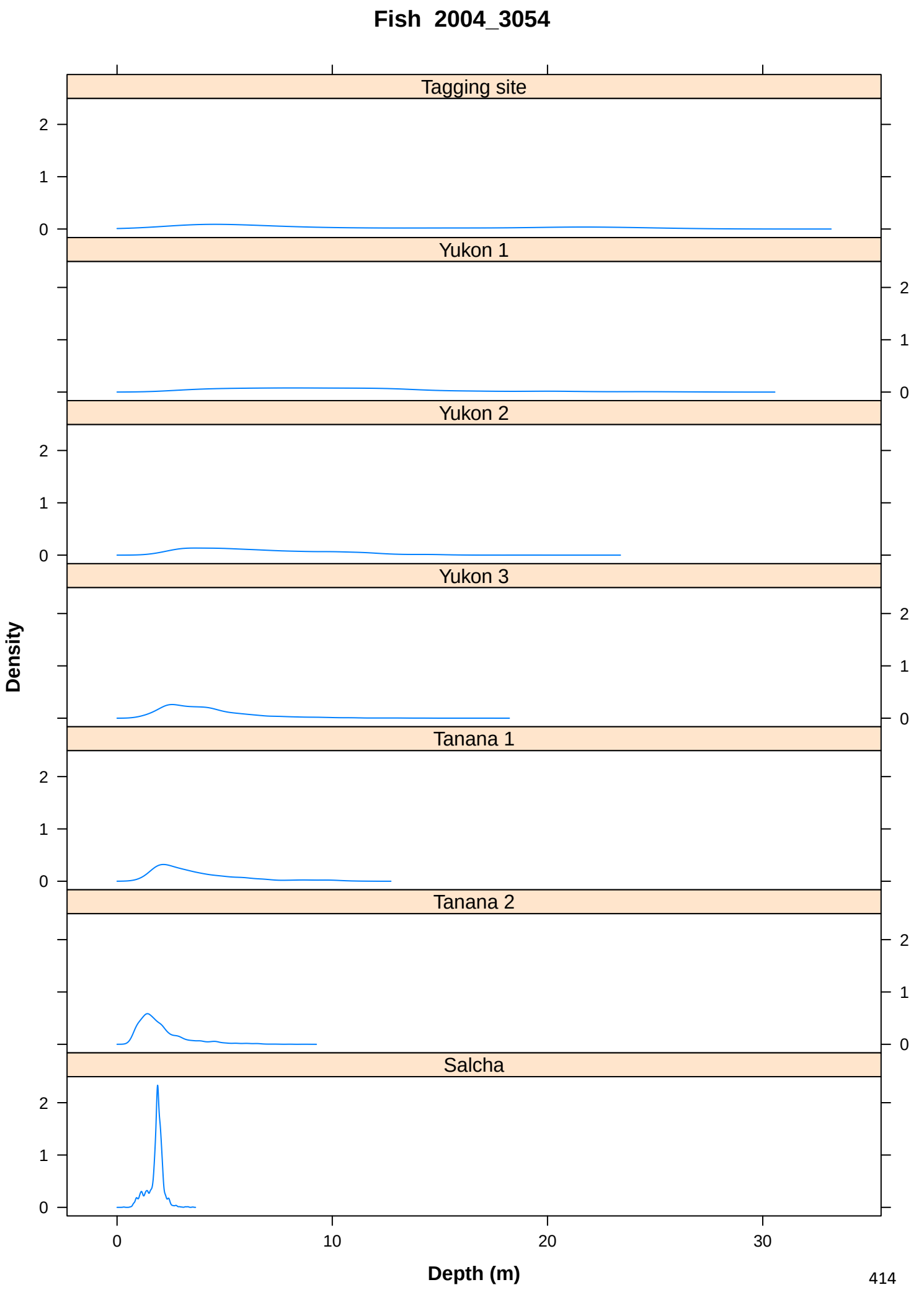

Fish 2004_3026
12
14
16
18
20
22
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
5
0
Density
Temperature (C)

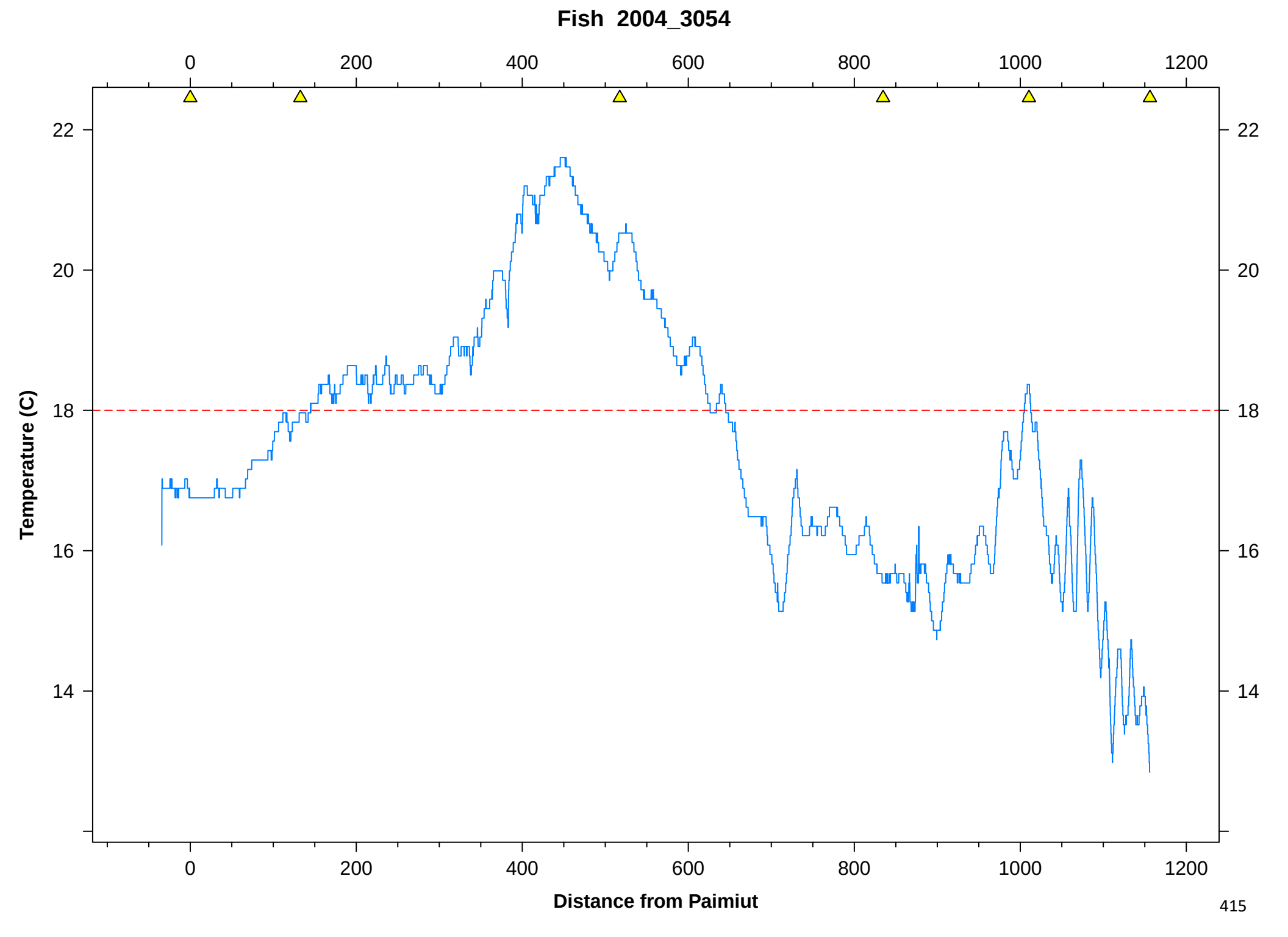

Fish 2004_3026
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Depth (m)
Temperature (C)
14
16
18
20
22
0
10
20

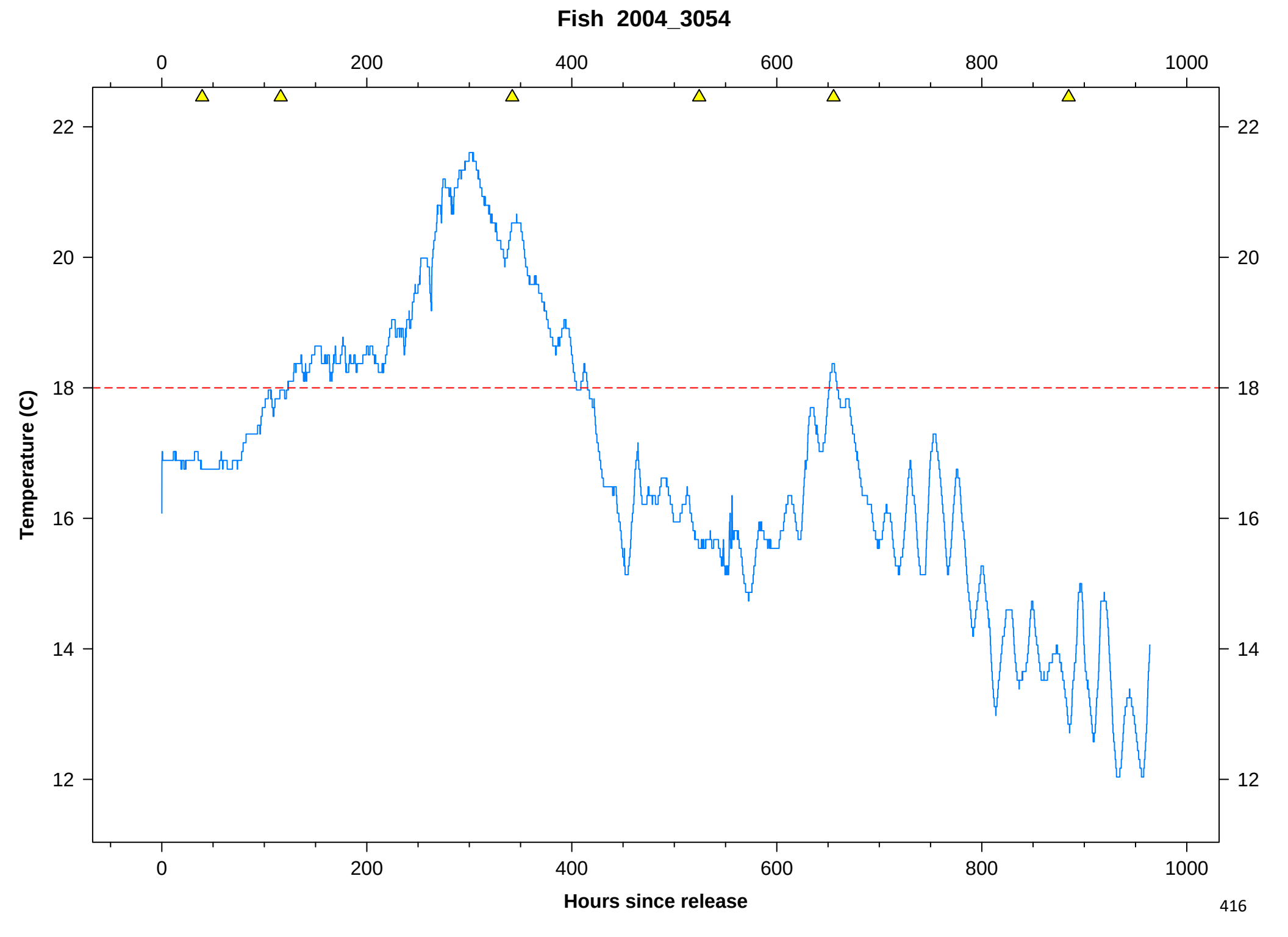

Fish 2004_3054
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

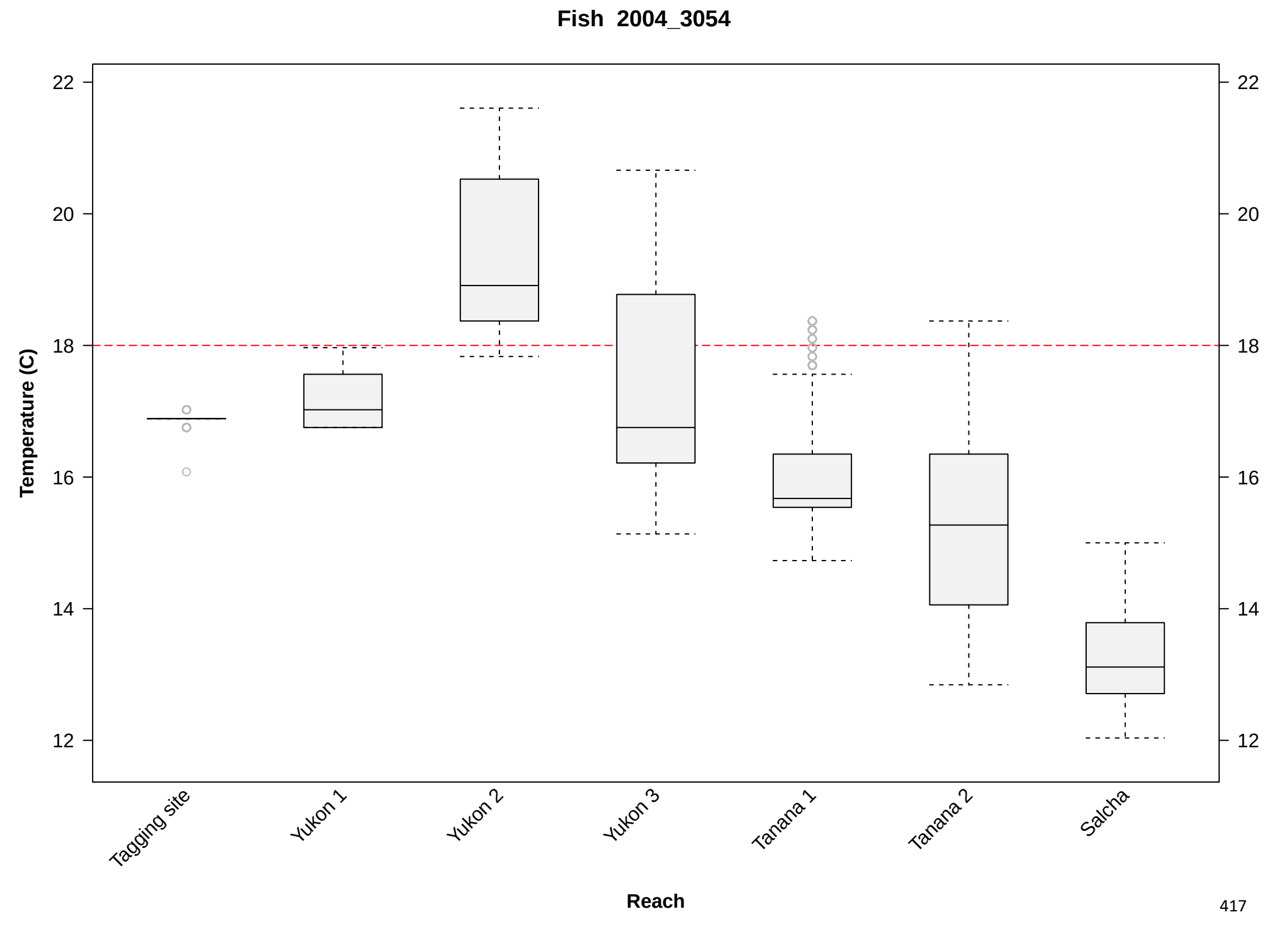

Fish 2004_3054
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release

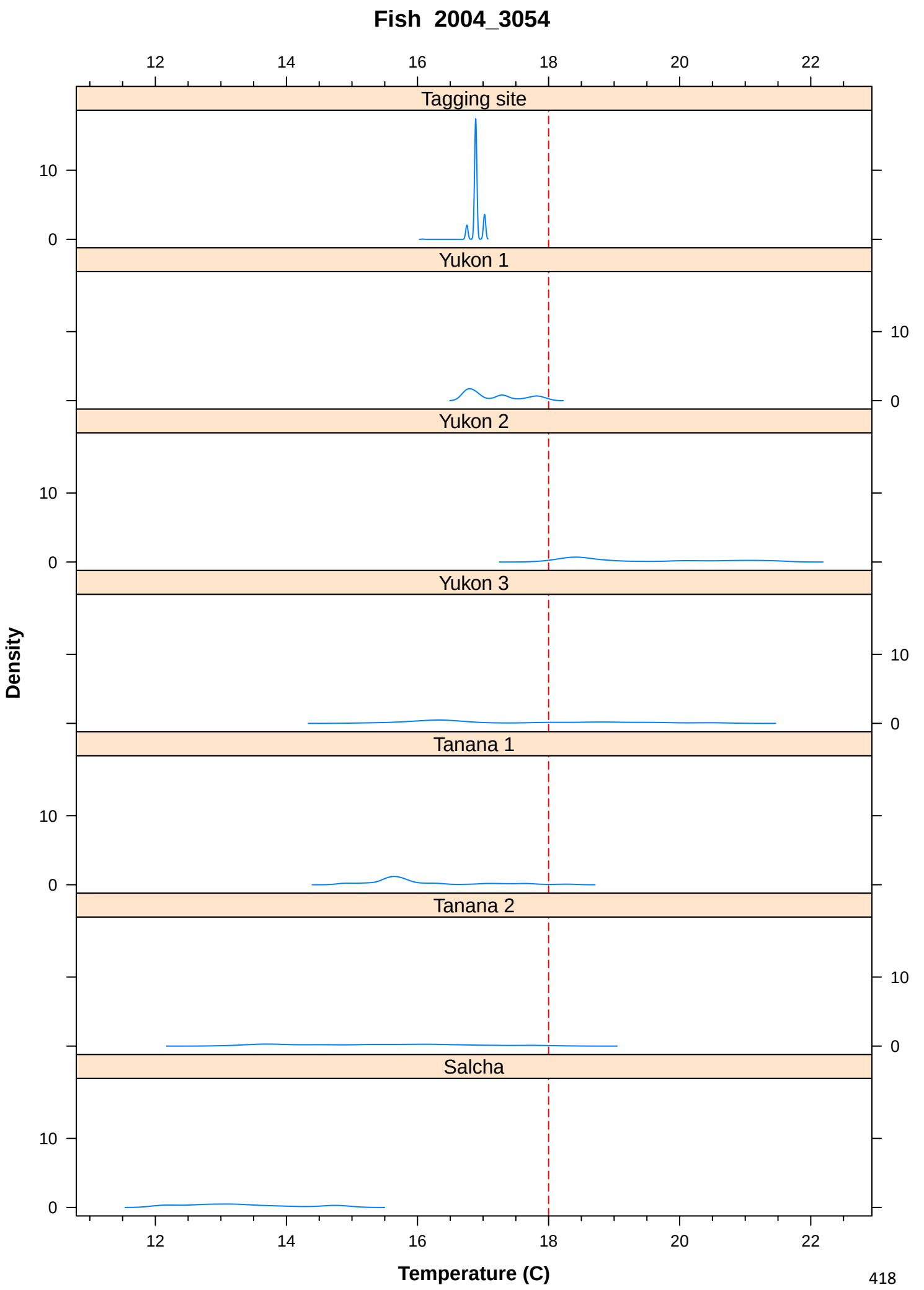

Fish 2004_3054
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

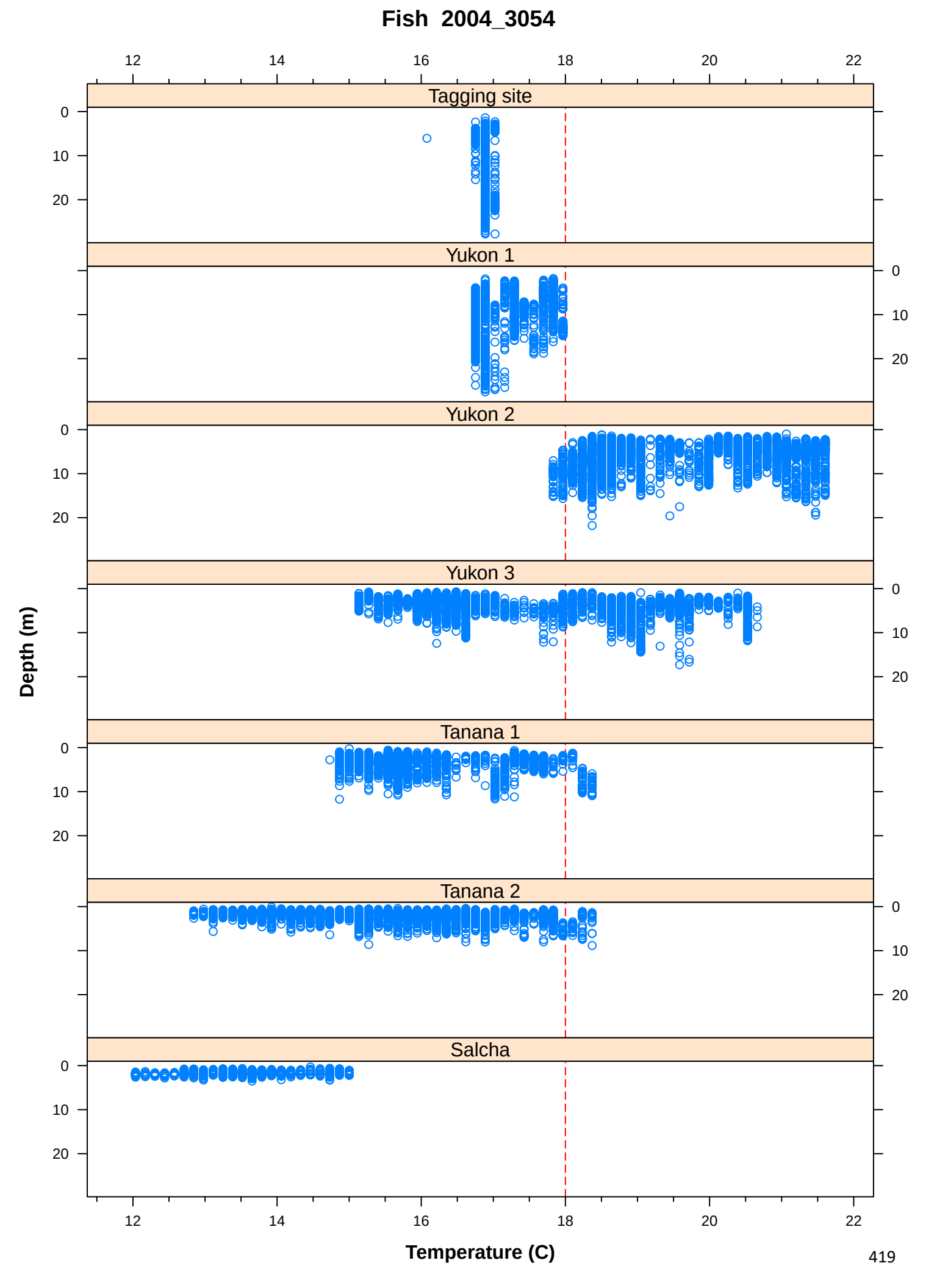

Fish 2004_3054
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
0
1
2
0
10
20
30
Depth (m)

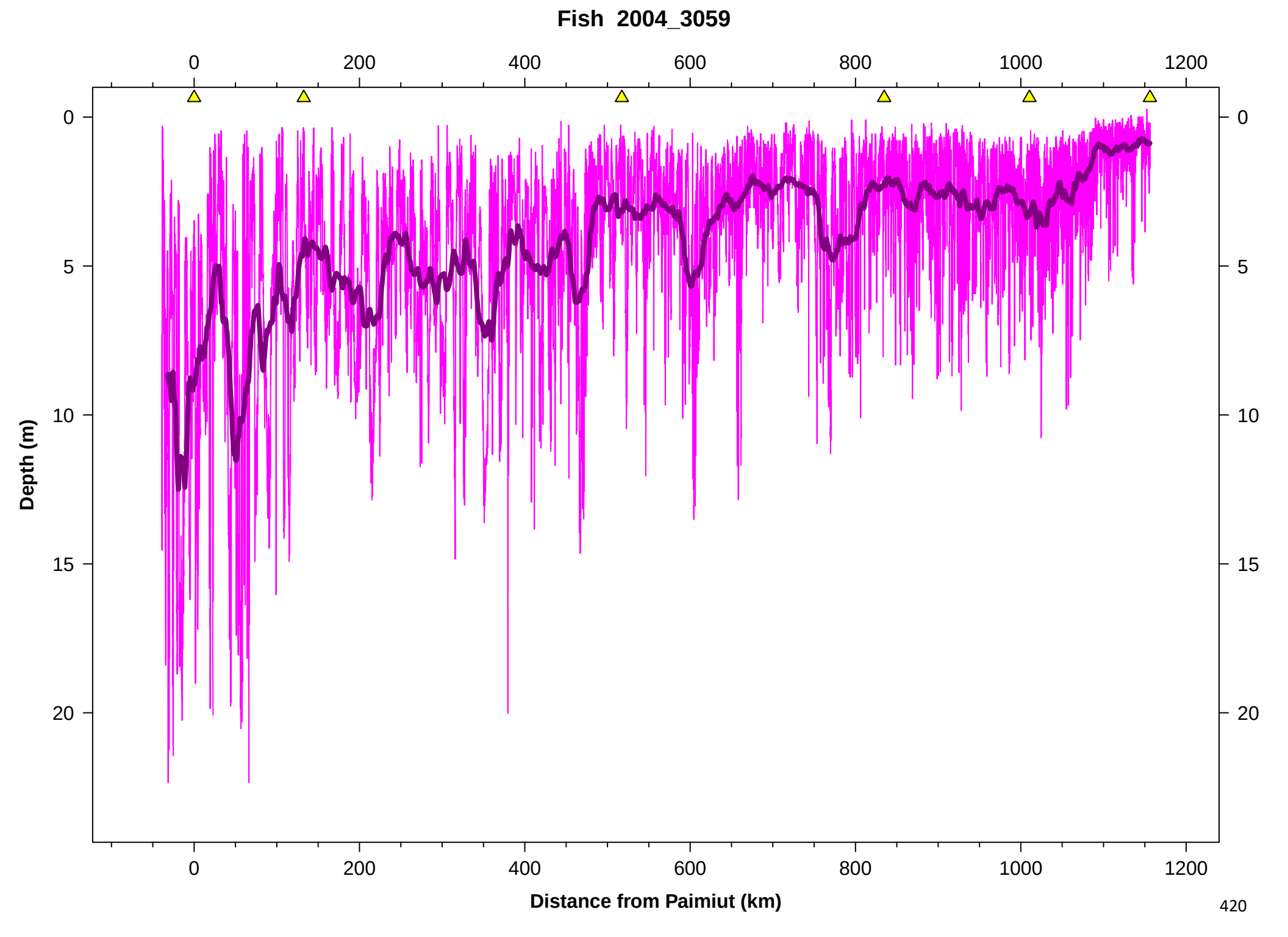

Fish 2004_3054
0
200
400
600
800
1000
1200
22
20
18
16
14
Temperature (C)
Distance from Paimiut

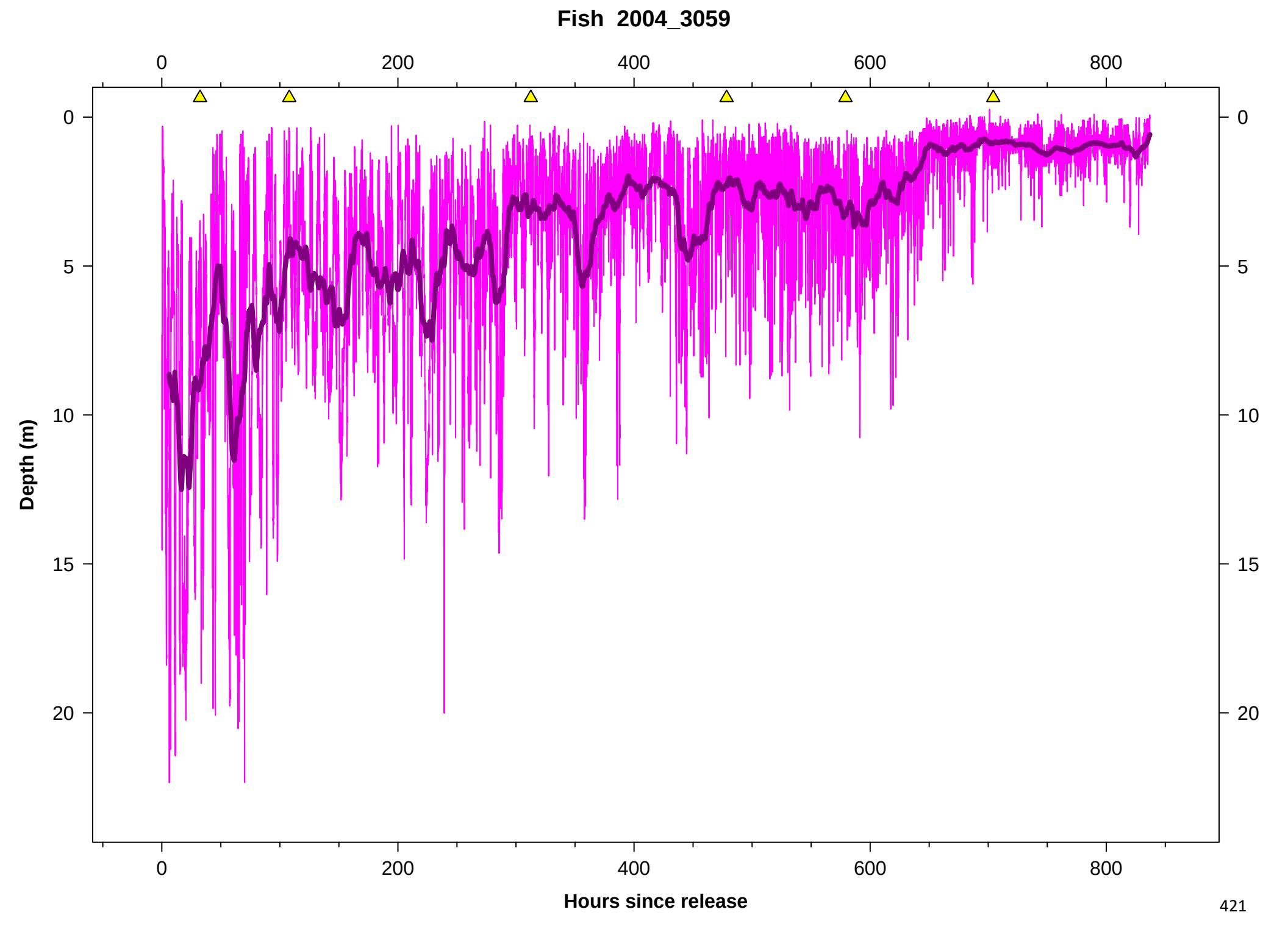

Fish 2004_3054
0
200
400
600
800
1000
22
20
18
16
14
12
Temperature (C)
Hours since release

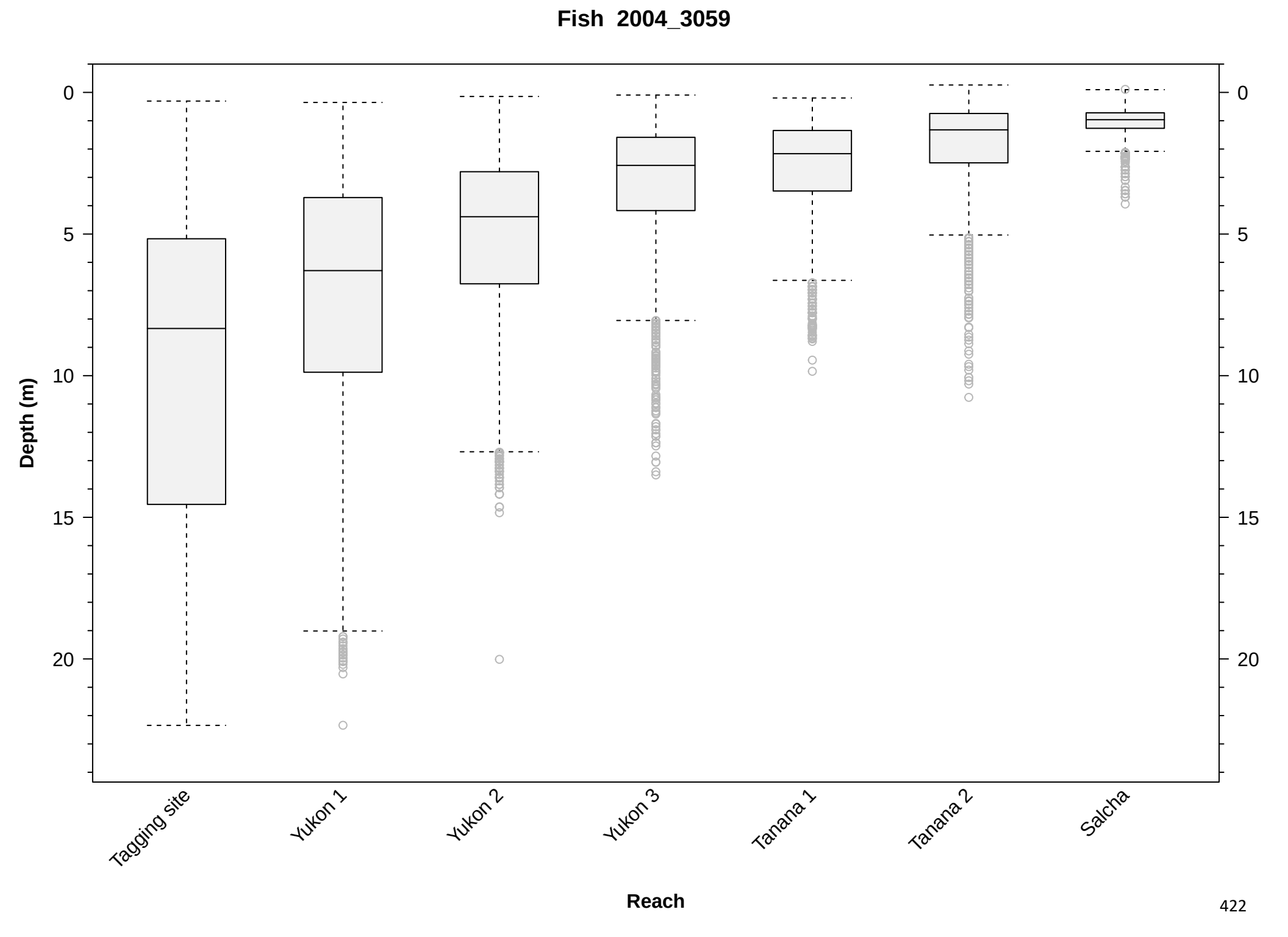

Fish 2004_3054
Temperature (C)
22
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

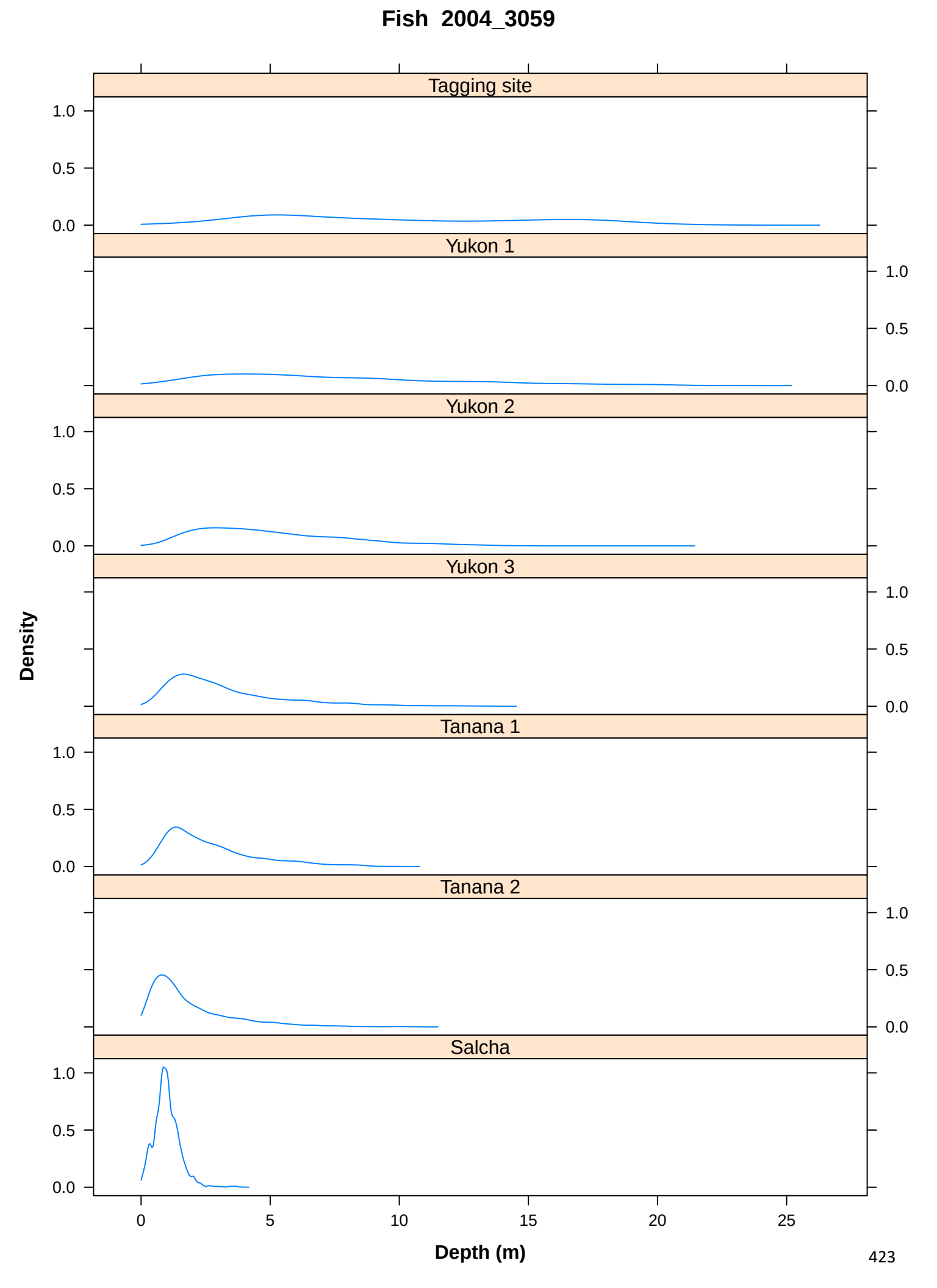

Fish 2004_3054
12
14
16
18
20
22
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
10
0
Density
Temperature (C)

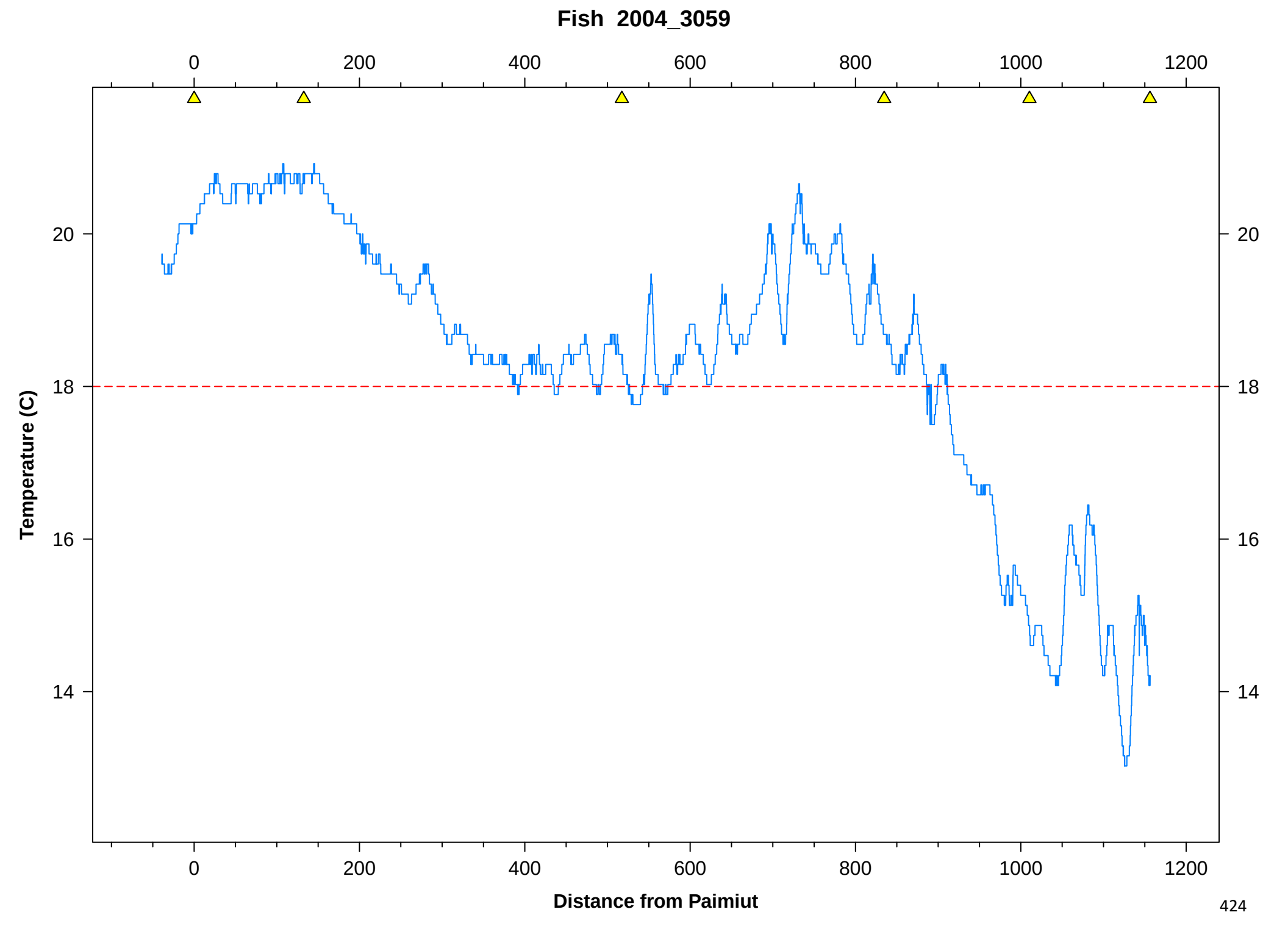

Fish 2004_3054
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Depth (m)
Temperature (C)
12
14
16
18
20
22
0
10
20

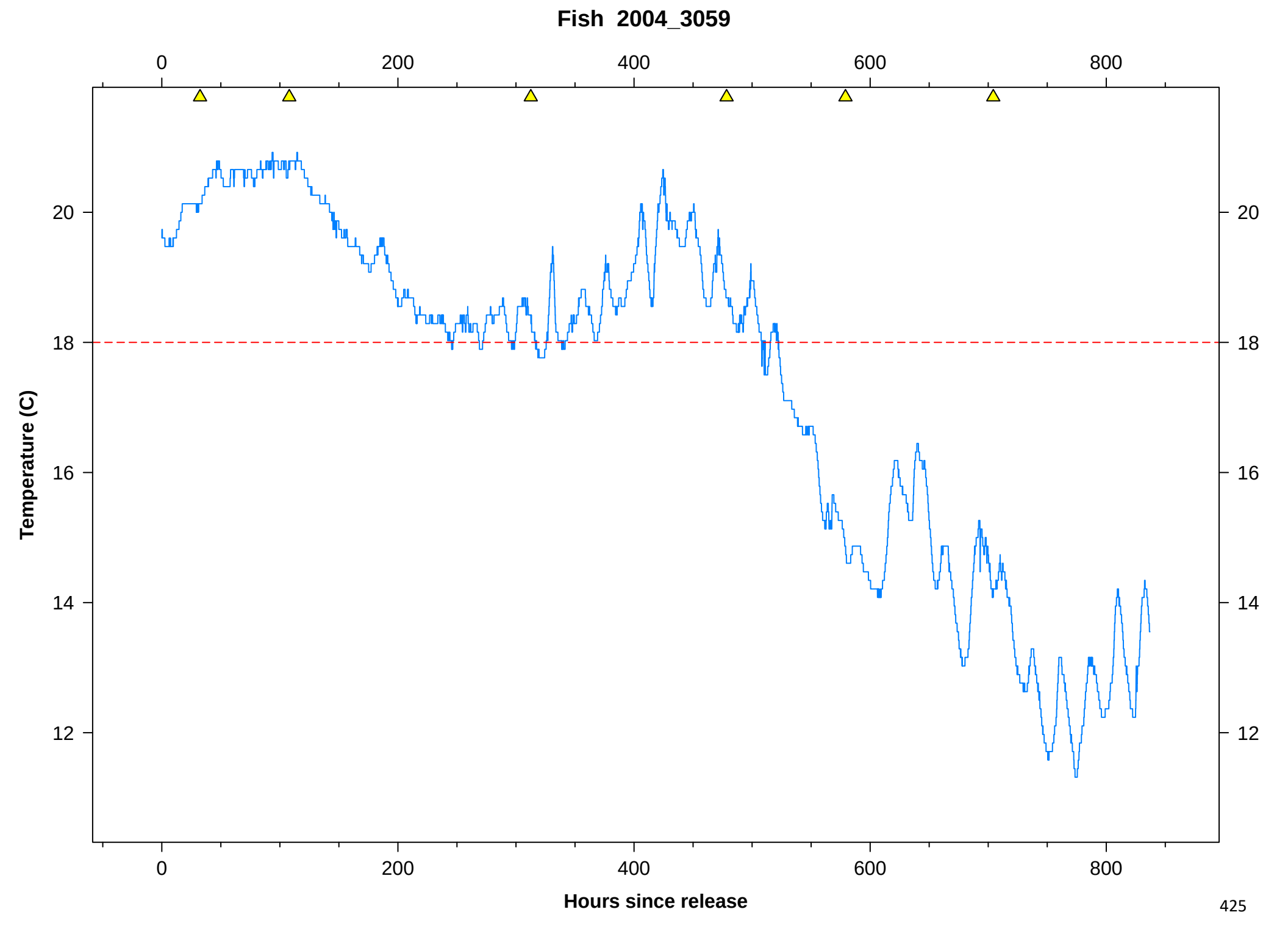

Fish 2004_3059
0
200
400
600
800
1000
1200
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

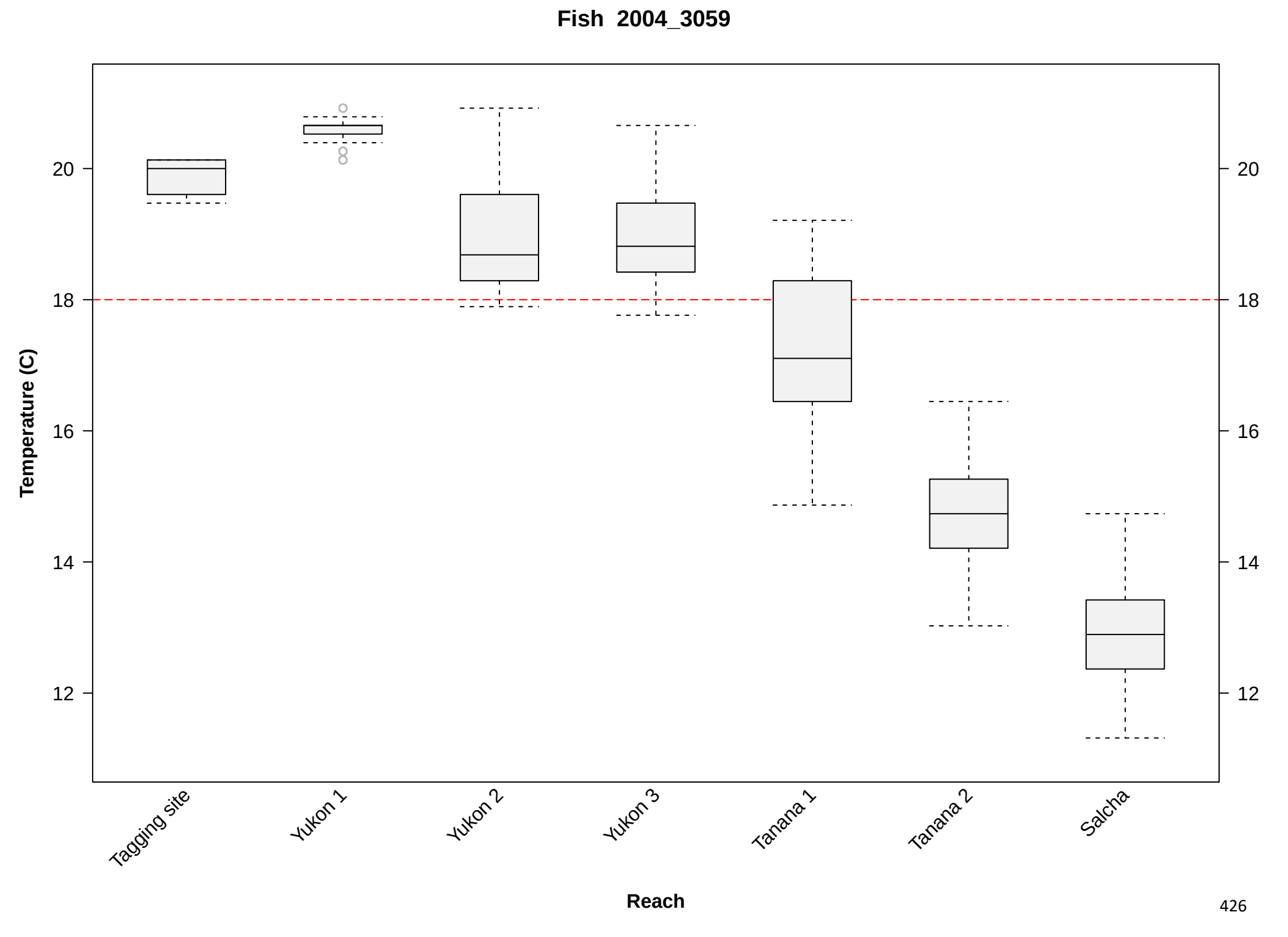

Fish 2004_3059
0
200
400
600
800
0
5
10
15
20
Depth (m)
Hours since release

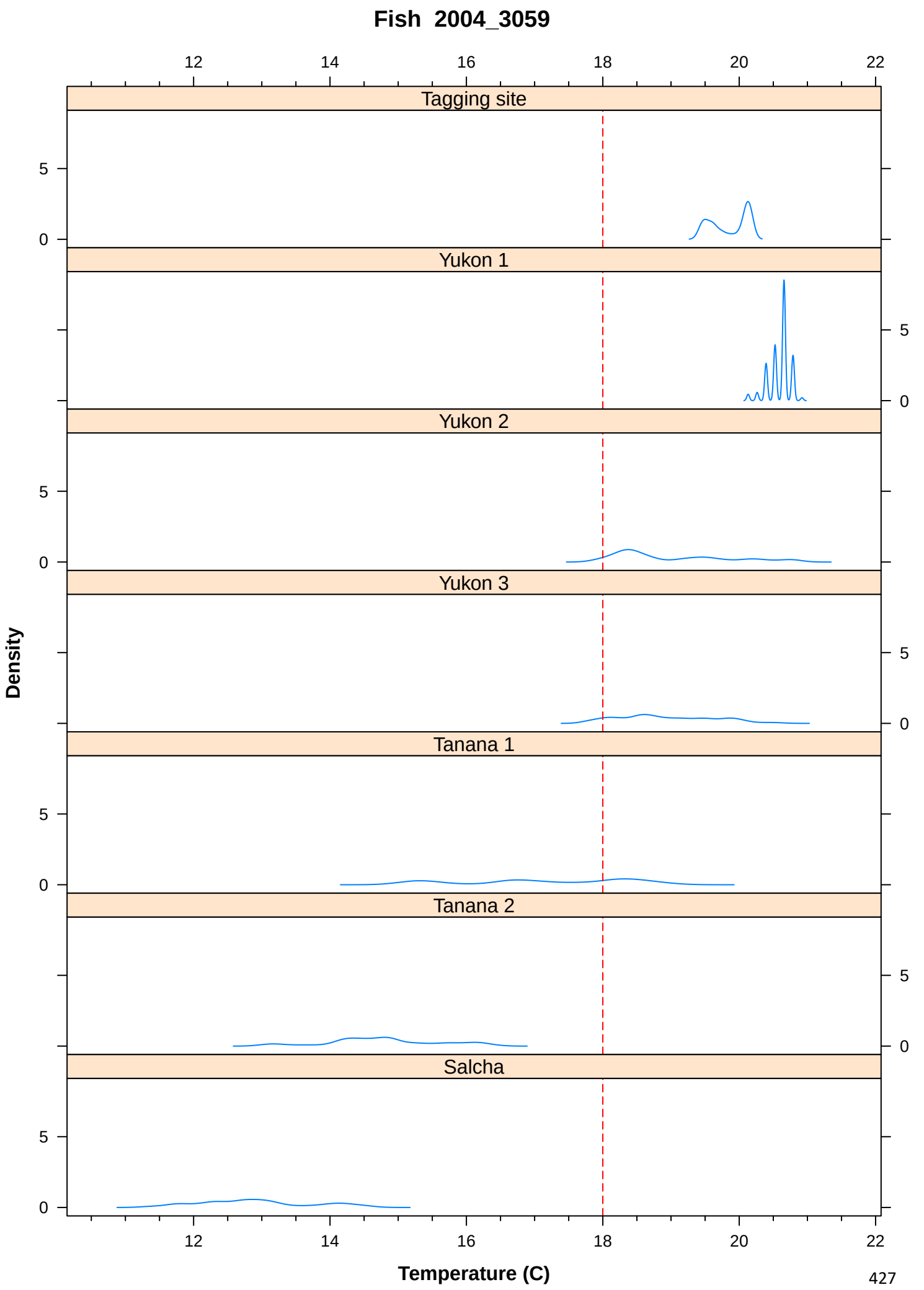

Fish 2004_3059
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

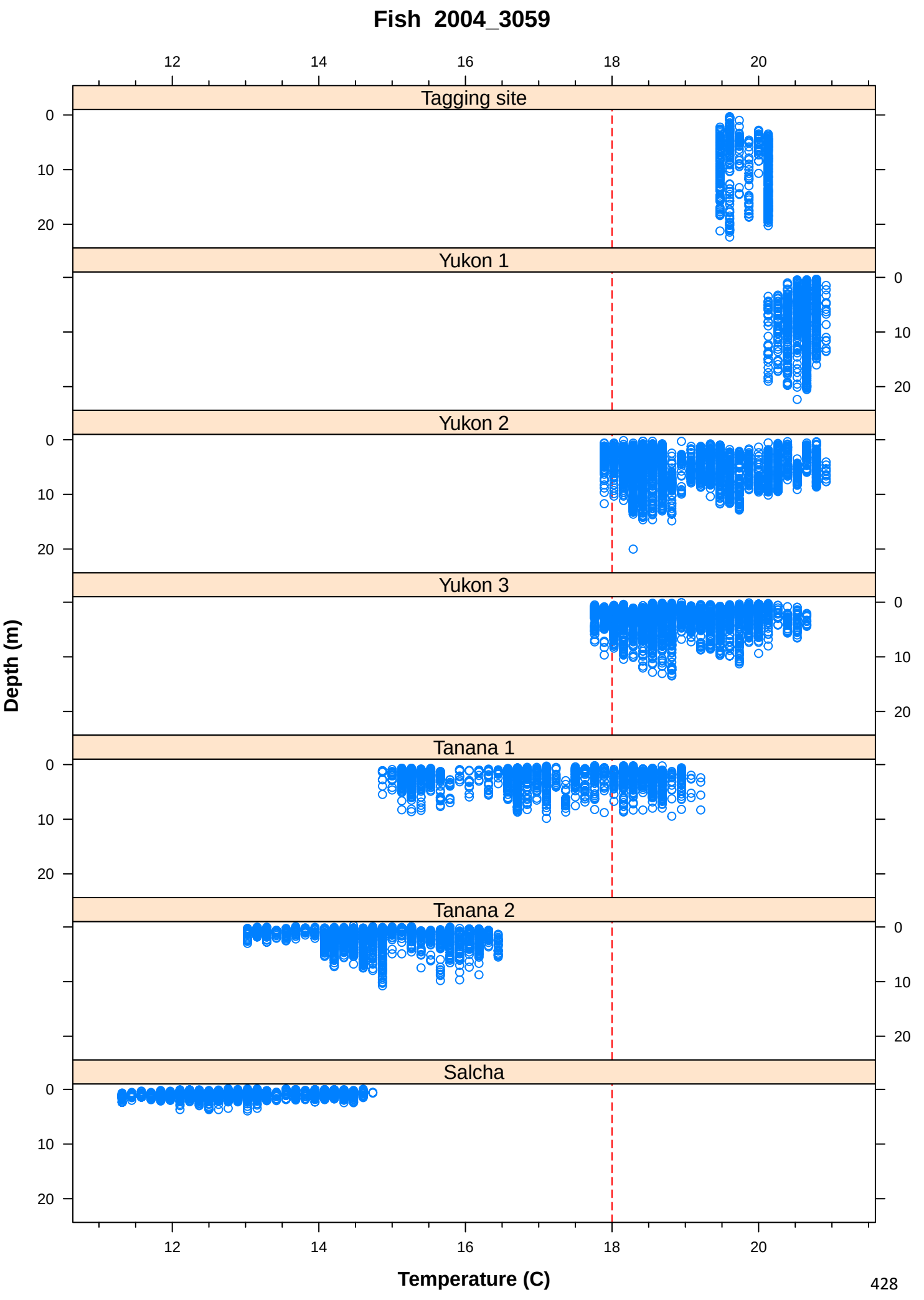

Fish 2004_3059
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
1.0
0.5
0.0
0
5
10
15
20
25
Depth (m)

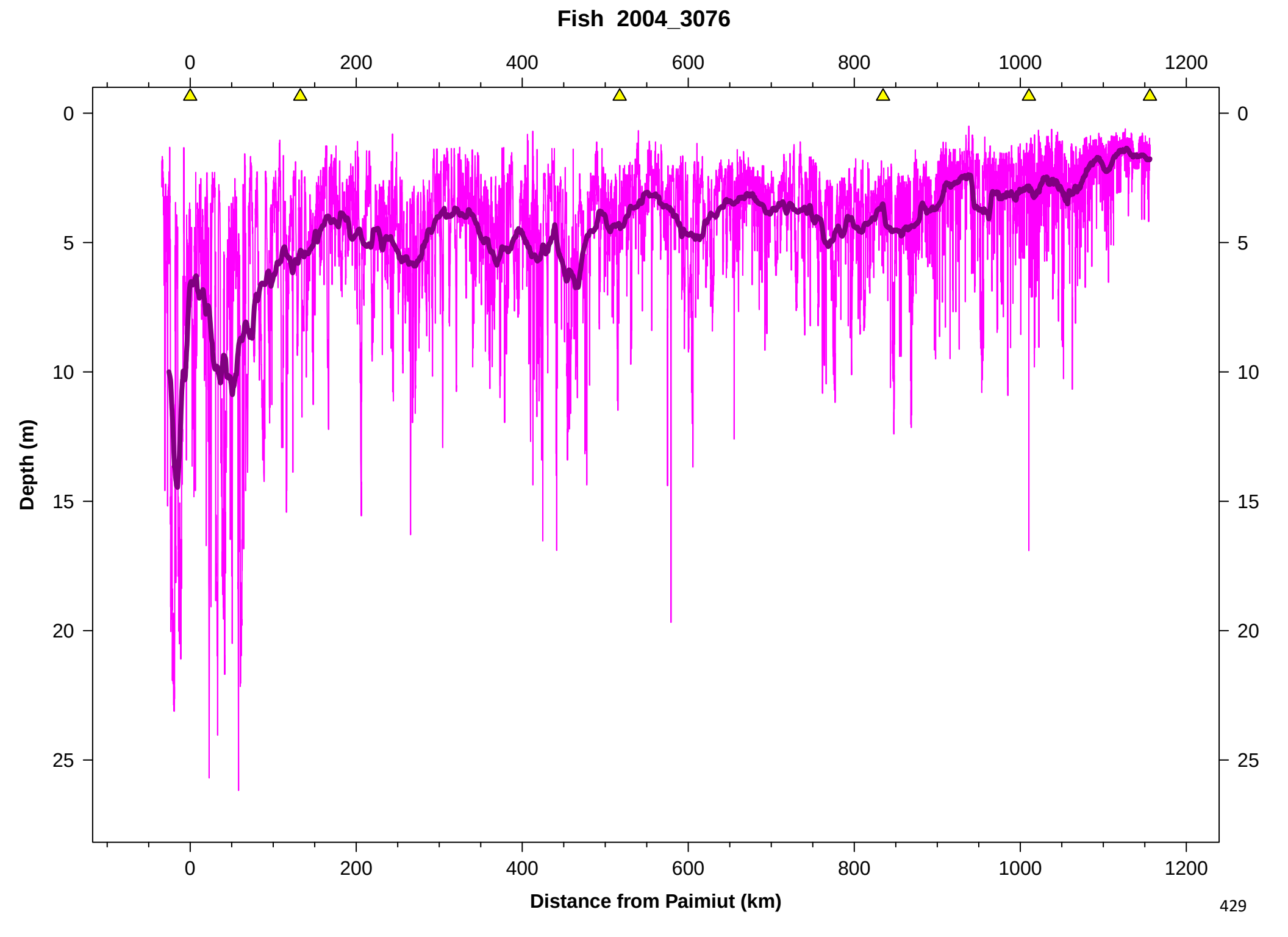

Fish 2004_3059
0
200
400
600
800
1000
1200
20
18
16
14
Temperature (C)
Distance from Paimiut

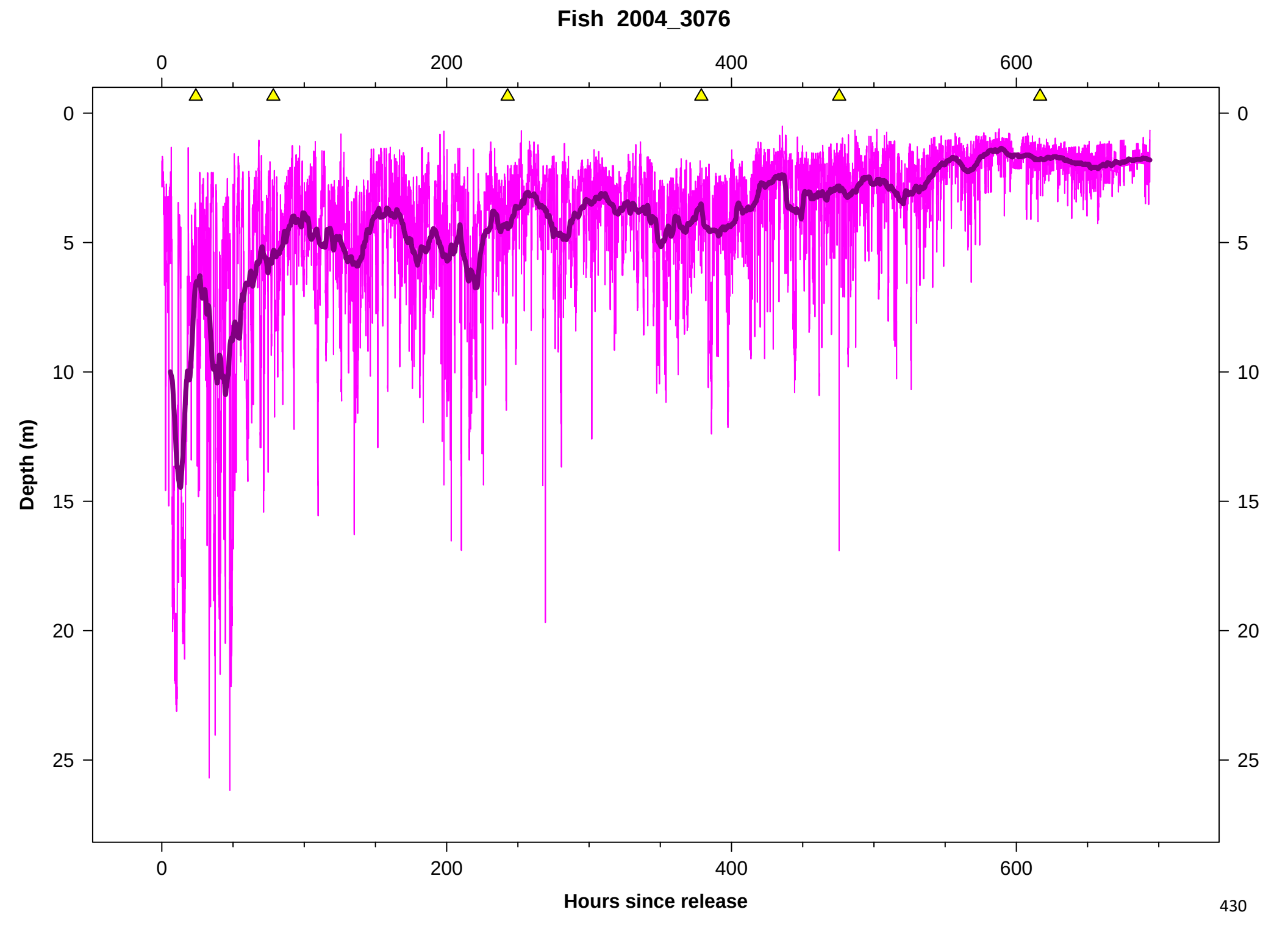

Fish 2004_3059
0
200
400
600
800
20
18
16
14
12
Temperature (C)
Hours since release

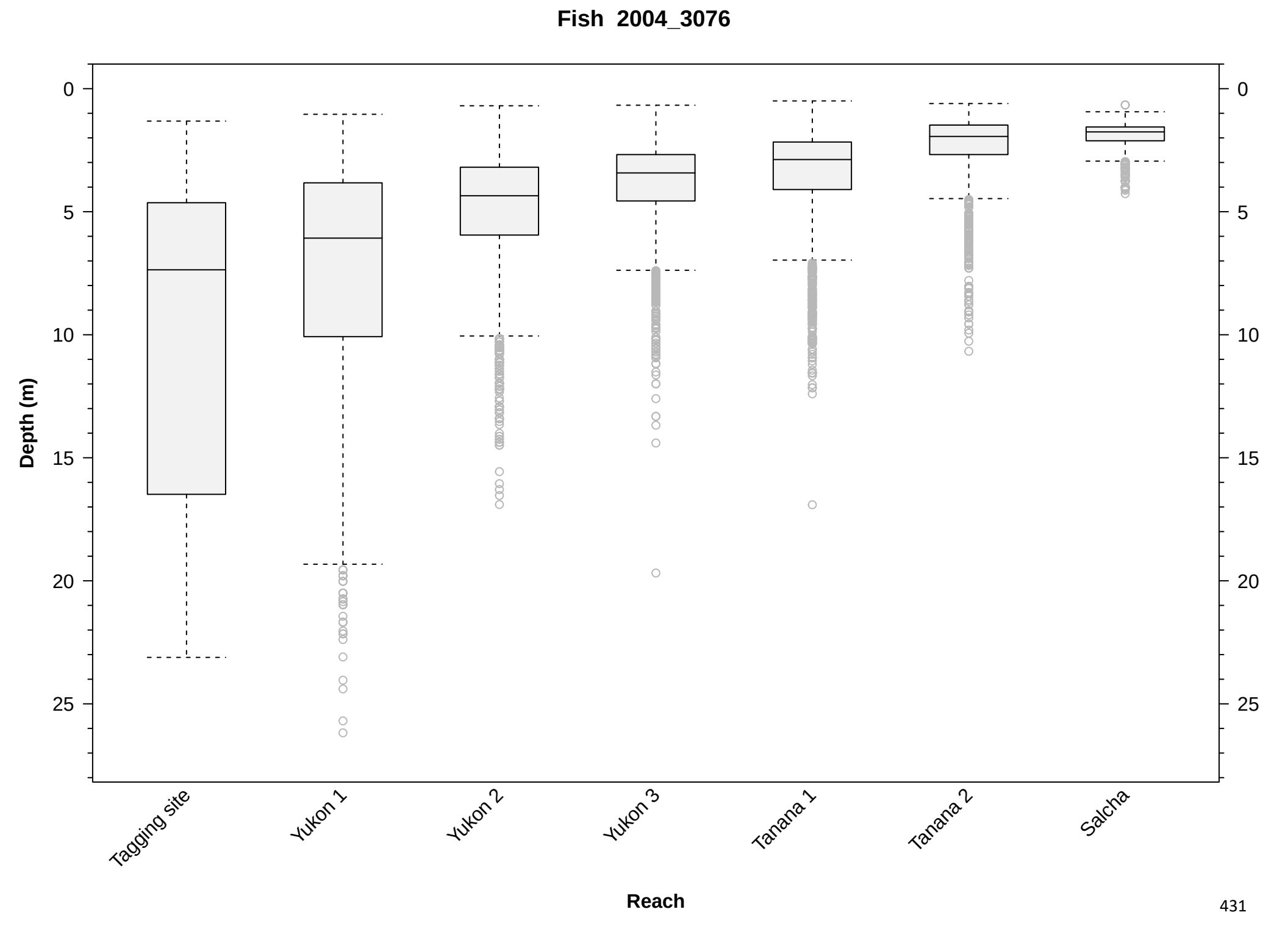

Fish 2004_3059
Temperature (C)
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

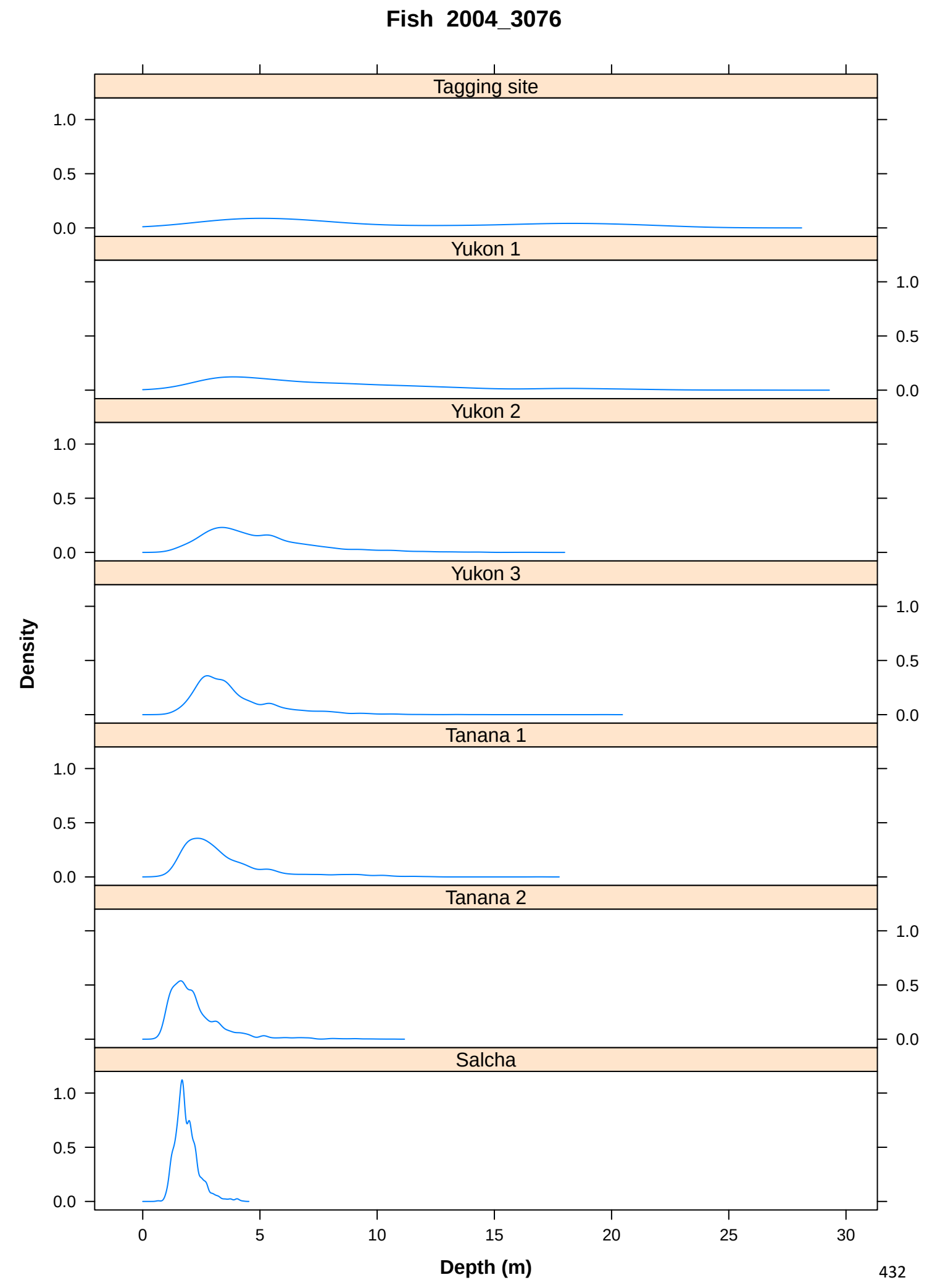

Fish 2004_3059
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
Temperature (C)
12
14
16
18
20
22
0
5

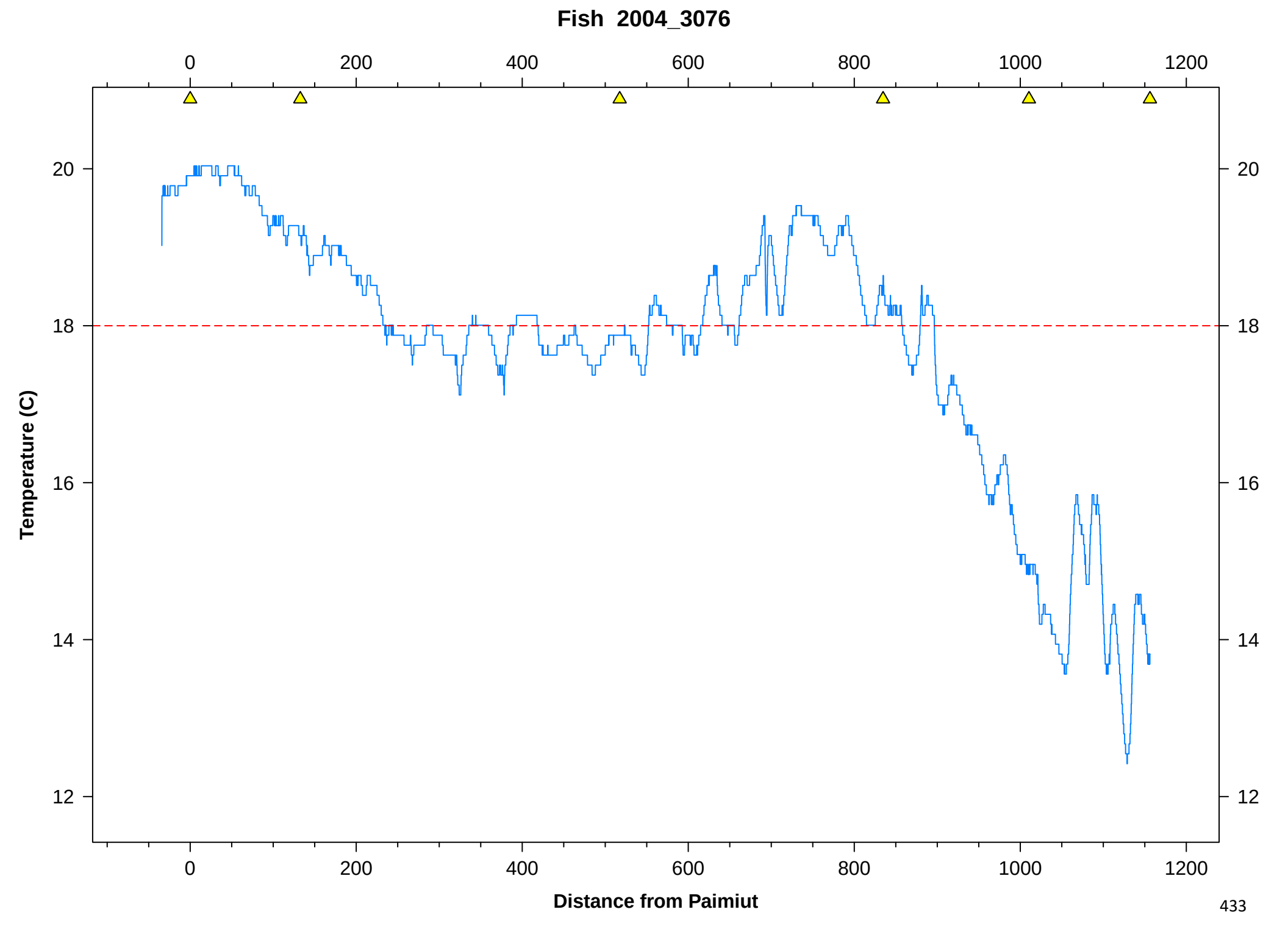

Fish 2004_3059
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Depth (m)
Temperature (C)
12
14
16
18
20
0
10
20

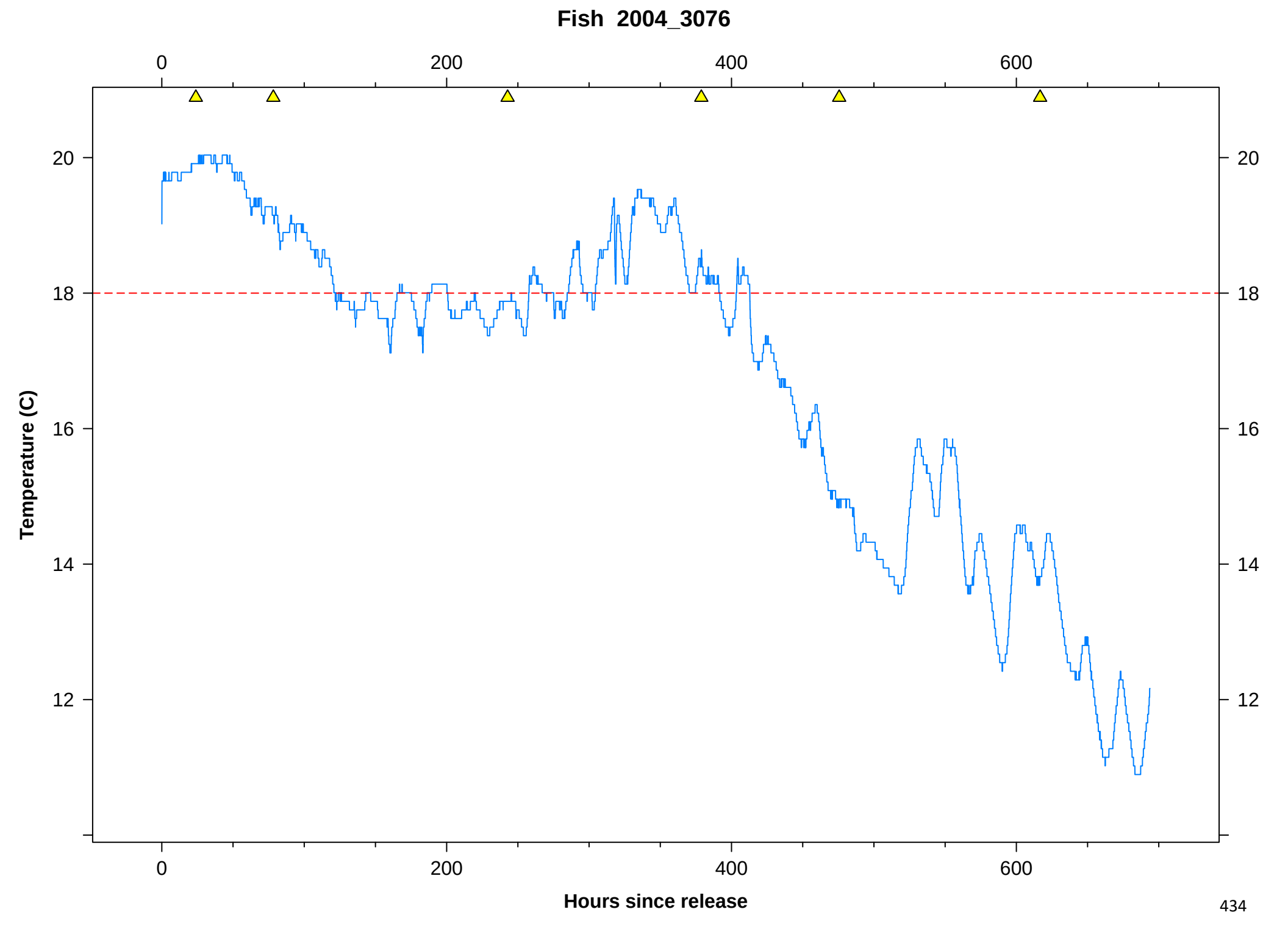

Fish 2004_3076
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

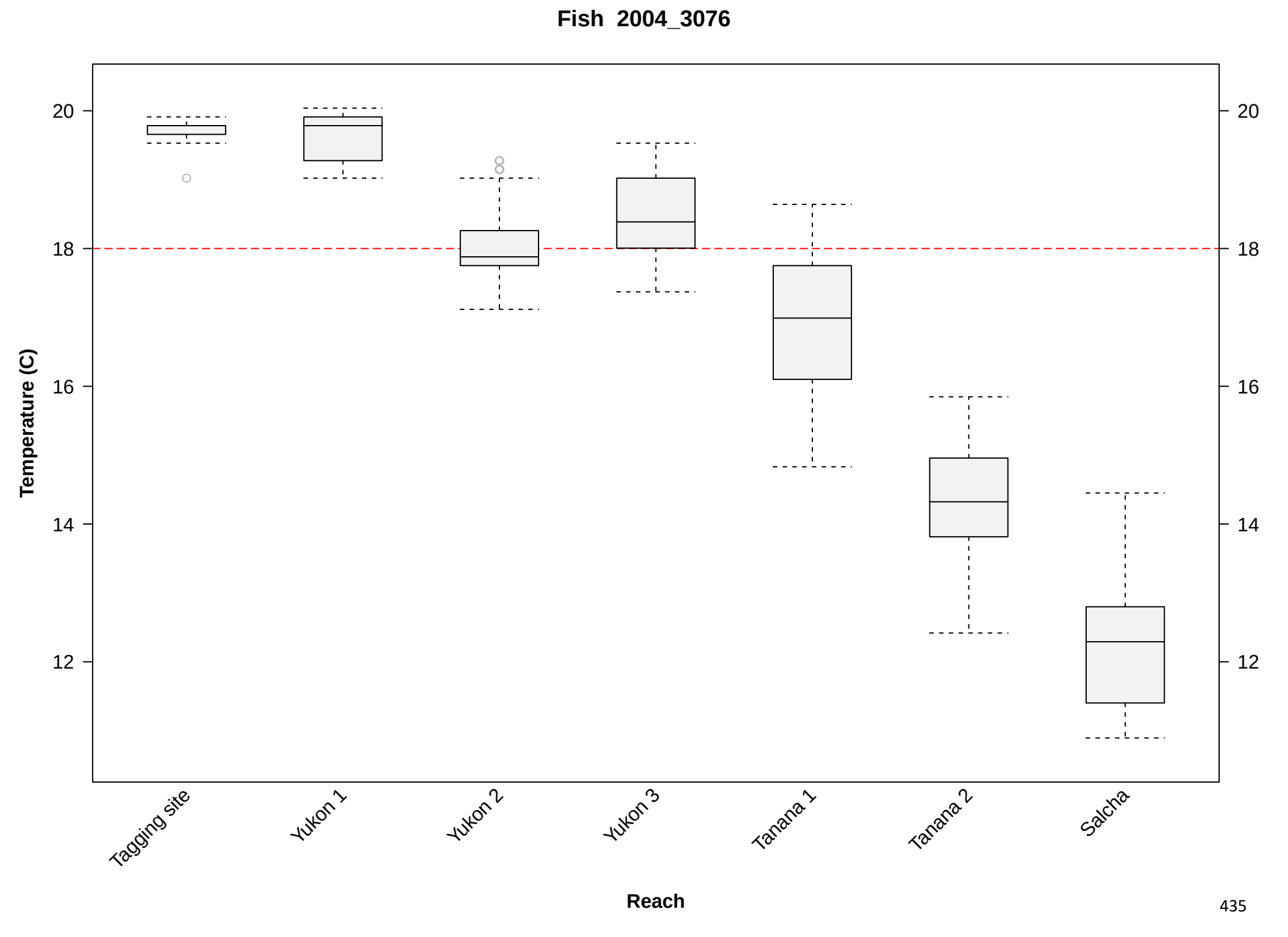

Fish 2004_3076
0
200
400
600
0
5
10
15
20
25
Depth (m)
Hours since release

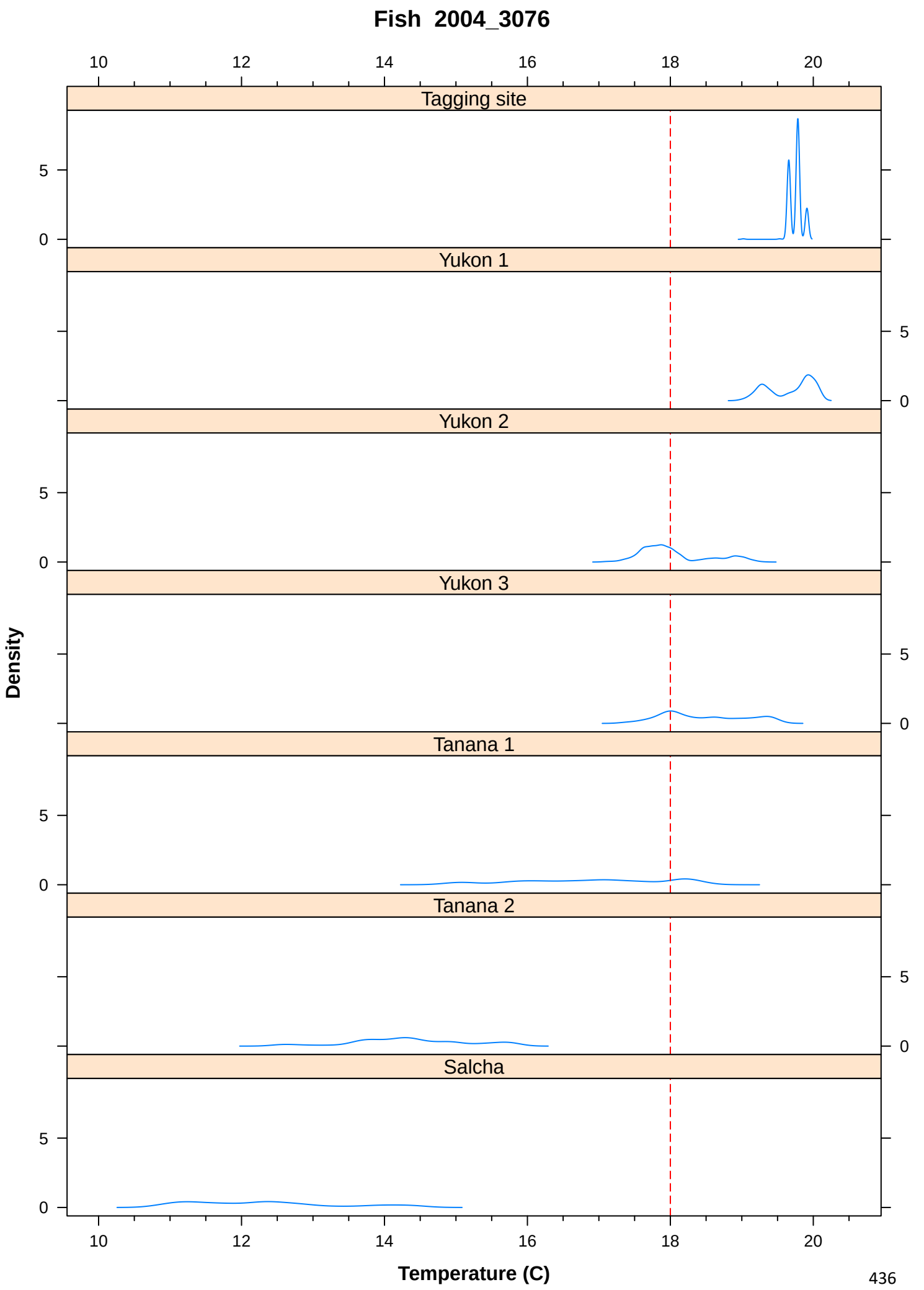

Fish 2004_3076
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

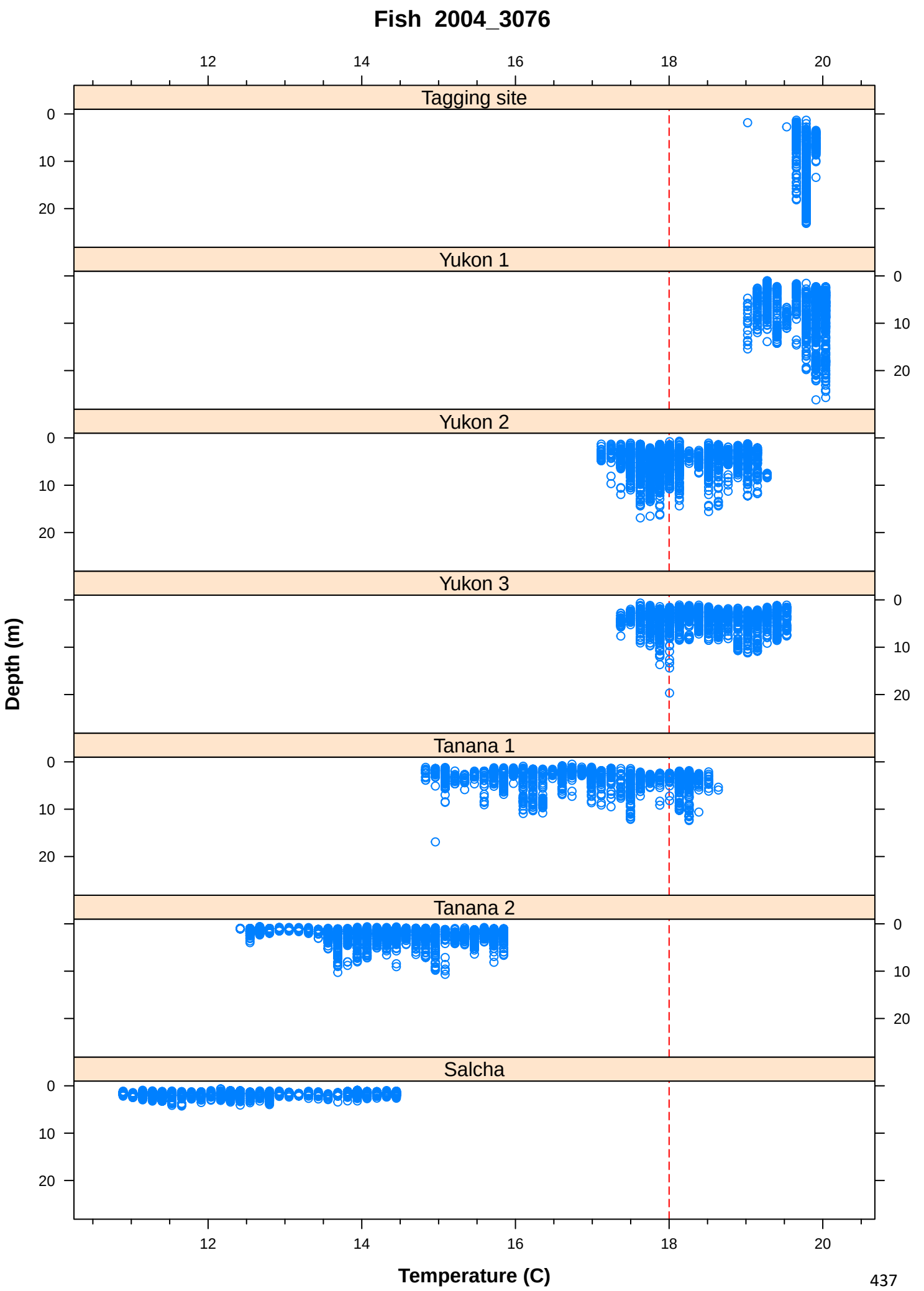

Fish 2004_3076
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
1.0
0.5
0.0
0
5
10
15
20
25
30
Depth (m)


Fish 2004_3076
0
200
400
600
800
1000
1200
20
18
16
14
12
Temperature (C)
Distance from Paimiut

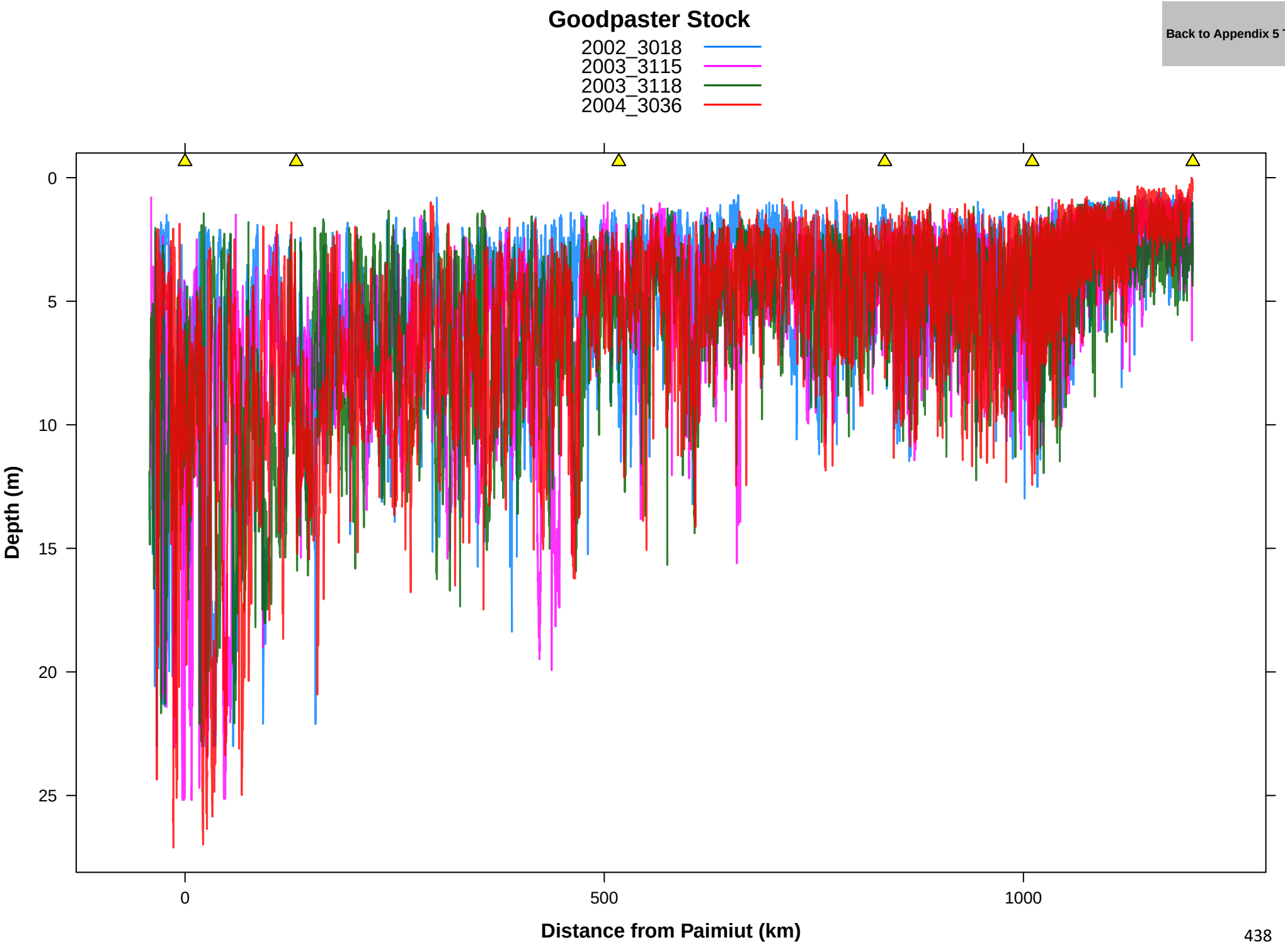

Fish 2004_3076
0
200
400
600
20
18
16
14
12
Temperature (C)
Hours since release

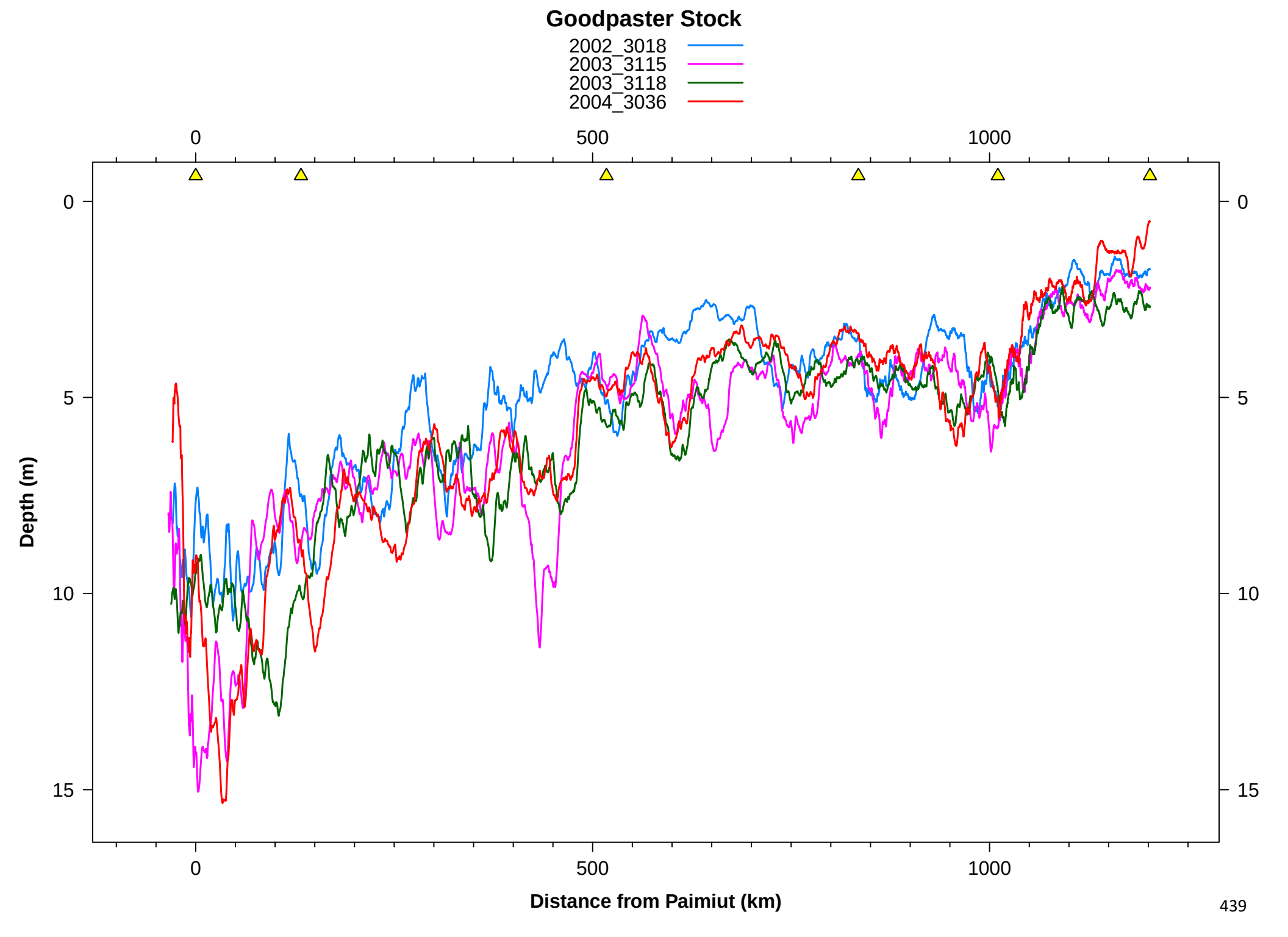

Fish 2004_3076
Temperature (C)
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Reach

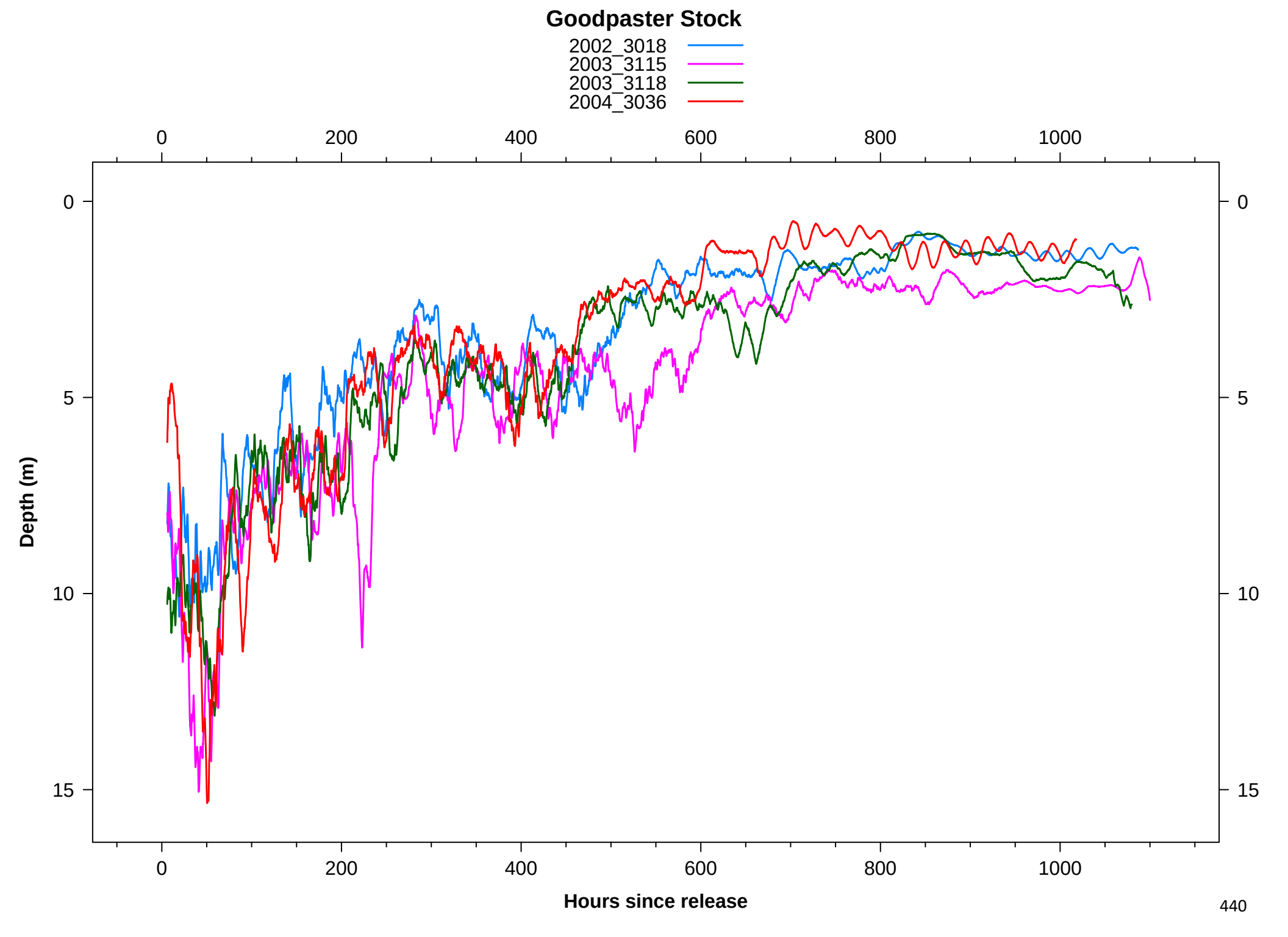

Fish 2004_3076
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Density
Temperature (C)
10
12
14
16
18
20
0
5

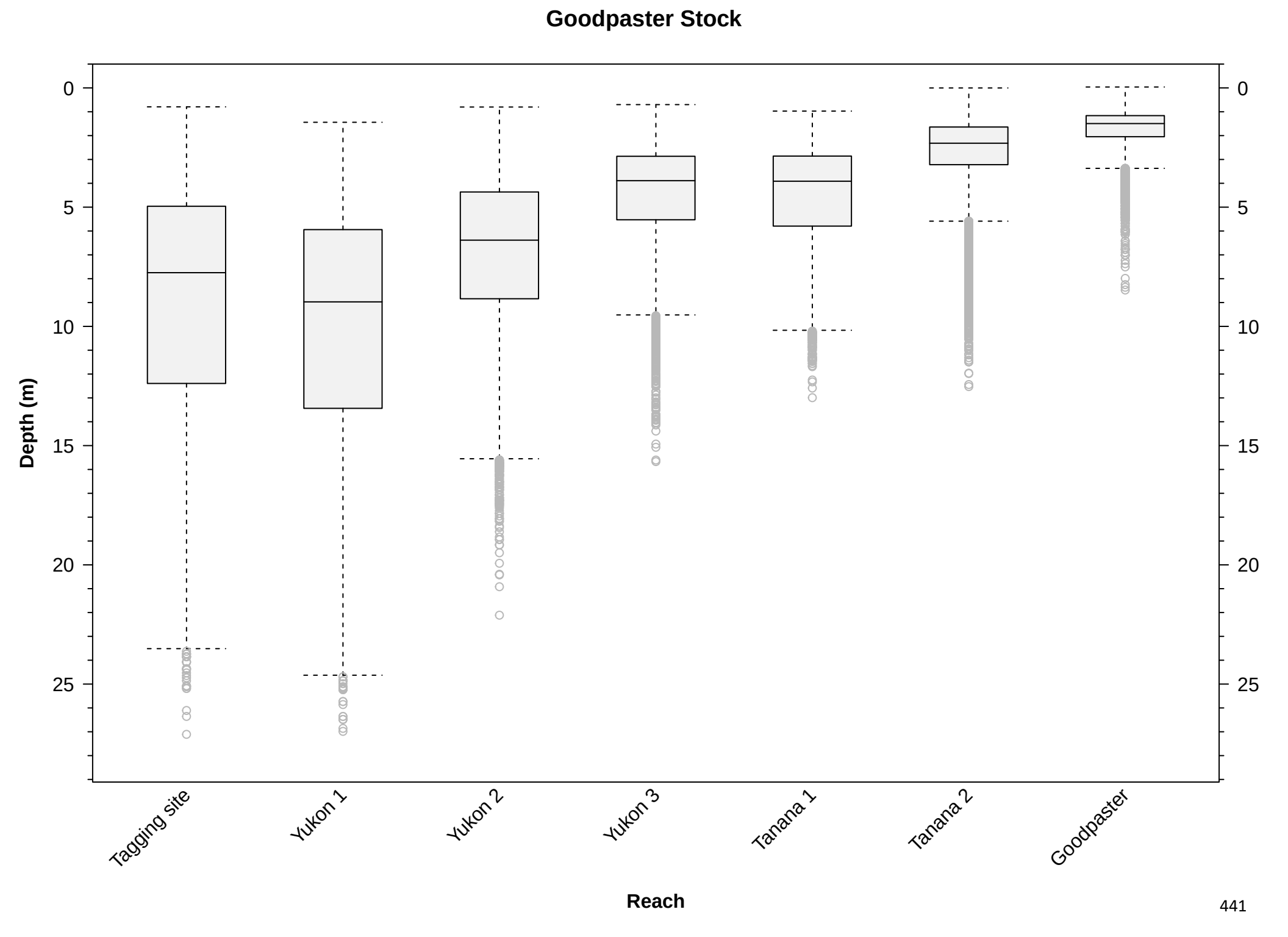

Fish 2004_3076
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Salcha
Depth (m)
Temperature (C)
12
14
16
18
20
0
10
20

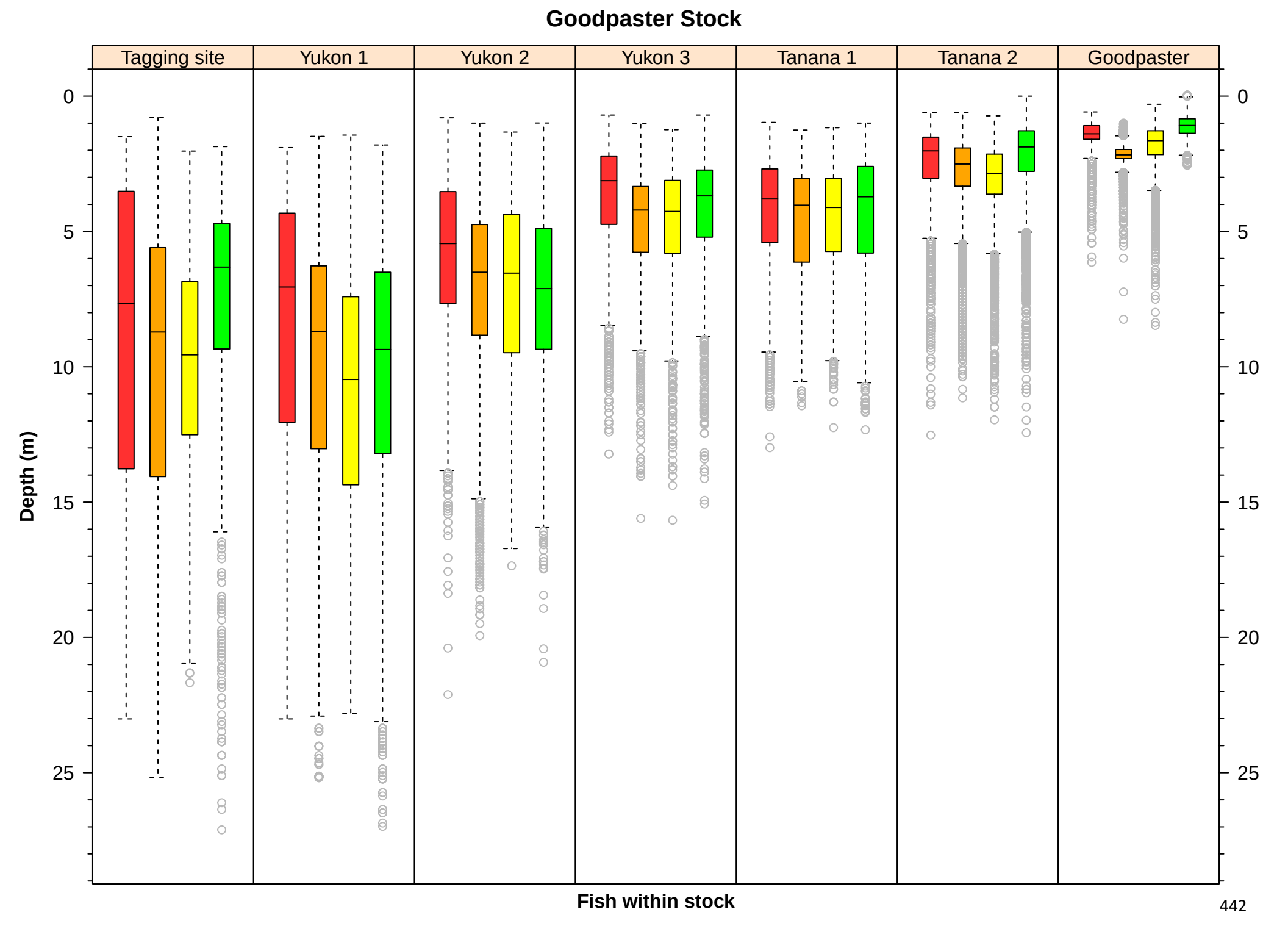
Back to Appendix 5 TOC

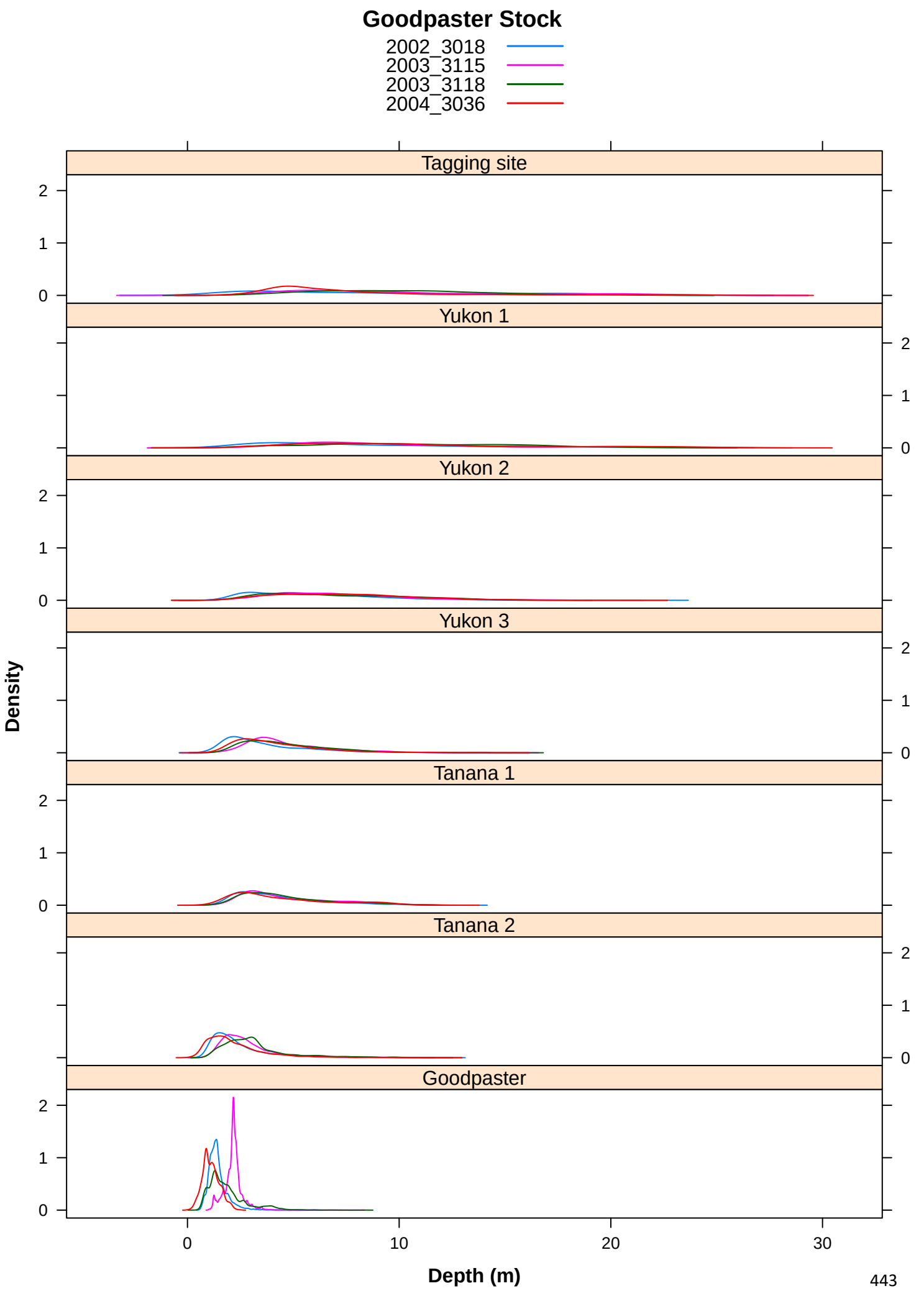


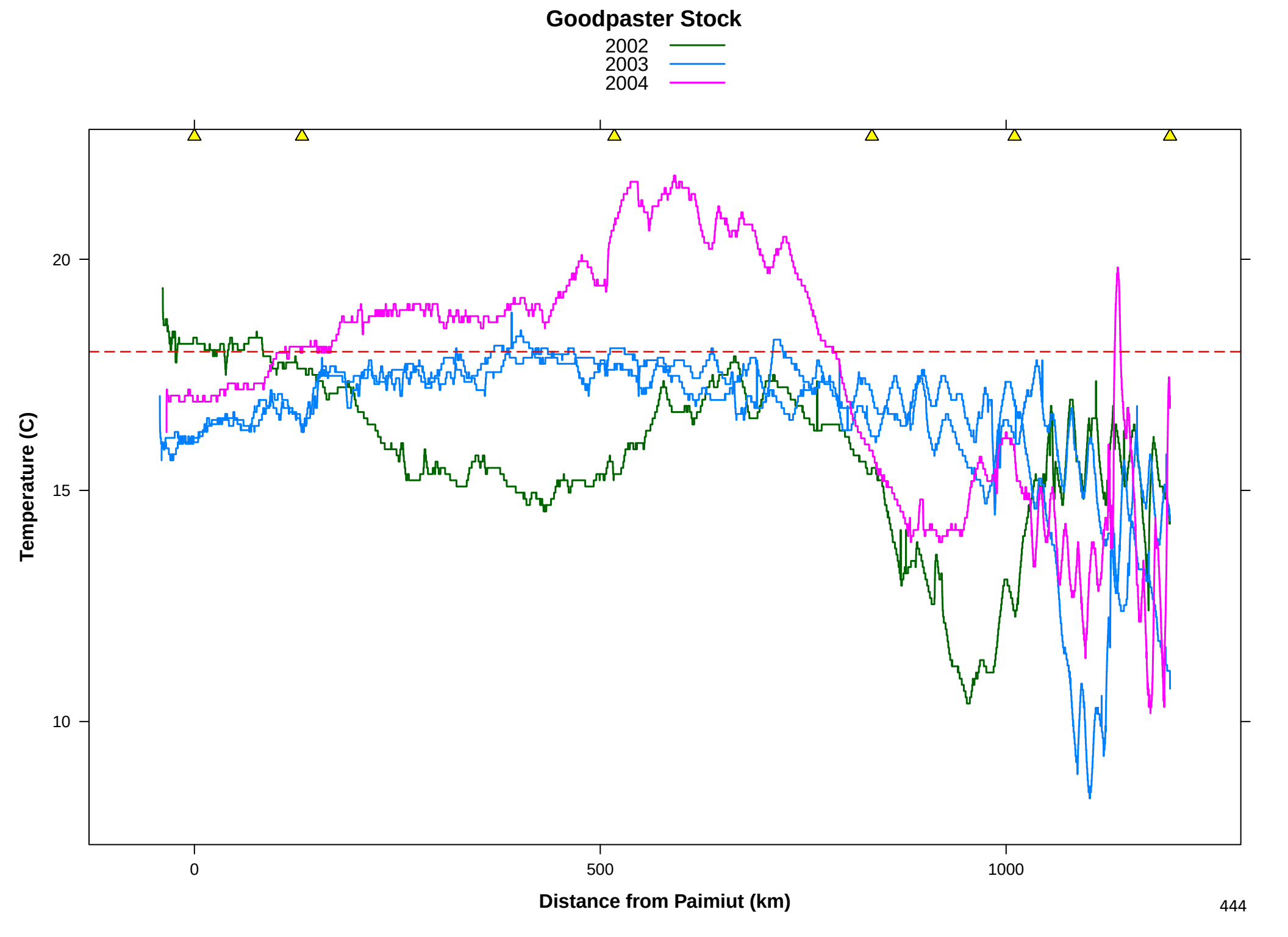

Goodpaster Stock
2002_3018
2003_3115
2003_3118
2004_3036
0
500
1000
0
5
10
15
Depth (m)
Distance from Paimiut (km)

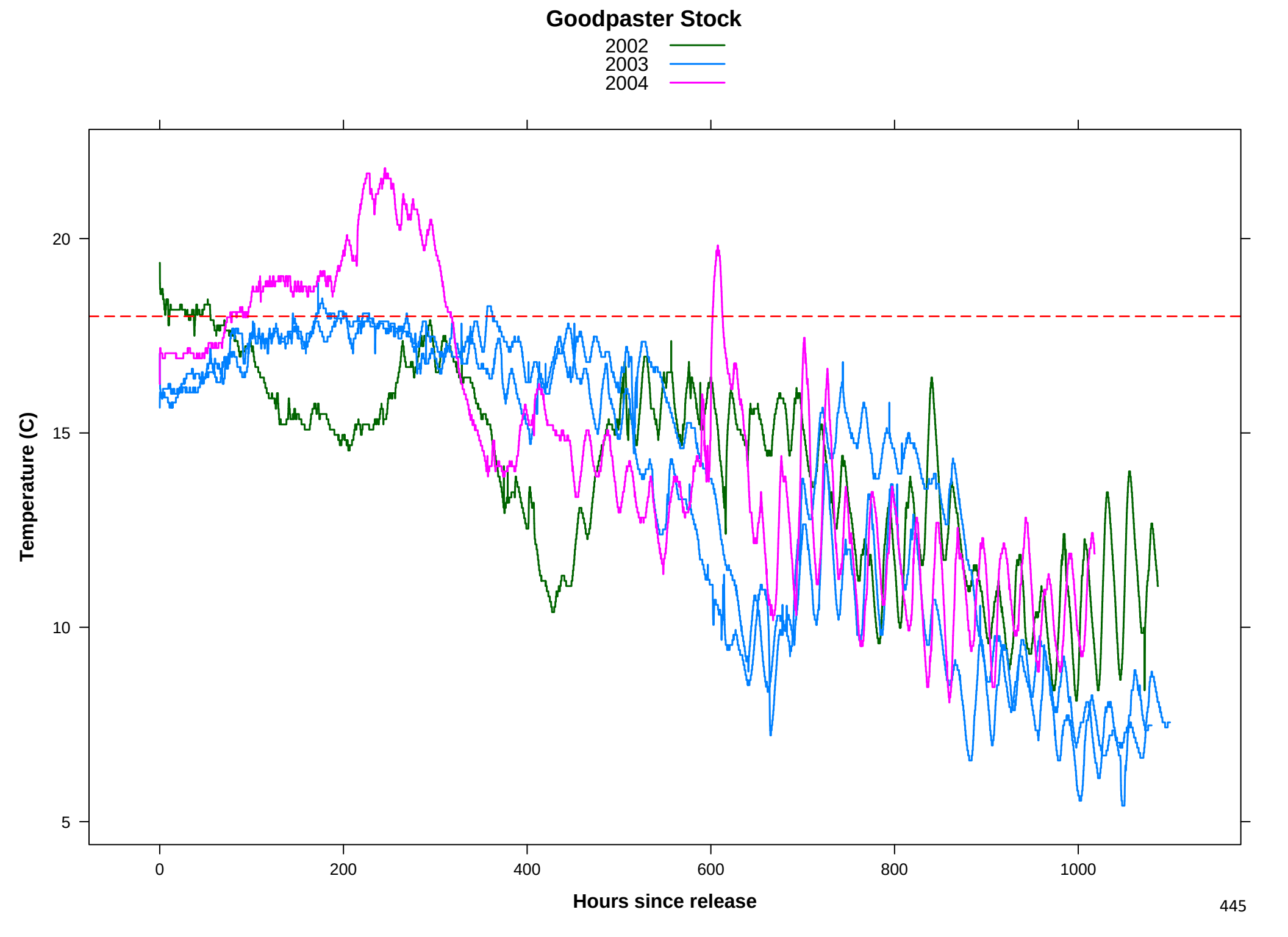

Goodpaster Stock
2002_3018
2003_3115
2003_3118
2004_3036
0
200
400
600
800
1000
0
5
10
15
Depth (m)
Hours since release

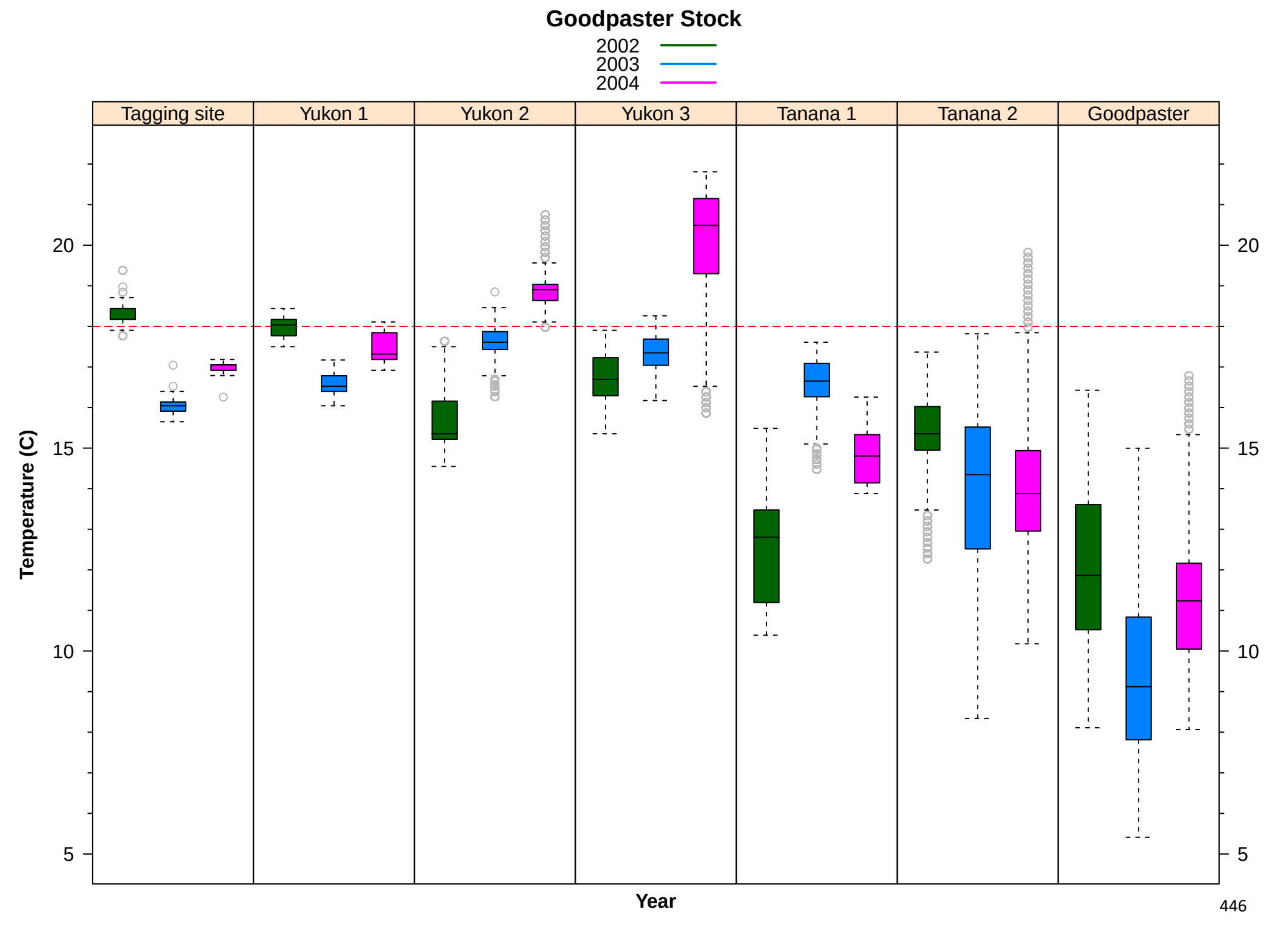

Goodpaster Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Reach

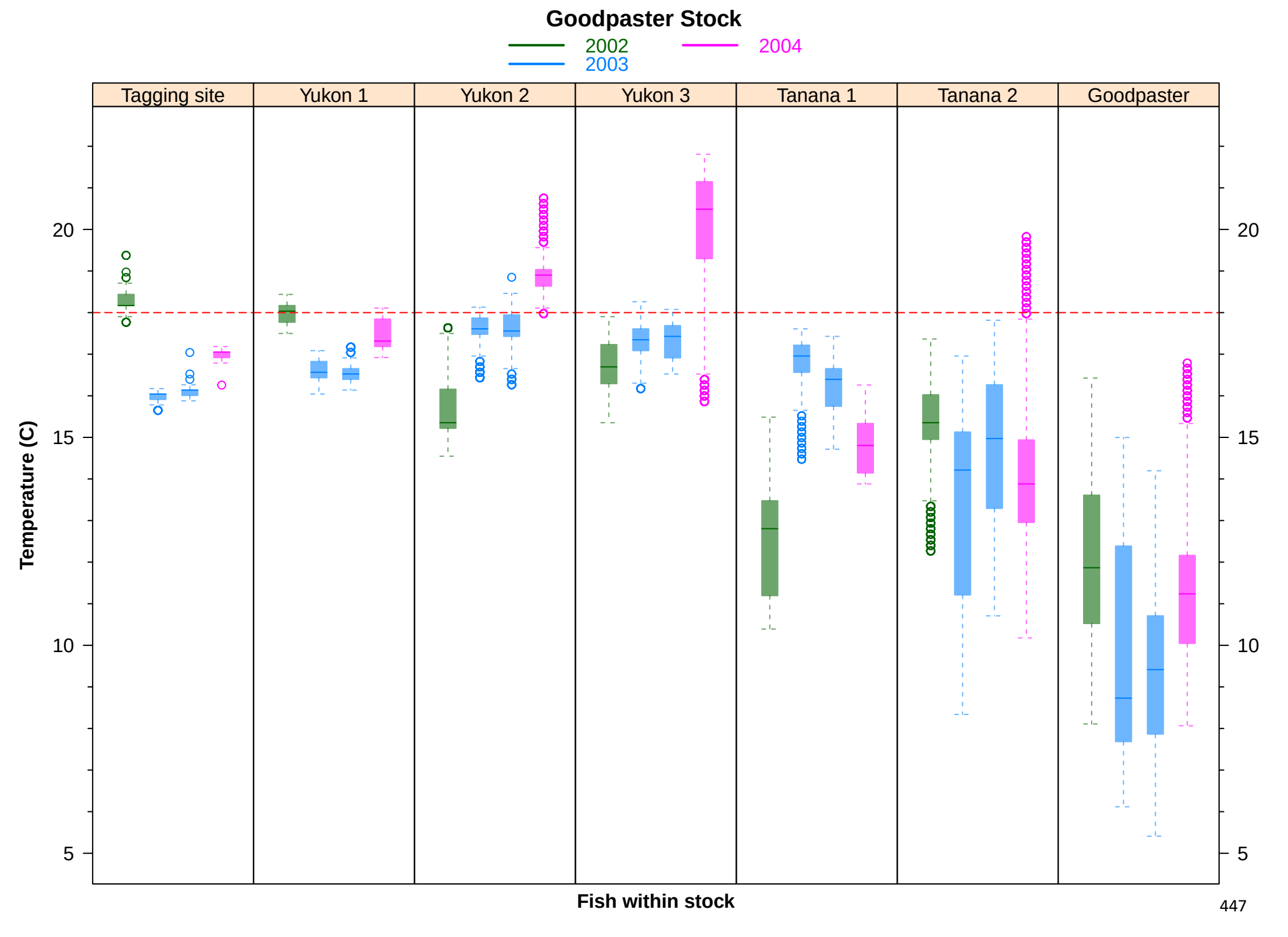

Goodpaster Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Depth (m)
0
5
10
15
20
25
Fish within stock

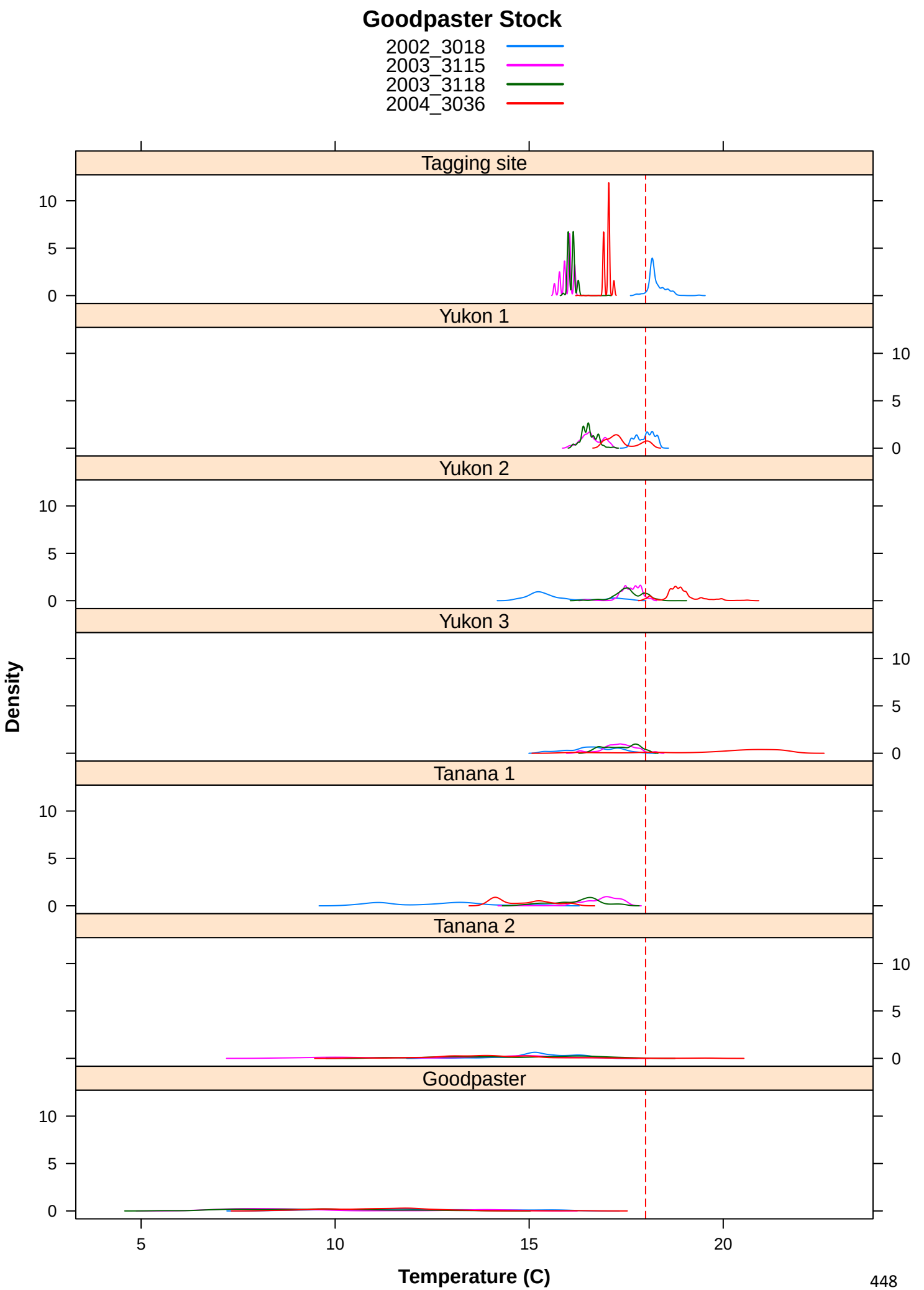

Goodpaster Stock
2002_3018
2003_3115
2003_3118
2004_3036
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Density
Depth (m)
0
10
20
30
0
1
2

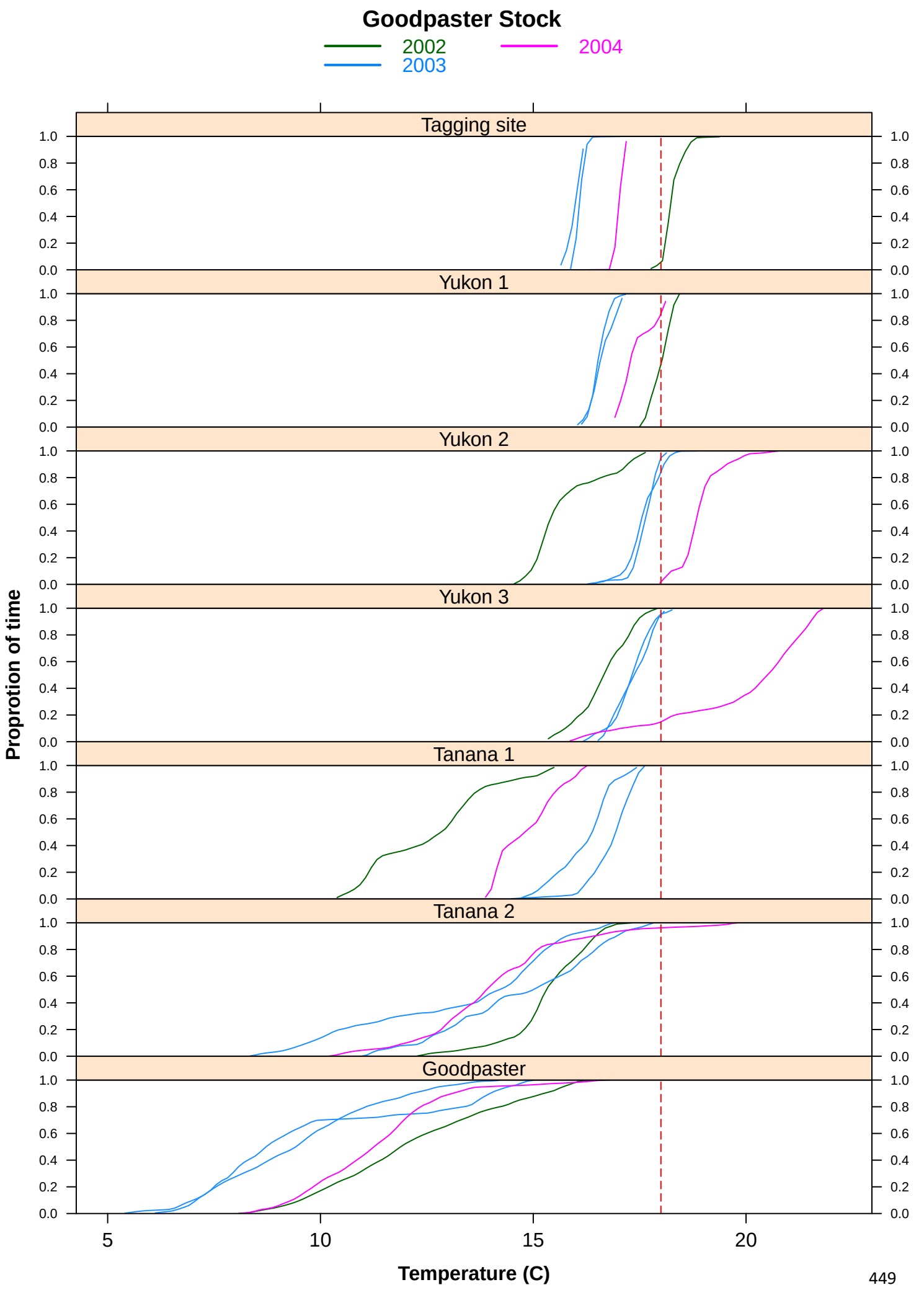

Goodpaster Stock
2002
2003
2004
20
15
10
Temperature (C)
0
500
1000
Distance from Paimiut (km)

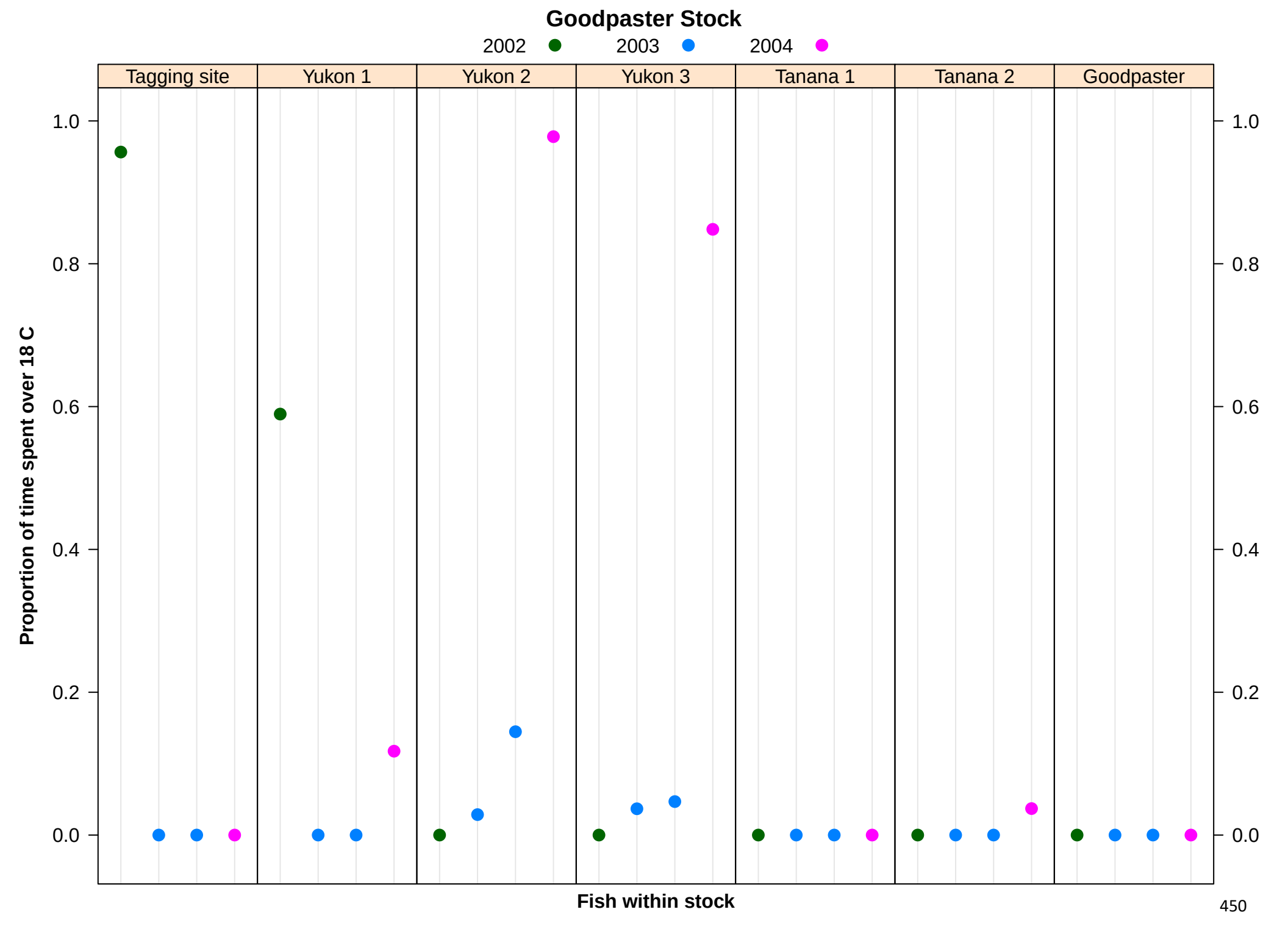

Goodpaster Stock
2002
2003
2004
Temperature (C)
20
15
10
5
0
200
400
600
800
1000
Hours since release

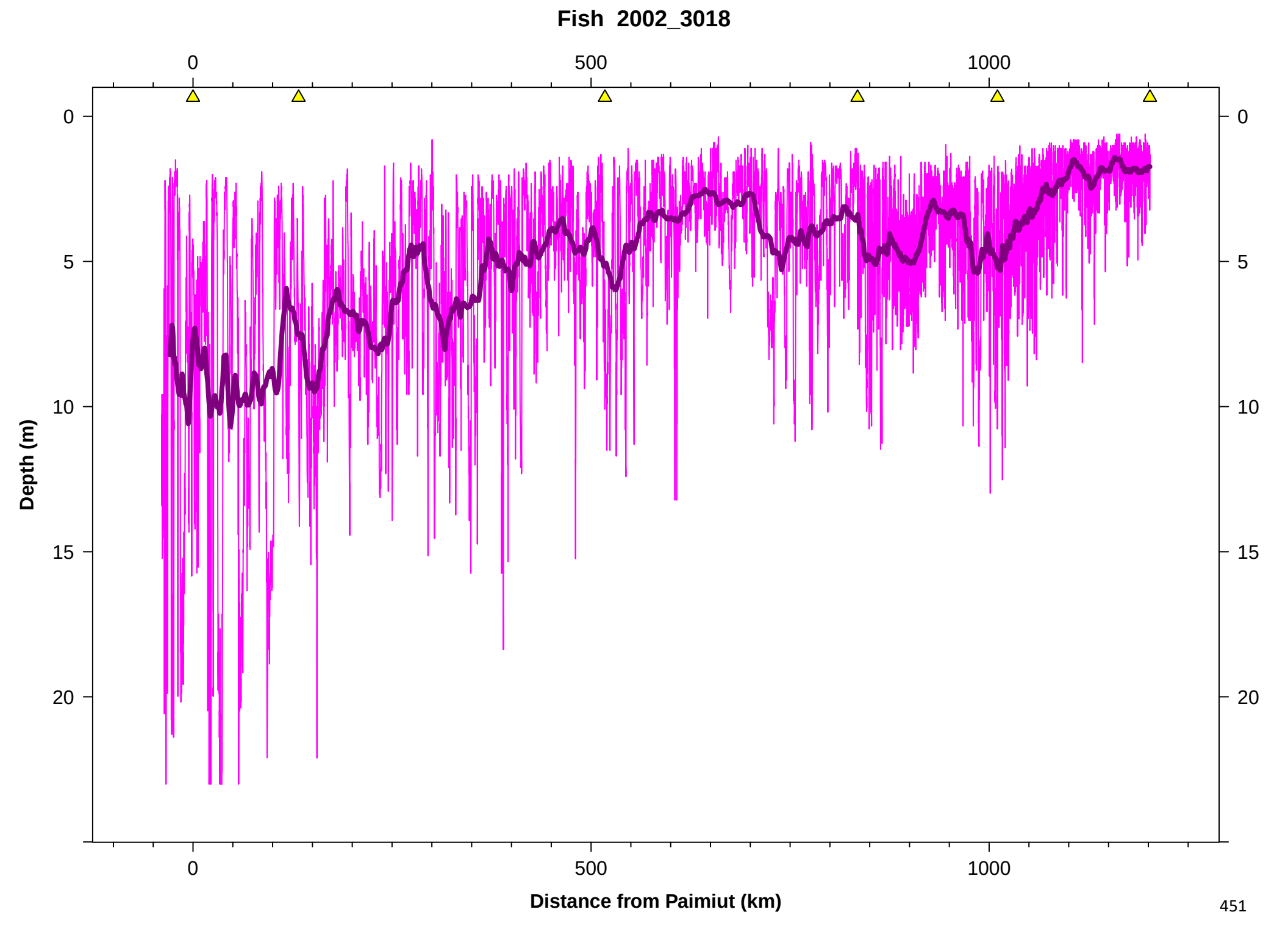

Goodpaster Stock
2002
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Temperature (C)
20
15
10
5
Year

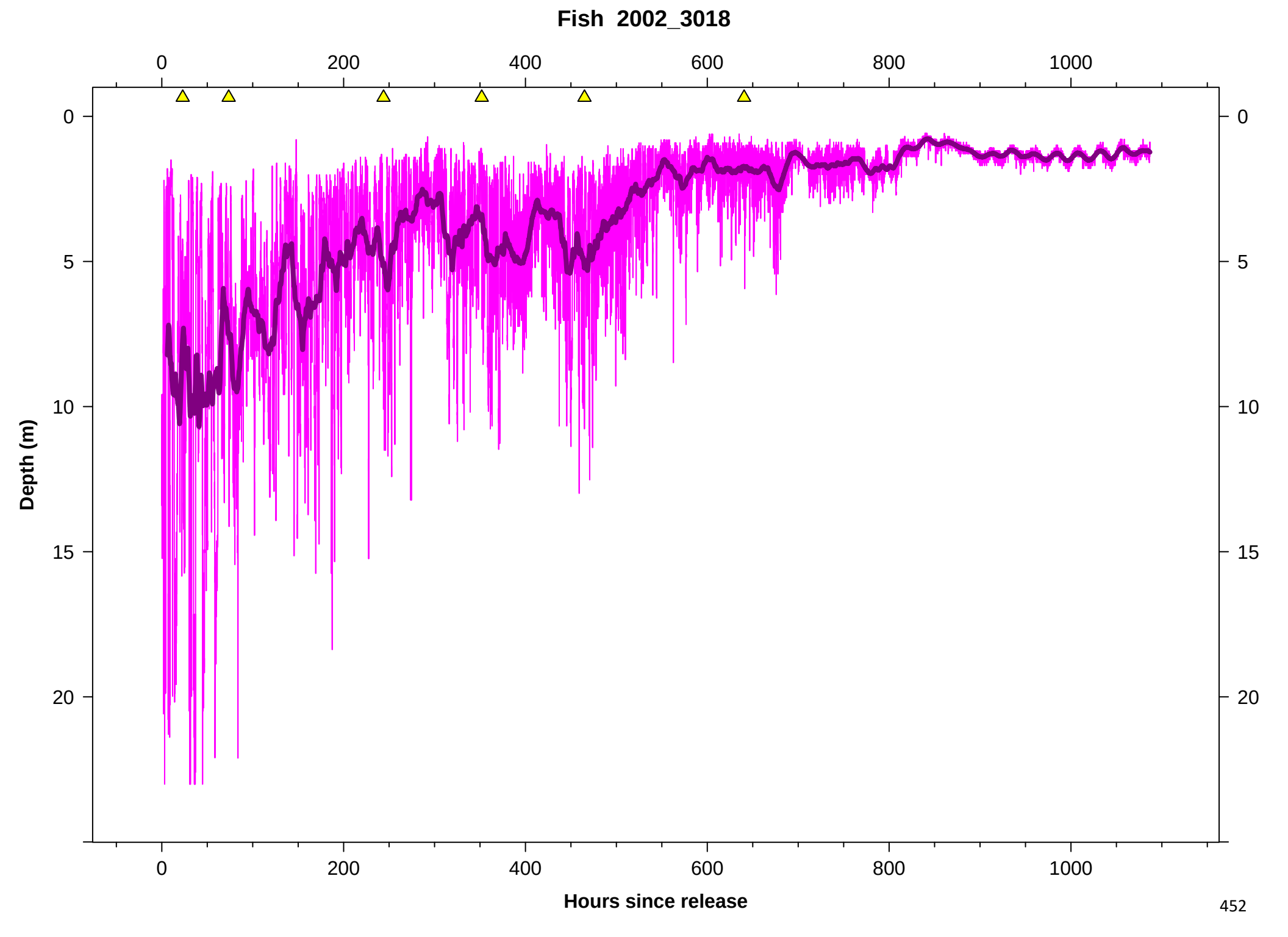

Goodpaster Stock
2002
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Temperature (C)
20
15
10
5
Fish within stock
447

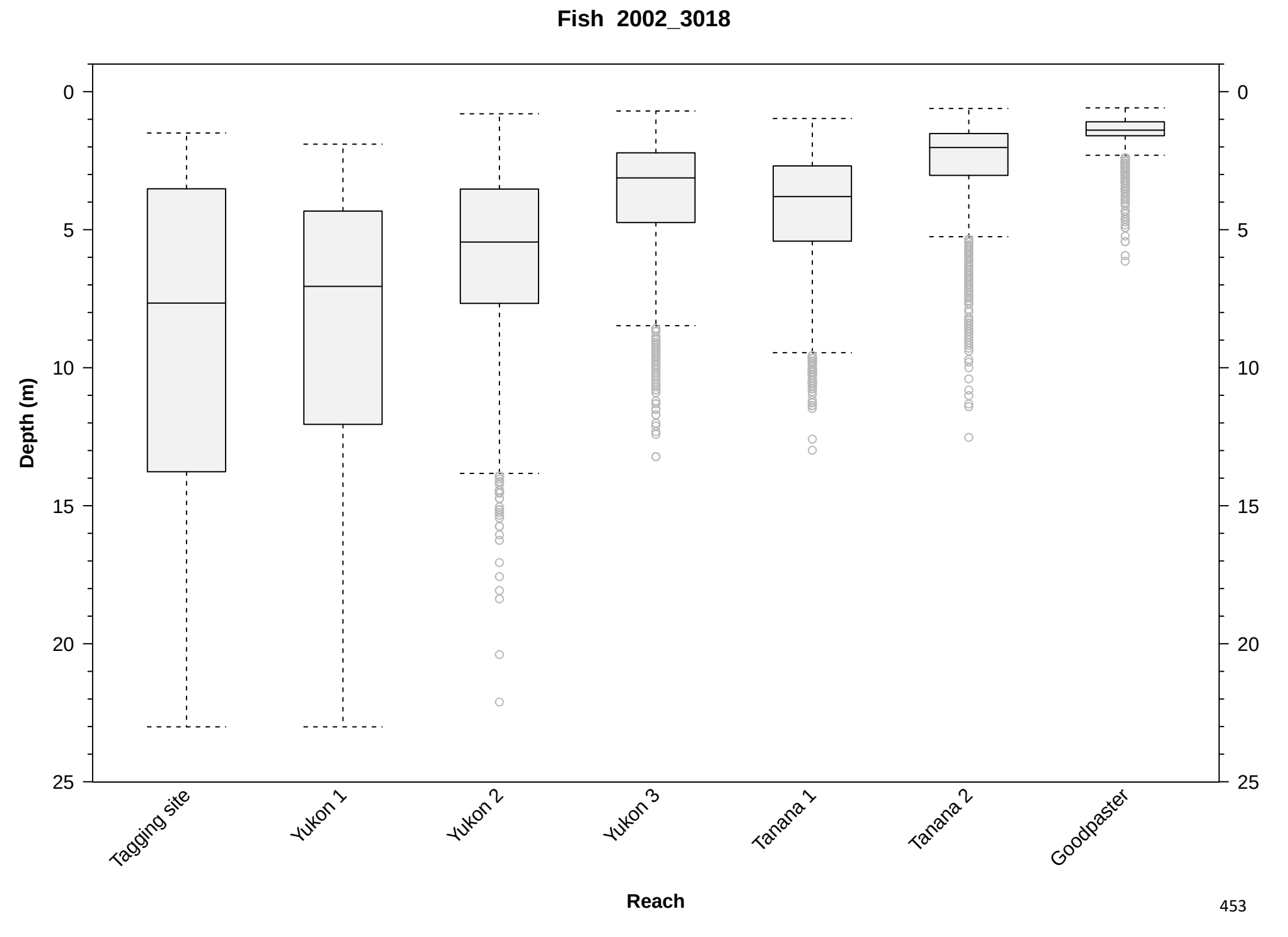

Goodpaster Stock
2002_3018
2003_3115
2003_3118
2004_3036
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Density
Temperature (C)
0
5
10
15
20

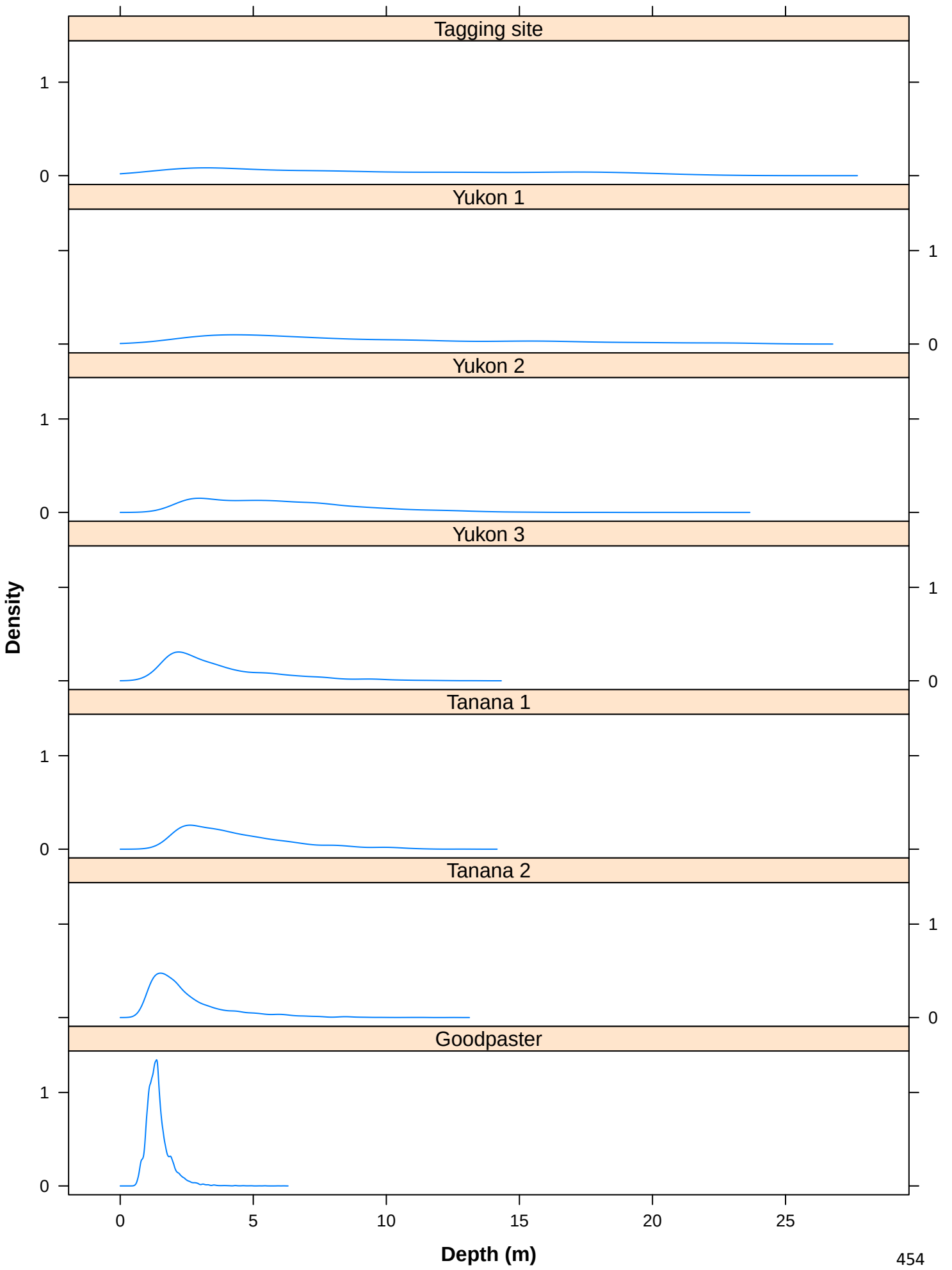

Goodpaster Stock
2002
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
5
10
15
20

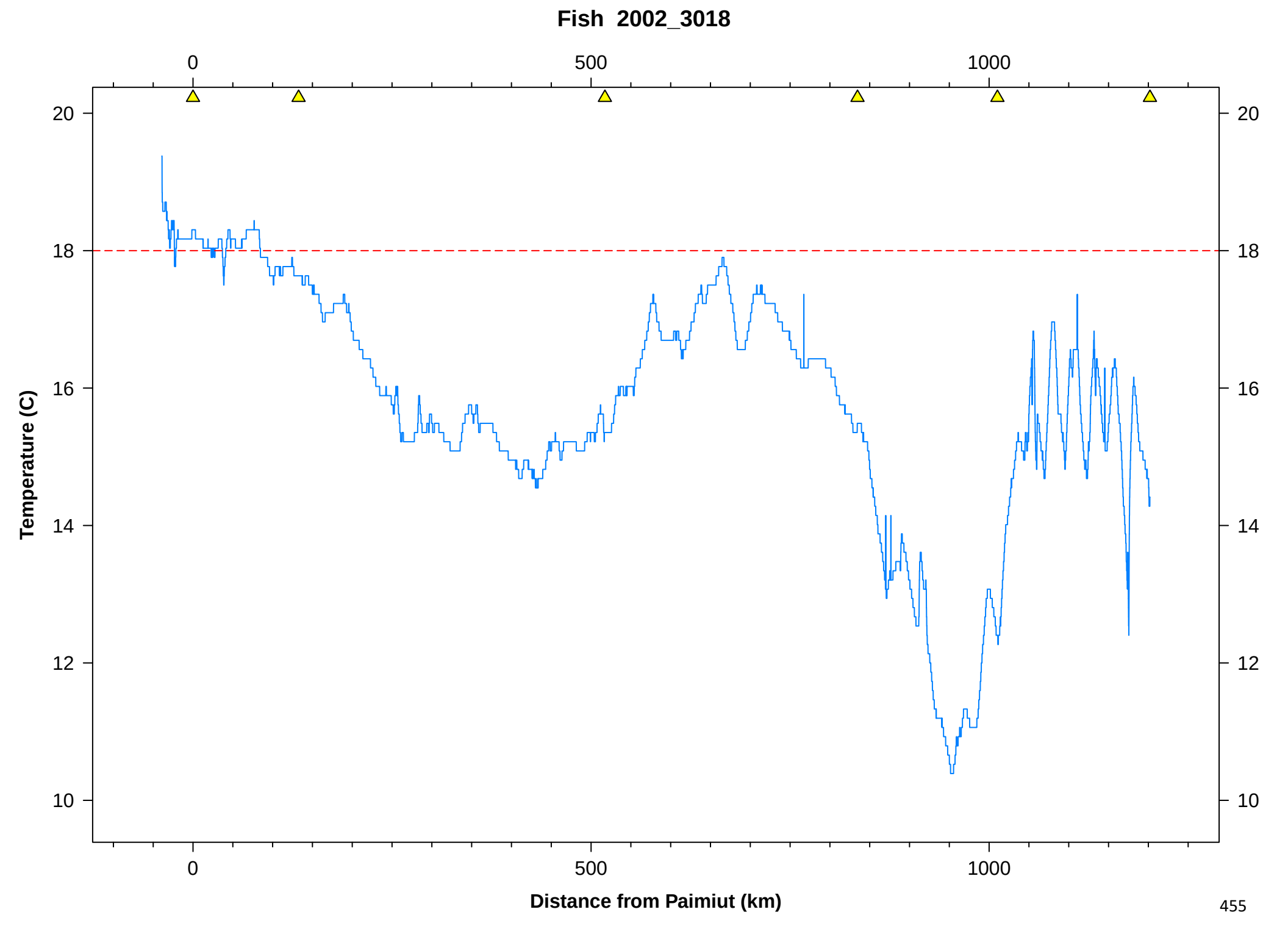

Goodpaster Stock
2002
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock
450

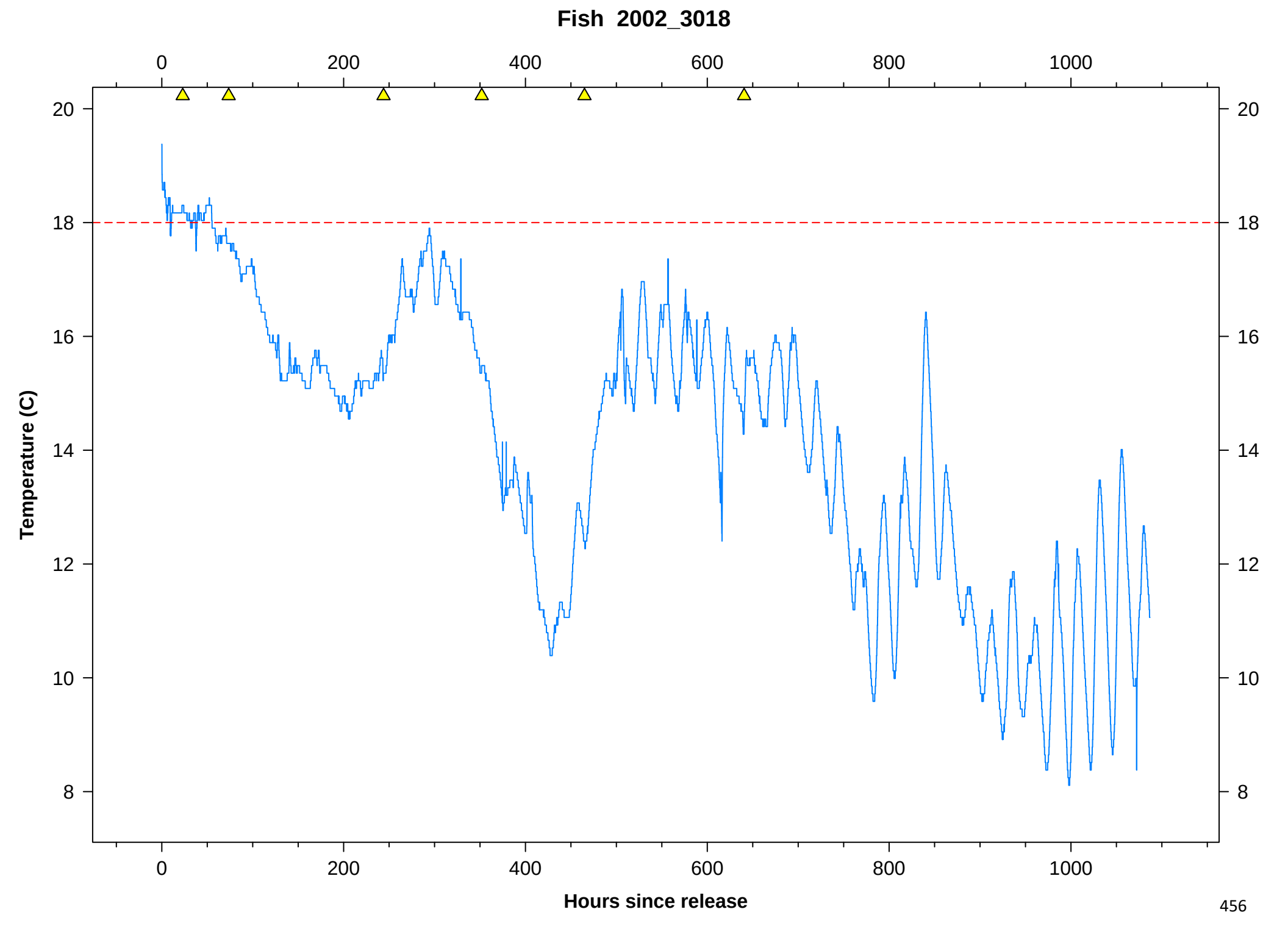

Fish 2002_3018
0
500
1000
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

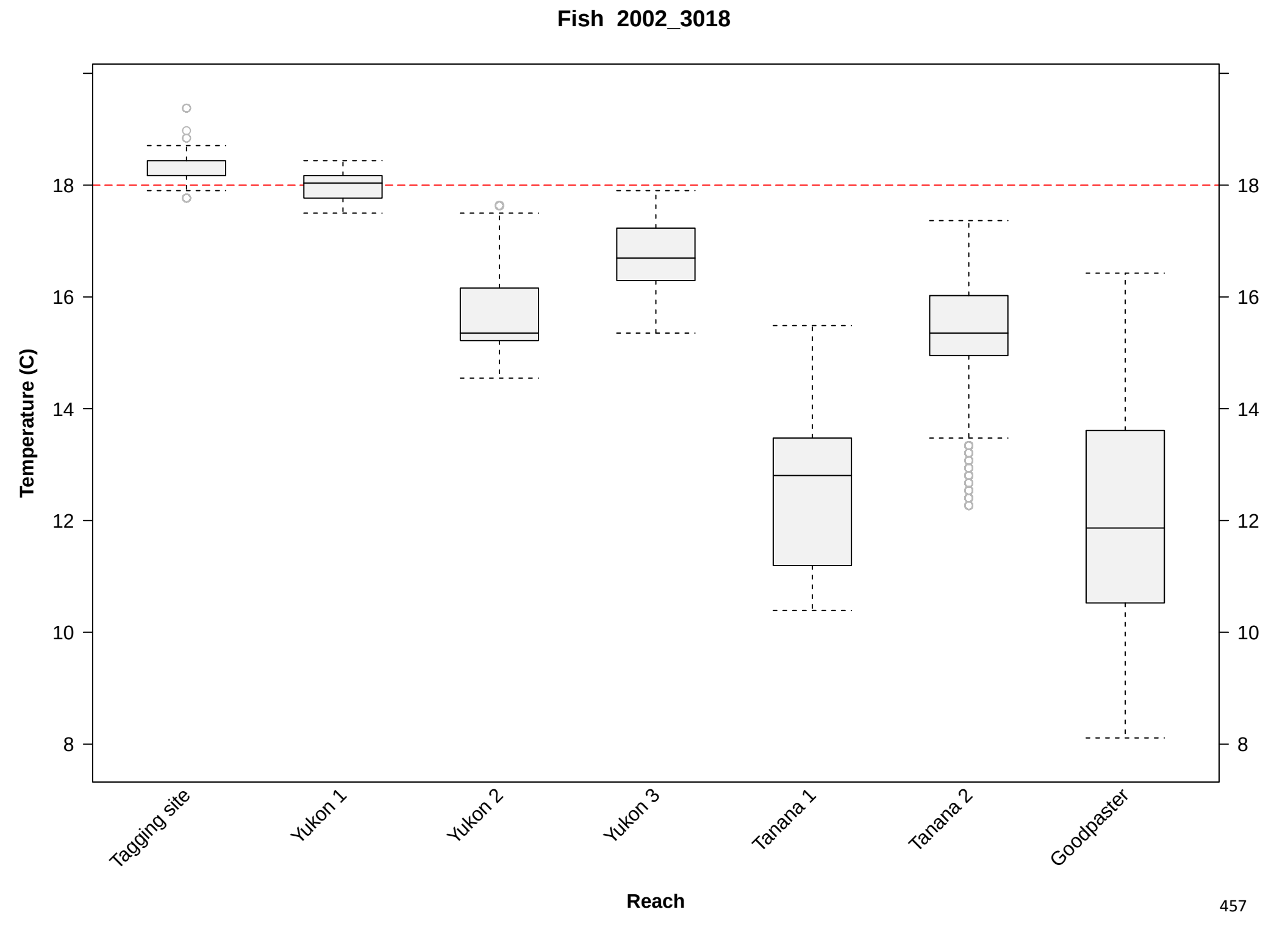

Fish 2002_3018
0
200
400
600
800
1000
0
5
10
15
20
Depth (m)
Hours since release

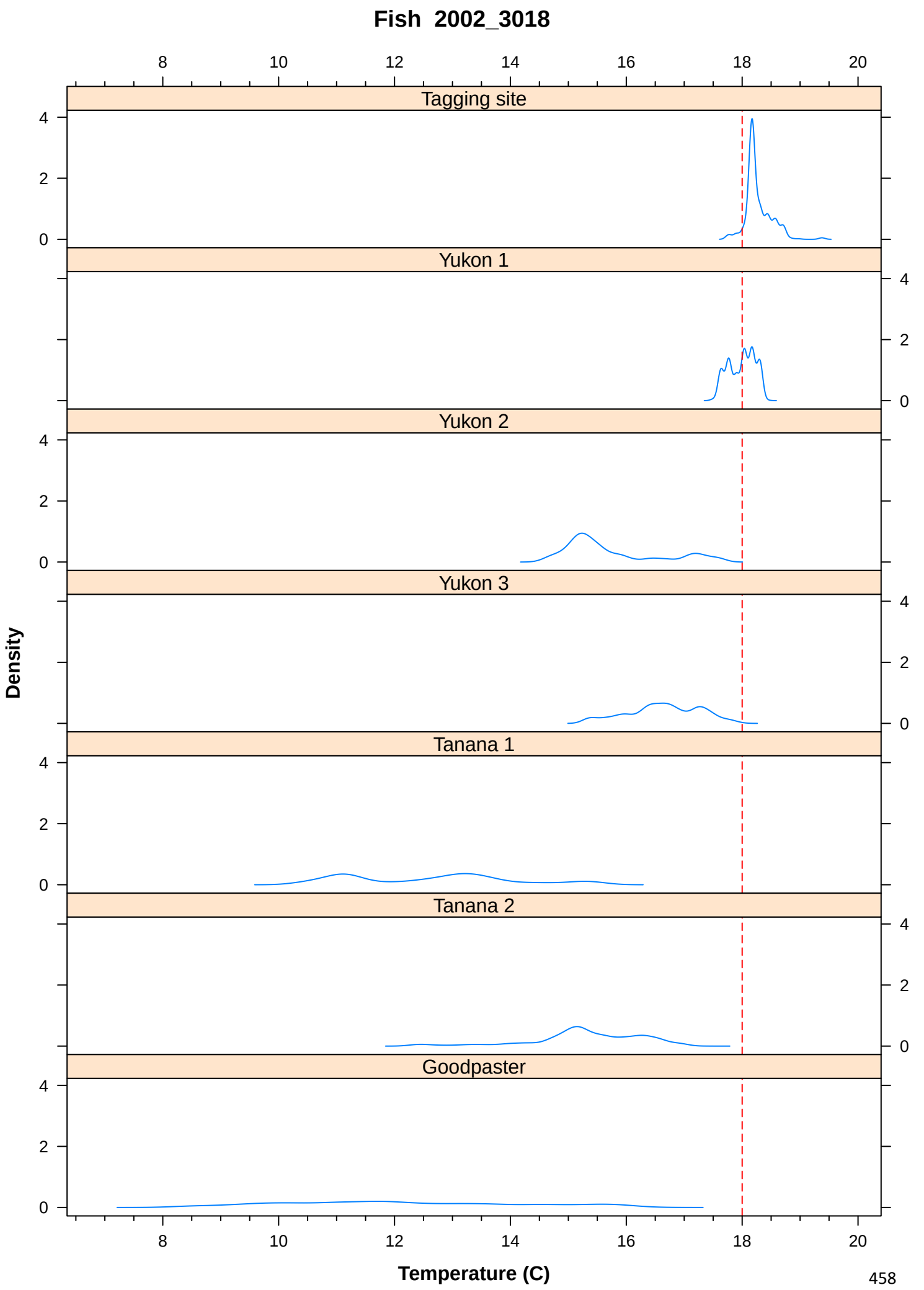

Fish 2002_3018
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Reach

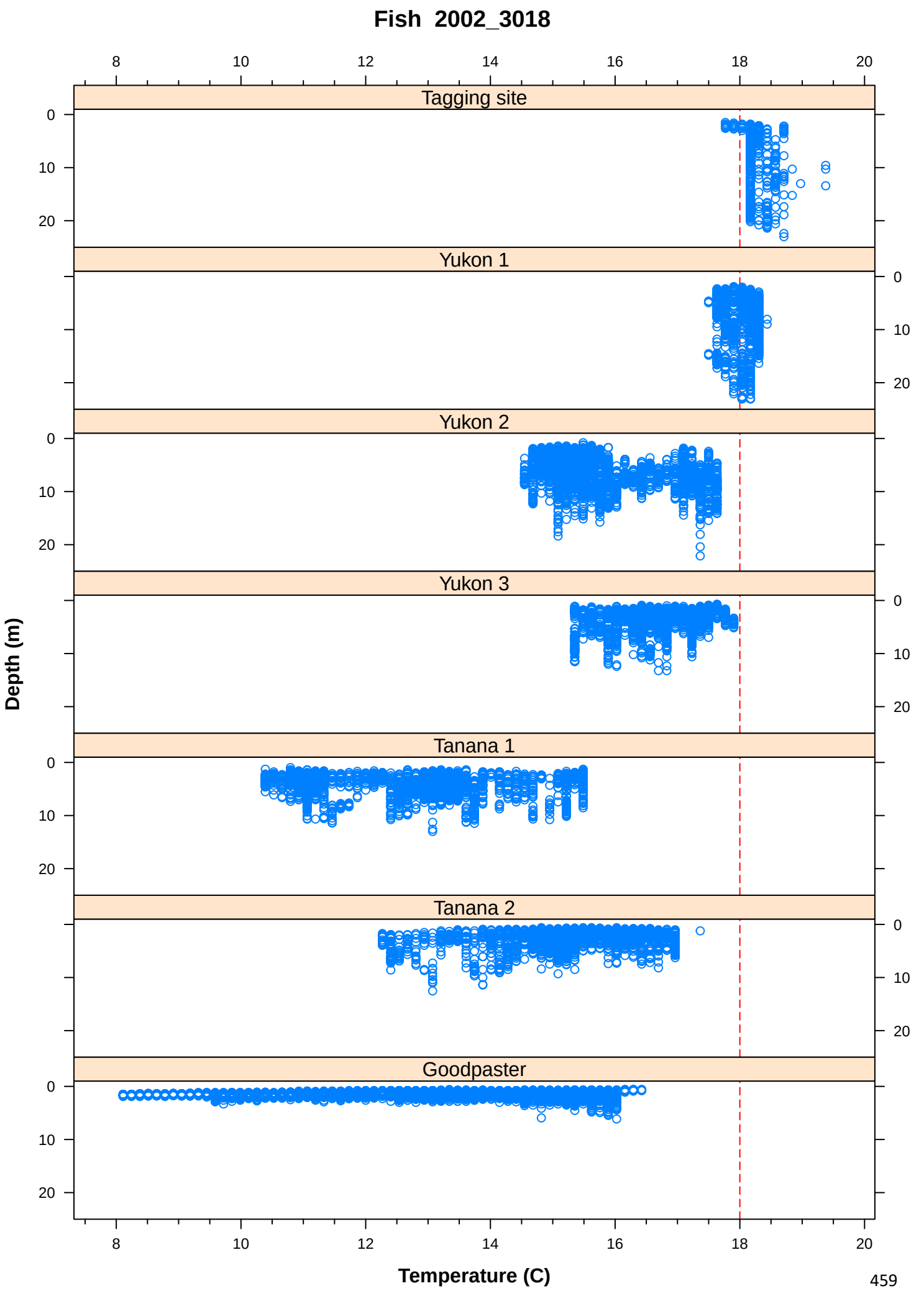

Fish 2002_3018
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Density
0
1
0
5
10
15
20
25
Depth (m)

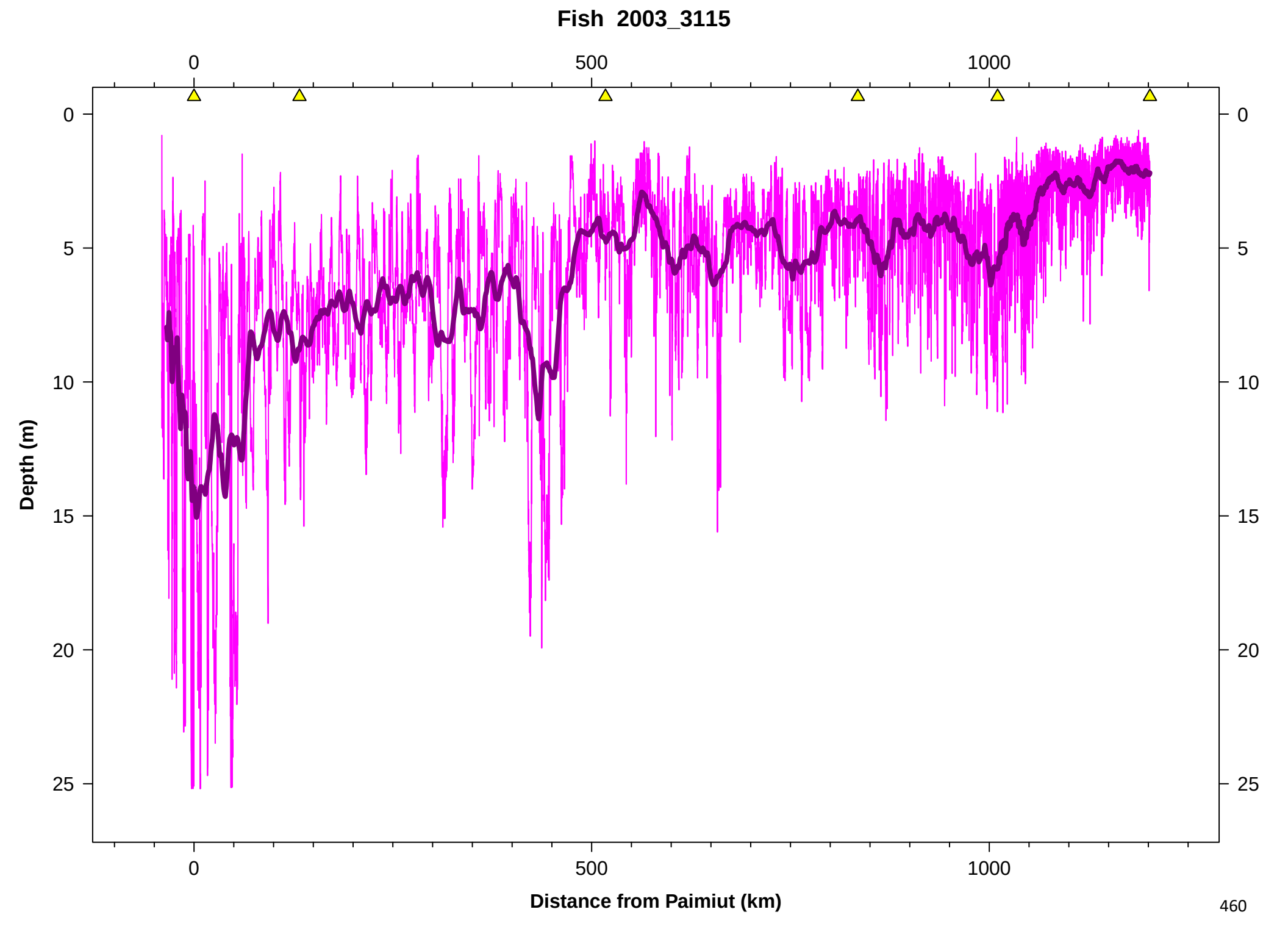

Fish 2002_3018
0
500
1000
20
18
16
14
12
10
Temperature (C)
Distance from Paimiut (km)

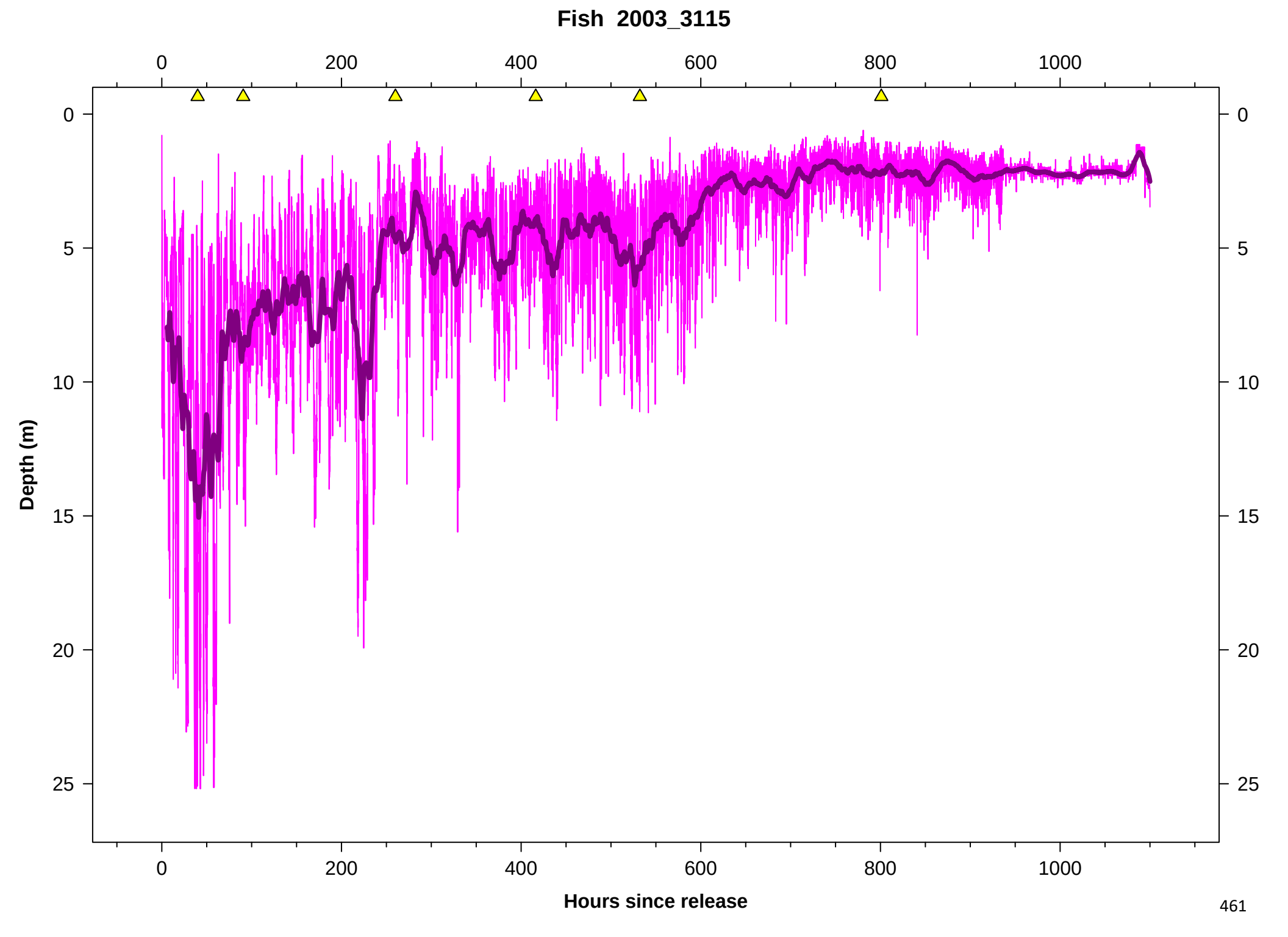

Fish 2002_3018
0
200
400
600
800
1000
20
18
16
14
12
10
8
Temperature (C)
Hours since release

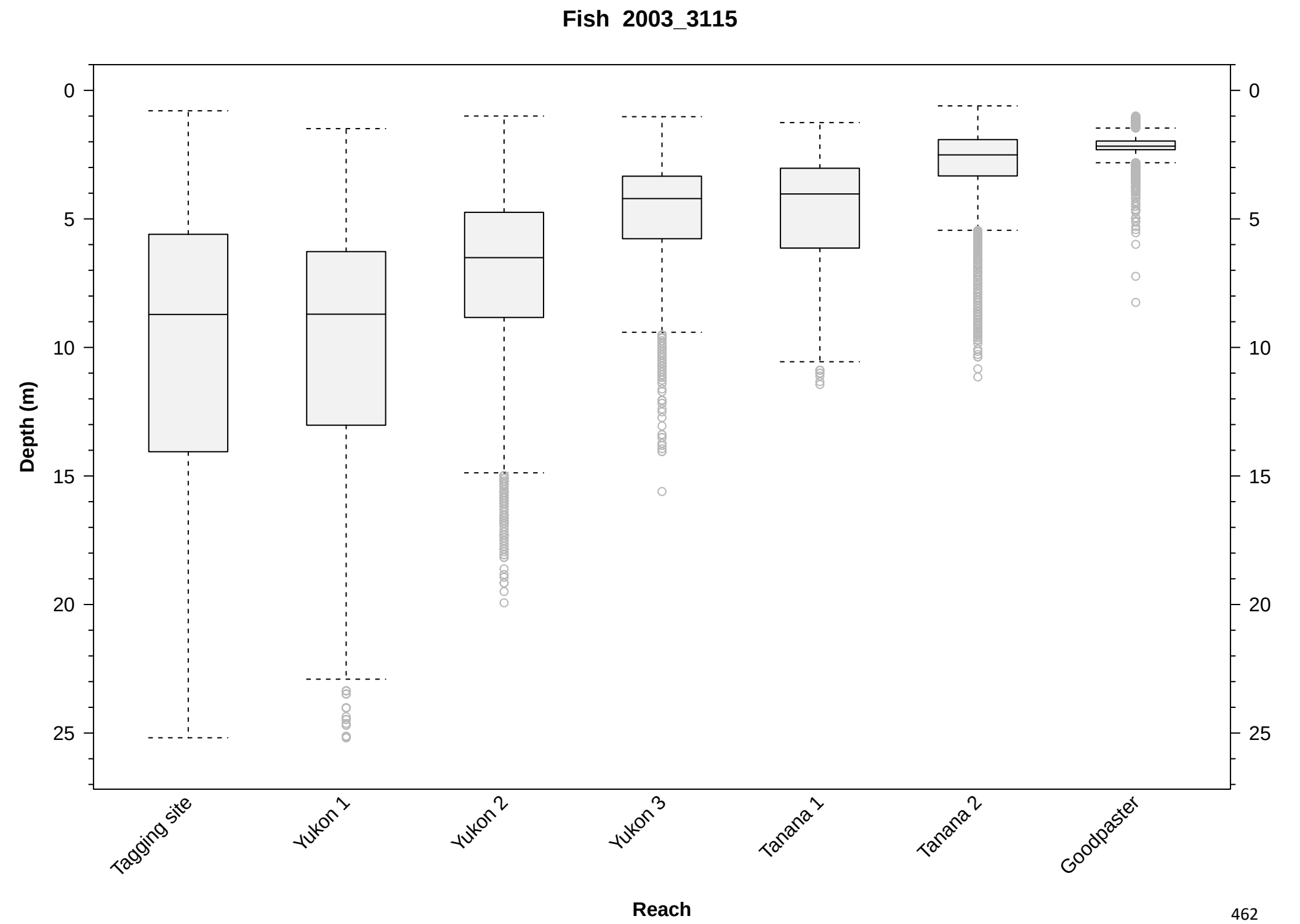

Fish 2002_3018
Temperature (C)
18
16
14
12
10
8
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Reach

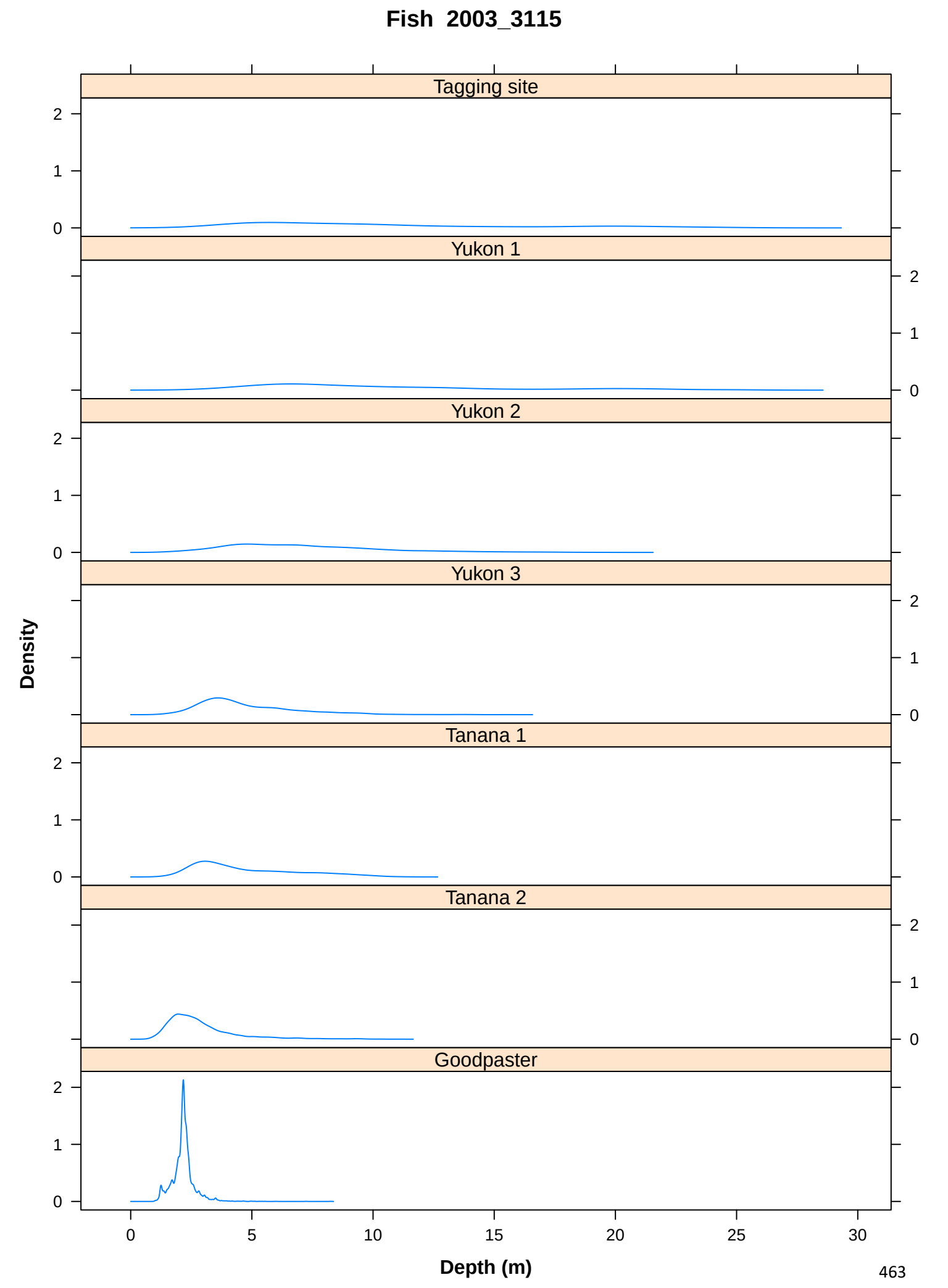

Fish 2002_3018
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Density
Temperature (C)
8
10
12
14
16
18
20
0
2
4

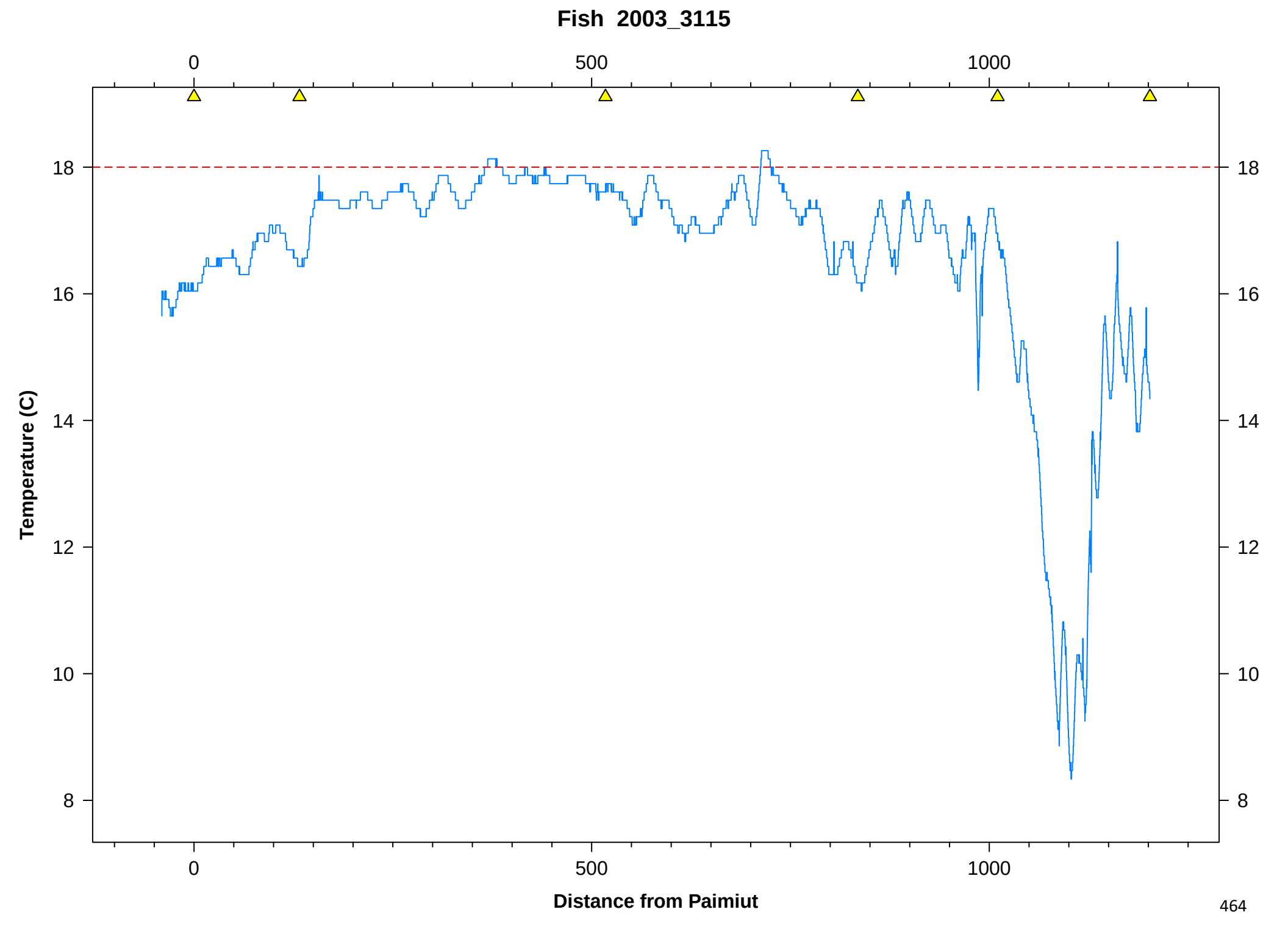

Fish 2002_3018
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Depth (m)
Temperature (C)
8
10
12
14
16
18
20
0
10
20

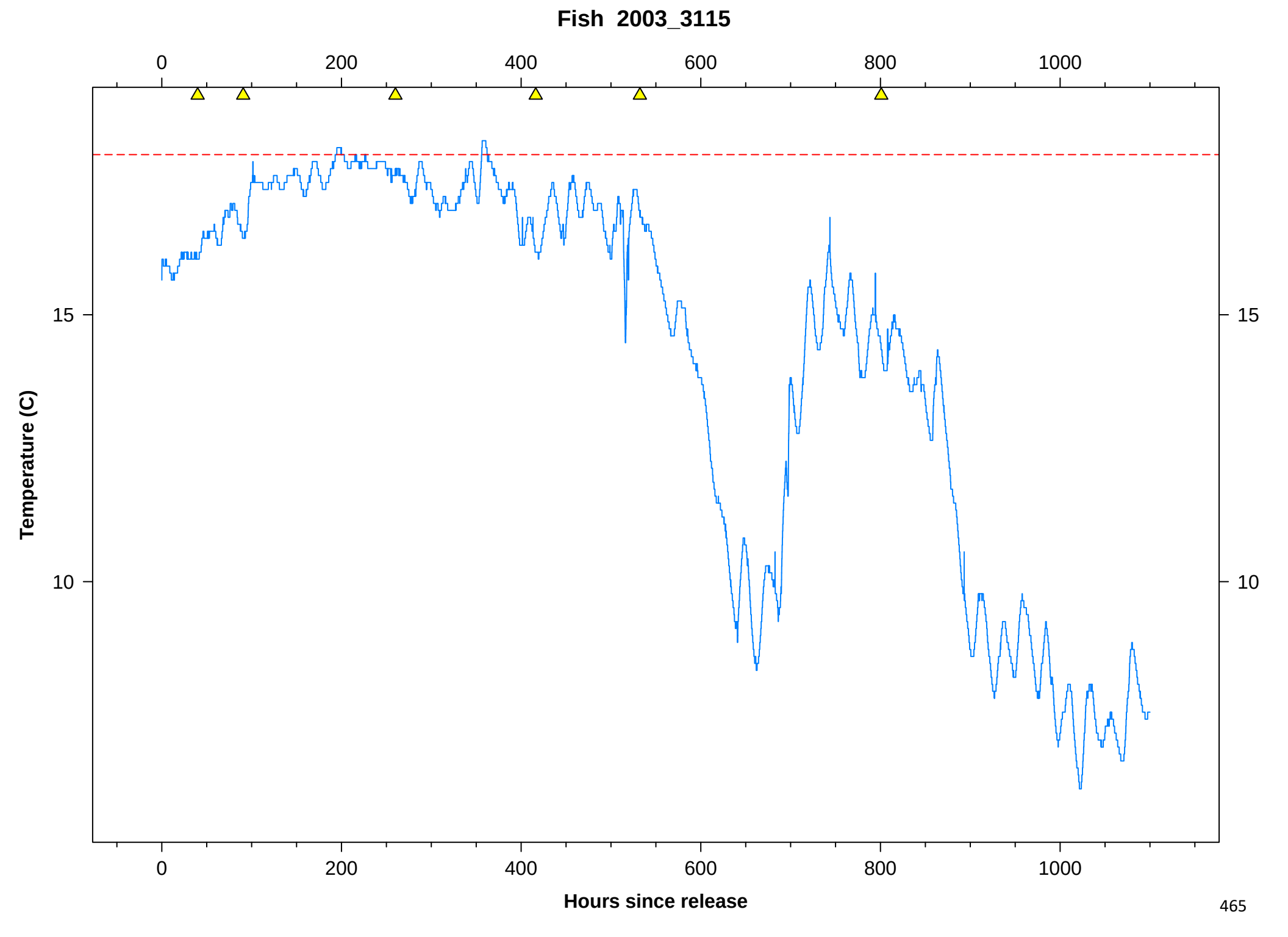

Fish 2003_3115
0
500
1000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

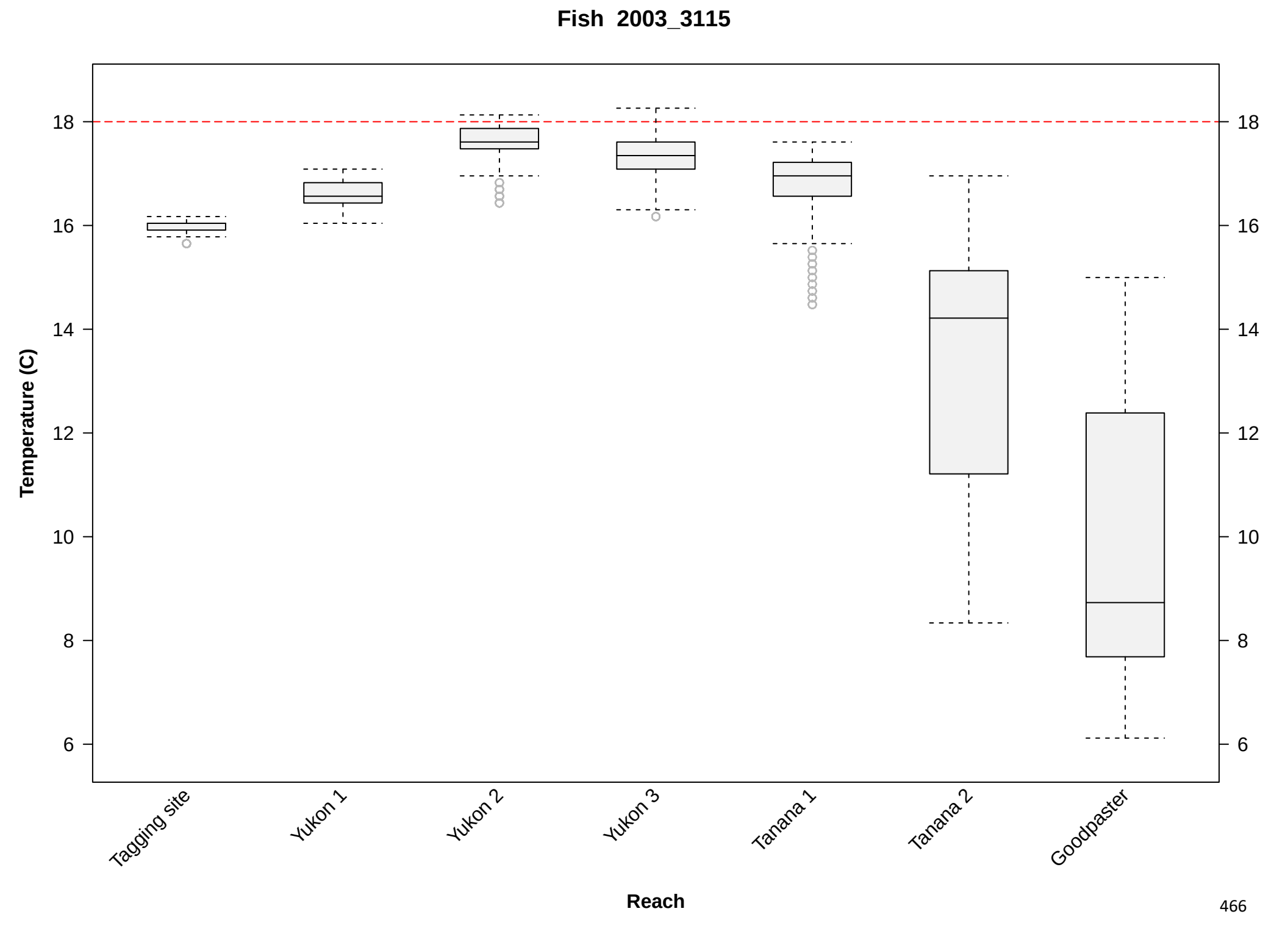

Fish 2003_3115
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release
461

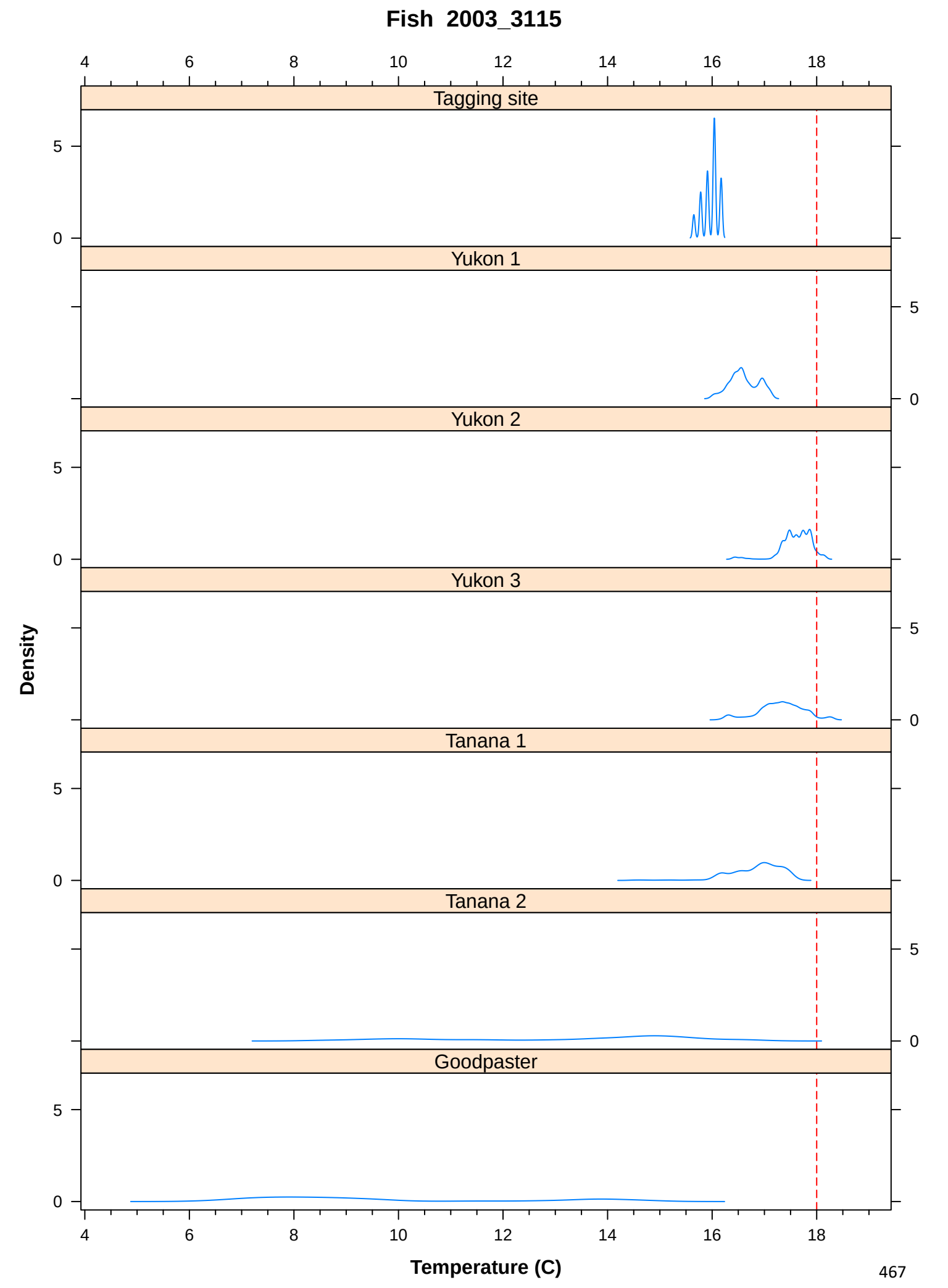

Fish 2003_3115
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Reach

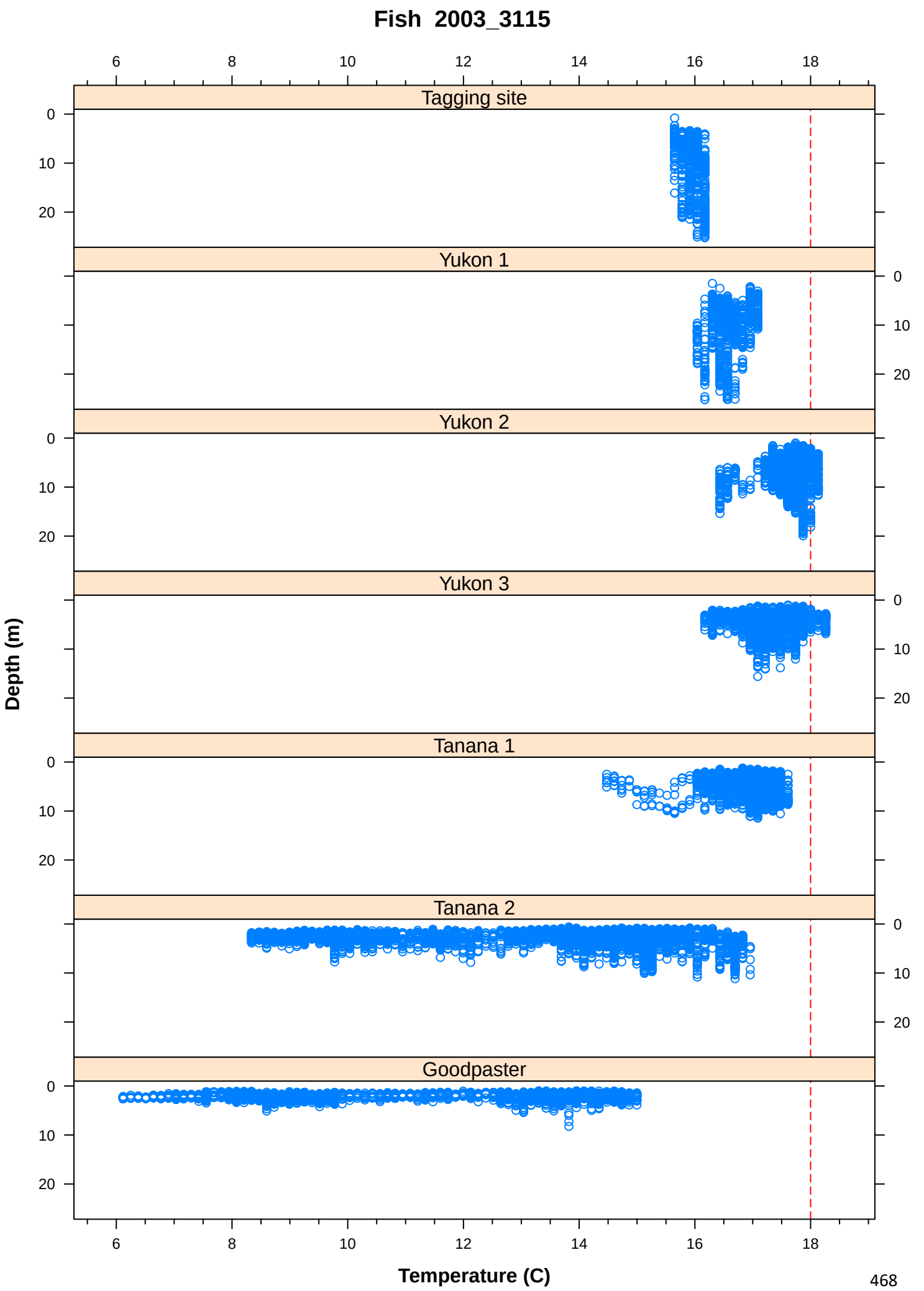

Fish 2003_3115
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Density
Depth (m)
0
5
10
15
20
25
30
0
1
2

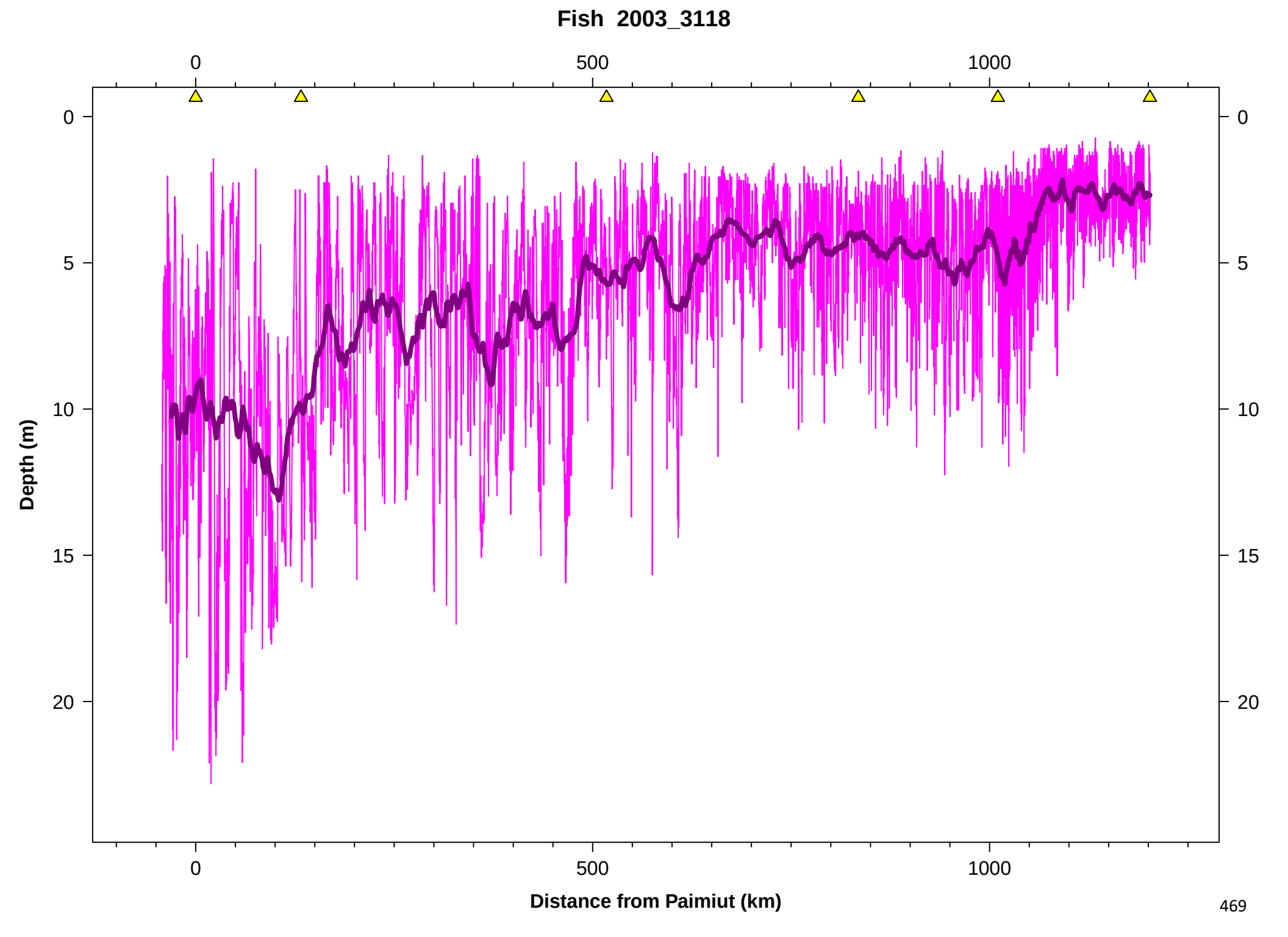

Fish 2003_3115
0
500
1000
18
16
14
12
10
8
Temperature (C)
0
500
1000
Distance from Paimiut

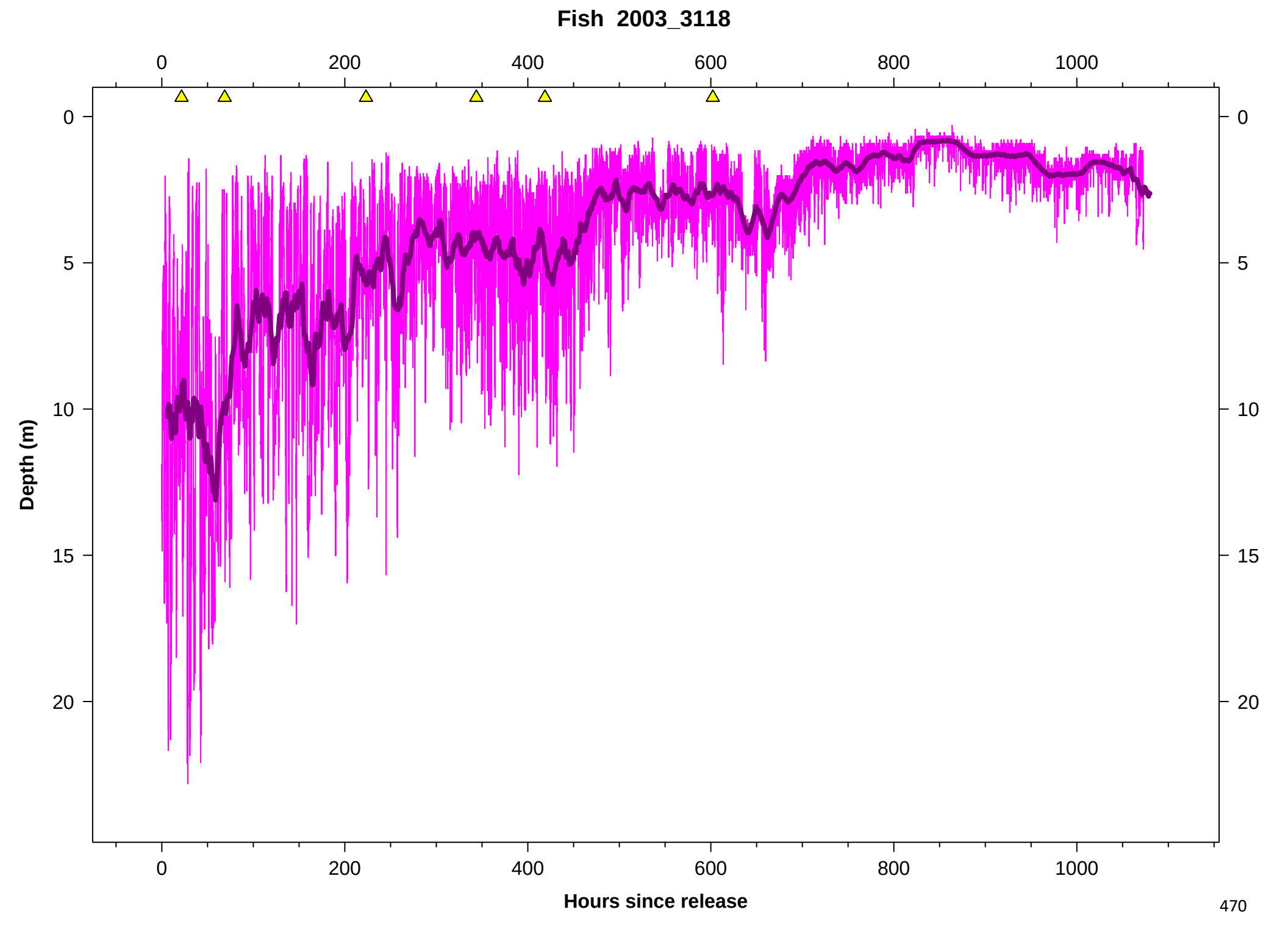

Fish 2003_3115
0
200
400
600
800
1000
15
10
Temperature (C)
Hours since release

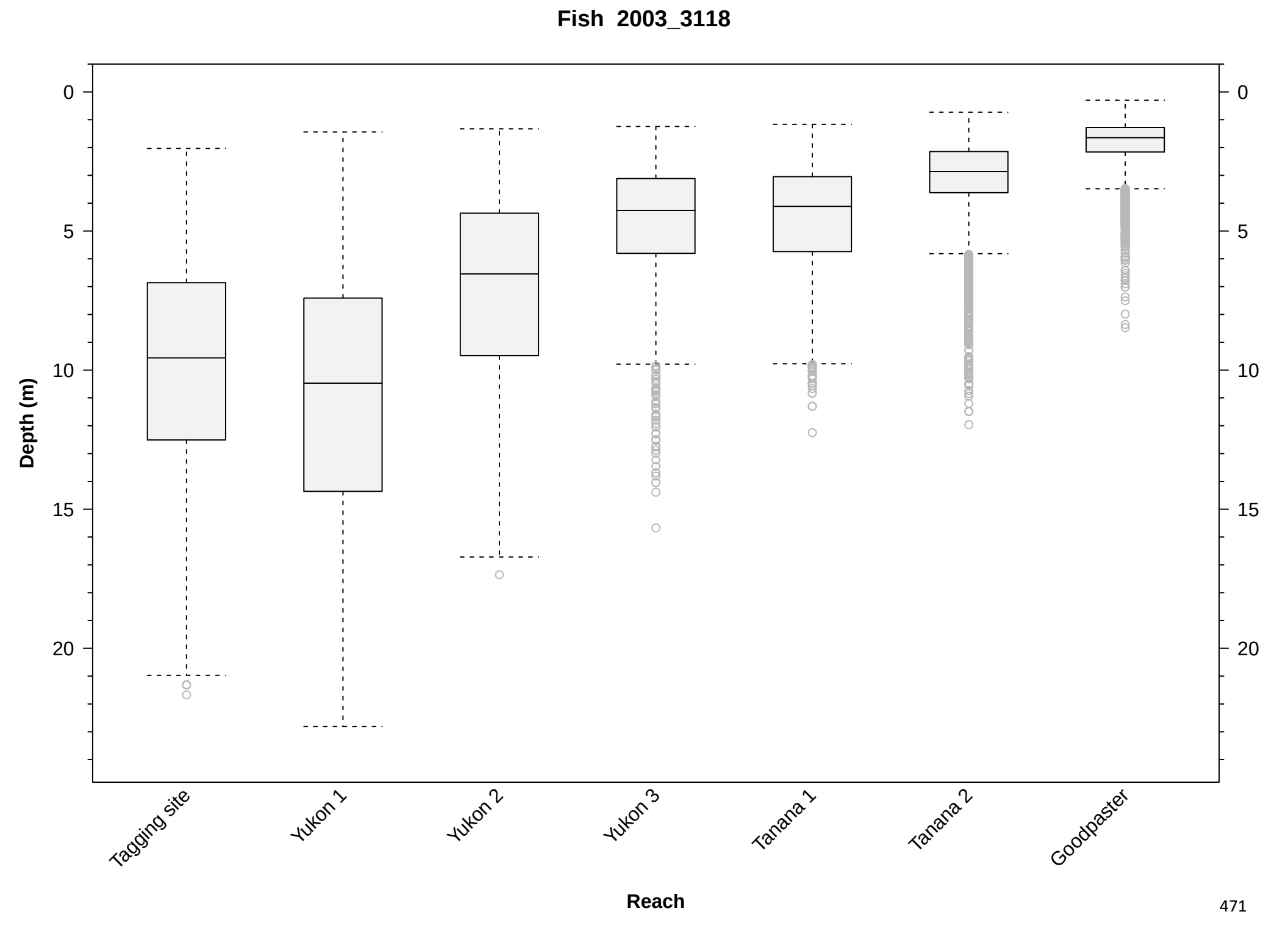

Fish 2003_3115
Temperature (C)
18
16
14
12
10
8
6
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Reach

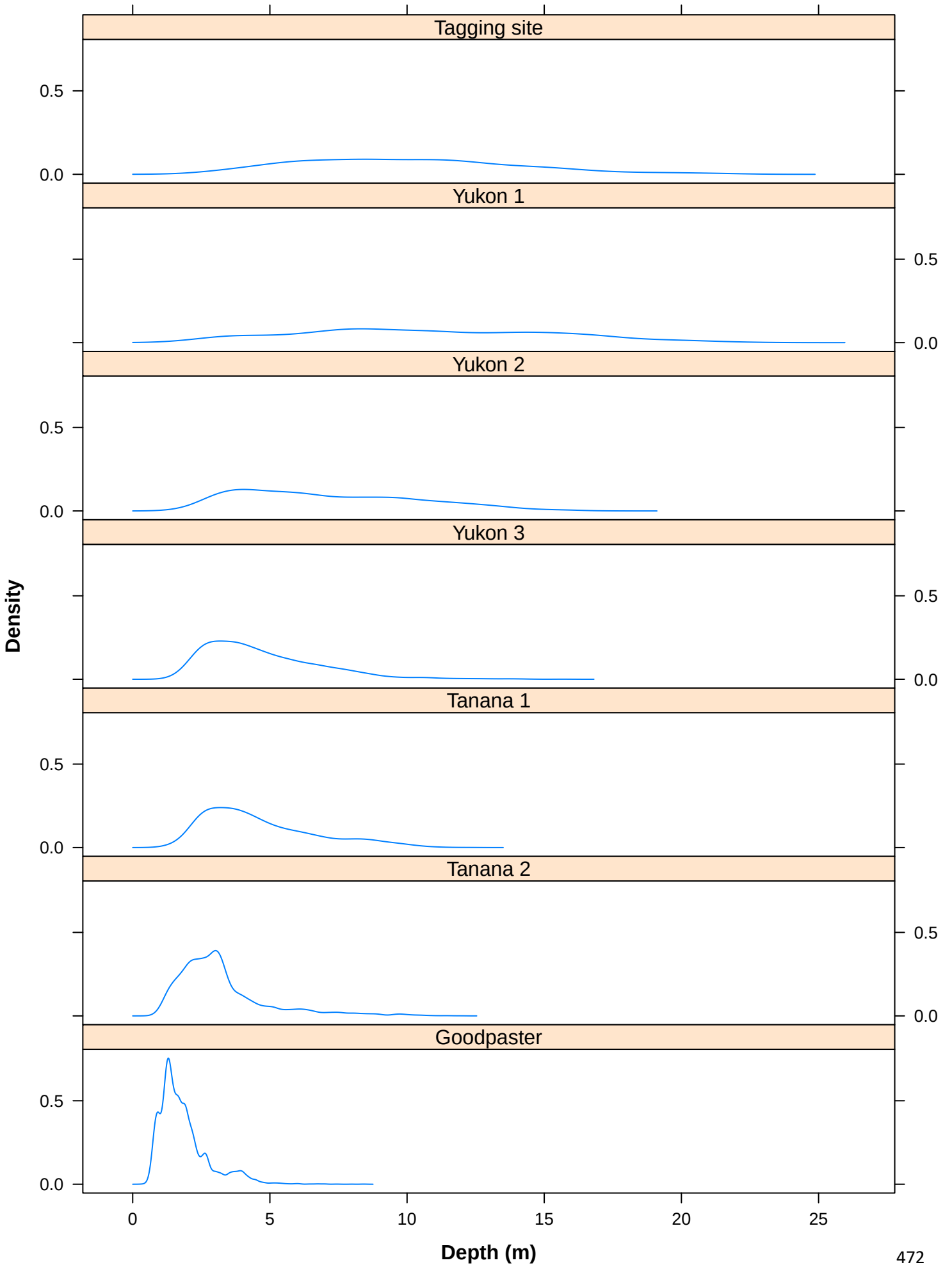

Fish 2003_3115
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Density
Temperature (C)
4
6
8
10
12
14
16
18
0
5

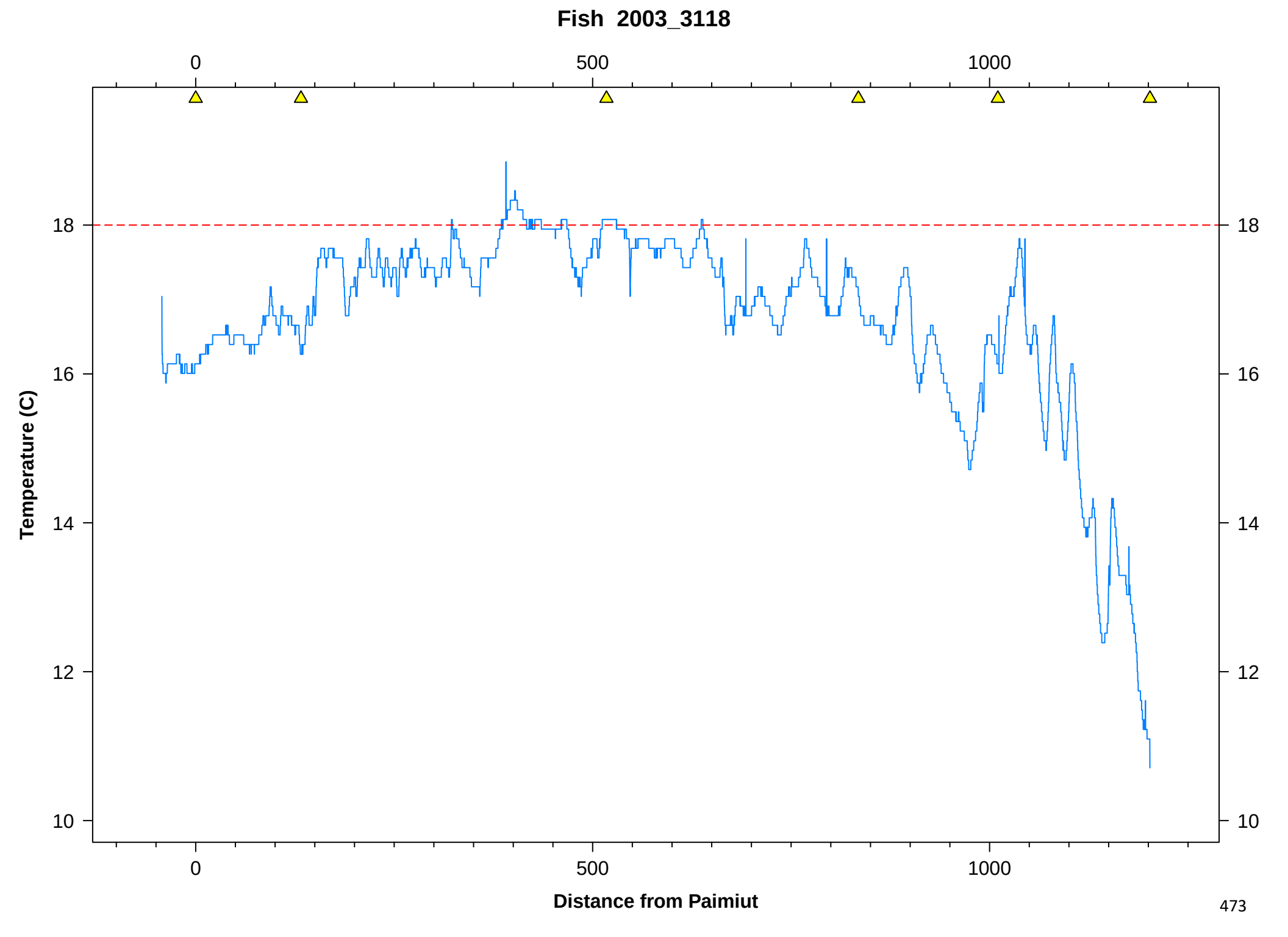

Fish 2003_3115
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Depth (m)
Temperature (C)
6
8
10
12
14
16
18
0
10
20

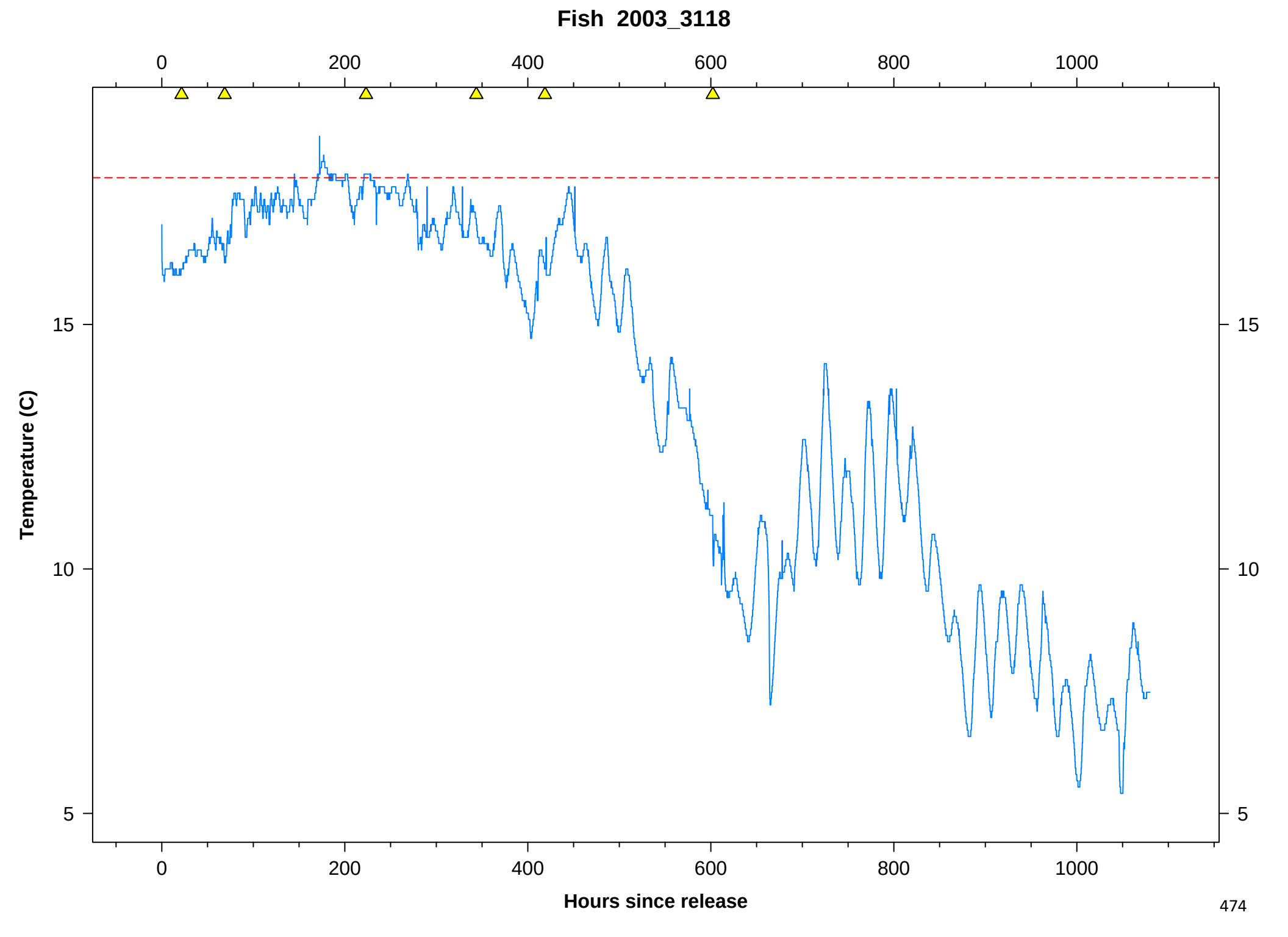

Fish 2003_3118
0
500
1000
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

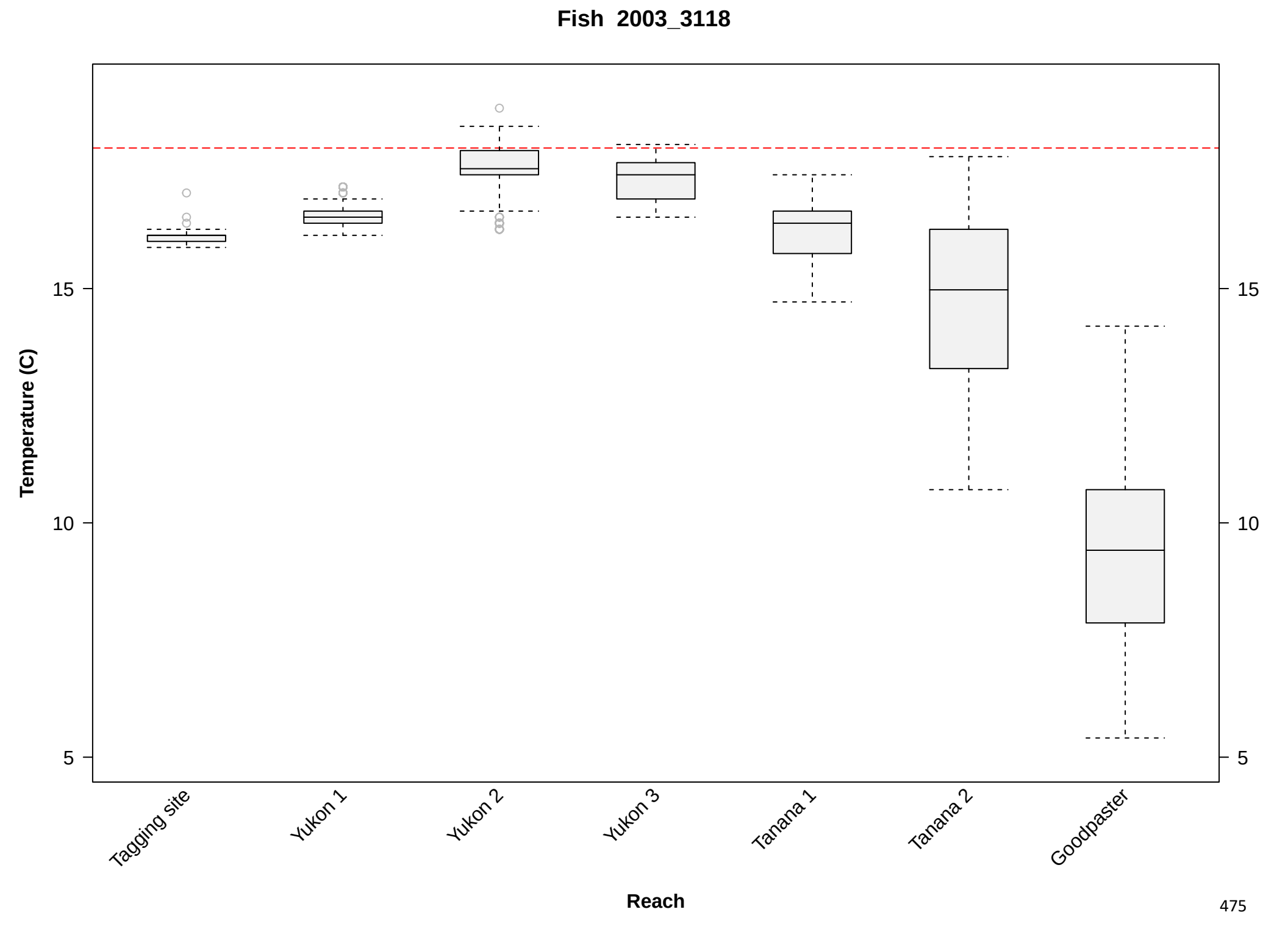

Fish 2003_3118
0
200
400
600
800
1000
0
5
10
15
20
Depth (m)
Hours since release

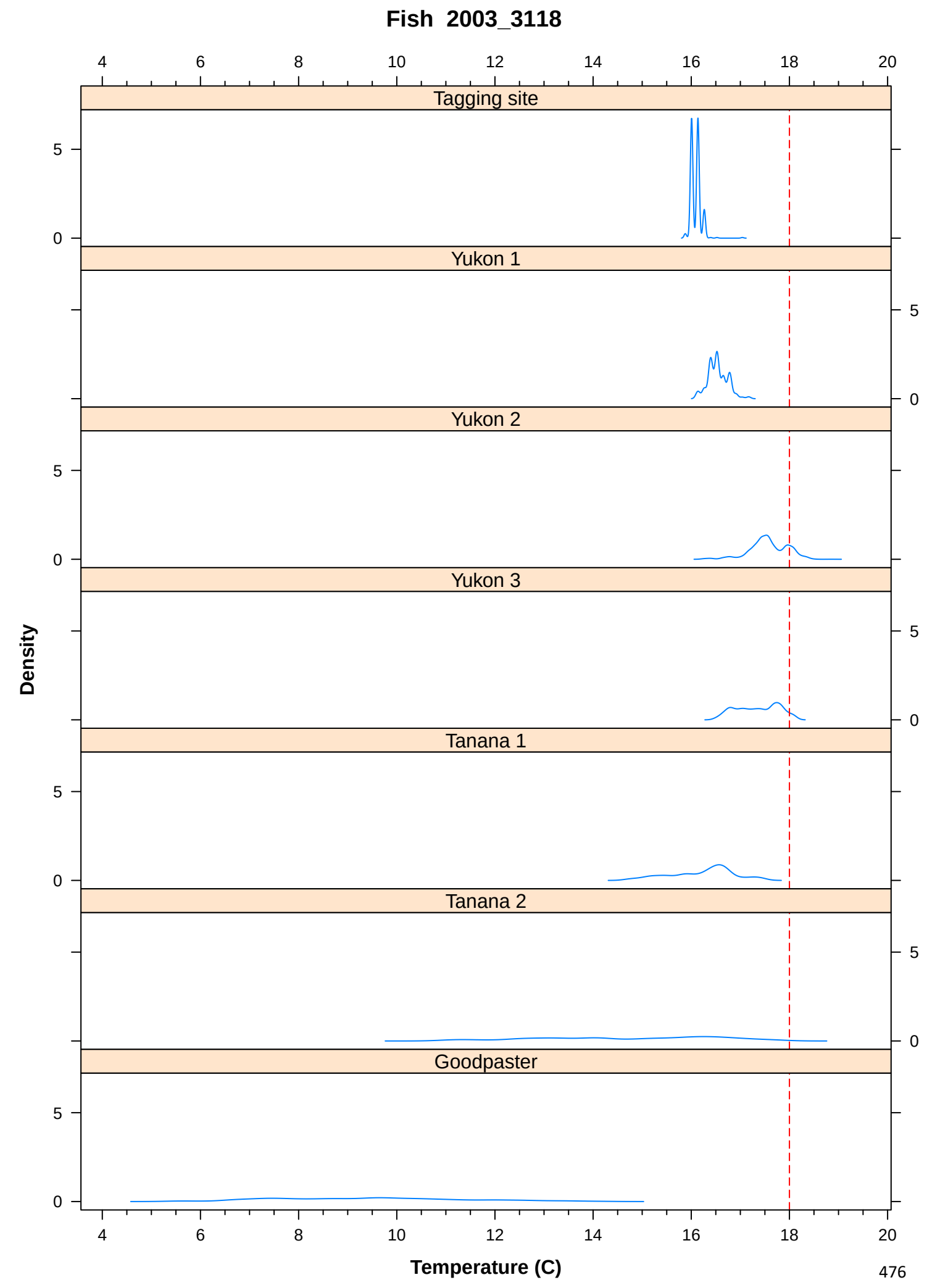

Fish 2003_3118
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Reach

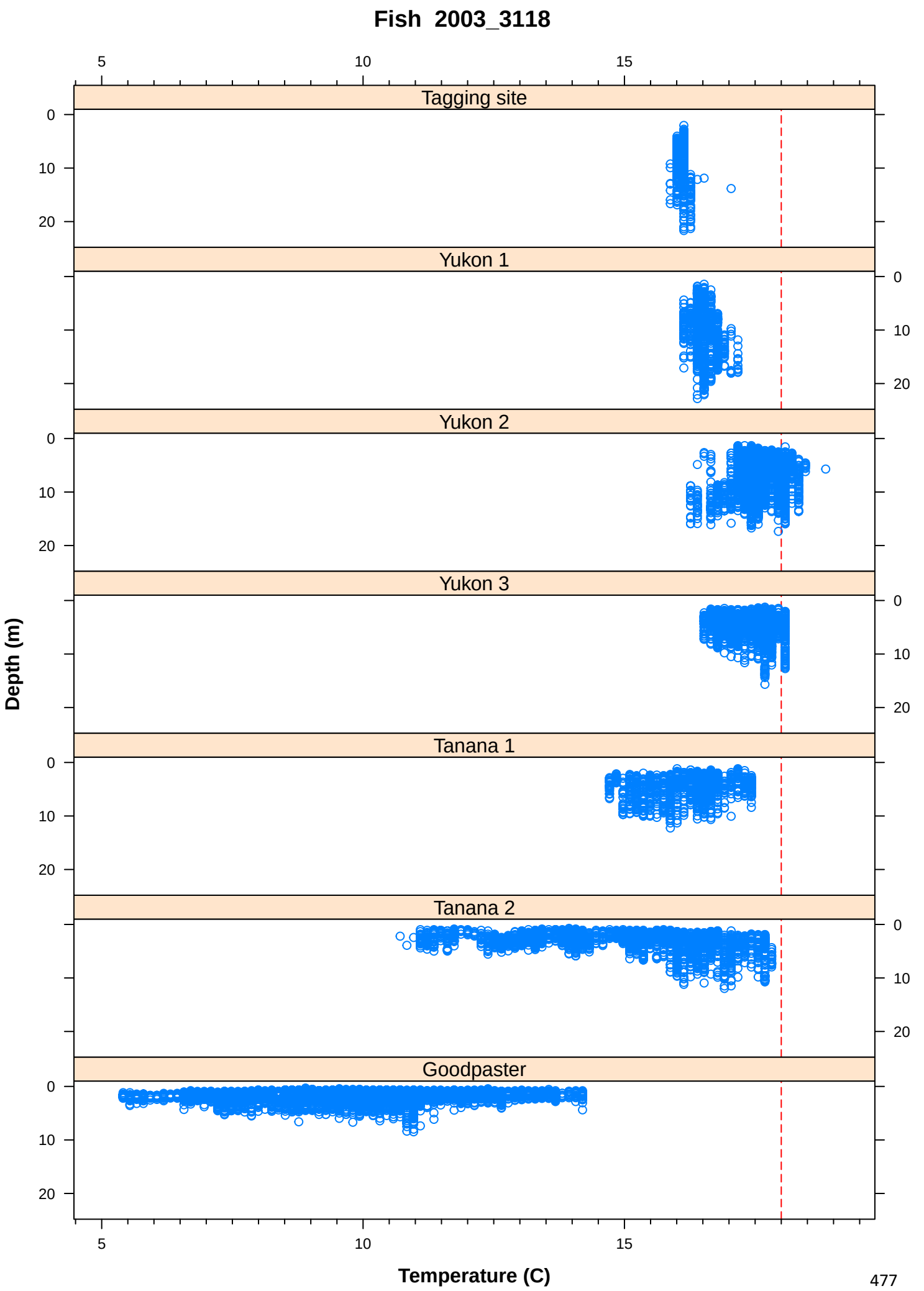

Fish 2003_3118
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Density
0.0
0.5
0
5
10
15
20
25
Depth (m)

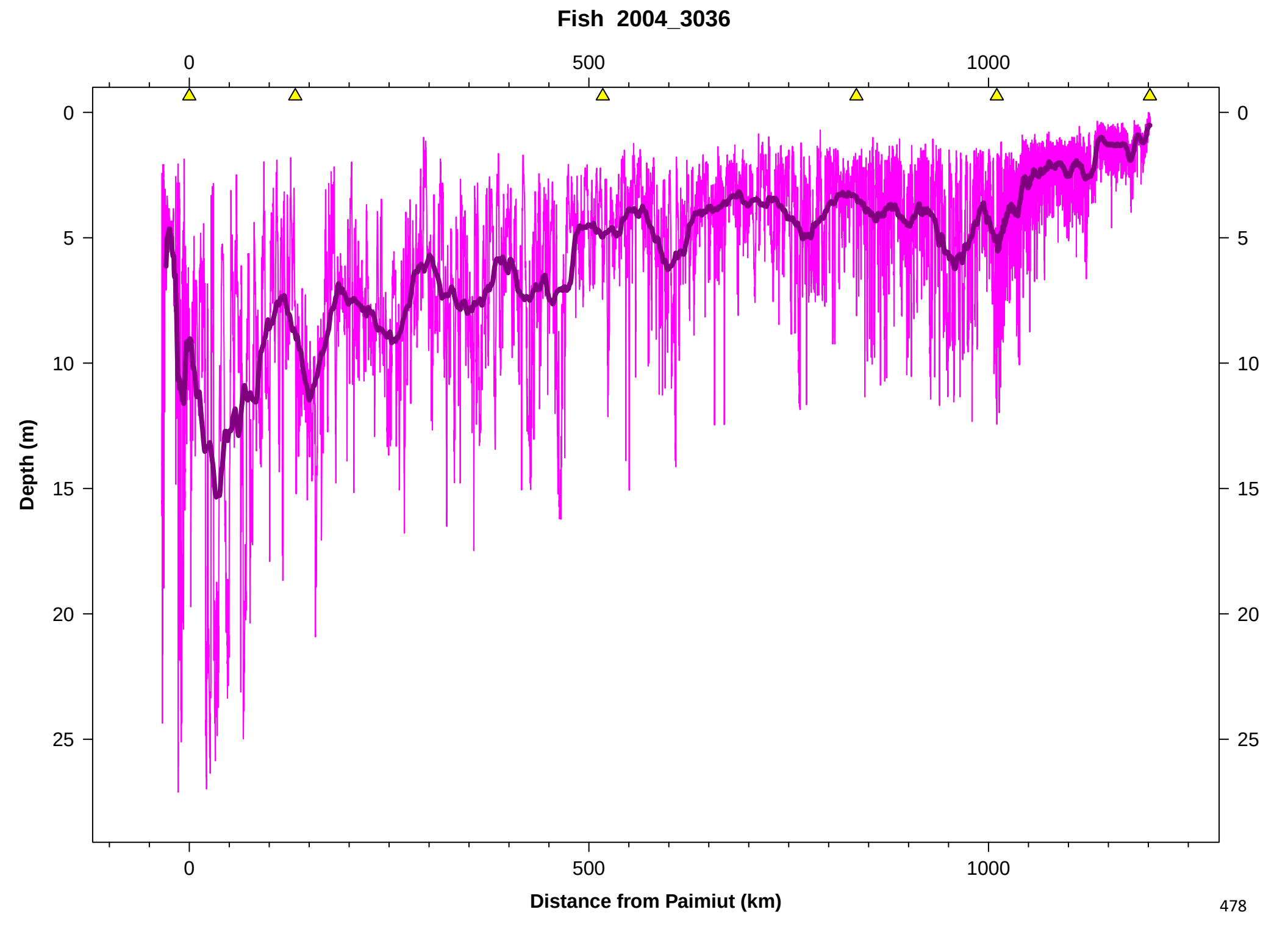

Fish 2003_3118
0
500
1000
18
16
14
12
10
Temperature (C)
Distance from Paimiut

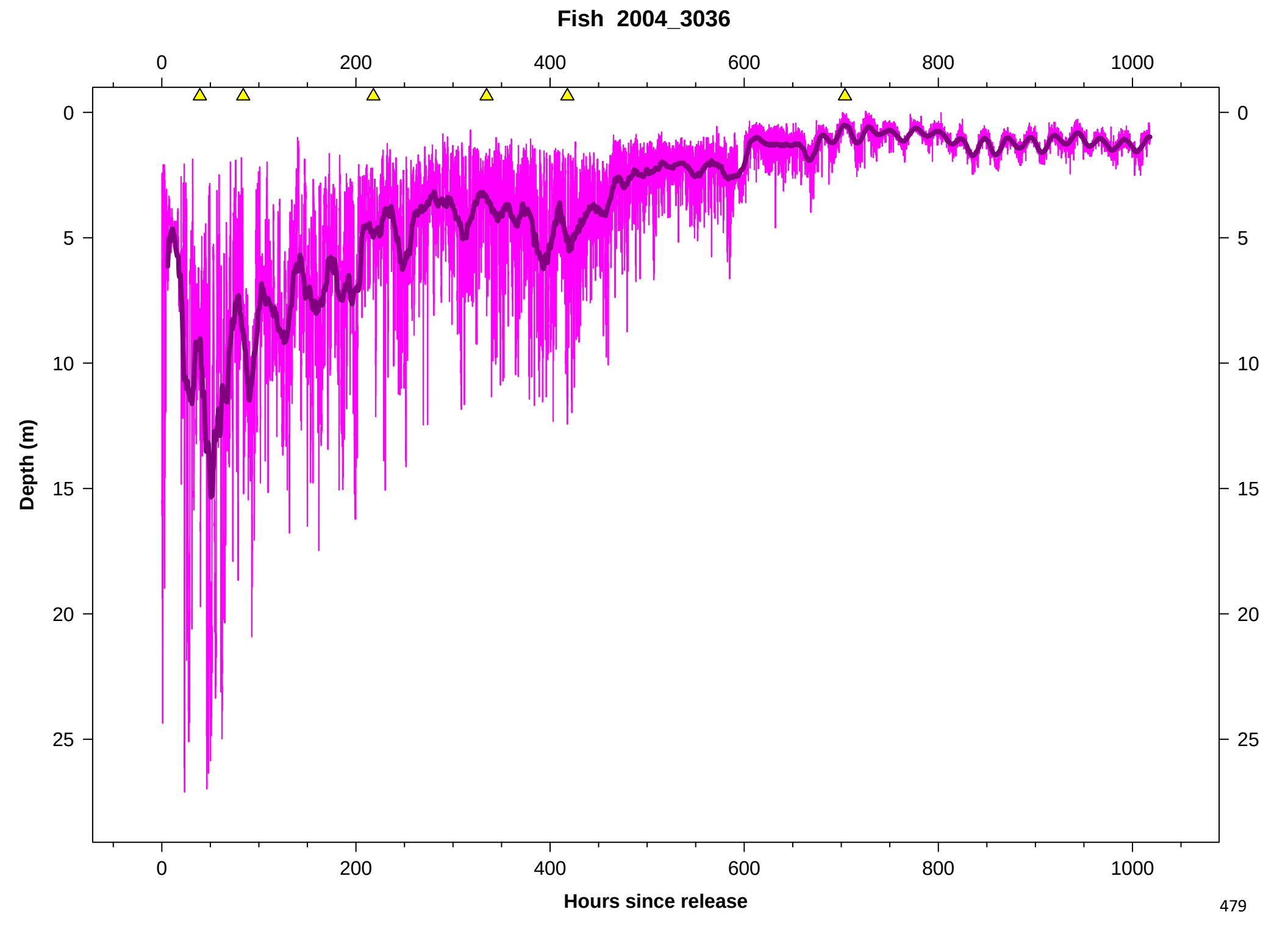

Fish 2003_3118
0
200
400
600
800
1000
15
10
5
Temperature (C)
Hours since release

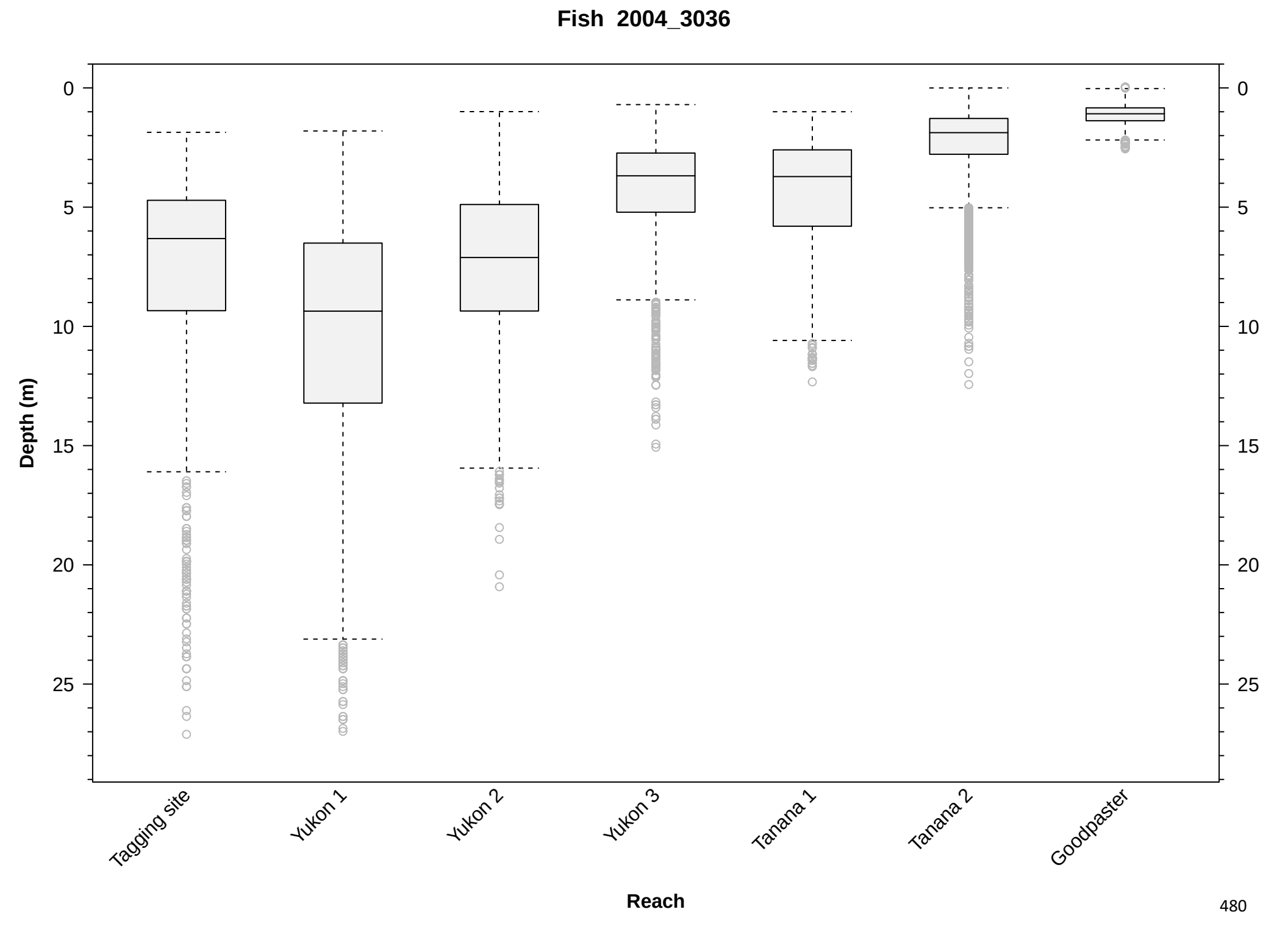

Fish 2003_3118
Temperature (C)
15
10
5
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Reach

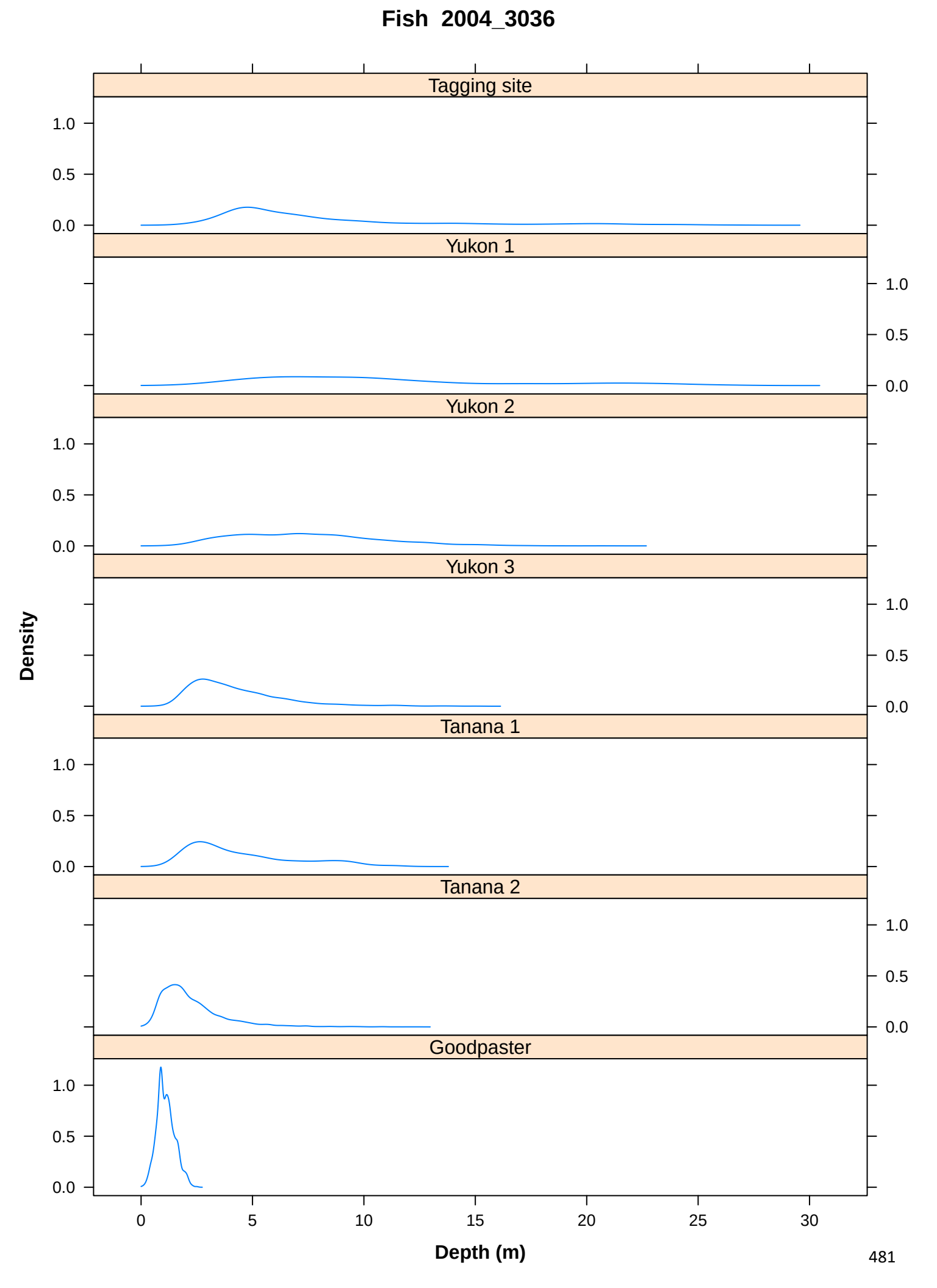

Fish 2003_3118
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Density
Temperature (C)
4
6
8
10
12
14
16
18
20
0
5

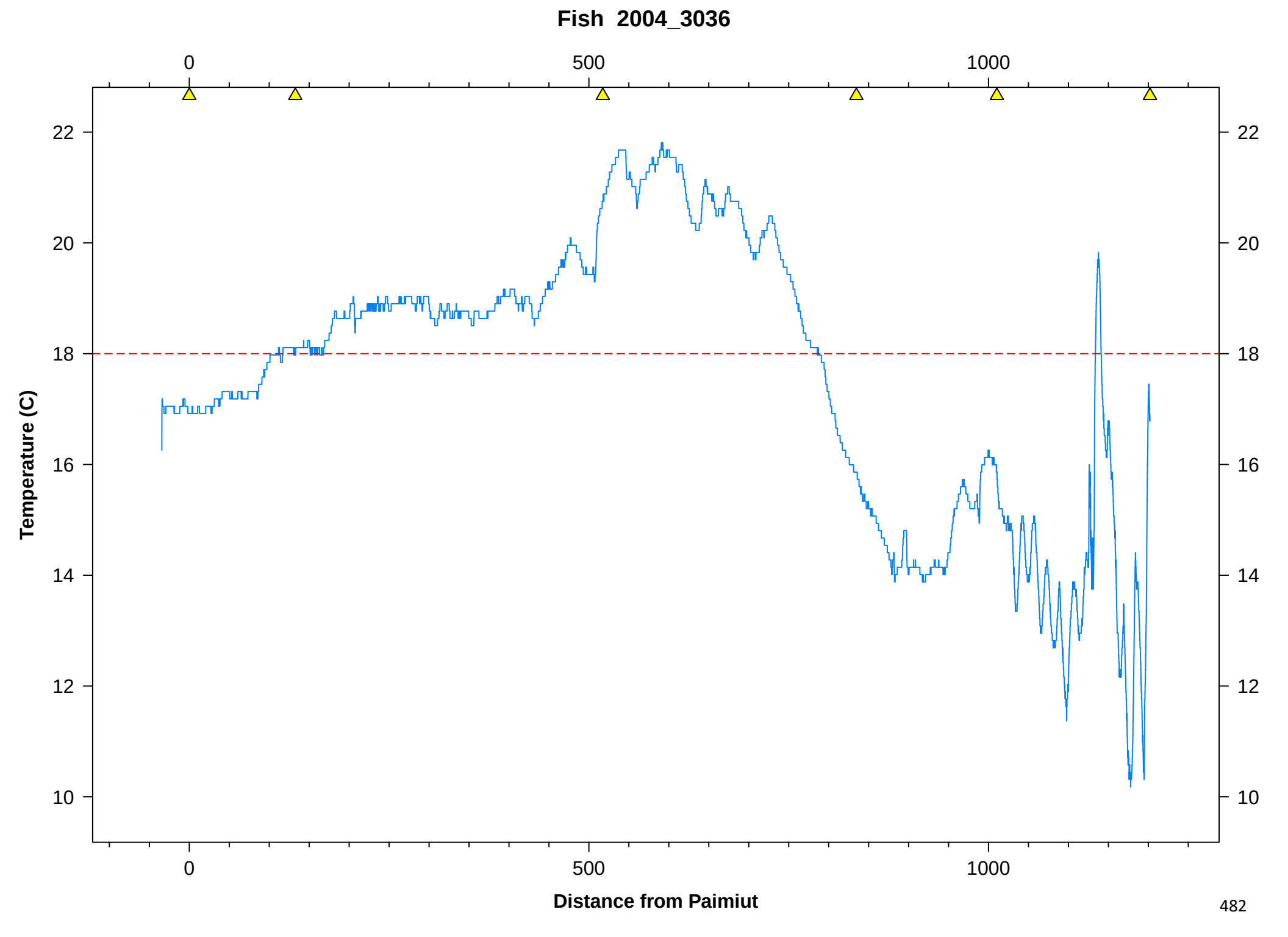

Fish 2003_3118
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Depth (m)
Temperature (C)
5
10
15
0
10
20

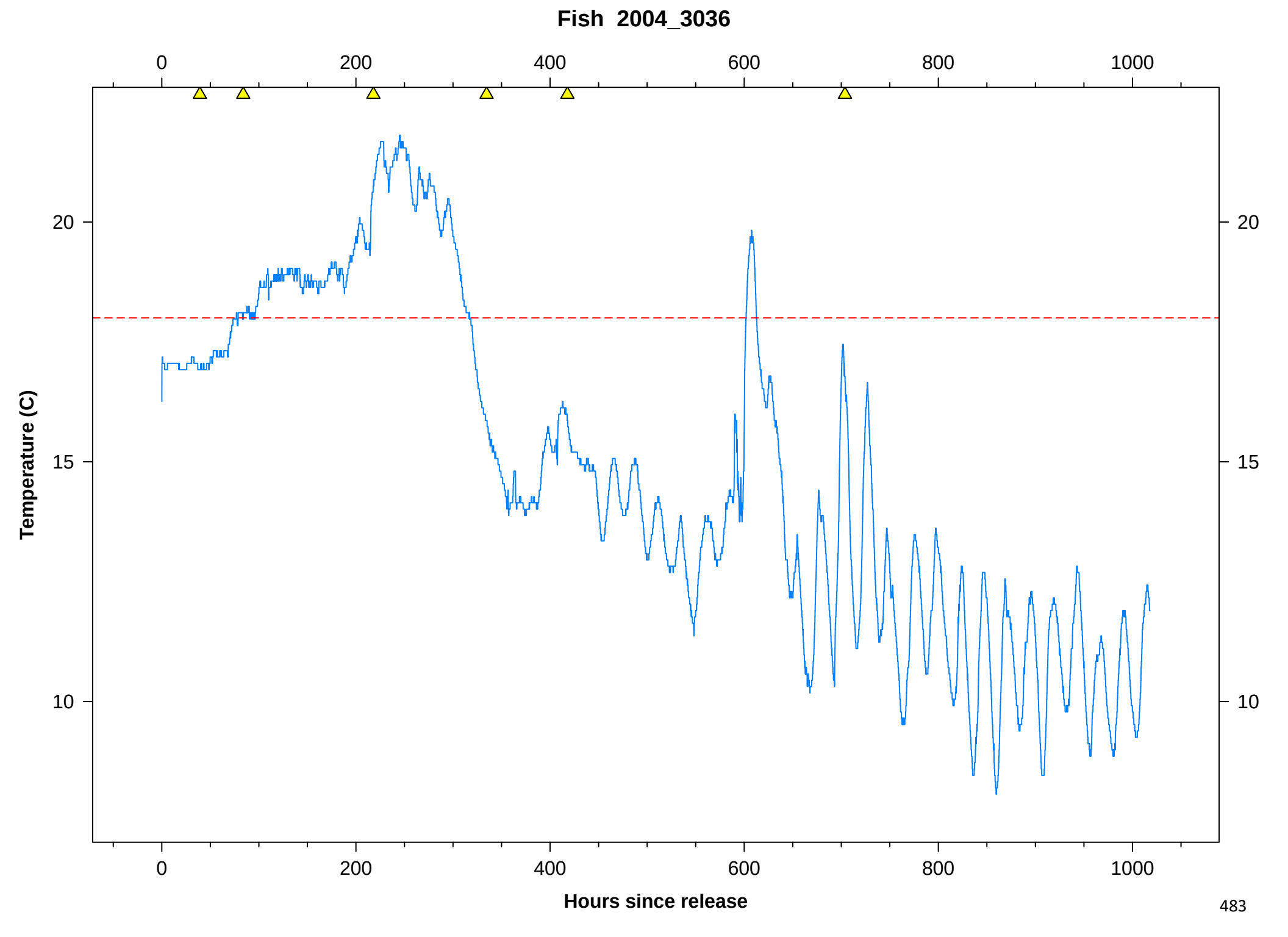

Fish 2004_3036
0
500
1000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

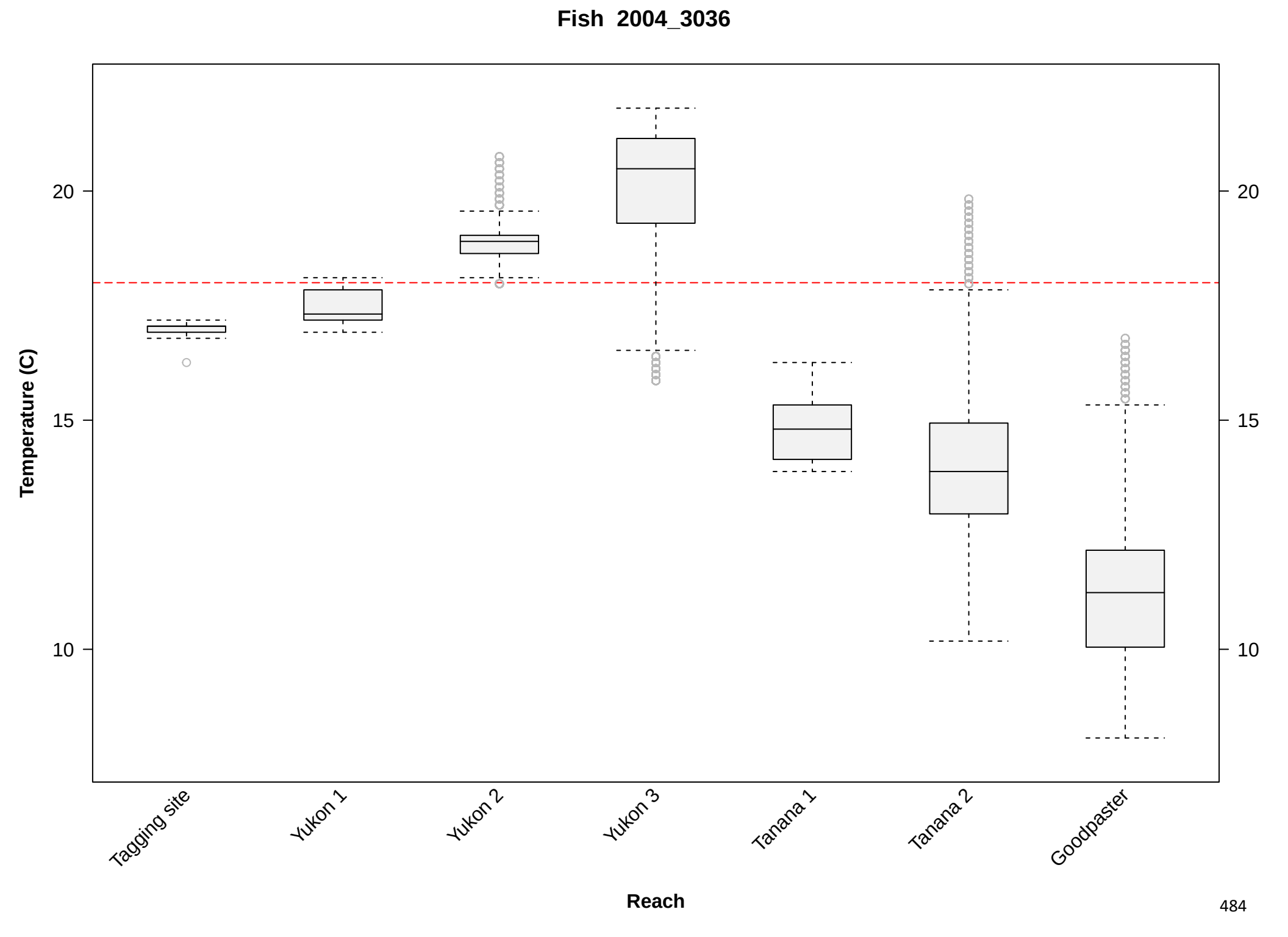

Fish 2004_3036
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release

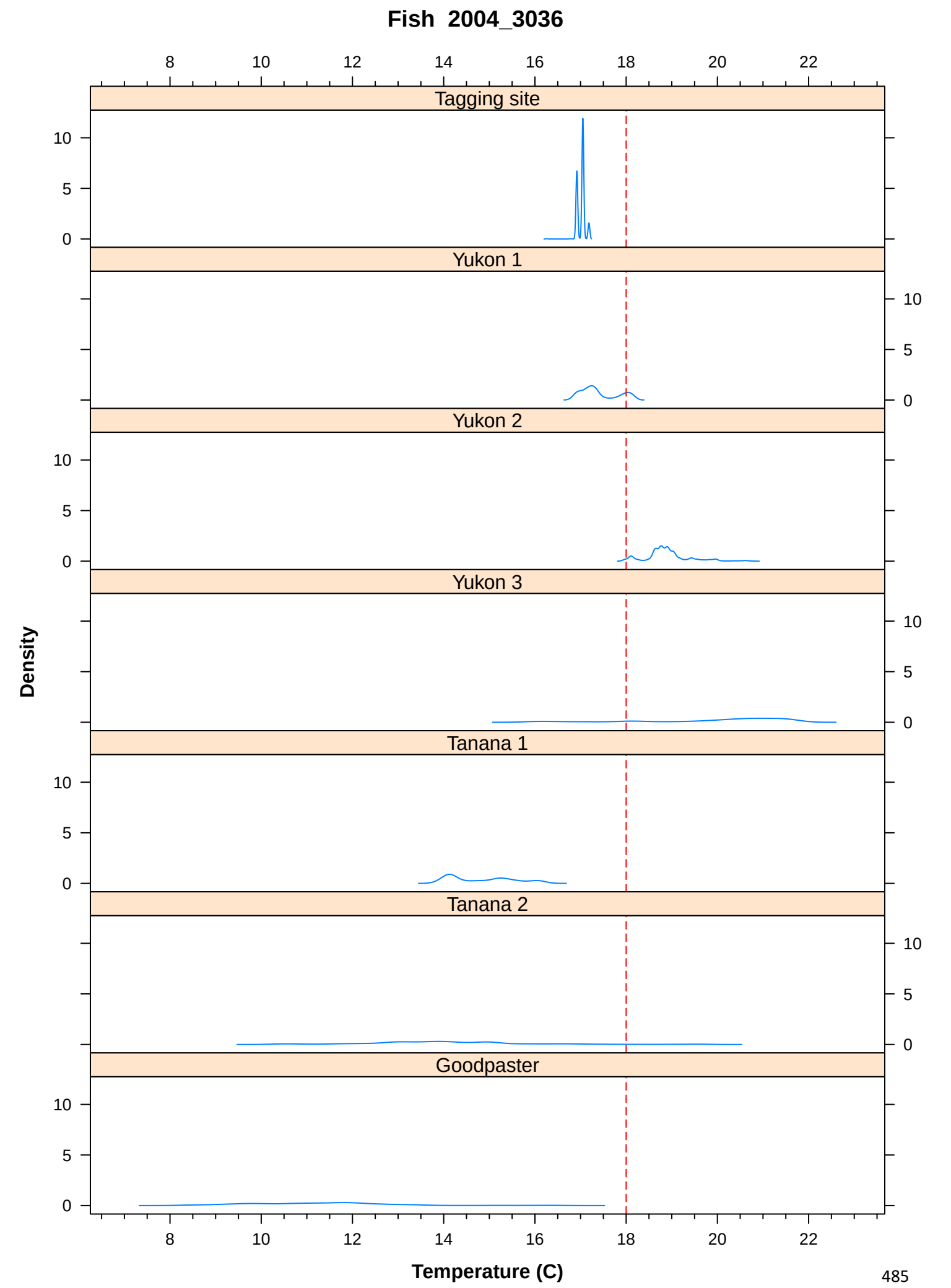

Fish 2004_3036
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Reach
480

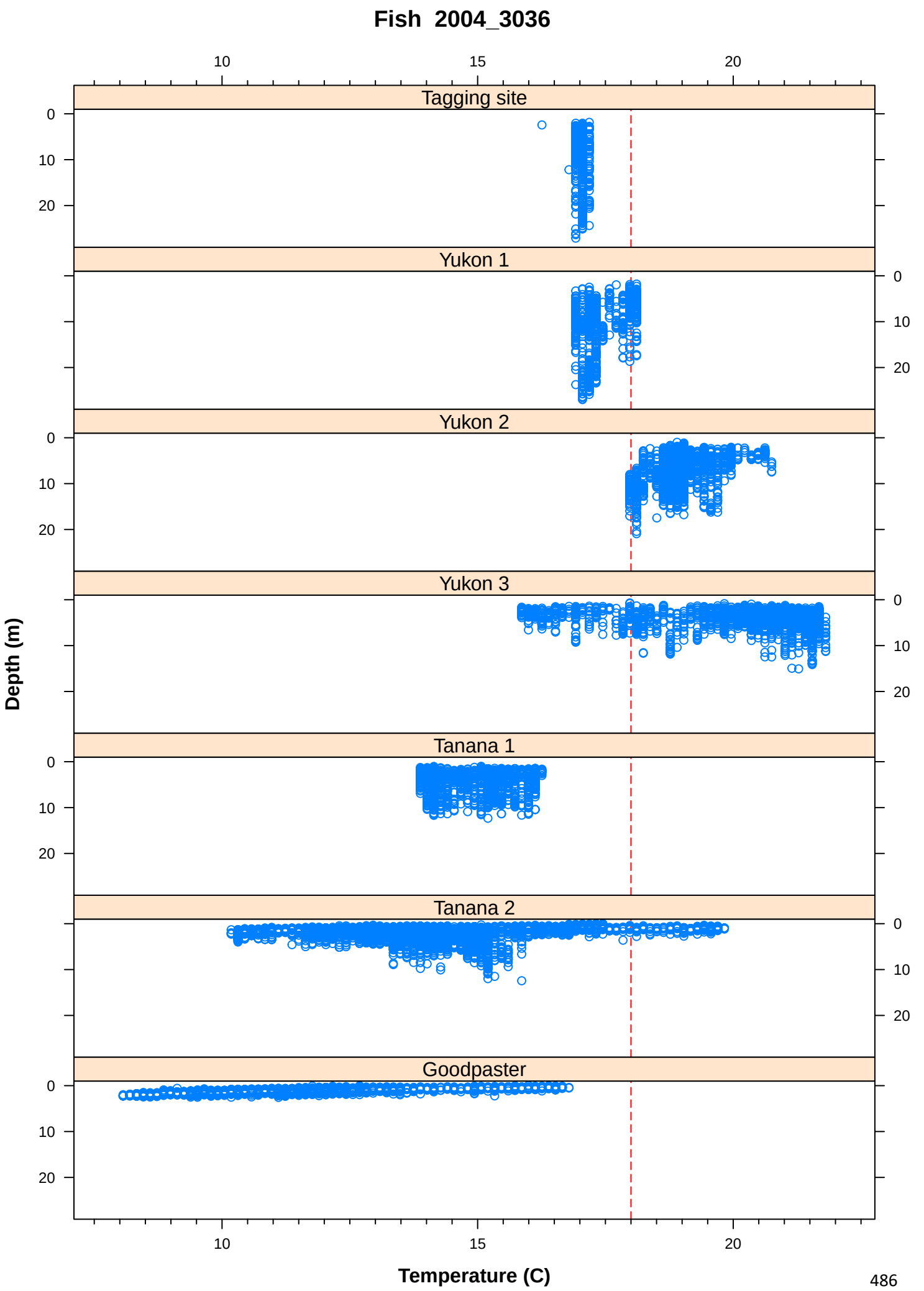

Fish 2004_3036
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Density
Depth (m)
0.0
0.5
1.0
0
5
10
15
20
25
30
481


Fish 2004_3036
0
500
1000
22
20
18
16
14
12
10
Temperature (C)
Distance from Paimiut

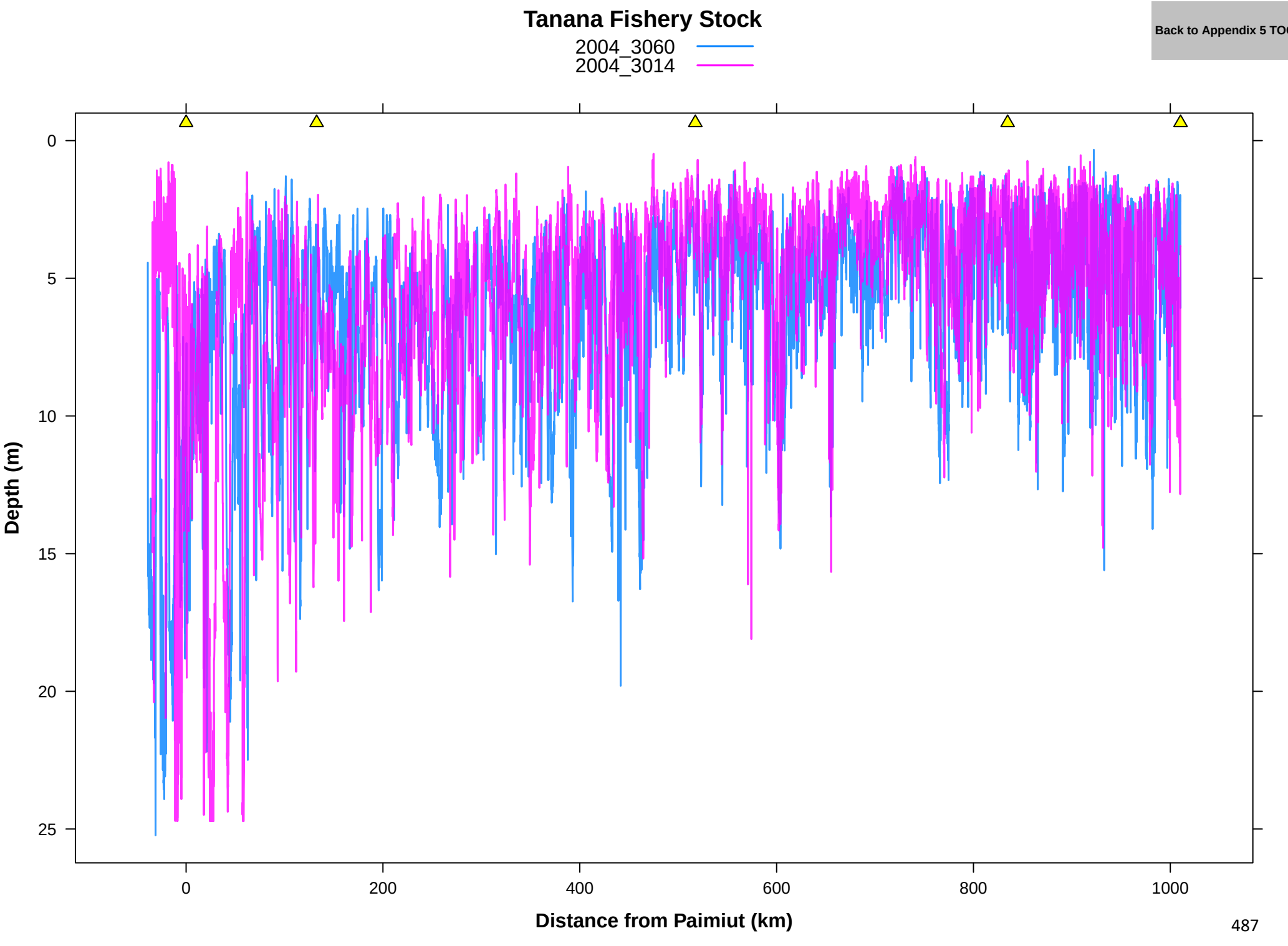

Fish 2004_3036
0
200
400
600
800
1000
20
15
10
Temperature (C)
Hours since release

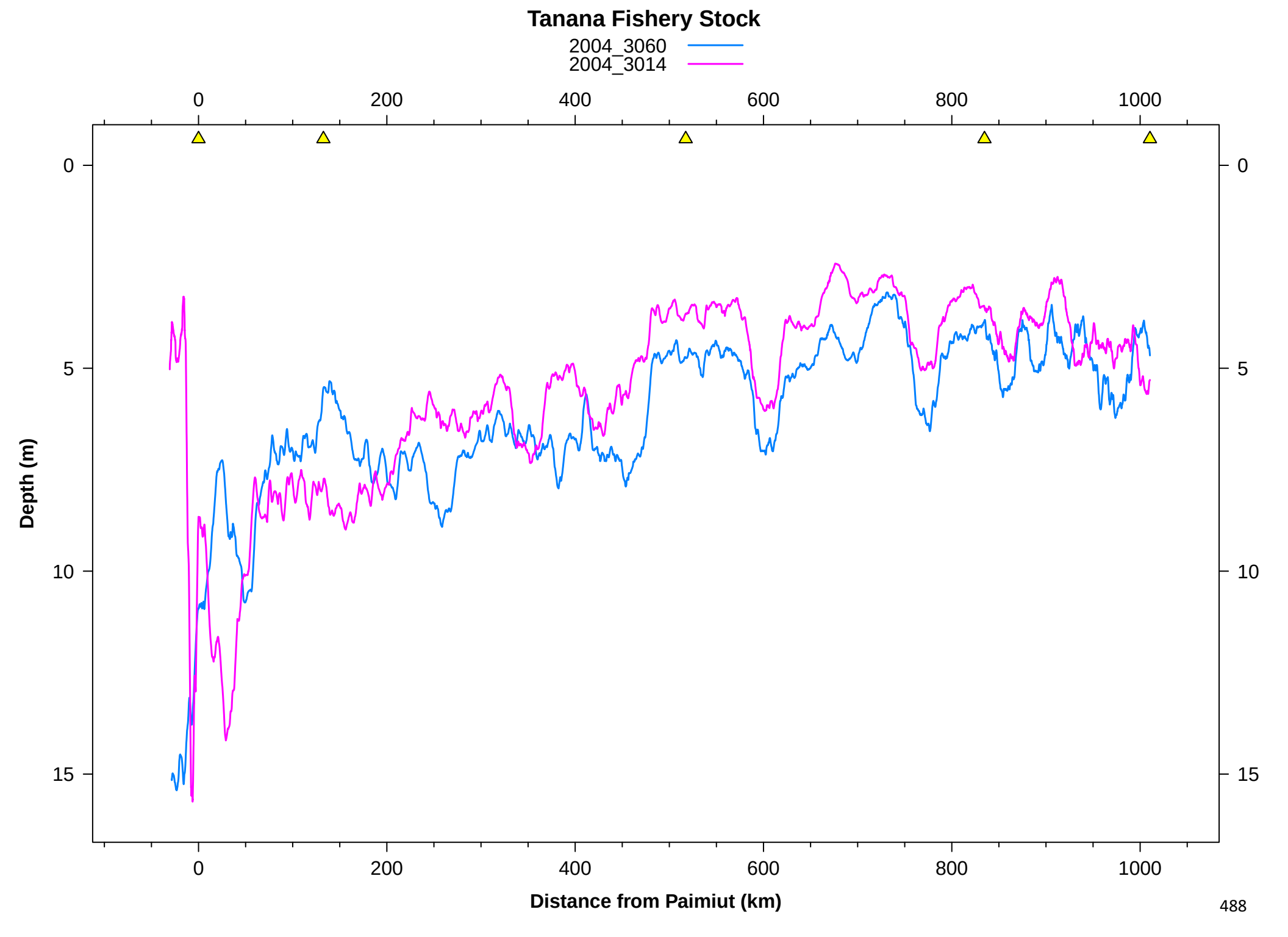

Fish 2004_3036
Temperature (C)
20
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Reach
484

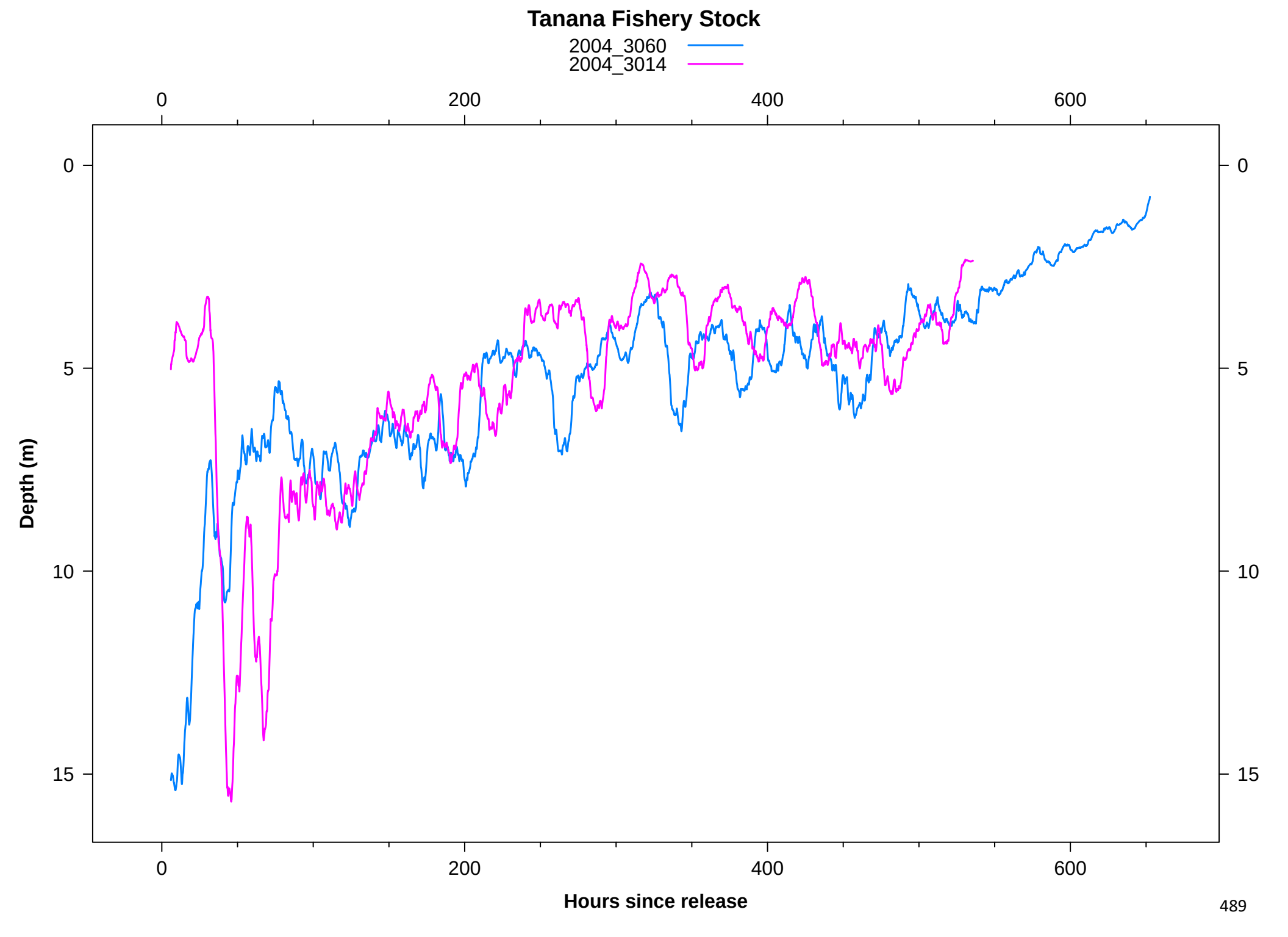

Fish 2004_3036
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Density
Temperature (C)
8
10
12
14
16
18
20
22
0
5
10

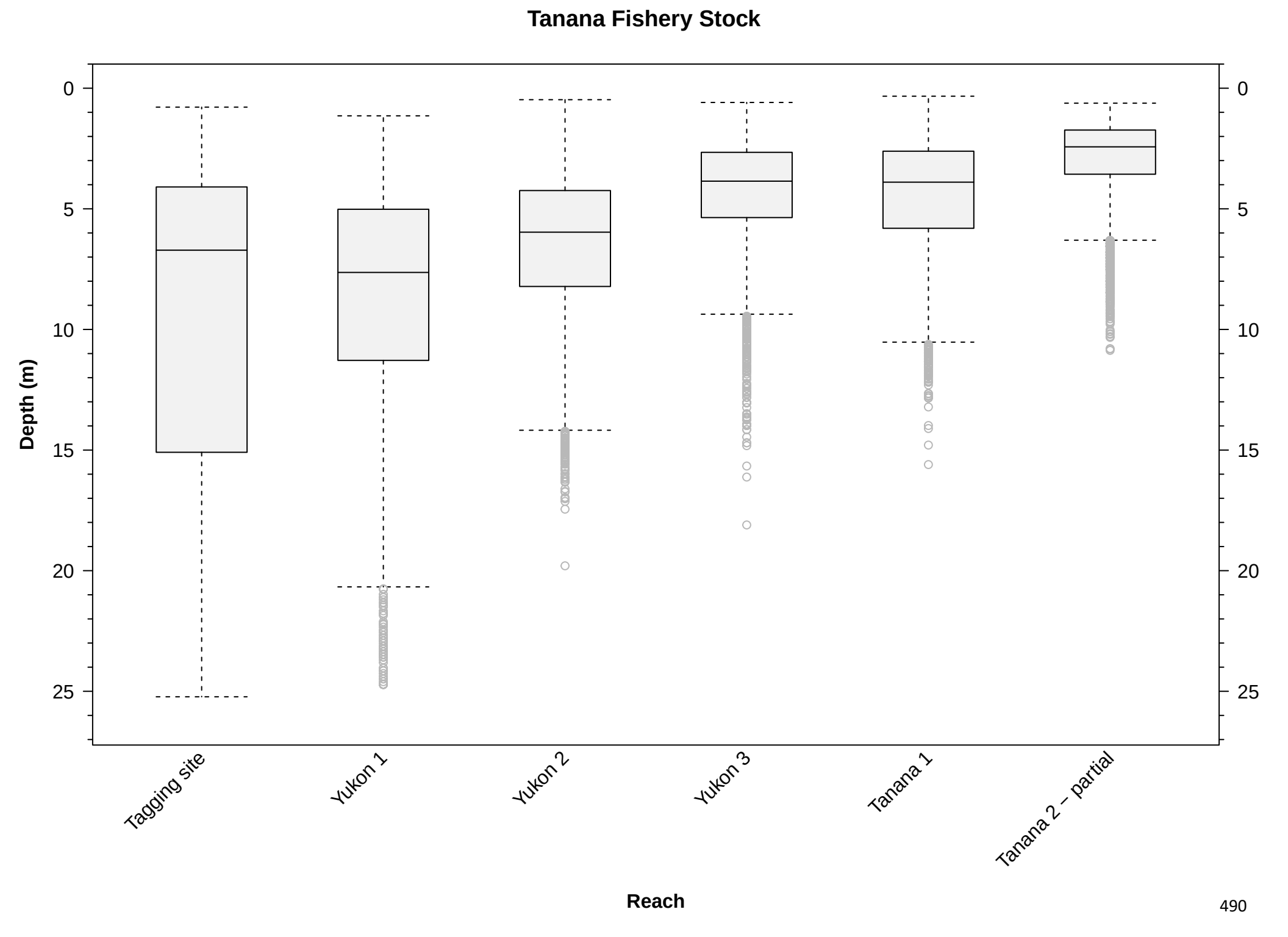

Fish 2004_3036
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2
Goodpaster
Depth (m)
Temperature (C)
10
15
20
0
10
20

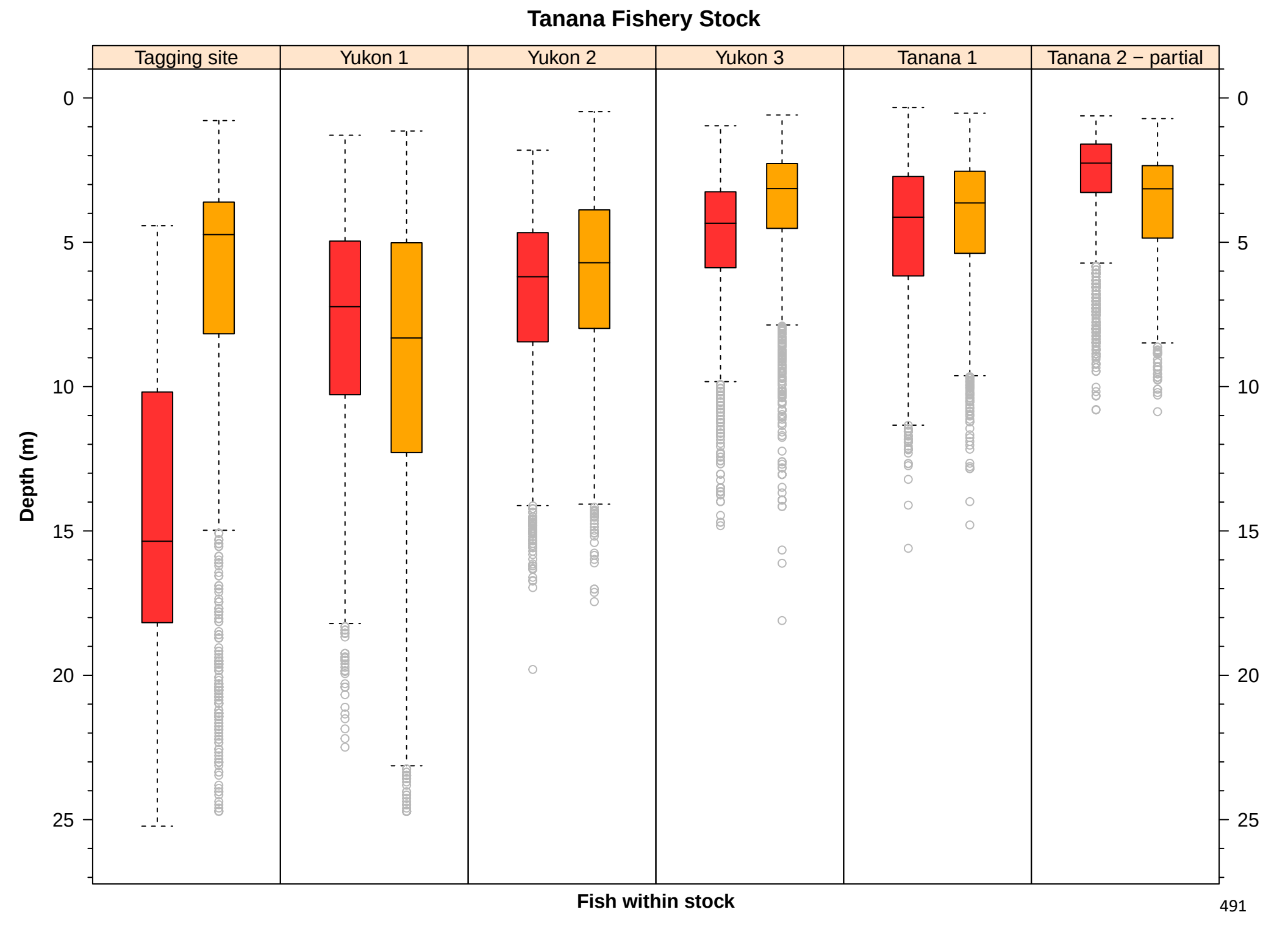
Back to Appendix 5 TOC

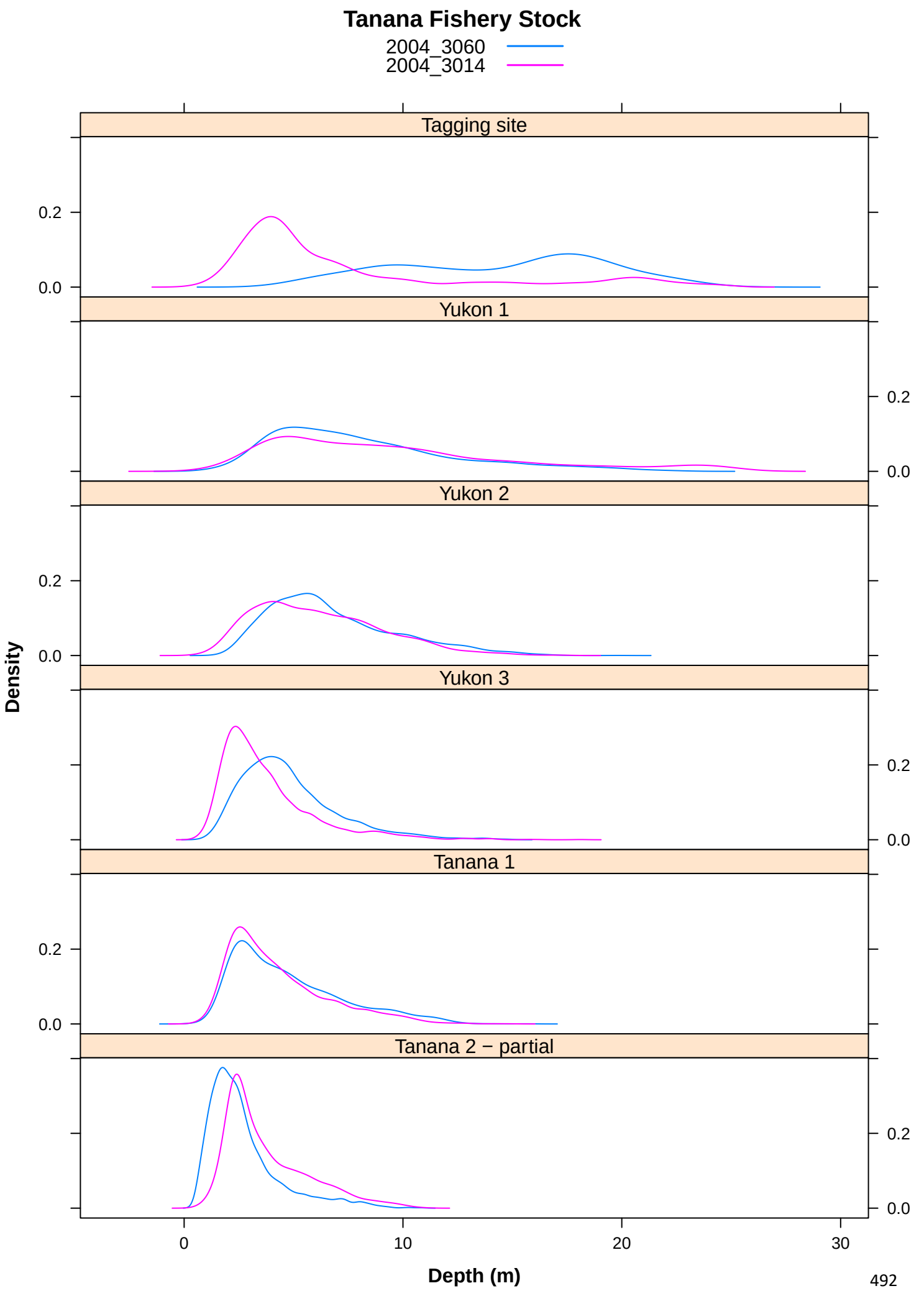


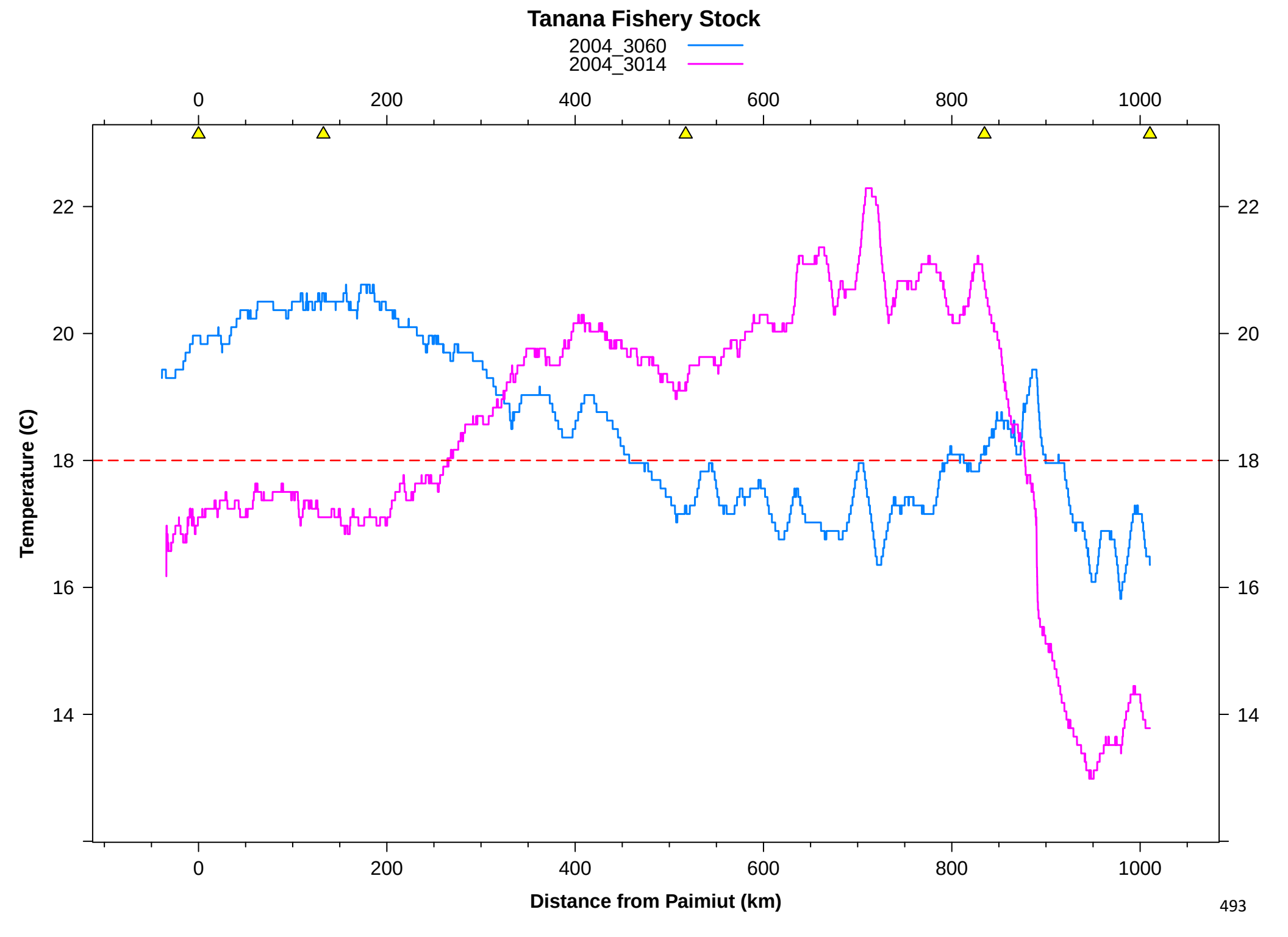

Tanana Fishery Stock
2004_3060
2004_3014
0
200
400
600
800
1000
0
5
10
15
Depth (m)
Distance from Paimiut (km)

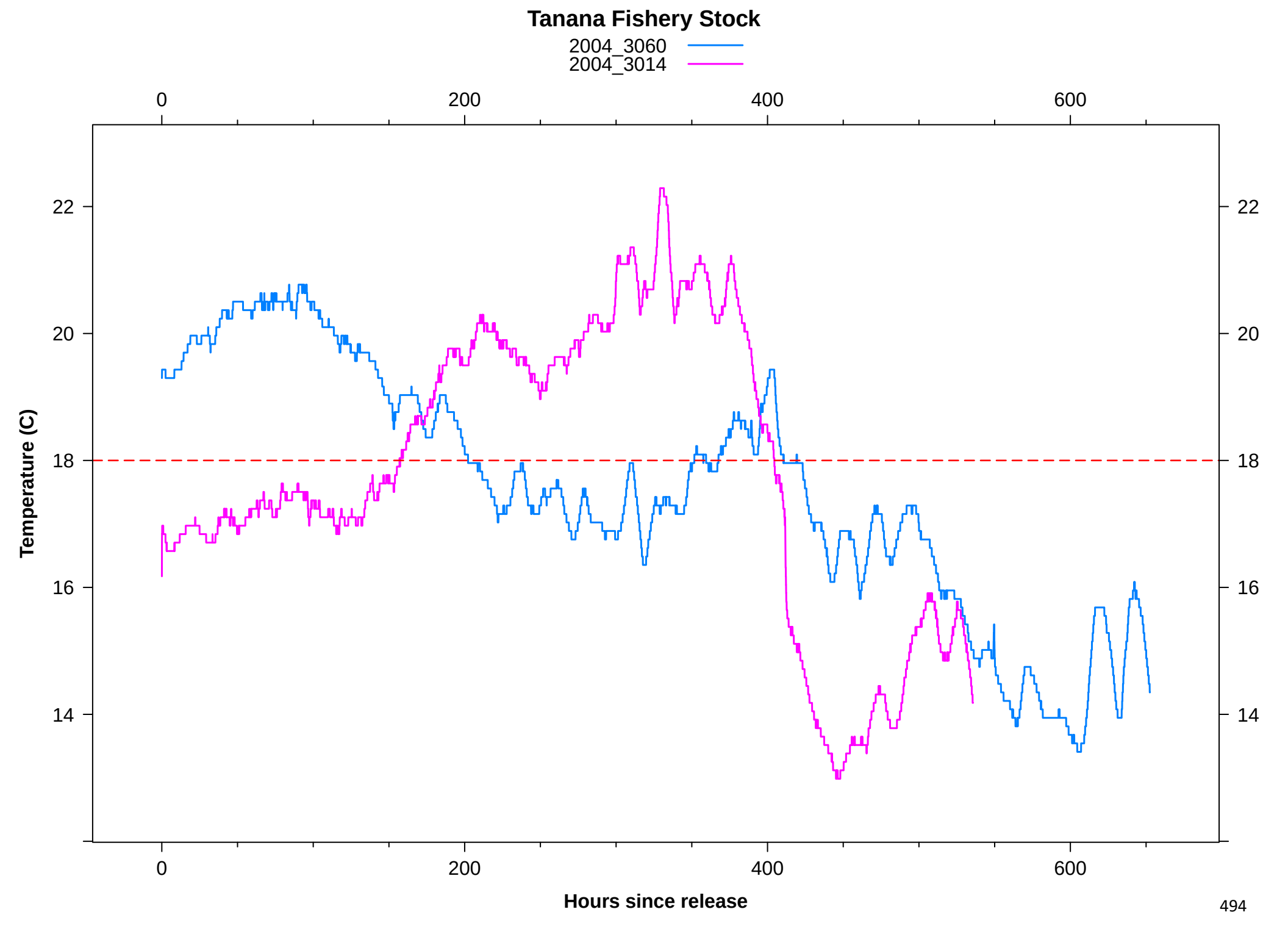

Tanana Fishery Stock
2004_3060
2004_3014
0
200
400
600
0
5
10
15
Depth (m)
Hours since release

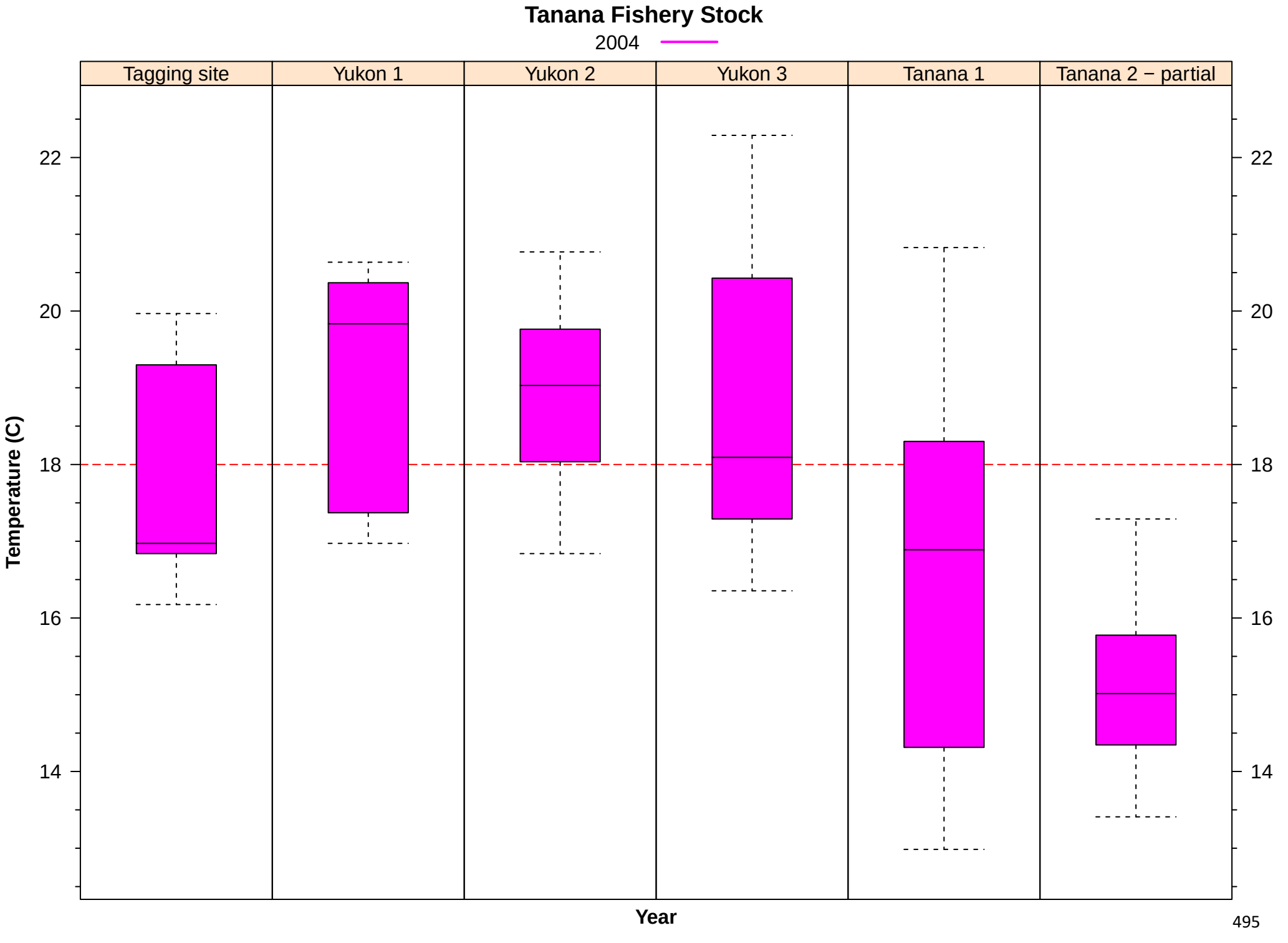

Tanana Fishery Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 – partial
Reach
490

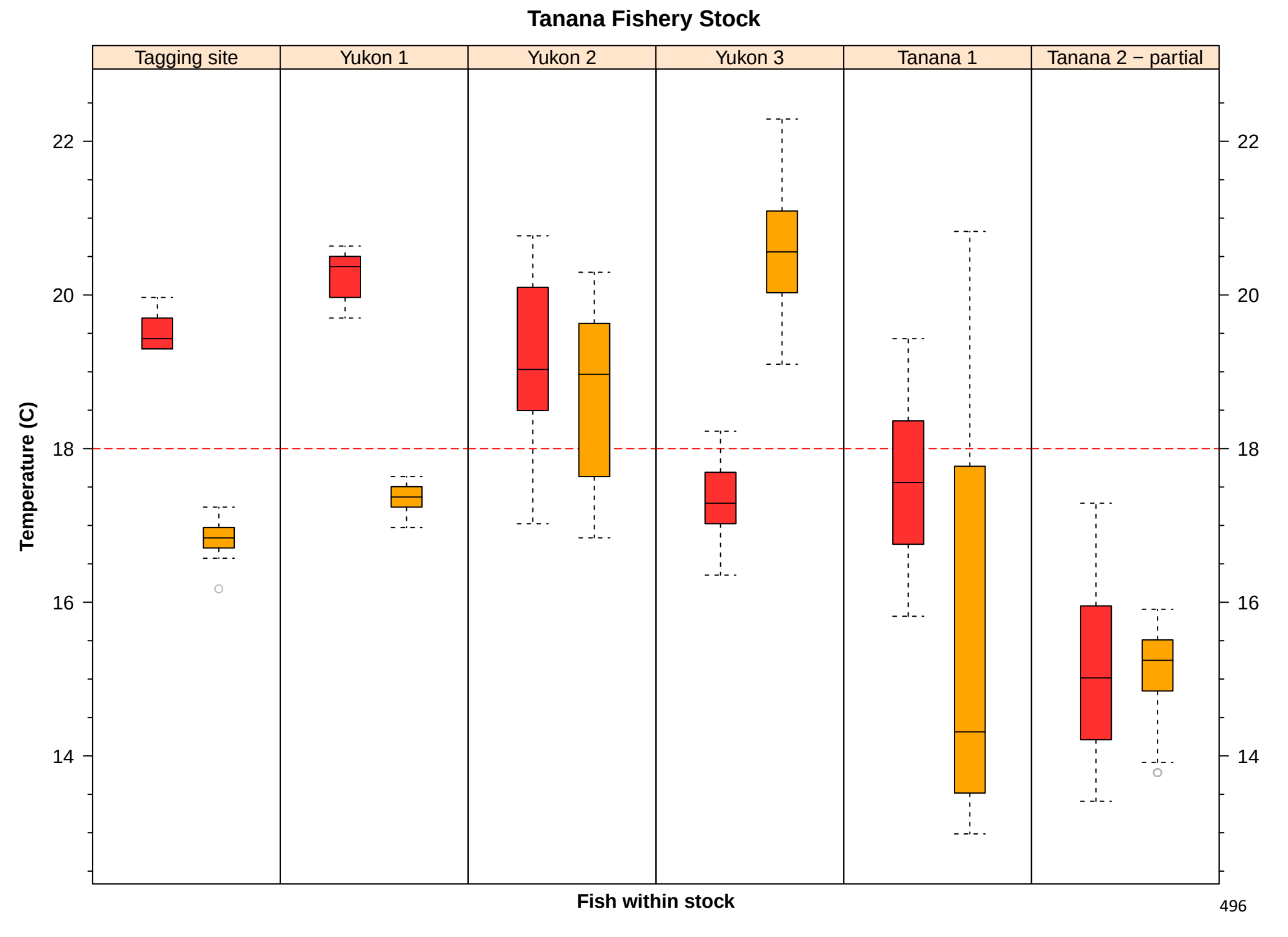

Tanana Fishery Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
Depth (m)
0
5
10
15
20
25
Fish within stock
491

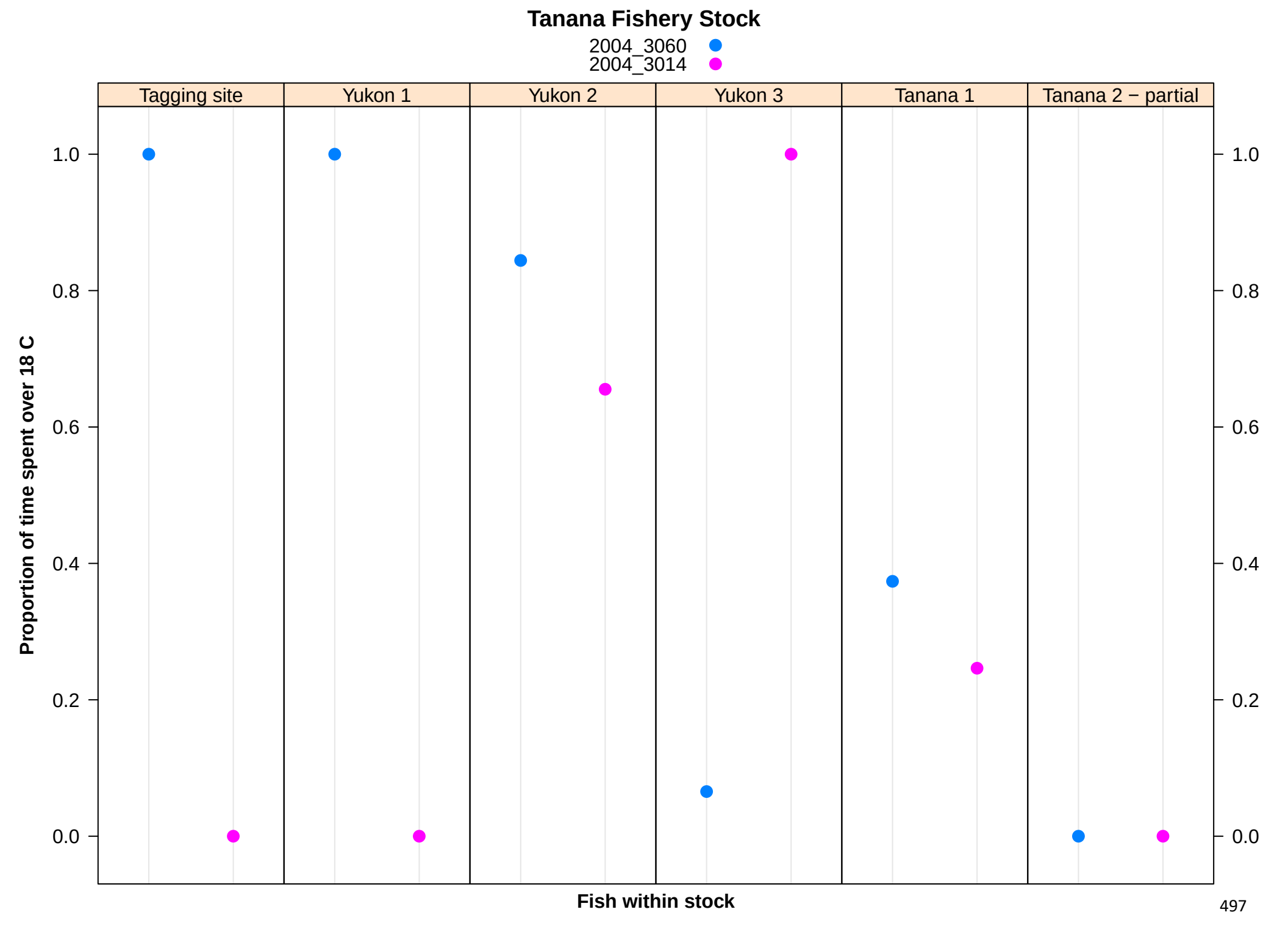

Tanana Fishery Stock
2004_3060
2004_3014
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
Density
0.0
0.2
0
10
20
30
Depth (m)

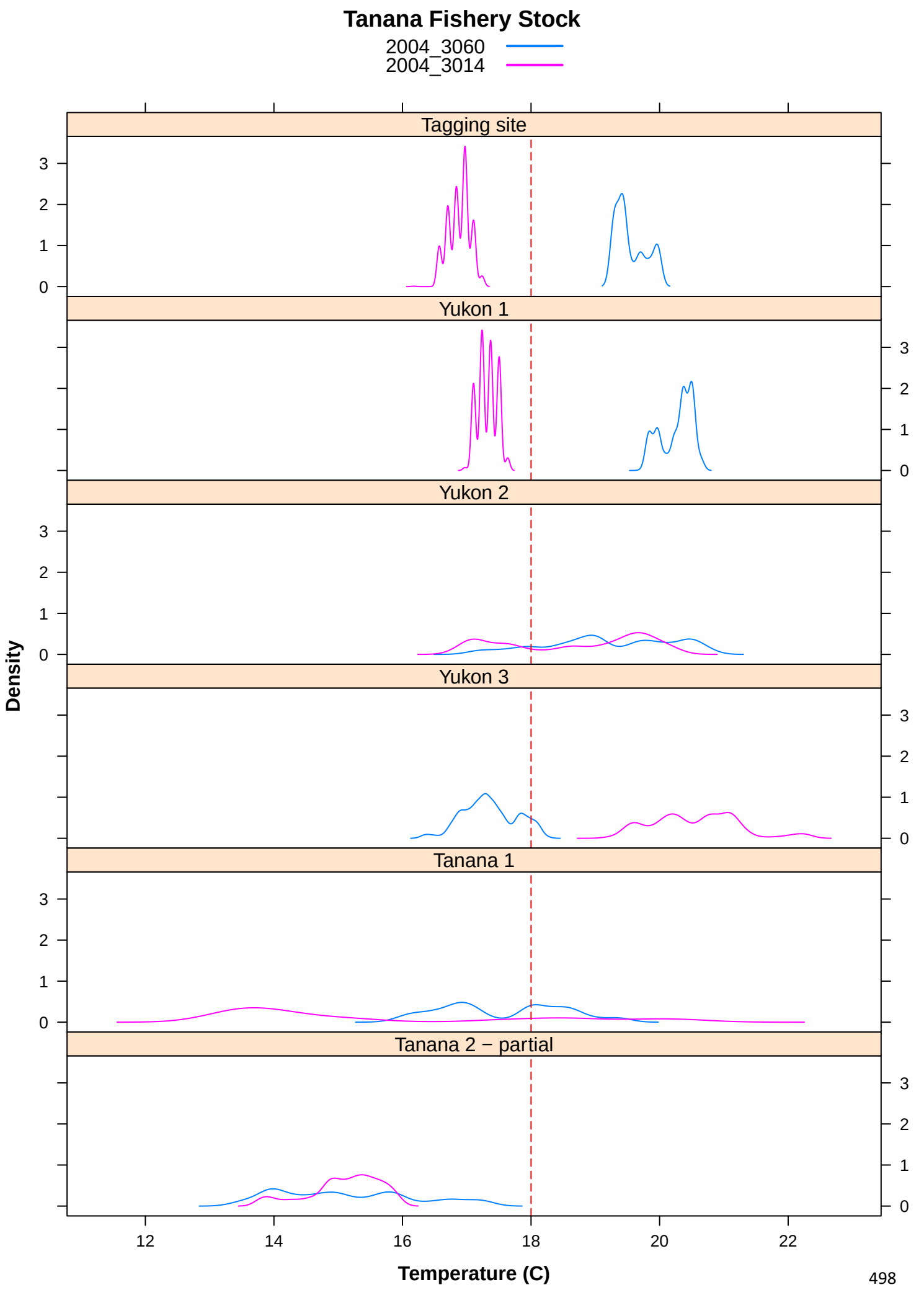

Tanana Fishery Stock
2004_3060
2004_3014
0
200
400
600
800
1000
22
20
18
16
14
Temperature (C)
Distance from Paimiut (km)

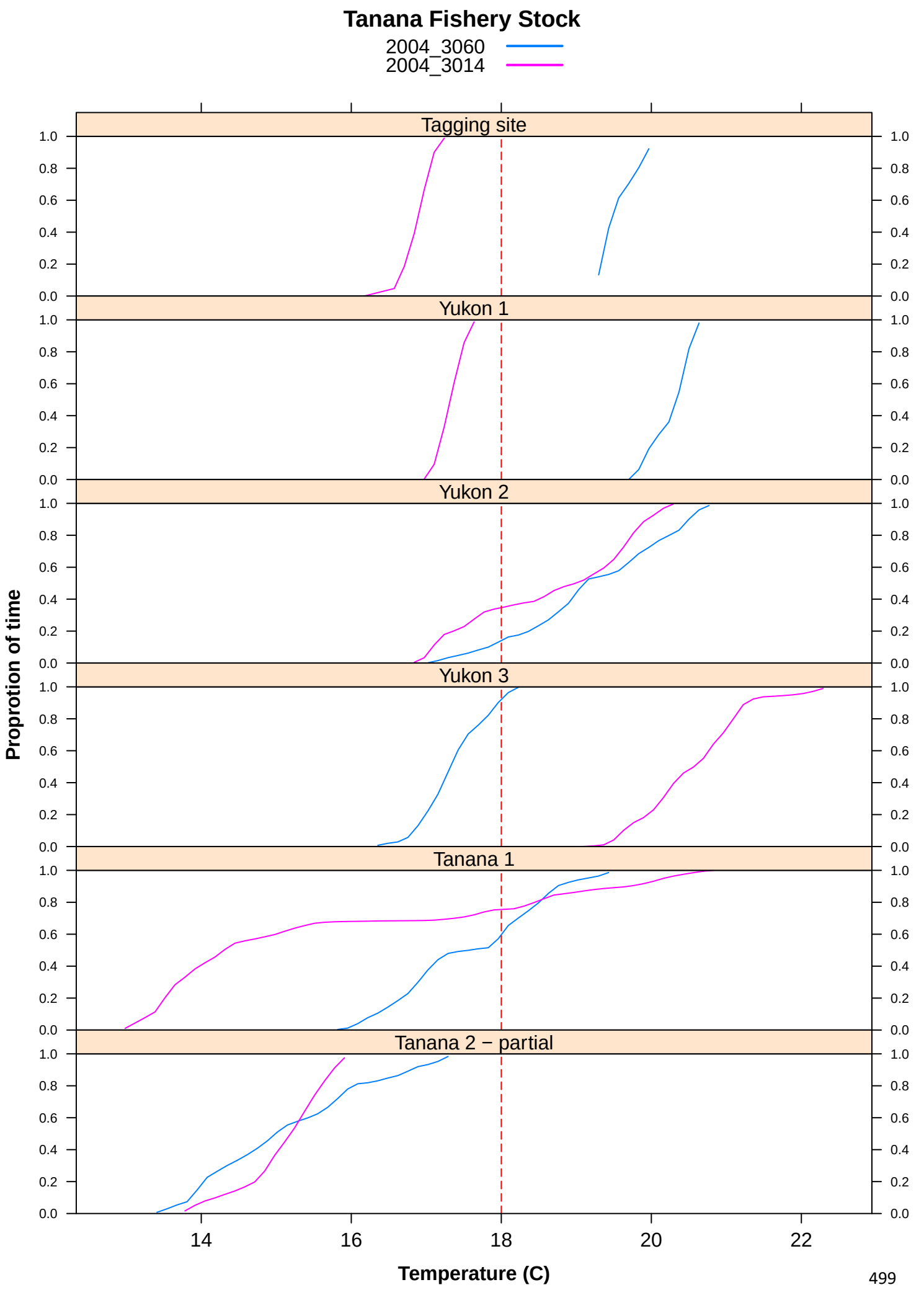

Tanana Fishery Stock
2004_3060
2004_3014
0
200
400
600
22
20
18
16
14
Temperature (C)
Hours since release

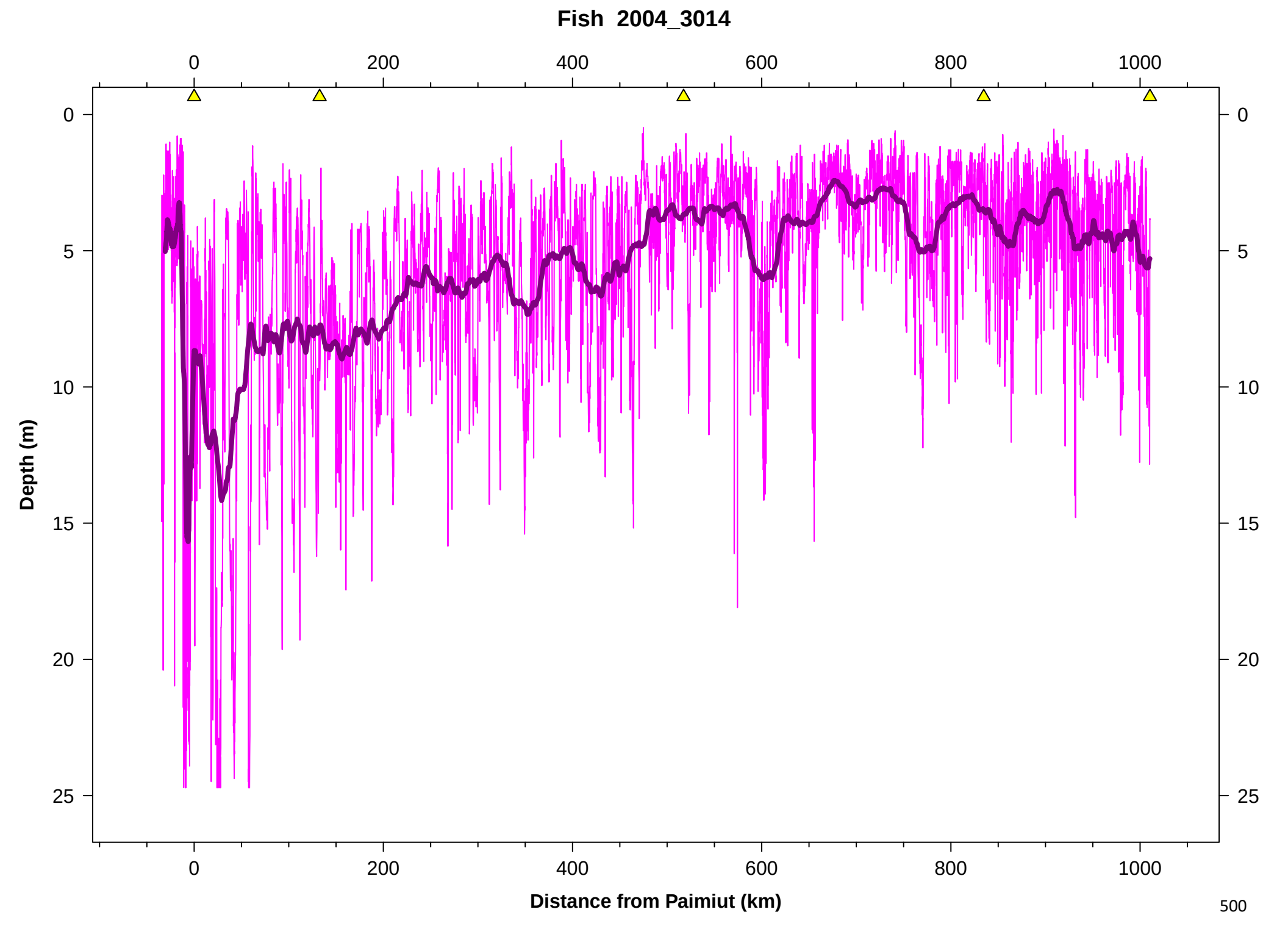

Tanana Fishery Stock
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
Temperature (C)
22
20
18
16
14
Year

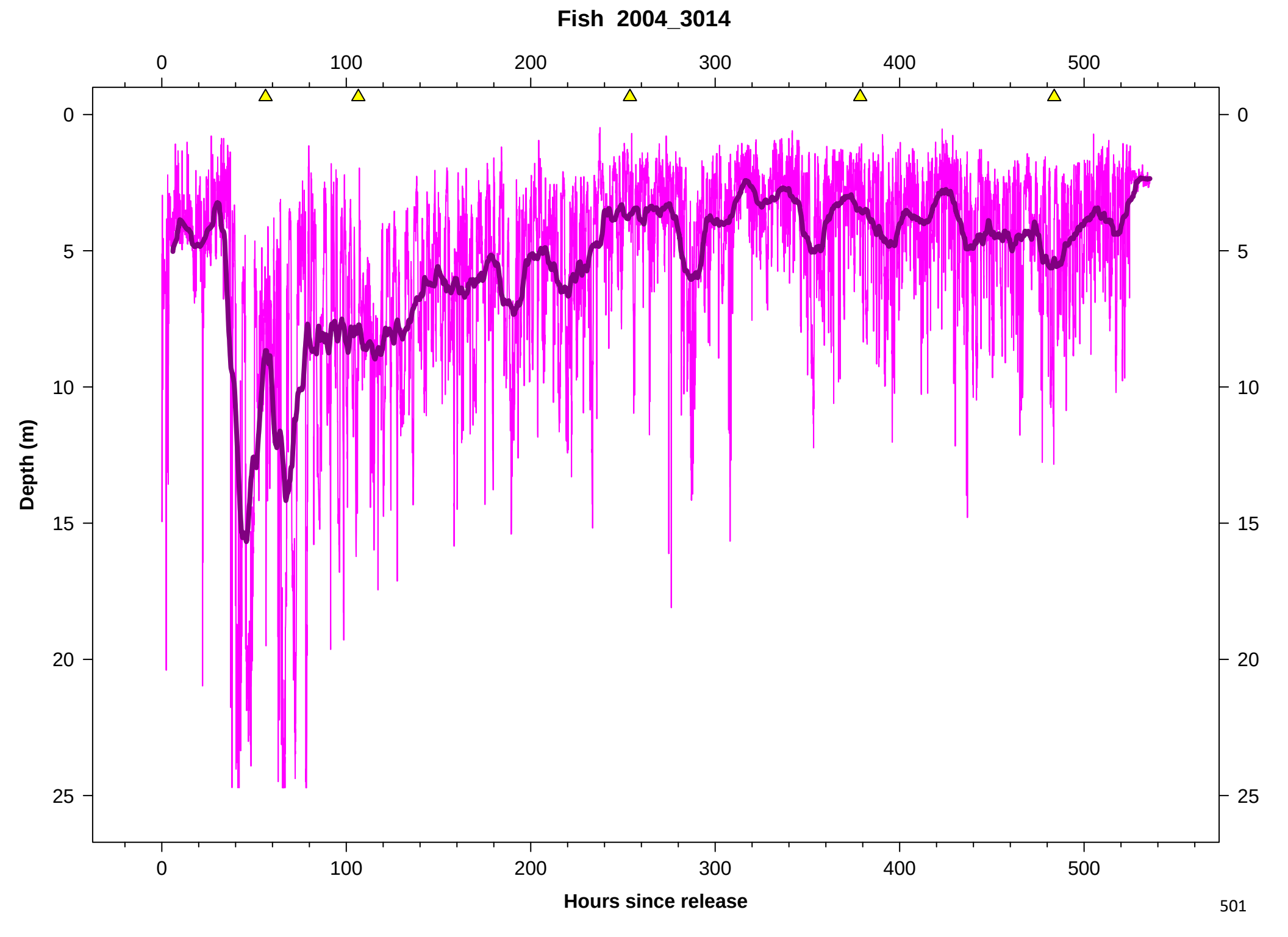

Tanana Fishery Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
Temperature (C)
22
20
18
16
14
Fish within stock
496

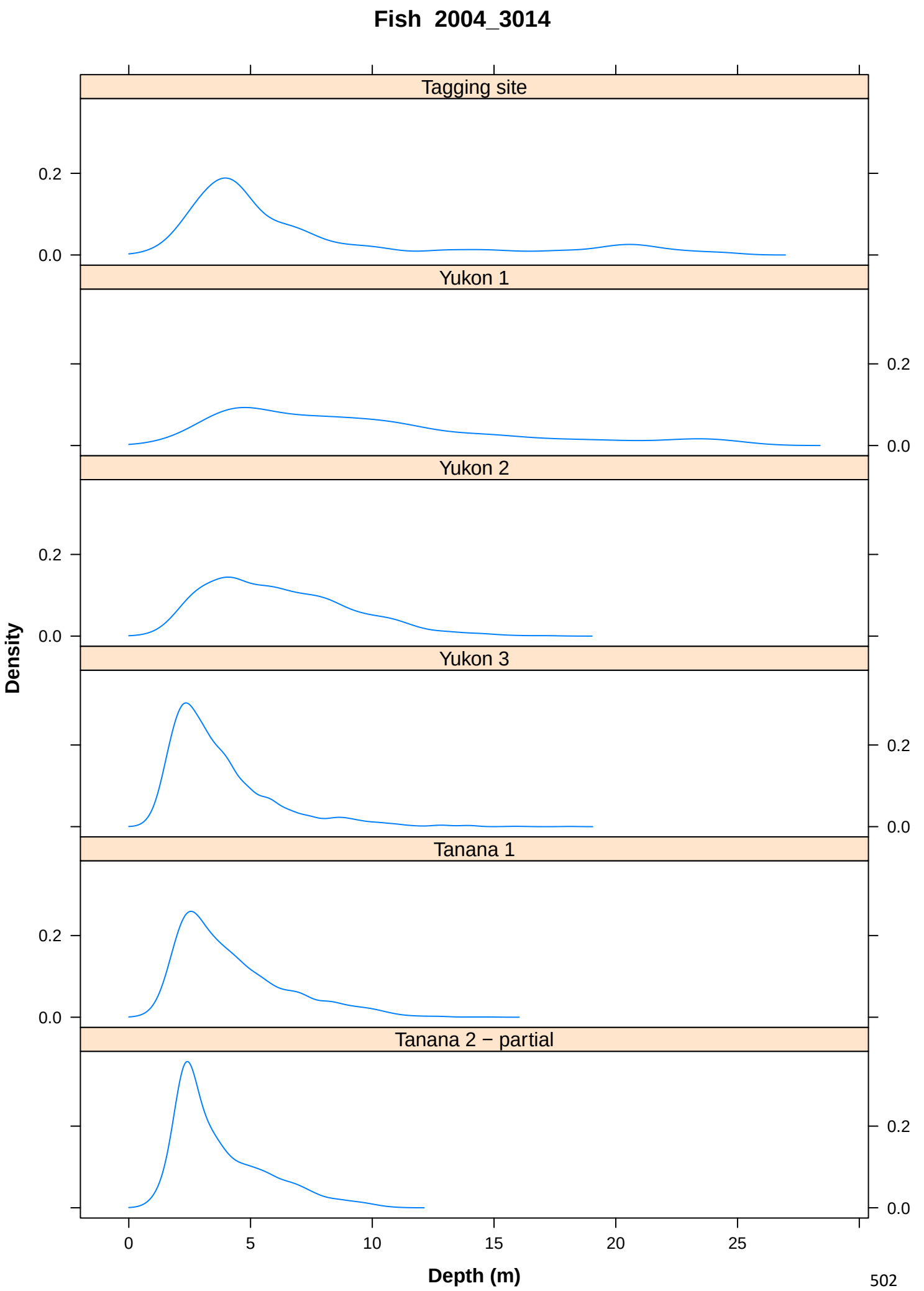

Tanana Fishery Stock
2004_3060
2004_3014
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock

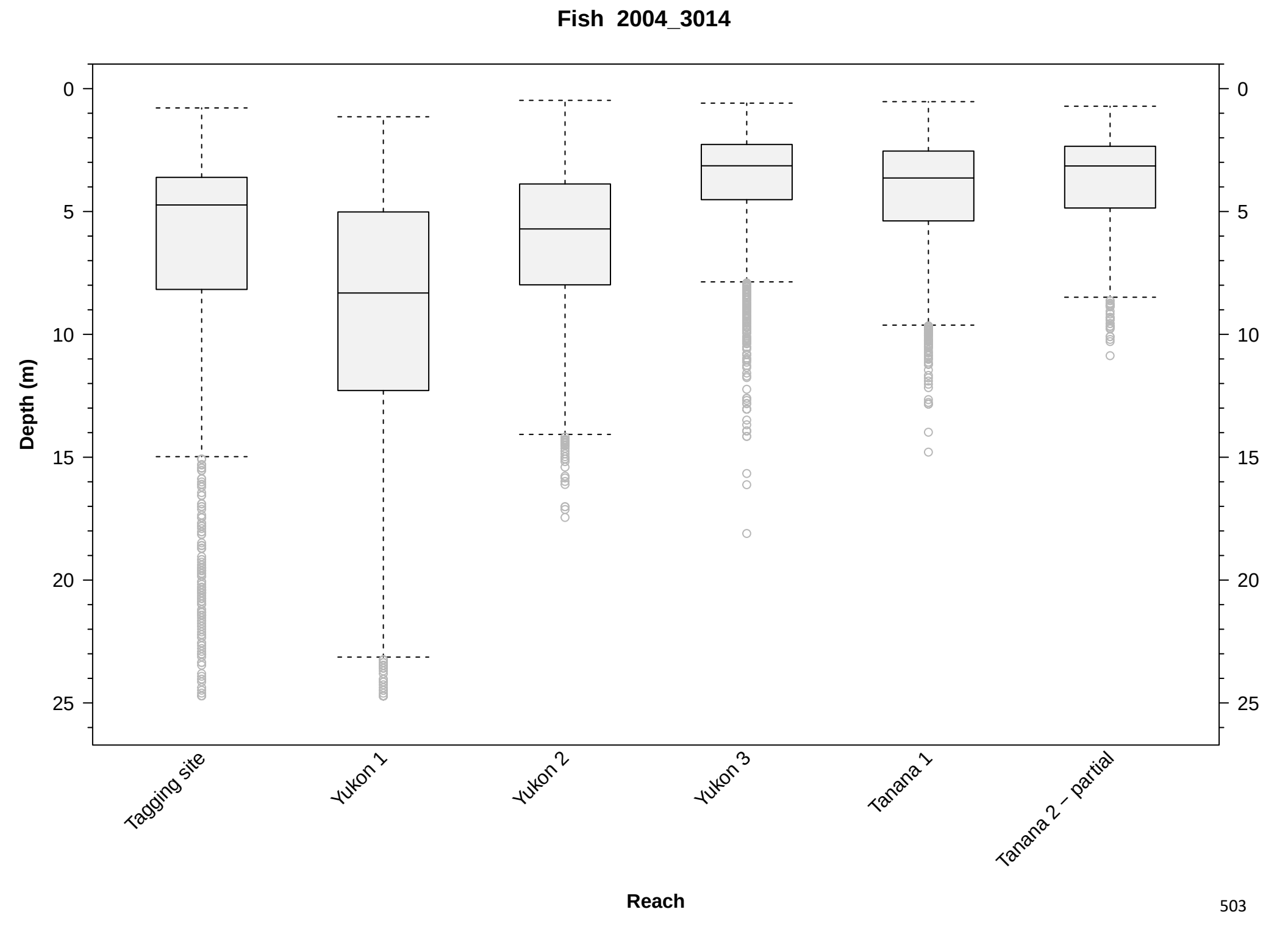

Tanana Fishery Stock
2004_3060
2004_3014
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
Density
Temperature (C)
0
1
2
3
12
14
16
18
20
22

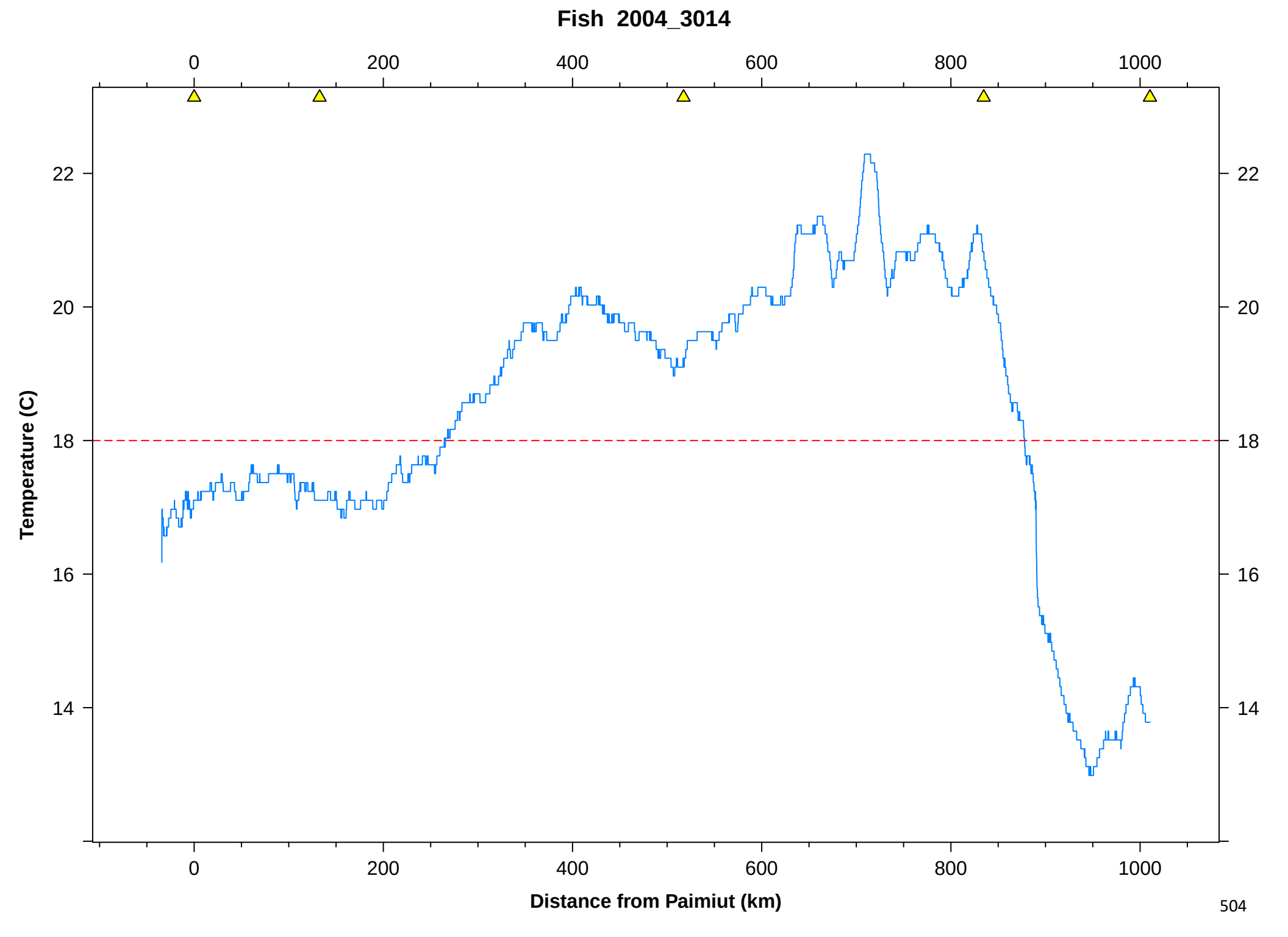

Tanana Fishery Stock
2004_3060
2004_3014
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
14
16
18
20
22

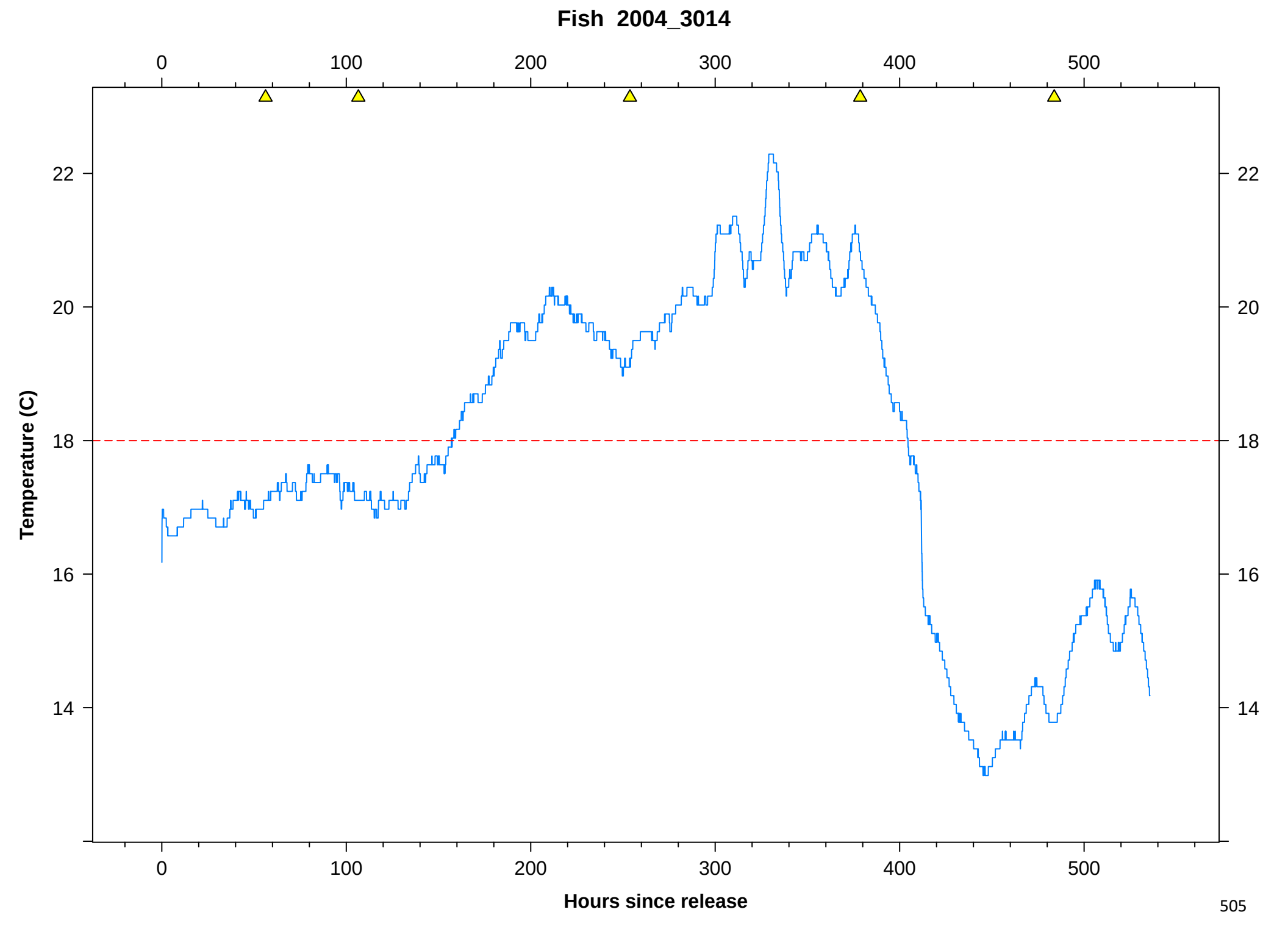

Fish 2004_3014
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
500

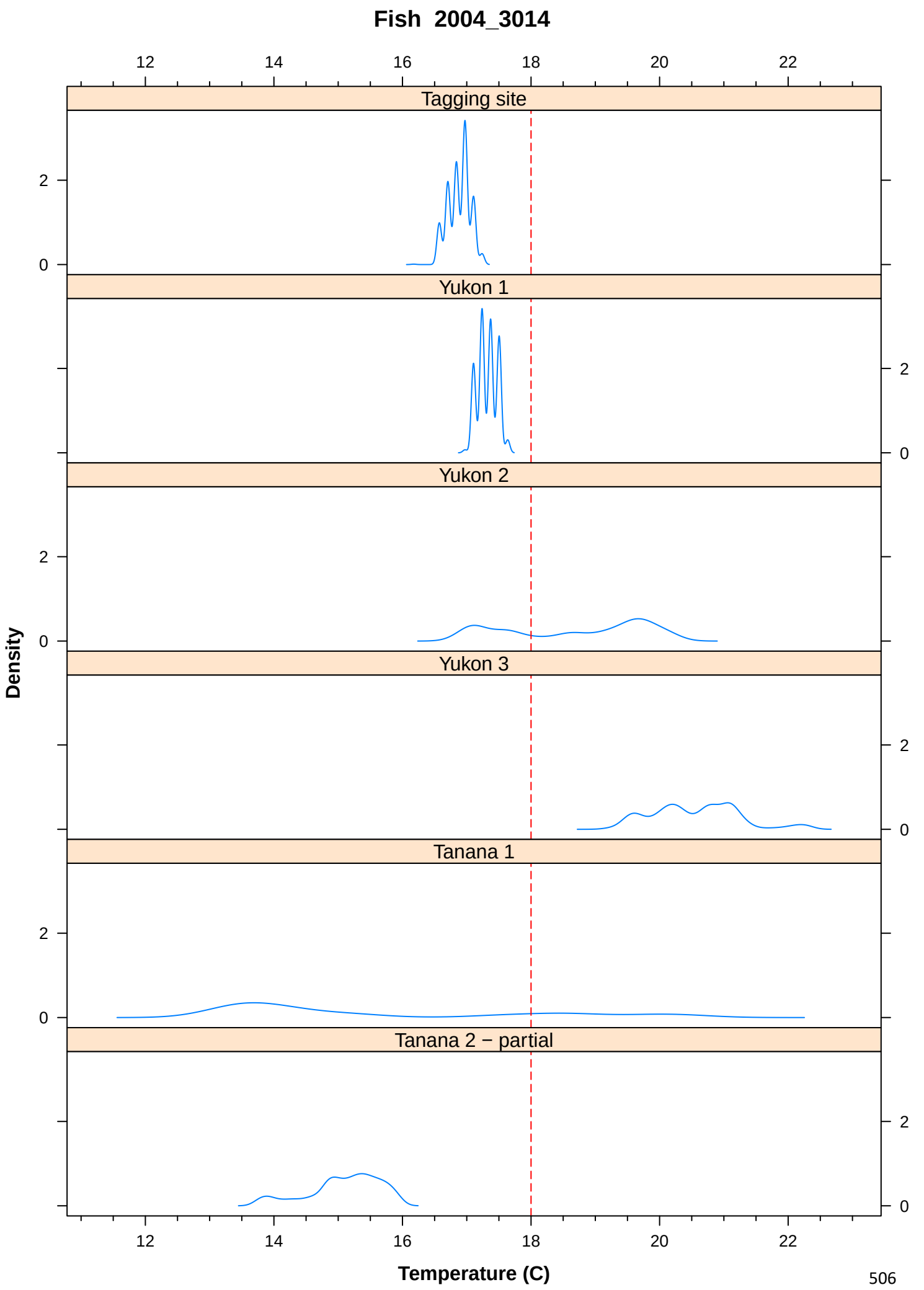

Fish 2004_3014
0
100
200
300
400
500
0
5
10
15
20
25
Depth (m)
Hours since release
501

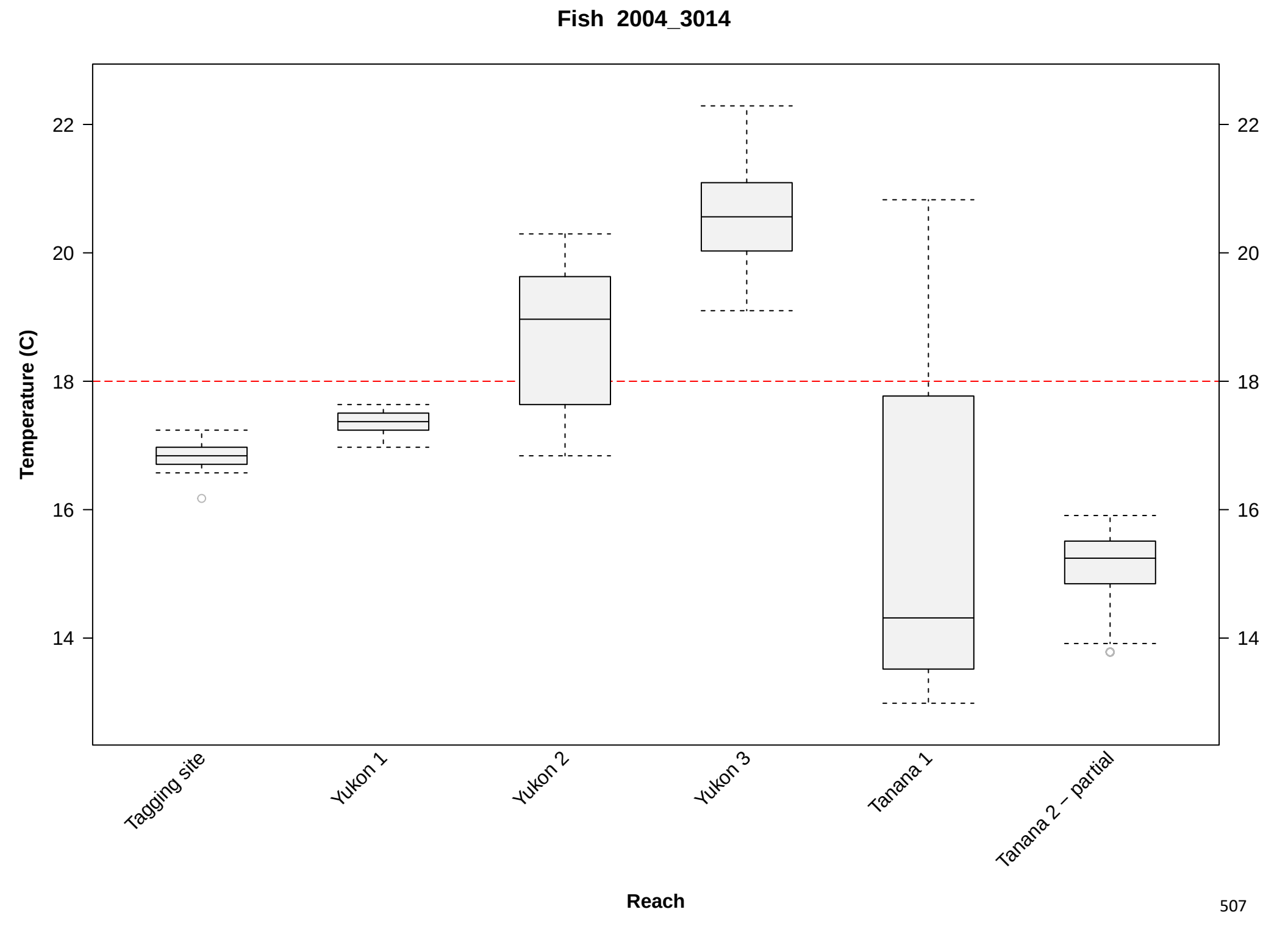

Fish 2004_3014
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
Density
0.0
0.2
0
5
10
15
20
25
Depth (m)

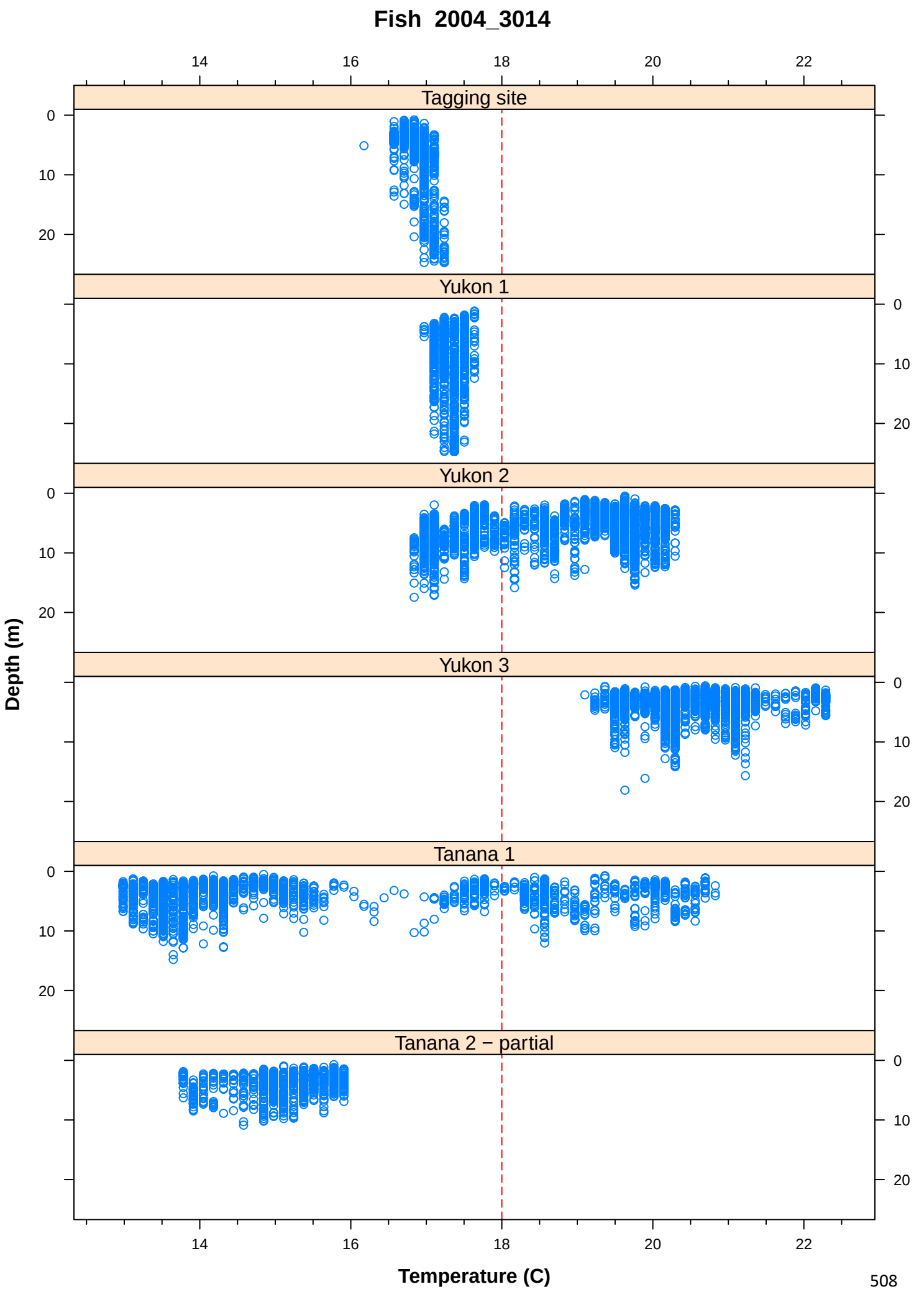

Fish 2004_3014
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 – partial
Reach

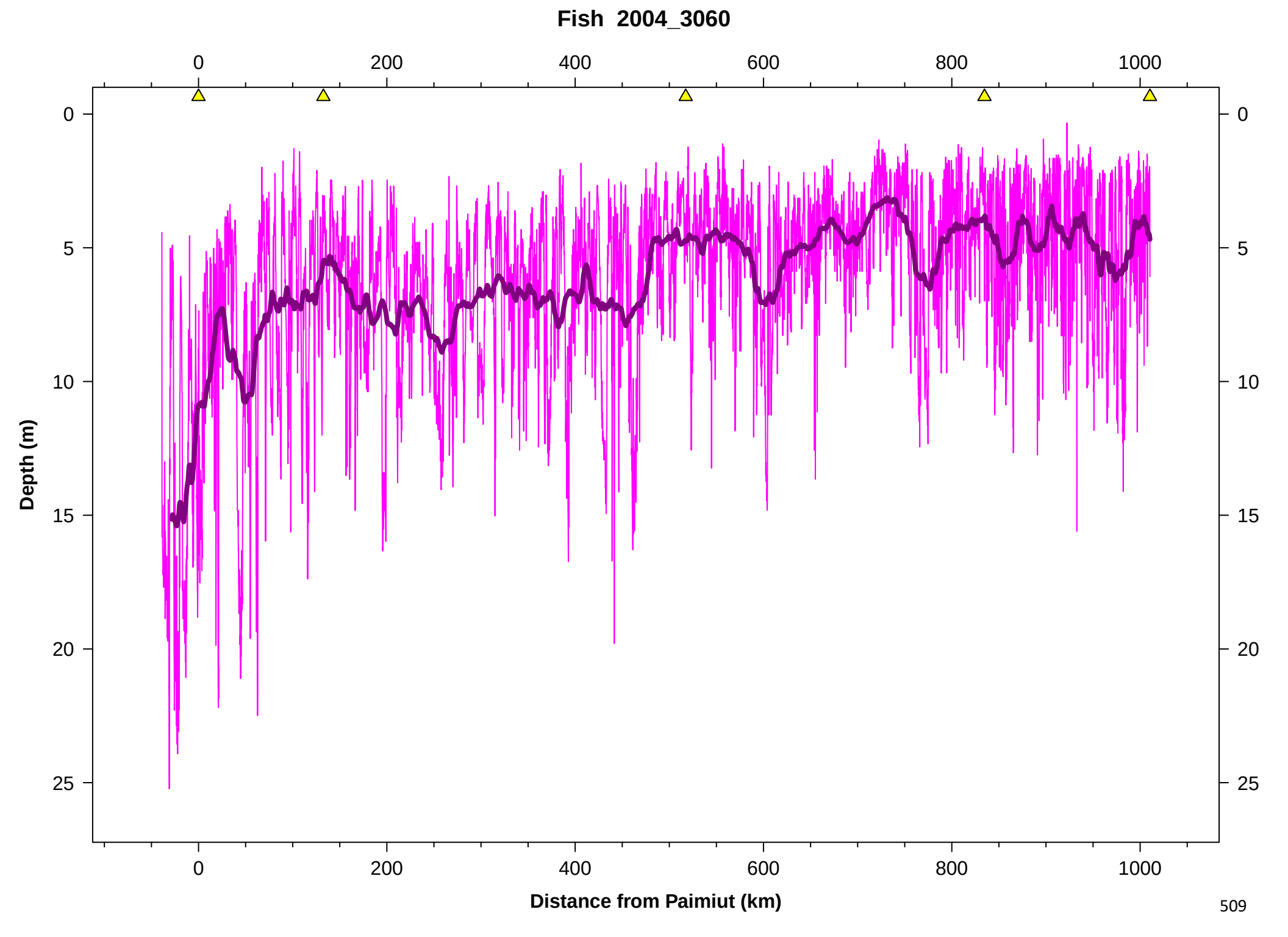

Fish 2004_3014
0
200
400
600
800
1000
22
20
18
16
14
Temperature (C)
Distance from Paimiut (km)

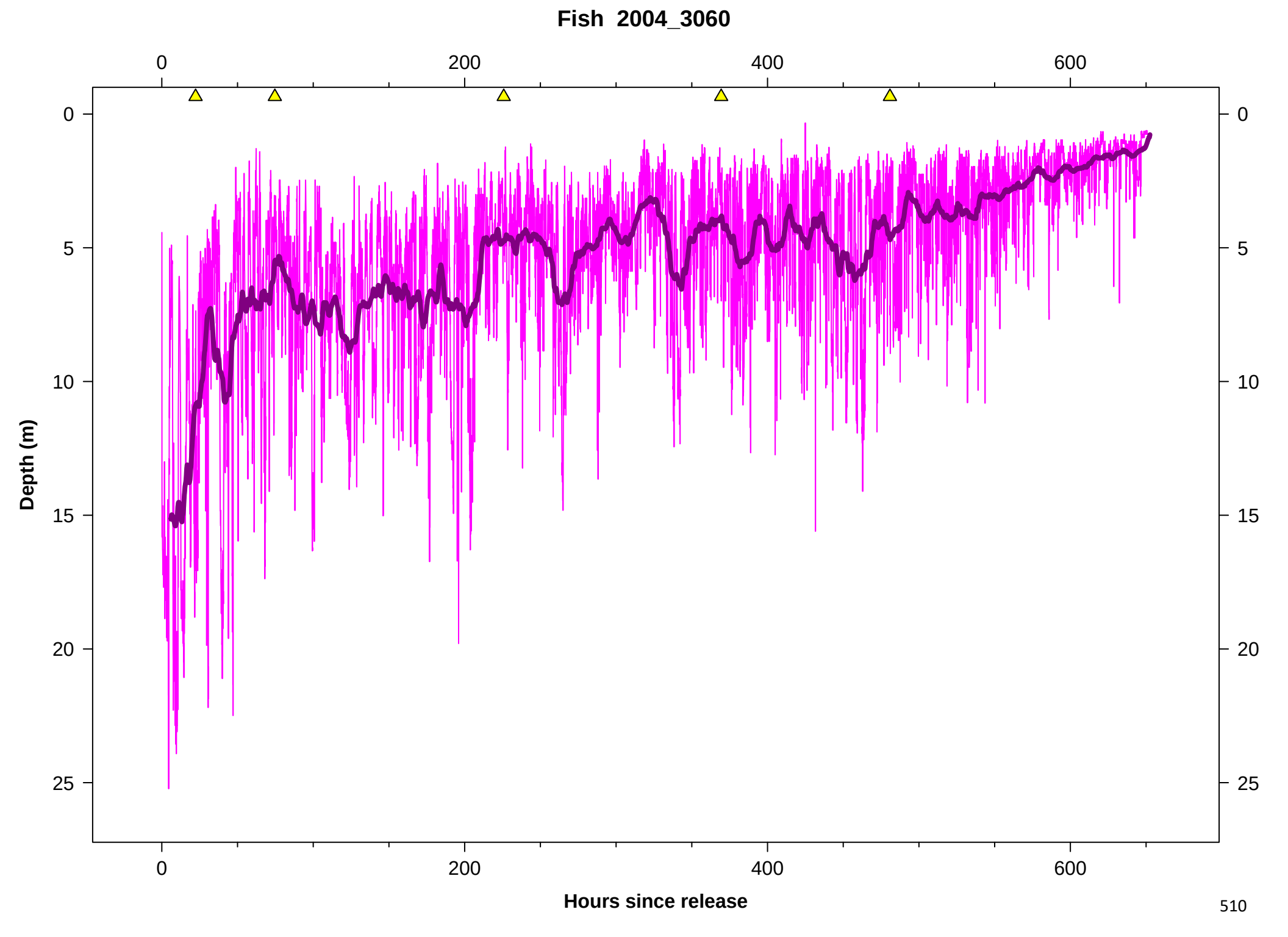

Fish 2004_3014
0
100
200
300
400
500
22
20
18
16
14
Temperature (C)
Hours since release

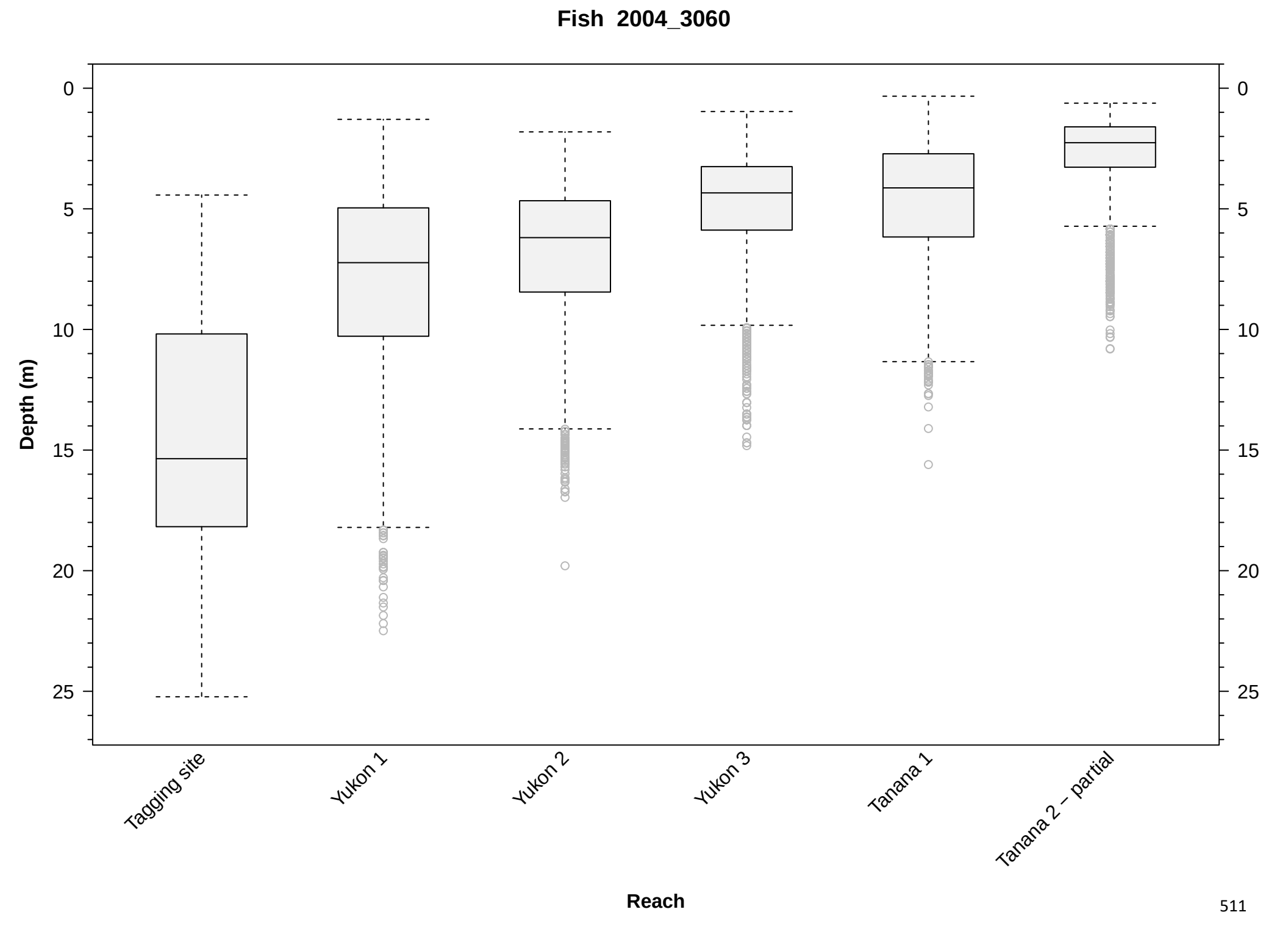

Fish 2004_3014
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
Density
Temperature (C)
12
14
16
18
20
22
0
2

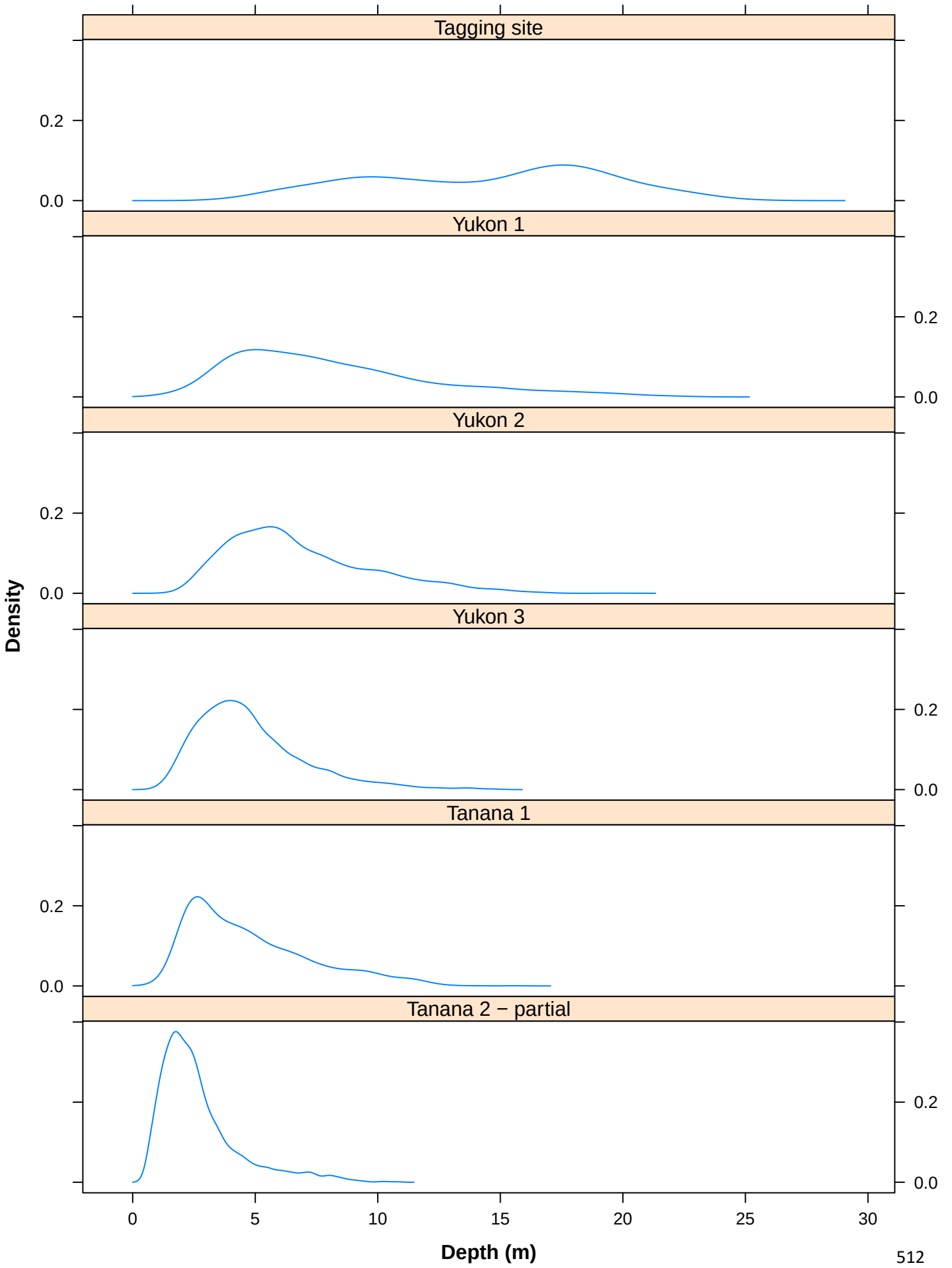

Fish 2004_3014
Temperature (C)
22
20
18
16
14
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 – partial
Reach

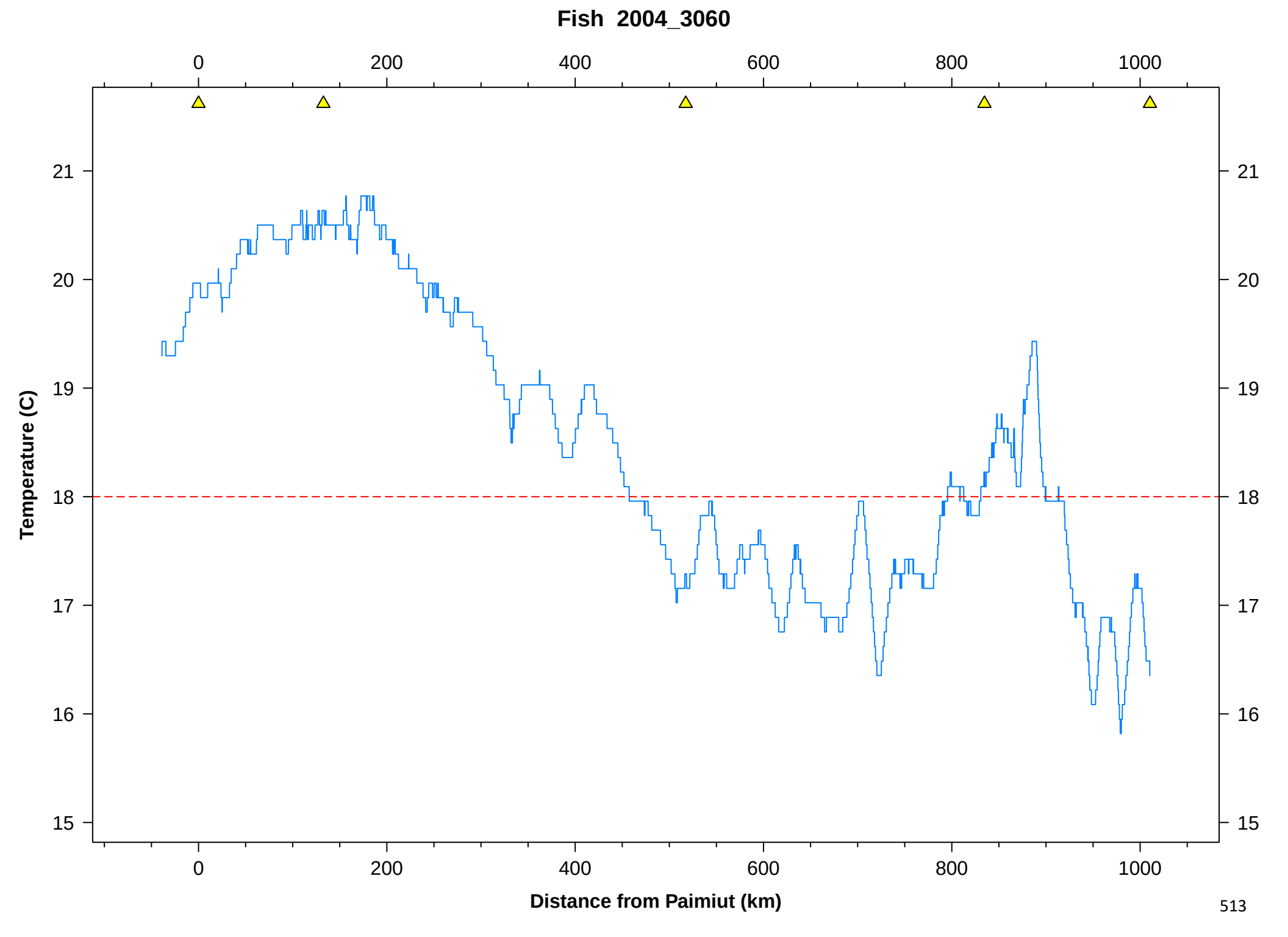

Fish 2004_3014
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
Depth (m)
Temperature (C)
14
16
18
20
22
0
10
20

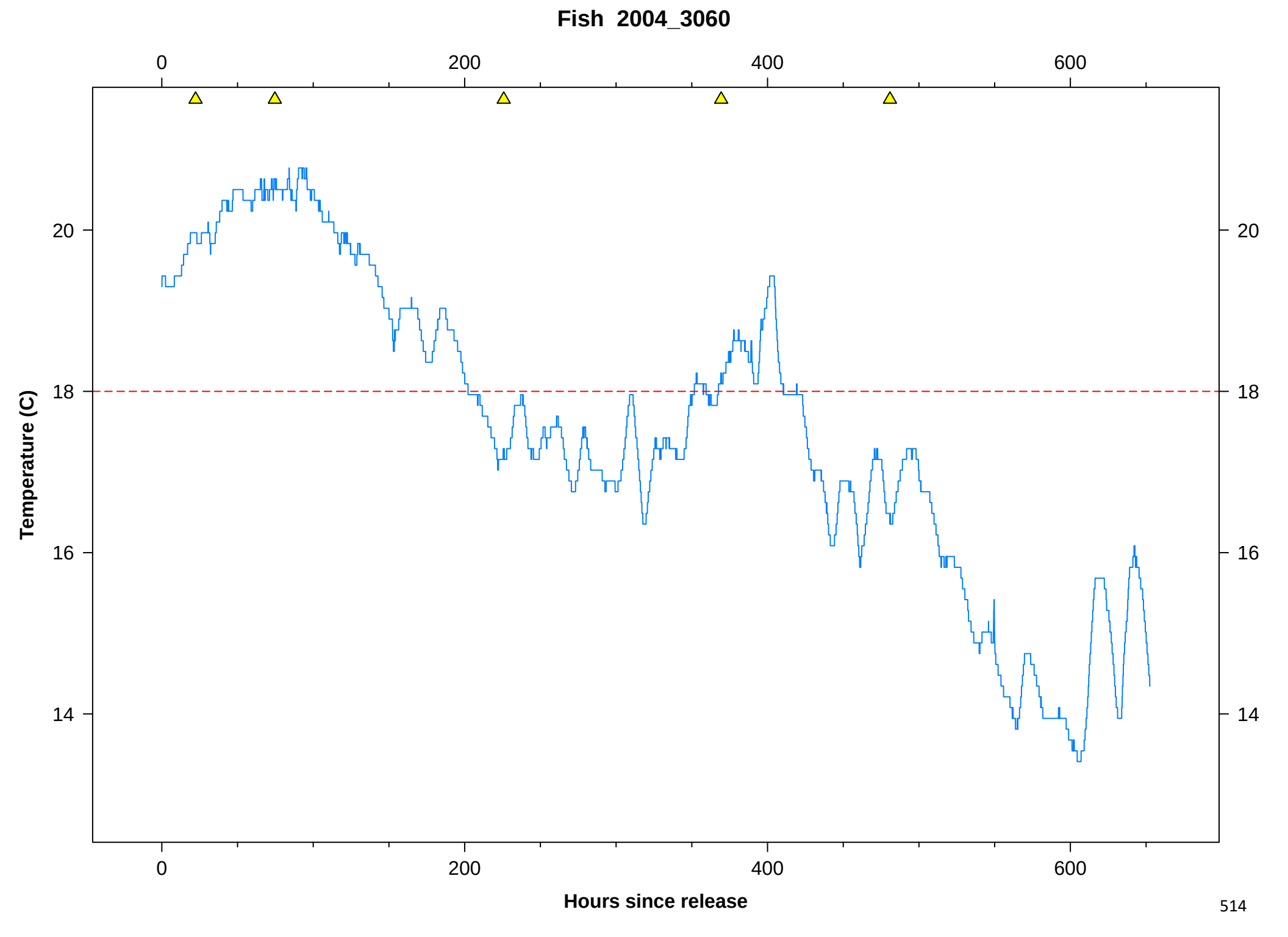

Fish 2004_3060
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

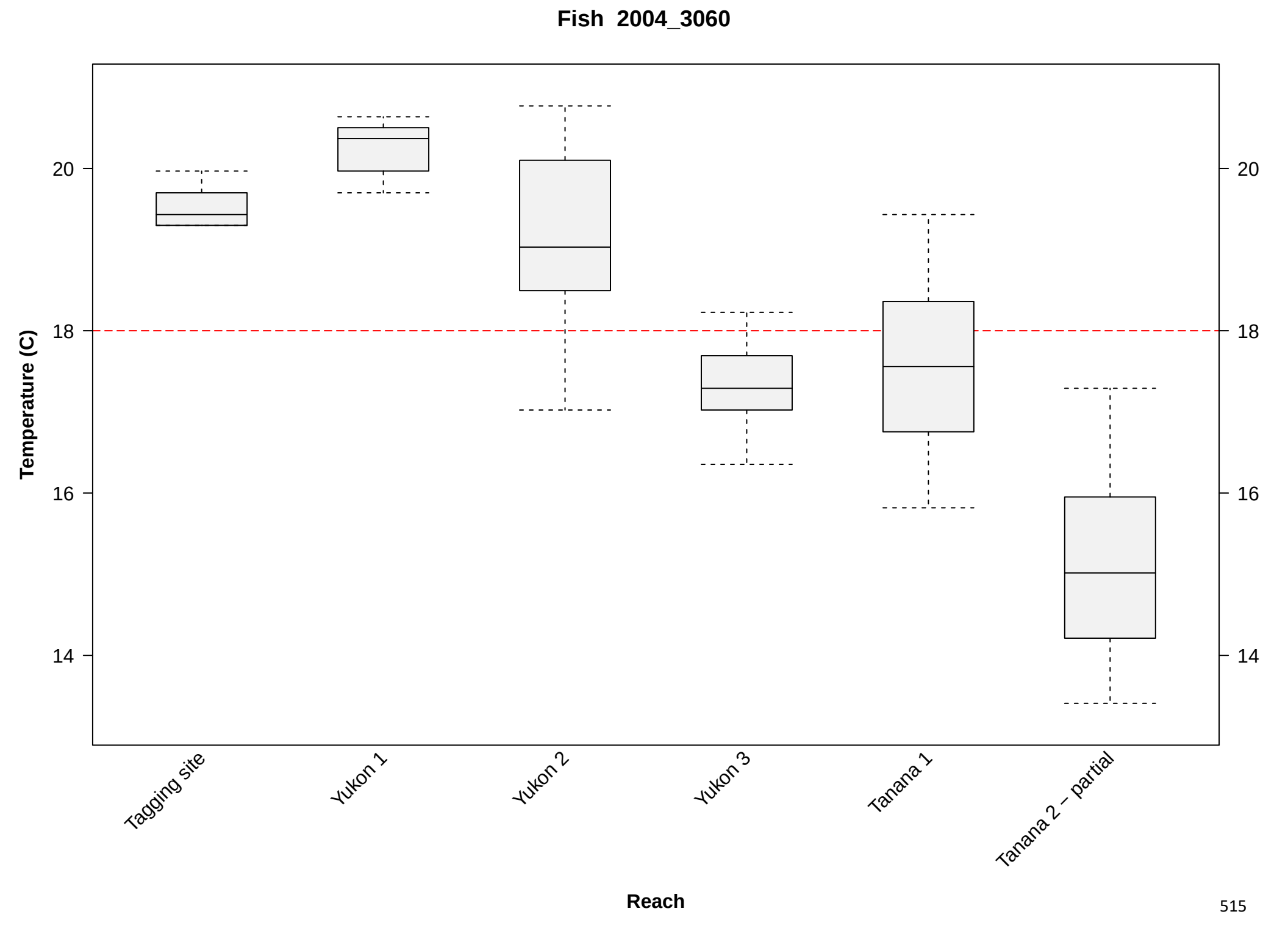

Fish 2004_3060
0
200
400
600
0
5
10
15
20
25
Depth (m)
Hours since release

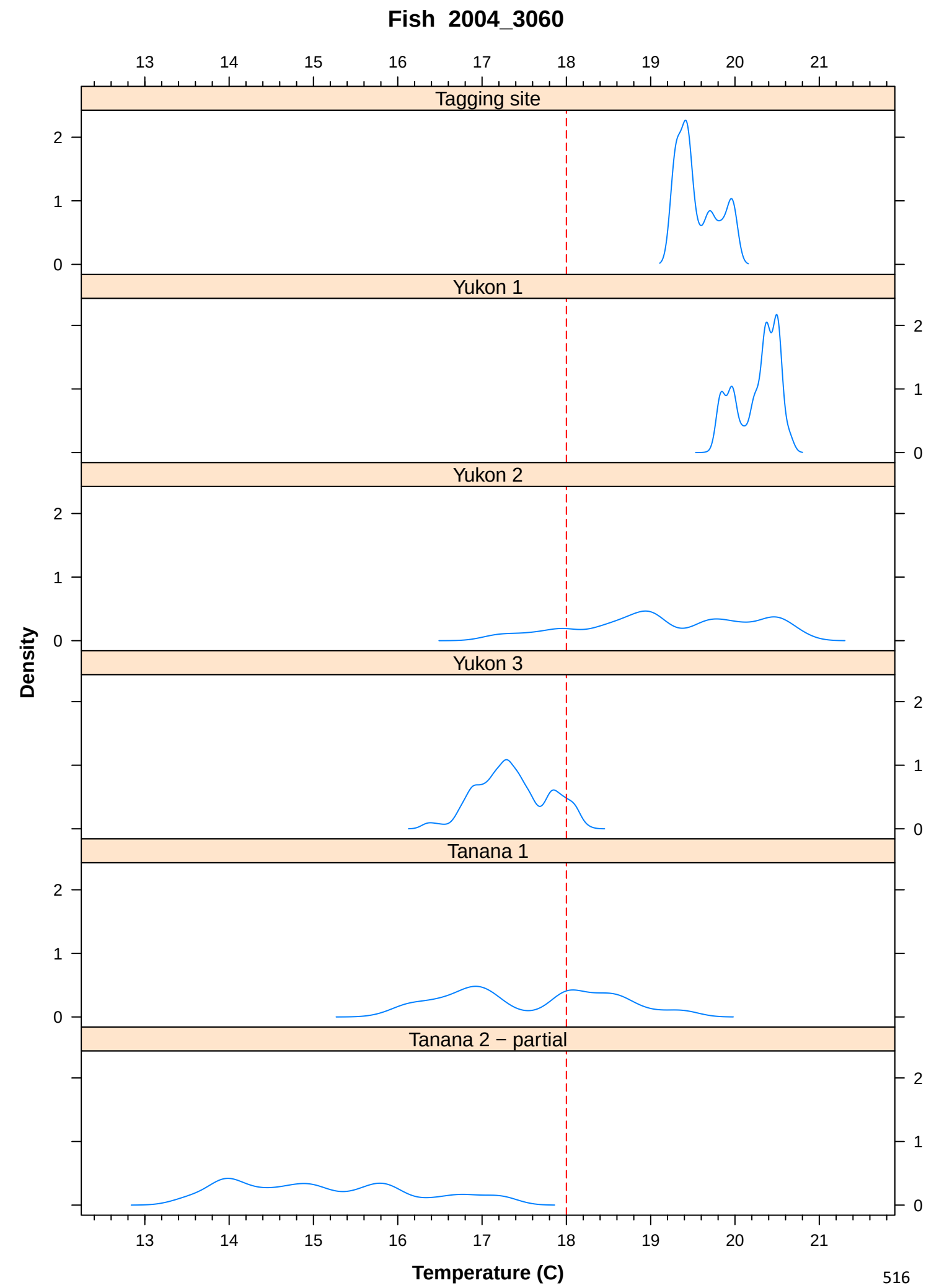

Fish 2004_3060
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 – partial
Reach

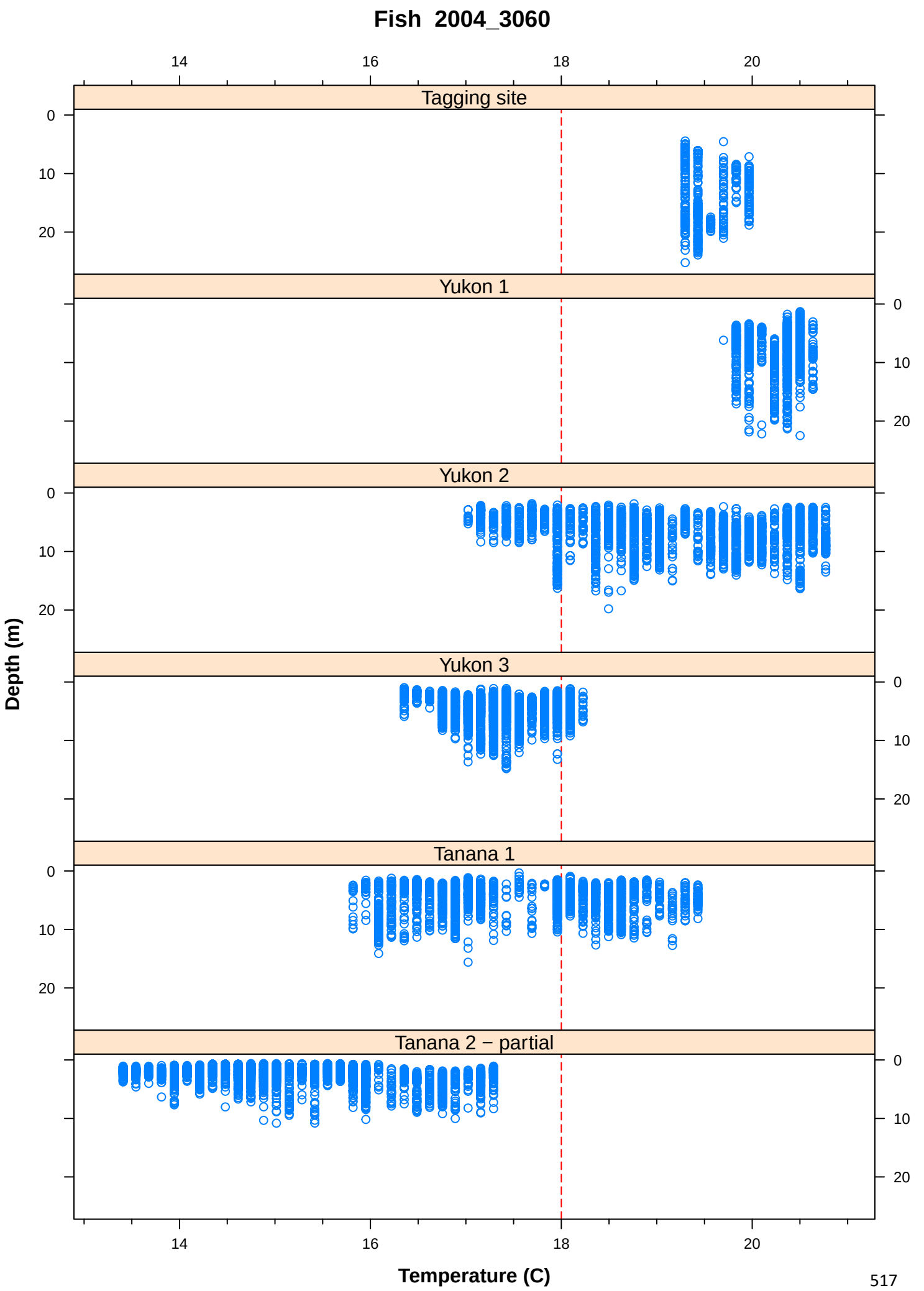

Fish 2004_3060
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
Density
0.0
0.2
0
5
10
15
20
25
30
Depth (m)


Fish 2004_3060
0
200
400
600
800
1000
21
20
19
18
17
16
15
Temperature (C)
Distance from Paimiut (km)


Fish 2004_3060
0
200
400
600
20
18
16
14
Temperature (C)
Hours since release


Fish 2004_3060
Temperature (C)
20
18
16
14
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 – partial
Reach


Fish 2004_3060
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
Density
Temperature (C)
13
14
15
16
17
18
19
20
21
0
1
2

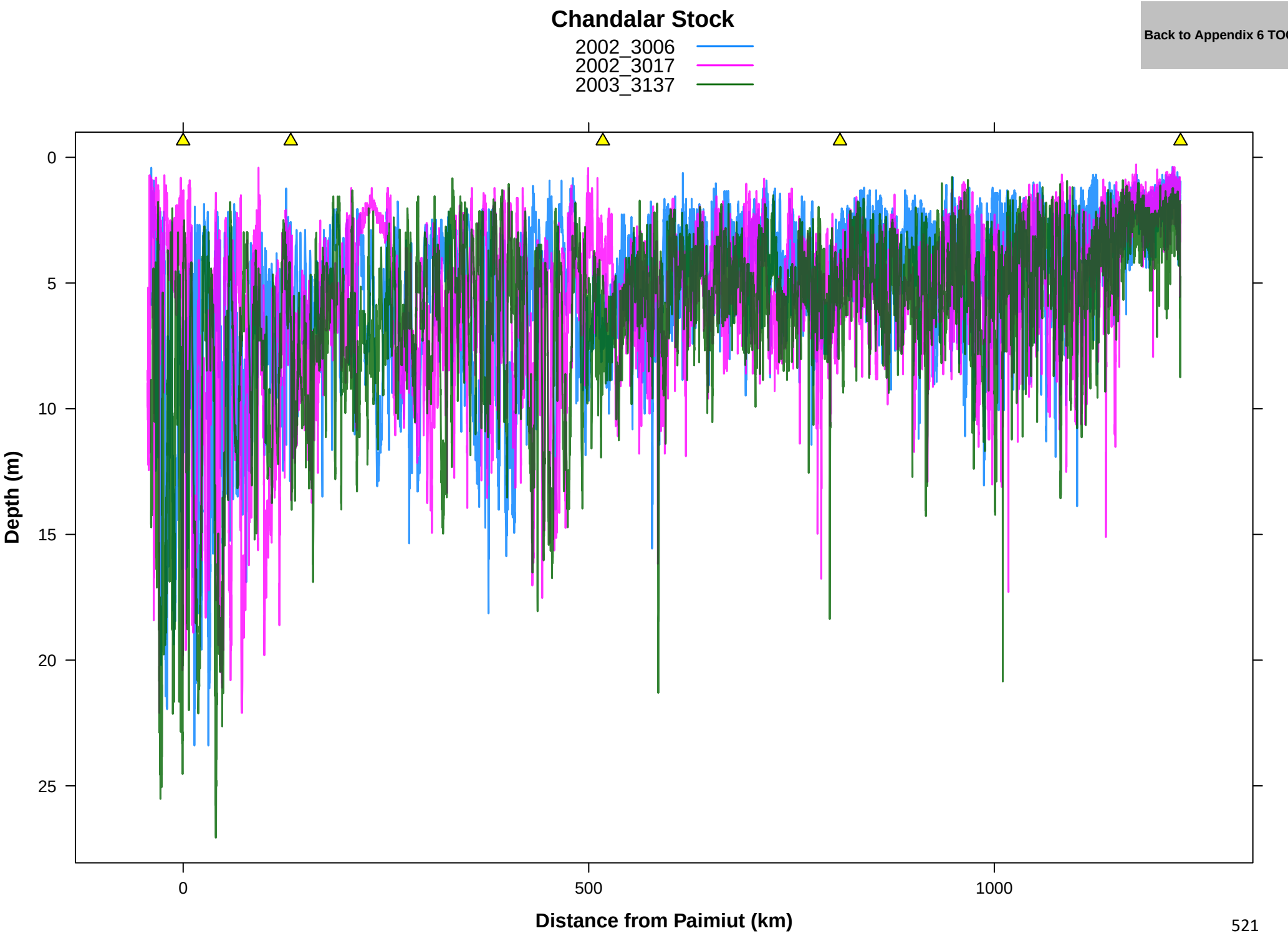

Fish 2004_3060
Tagging site
Yukon 1
Yukon 2
Yukon 3
Tanana 1
Tanana 2 − partial
Depth (m)
Temperature (C)
14
16
18
20
0
10
20

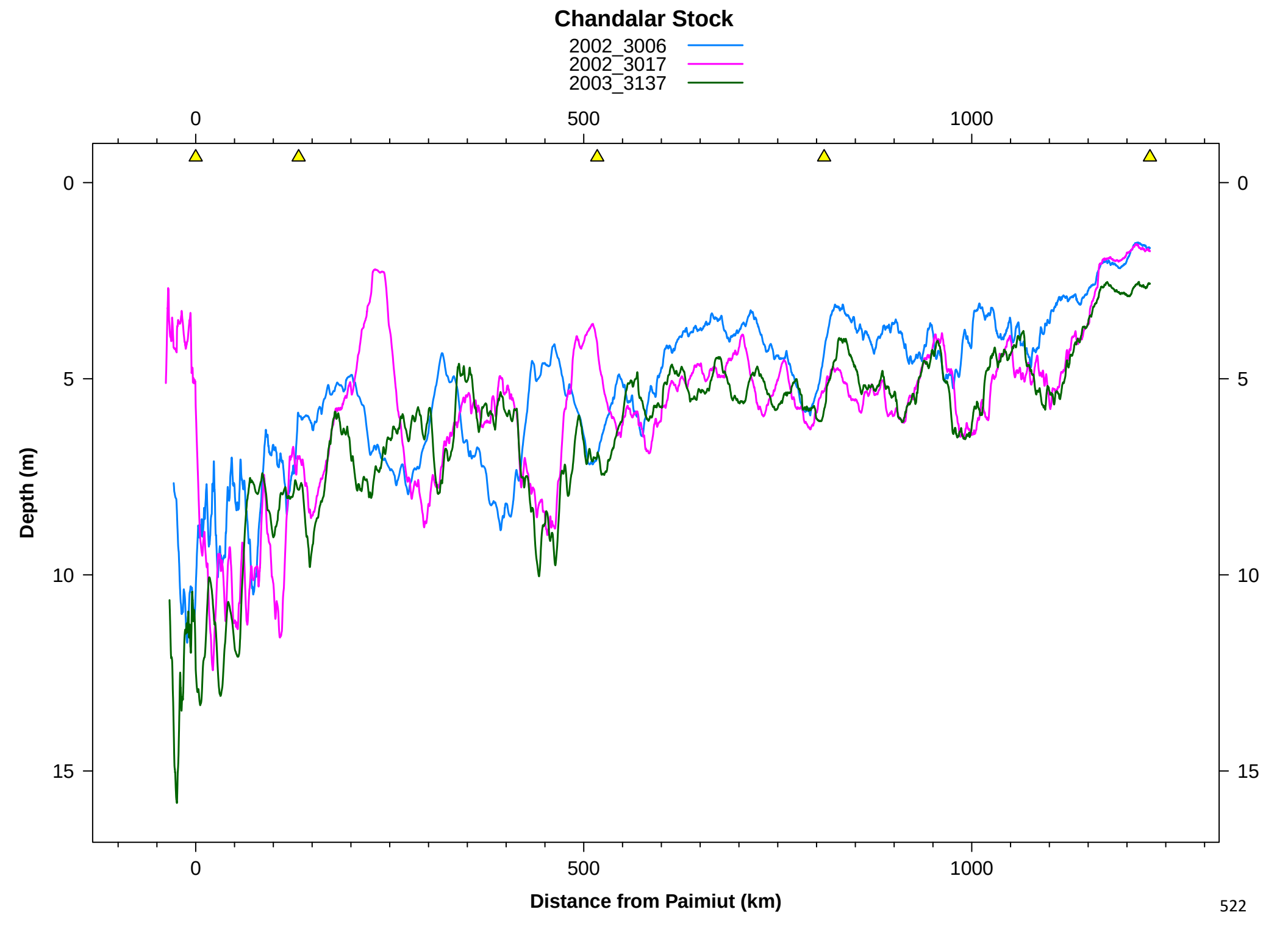
Appendix 6. -- Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Yukon Flats in 2002-2004.

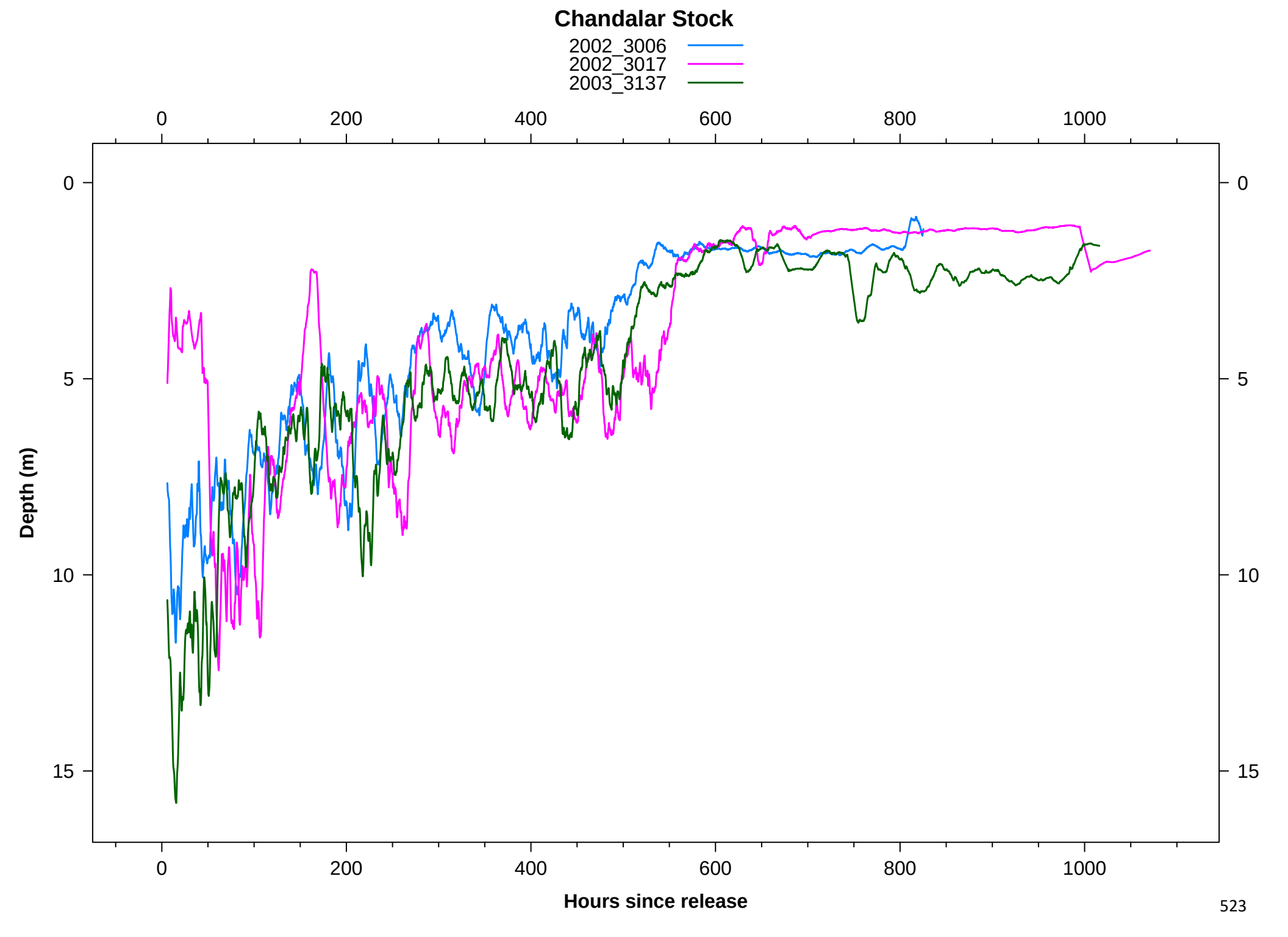
Chandalar 521

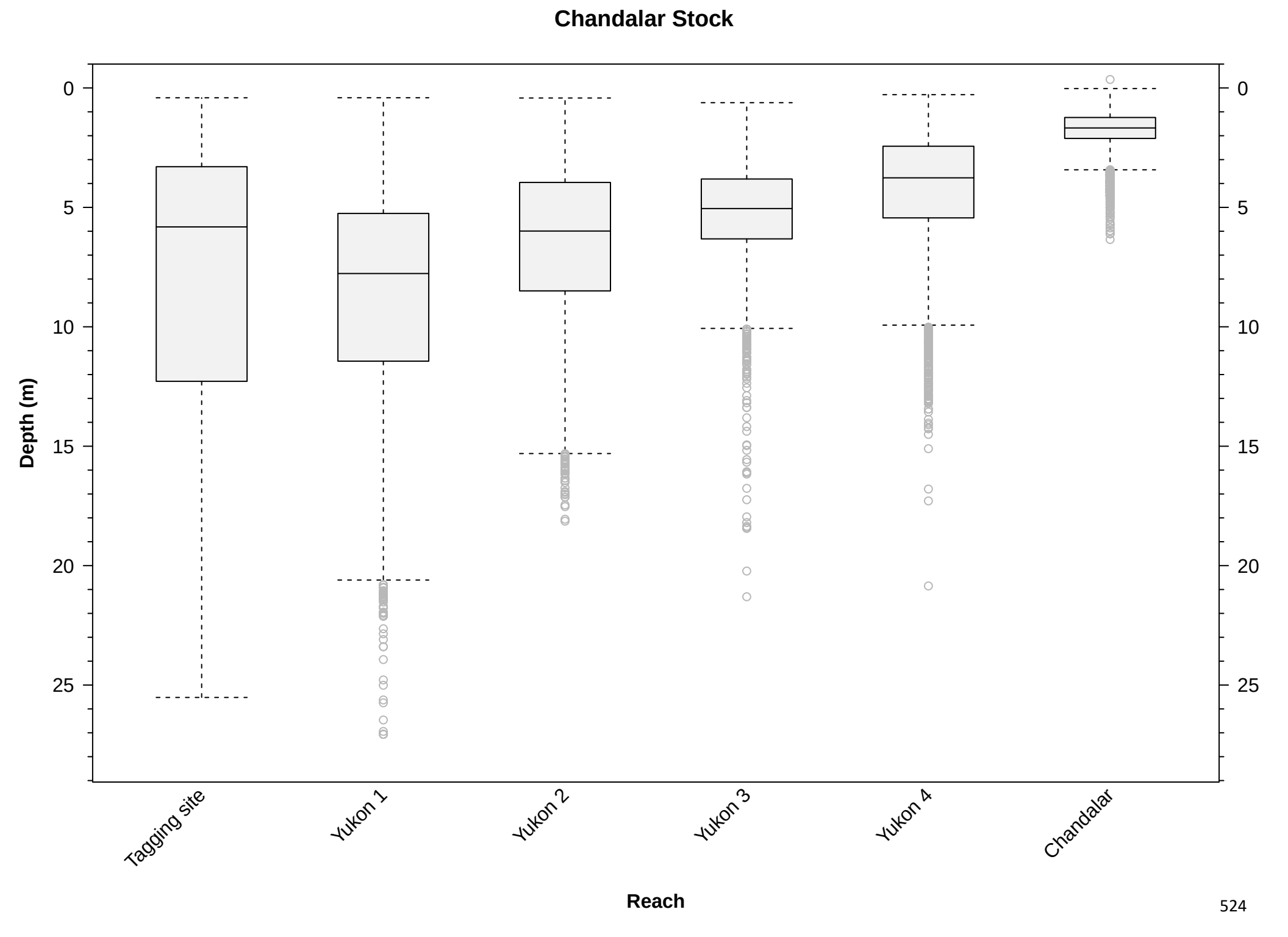
Sheenjek 561

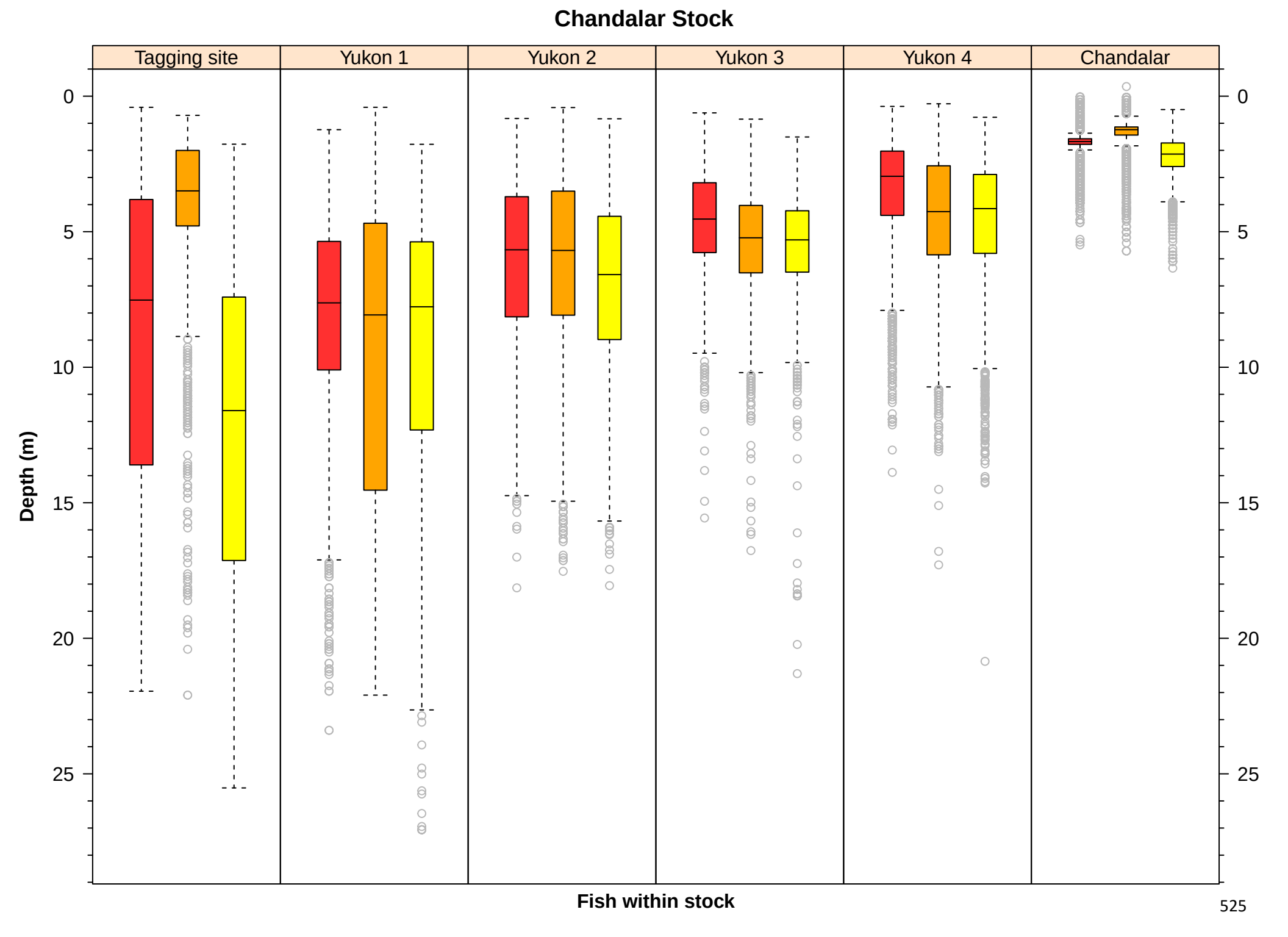
Back to Appendix 6 TOC

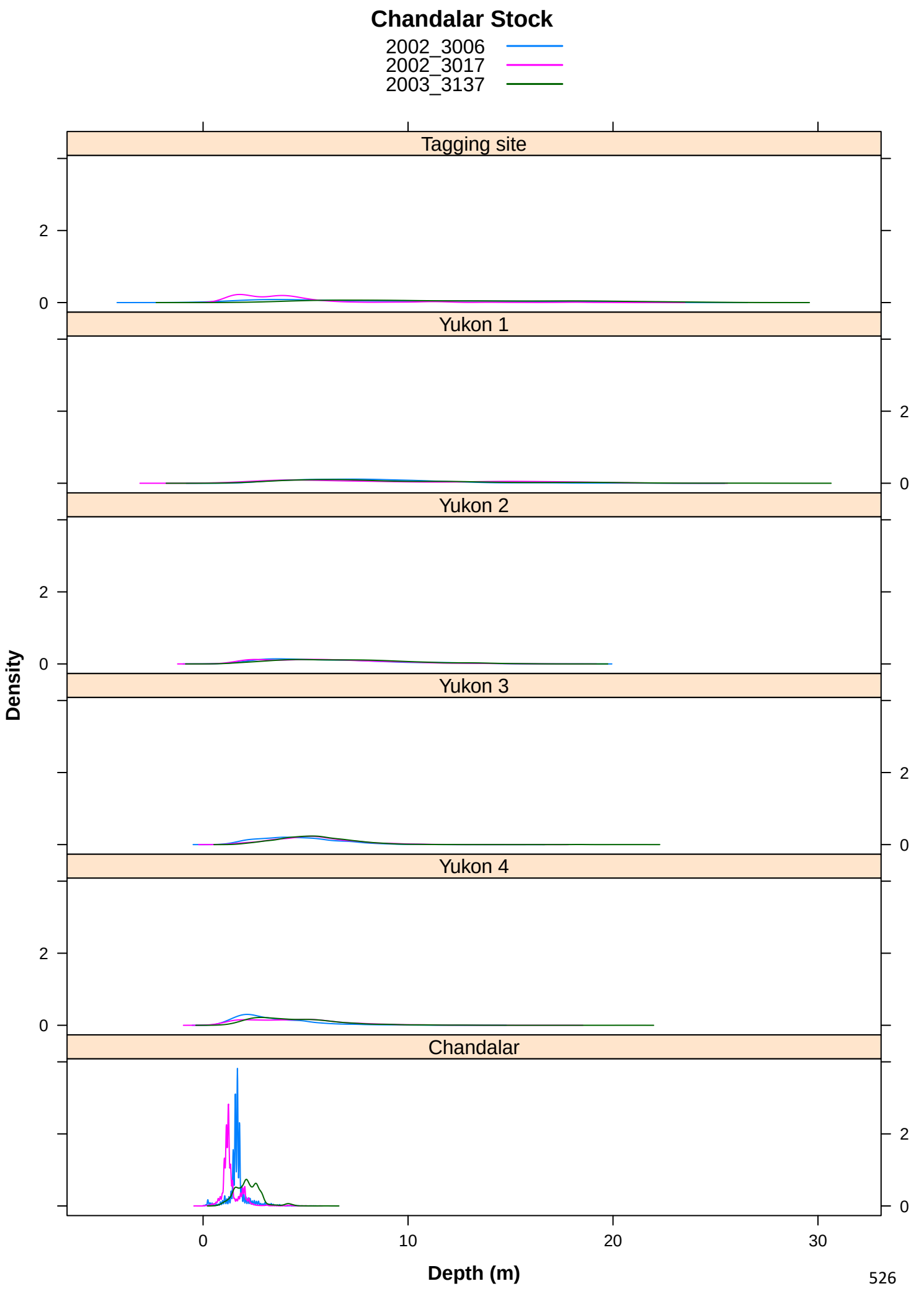


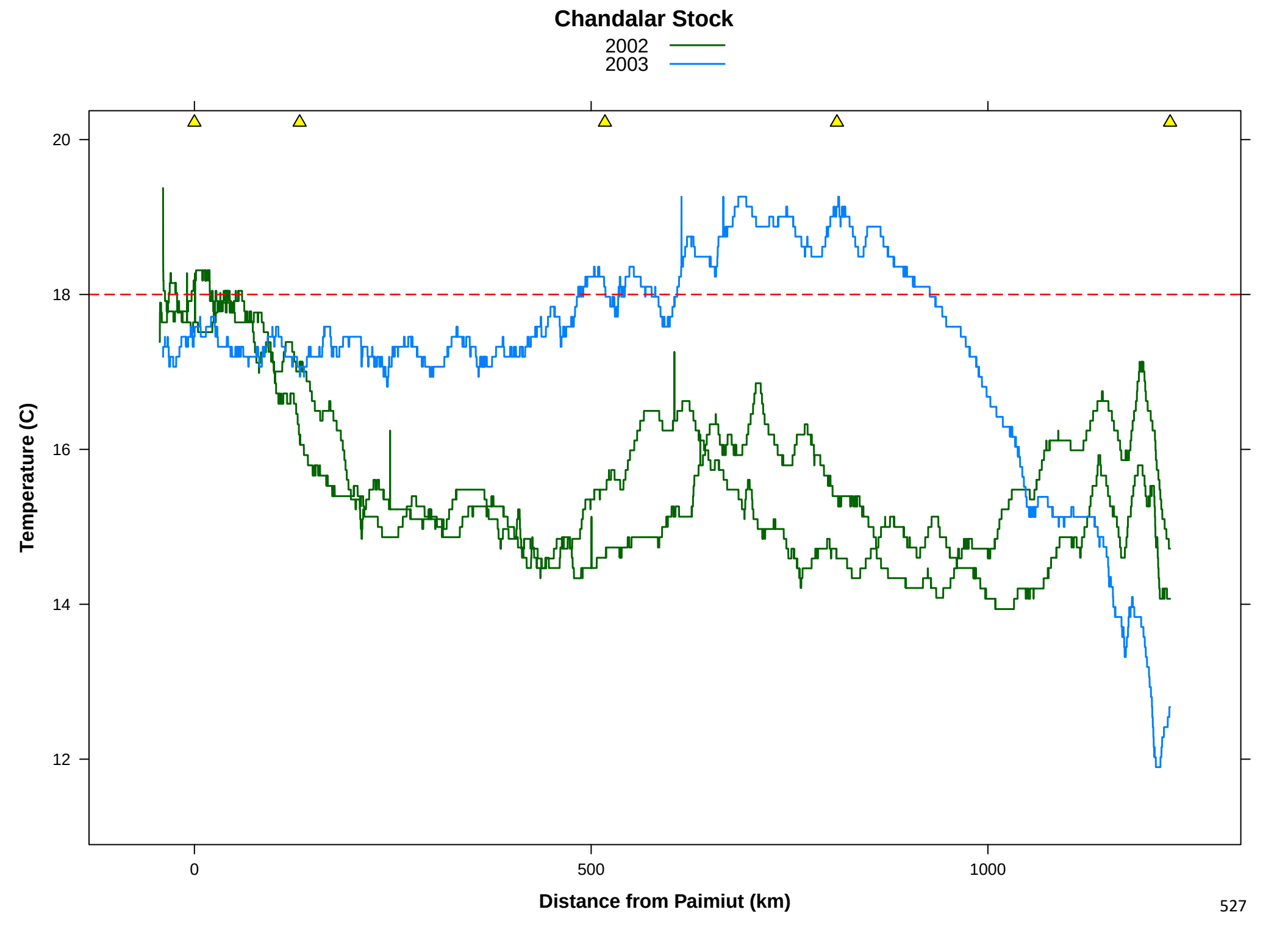

Chandalar Stock
2002_3006
2002_3017
2003_3137
0
500
1000
0
5
10
15
Depth (m)
Distance from Paimiut (km)

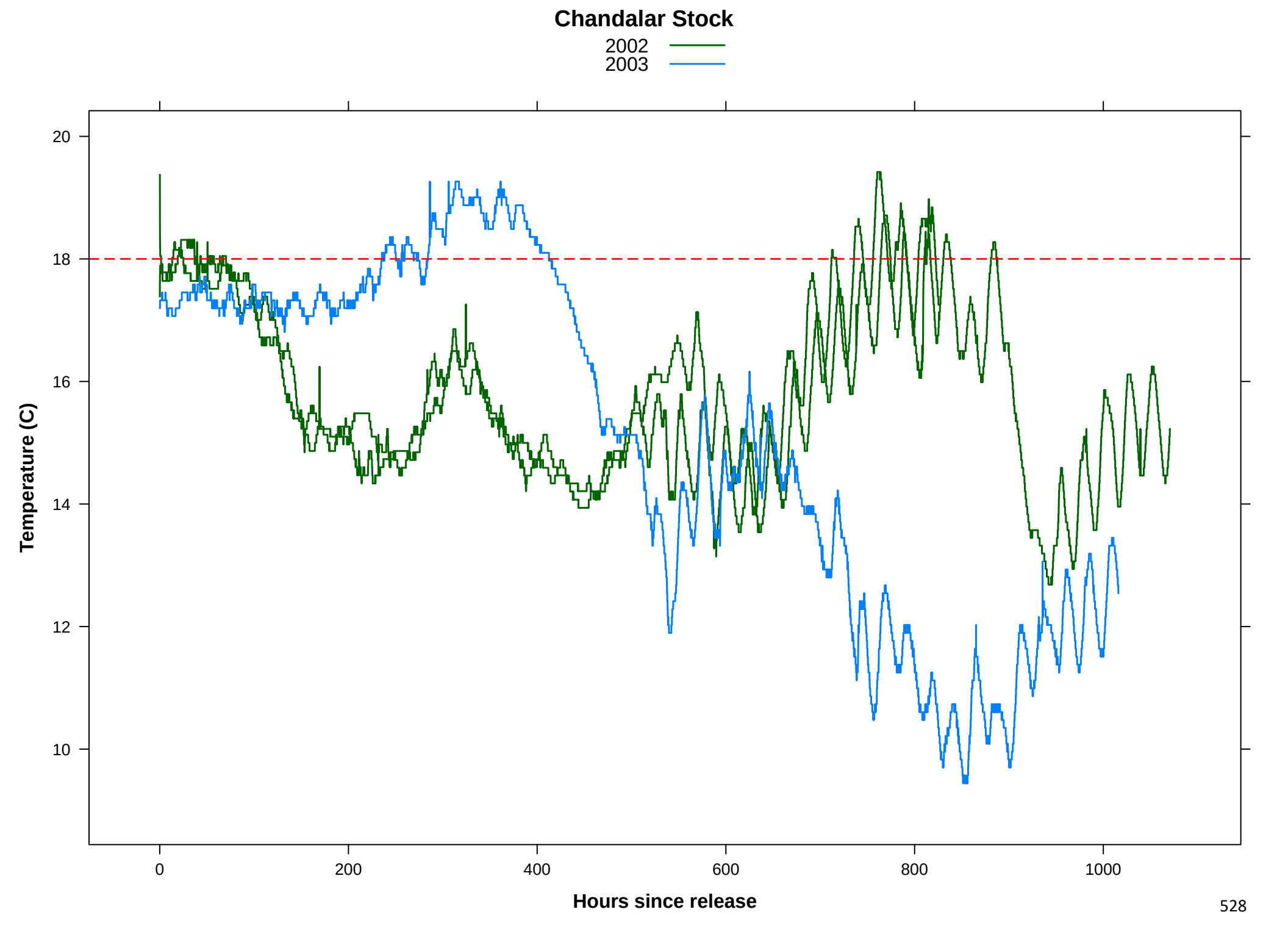

Chandalar Stock
2002_3006
2002_3017
2003_3137
0
200
400
600
800
1000
0
5
10
15
Depth (m)
Hours since release

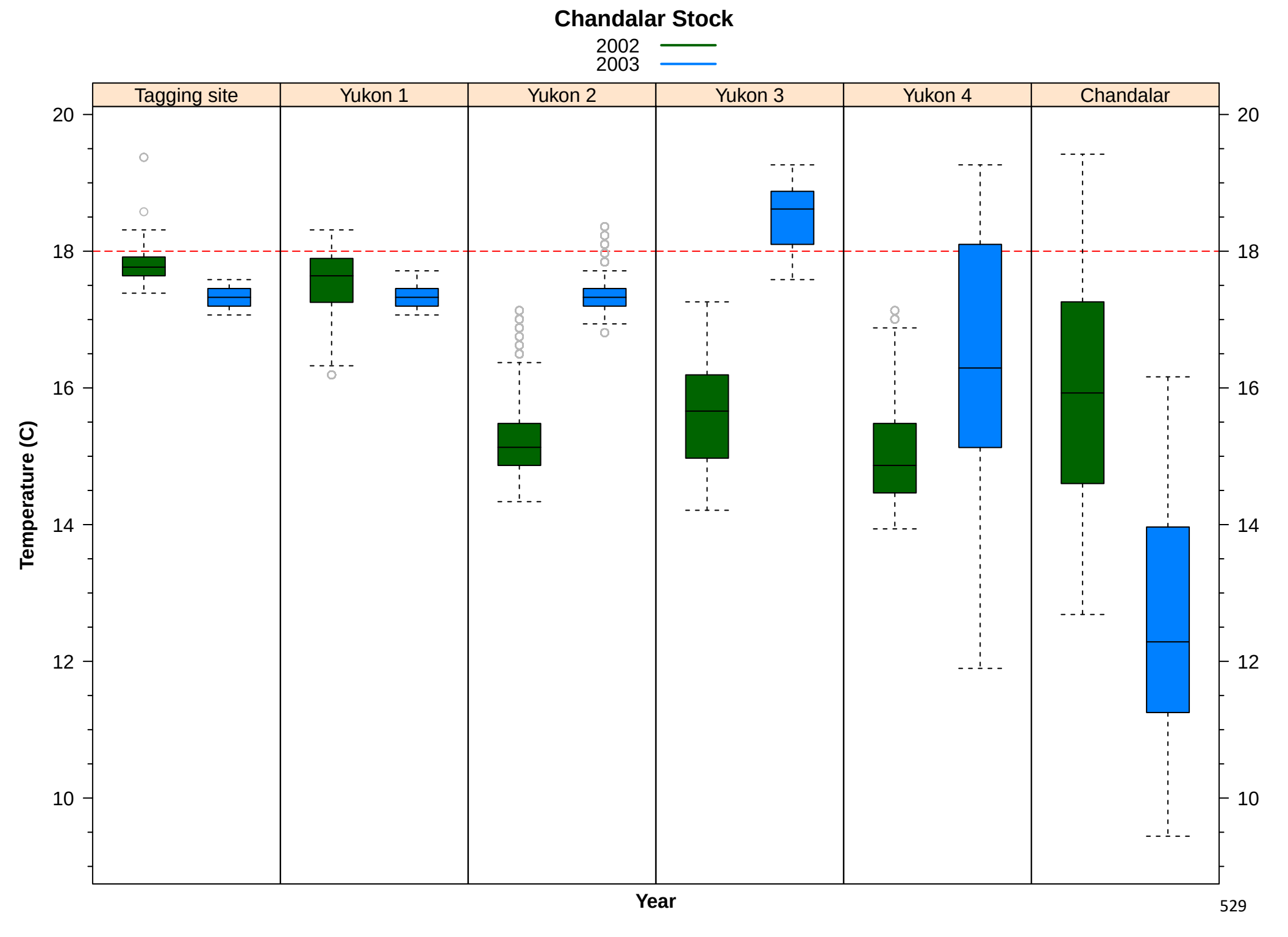

Chandalar Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Reach

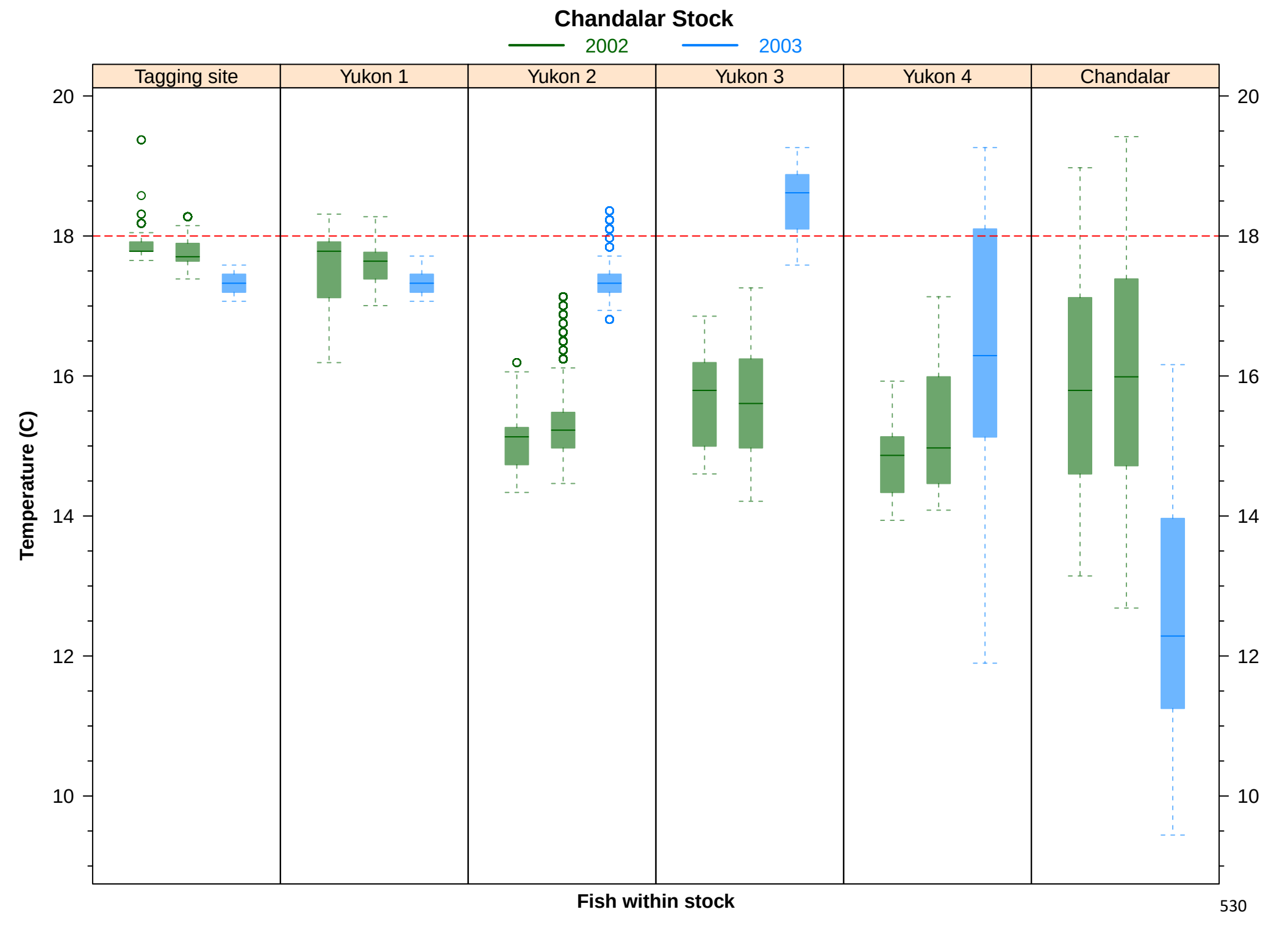

Chandalar Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Depth (m)
0
5
10
15
20
25
Fish within stock
525

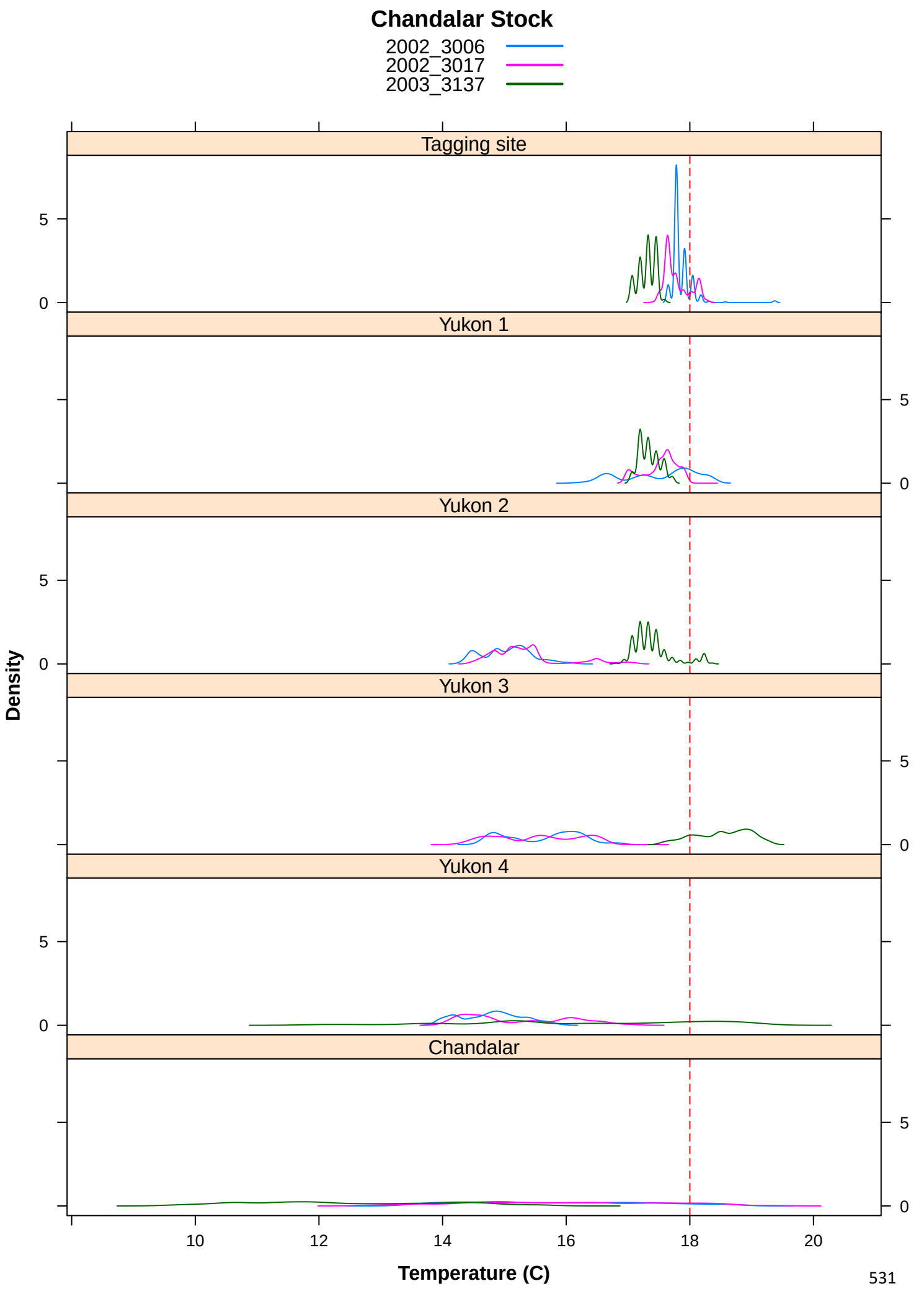

Chandalar Stock
2002_3006
2002_3017
2003_3137
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Density
Depth (m)
0
10
20
30
2
0

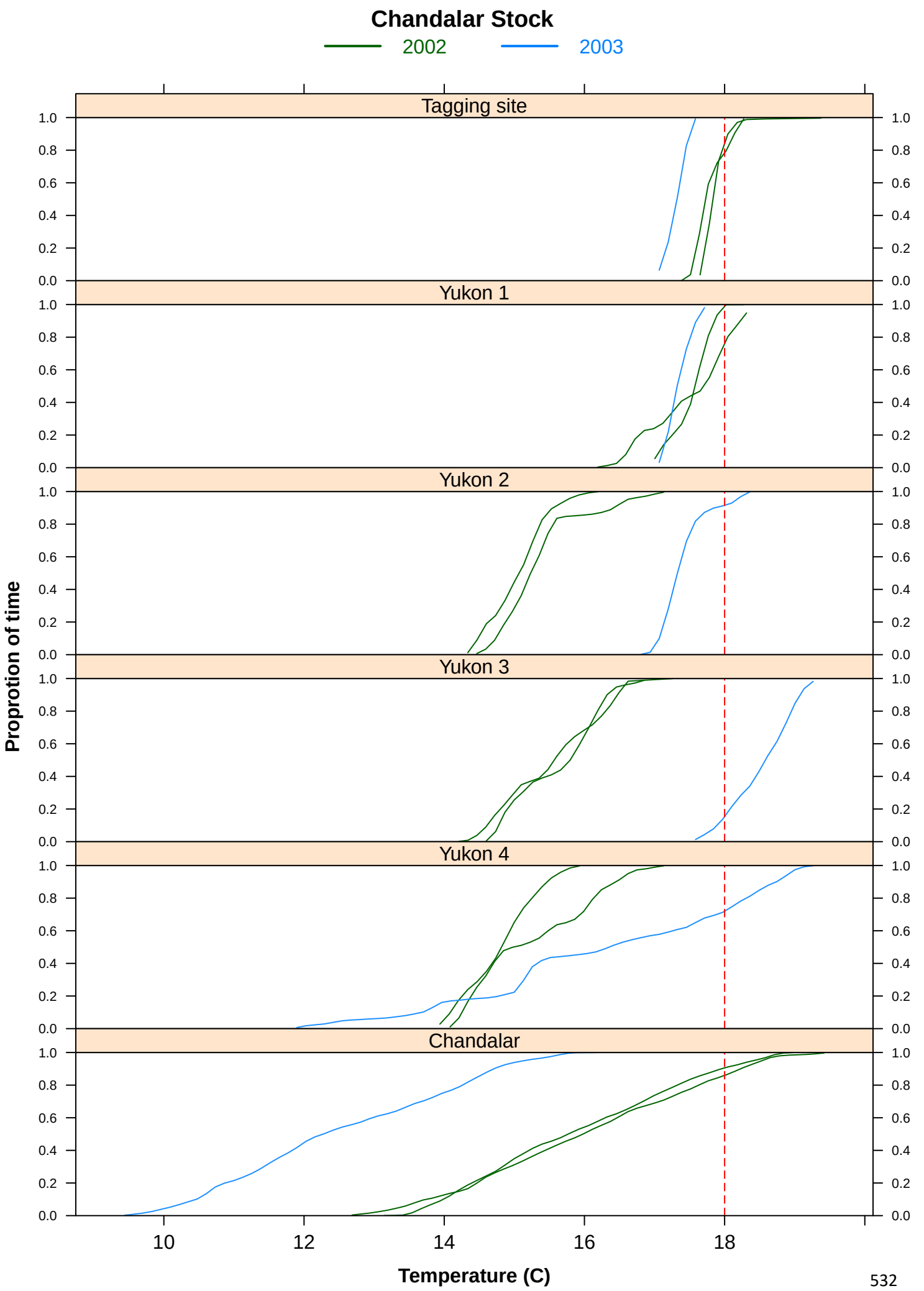

Chandalar Stock
2002
2003
20
18
16
14
12
Temperature (C)
0
500
1000
Distance from Paimiut (km)

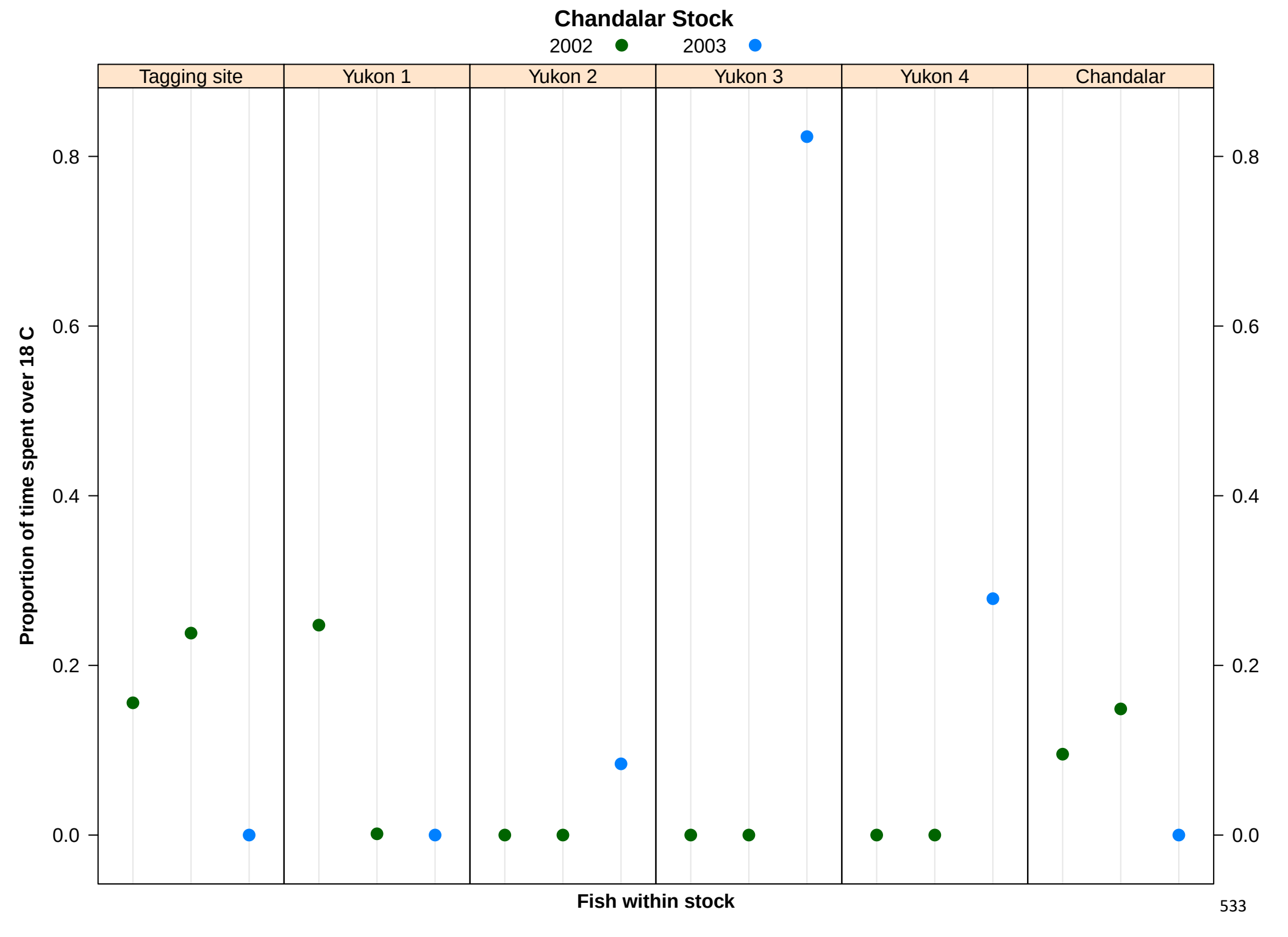

Chandalar Stock
2002
2003
Temperature (C)
20
18
16
14
12
10
0
200
400
600
800
1000
Hours since release

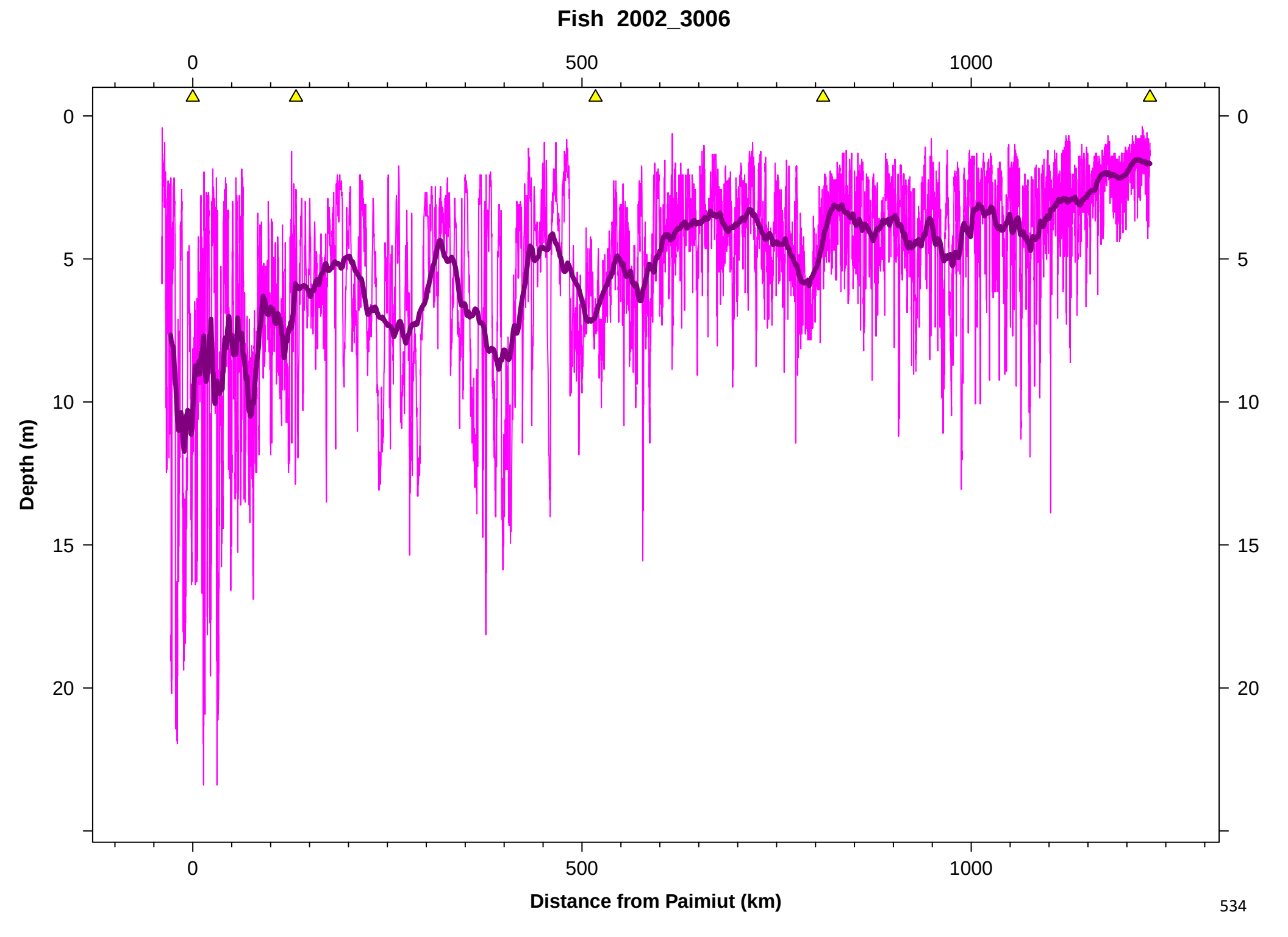

Chandalar Stock
2002
2003
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Temperature (C)
Year
20
18
16
14
12
10

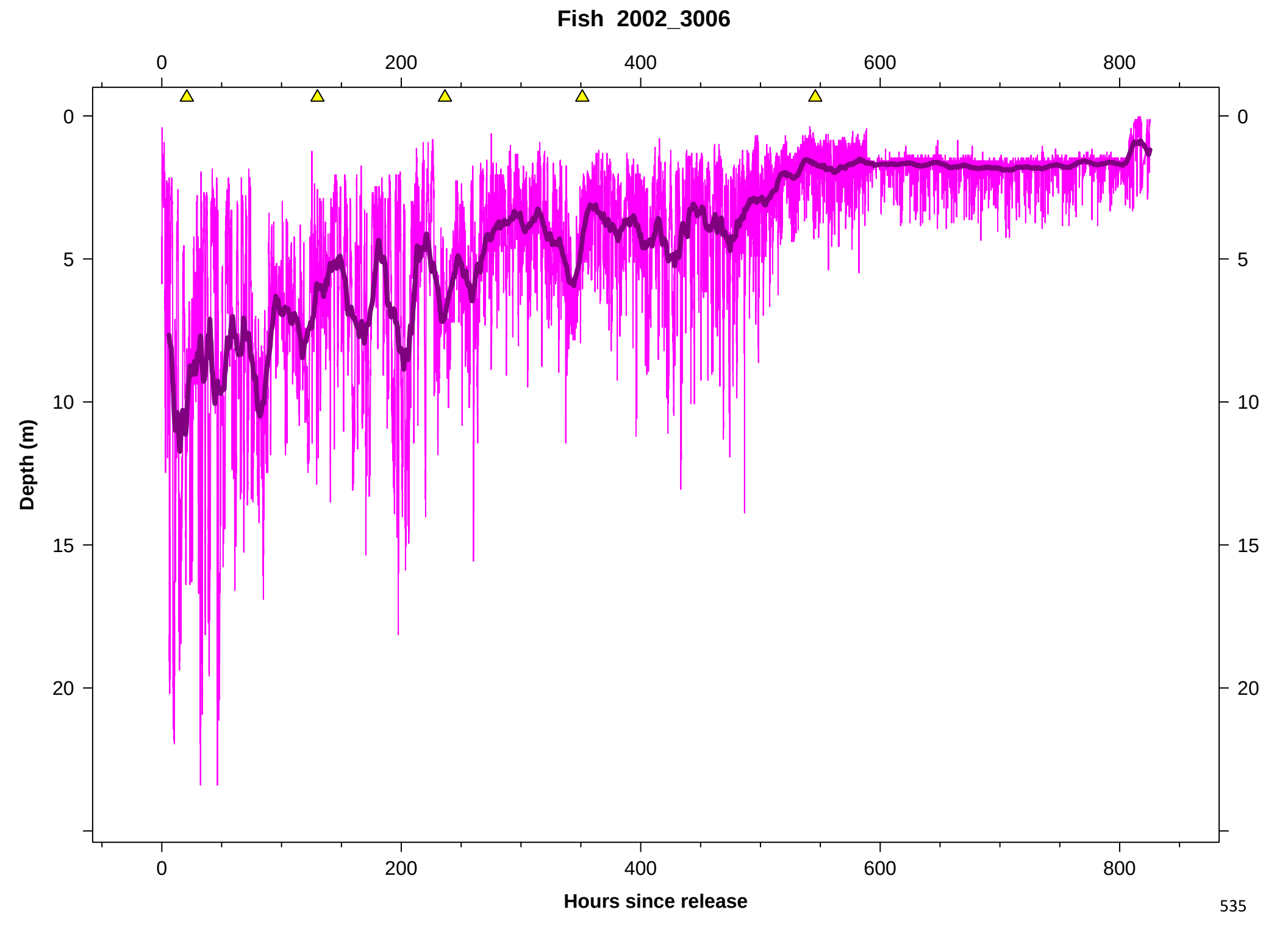

Chandalar Stock
2002
2003
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
20
18
16
14
12
10
Temperature (C)
Fish within stock

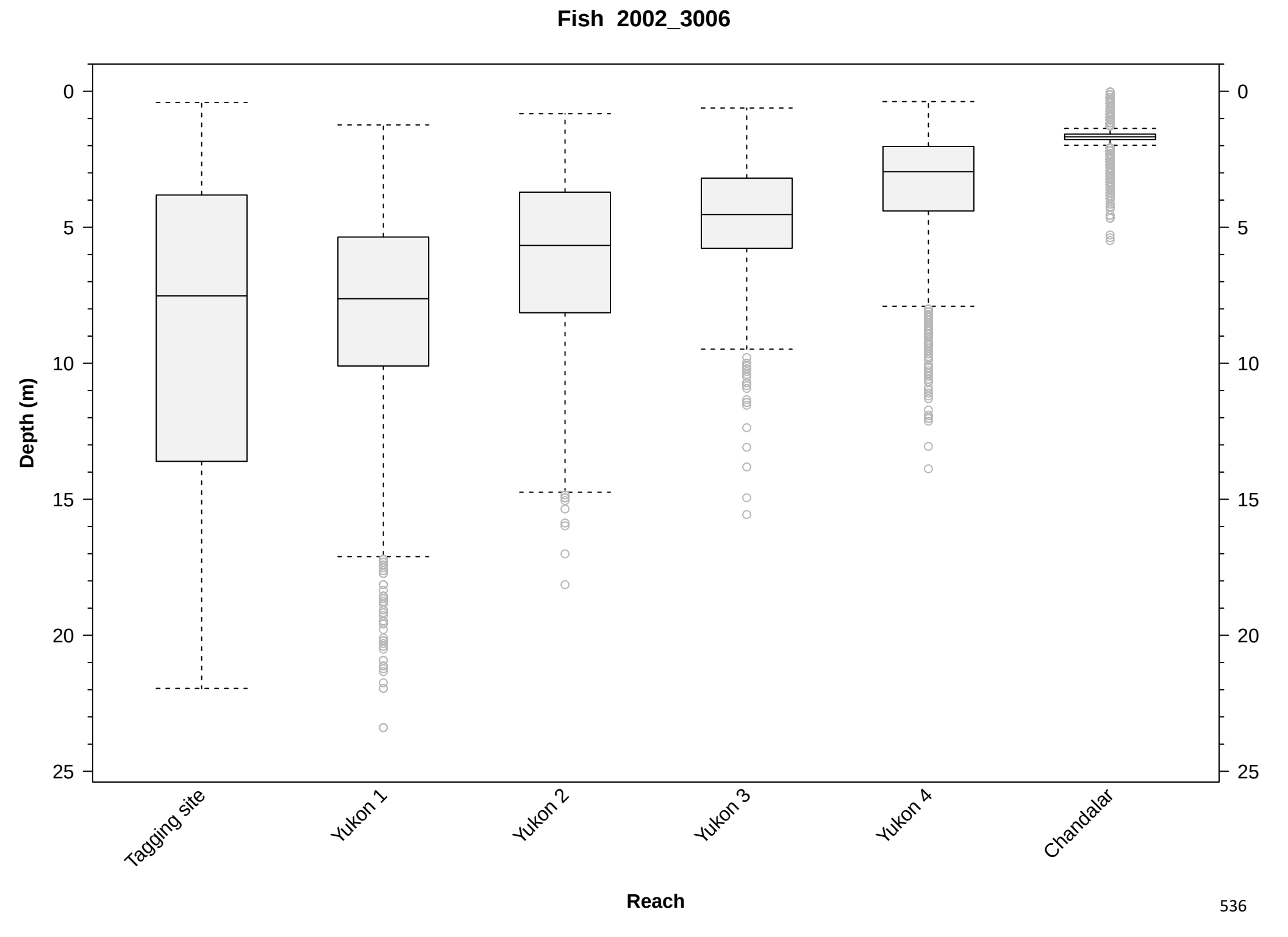

Chandalar Stock
2002_3006
2002_3017
2003_3137
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Density
0
5
10
12
14
16
18
20
Temperature (C)

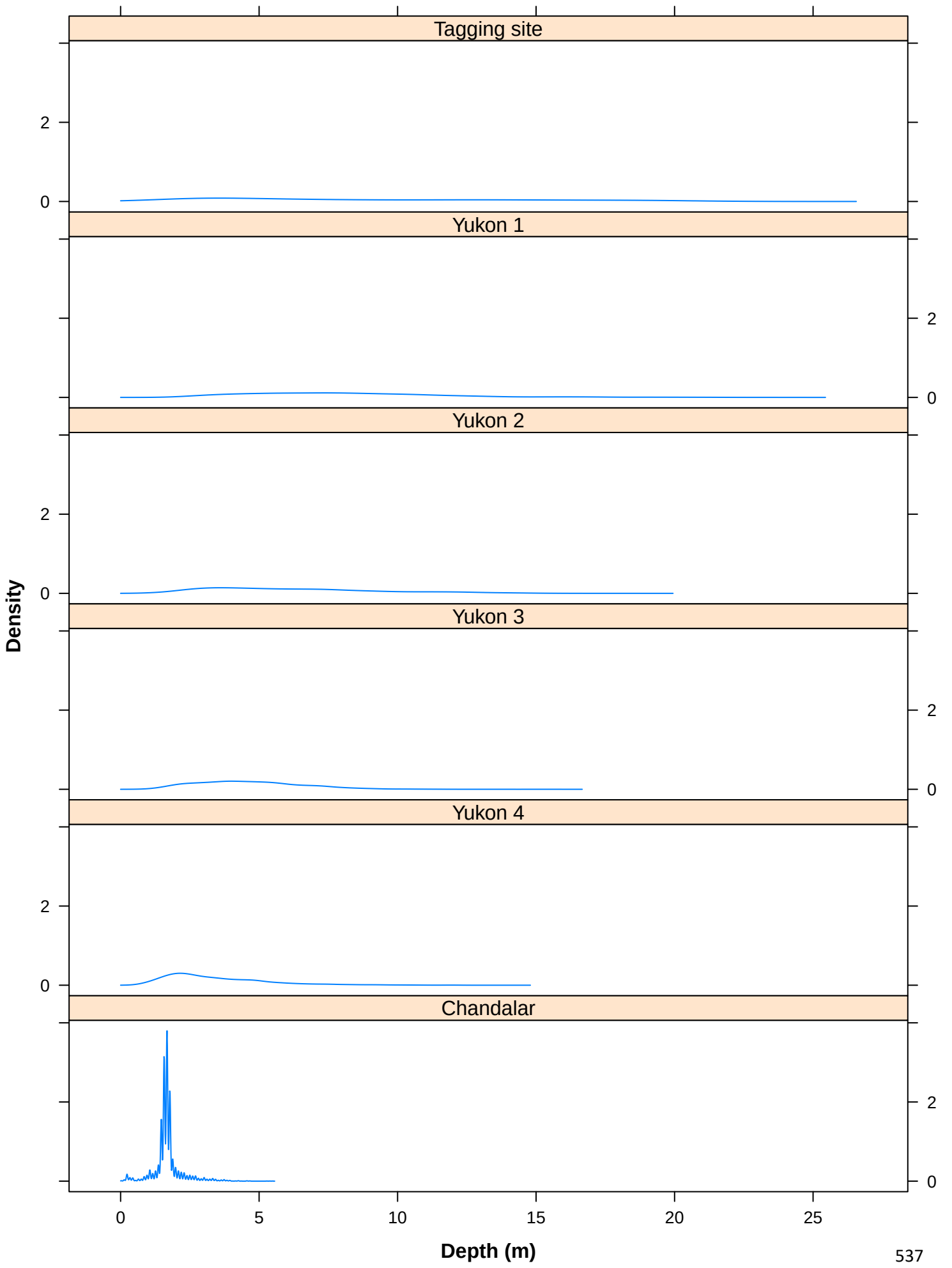

Chandalar Stock
2002
2003
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Proprotion of time
0.0
0.2
0.4
0.6
0.8
1.0
10
12
14
16
18
Temperature (C)

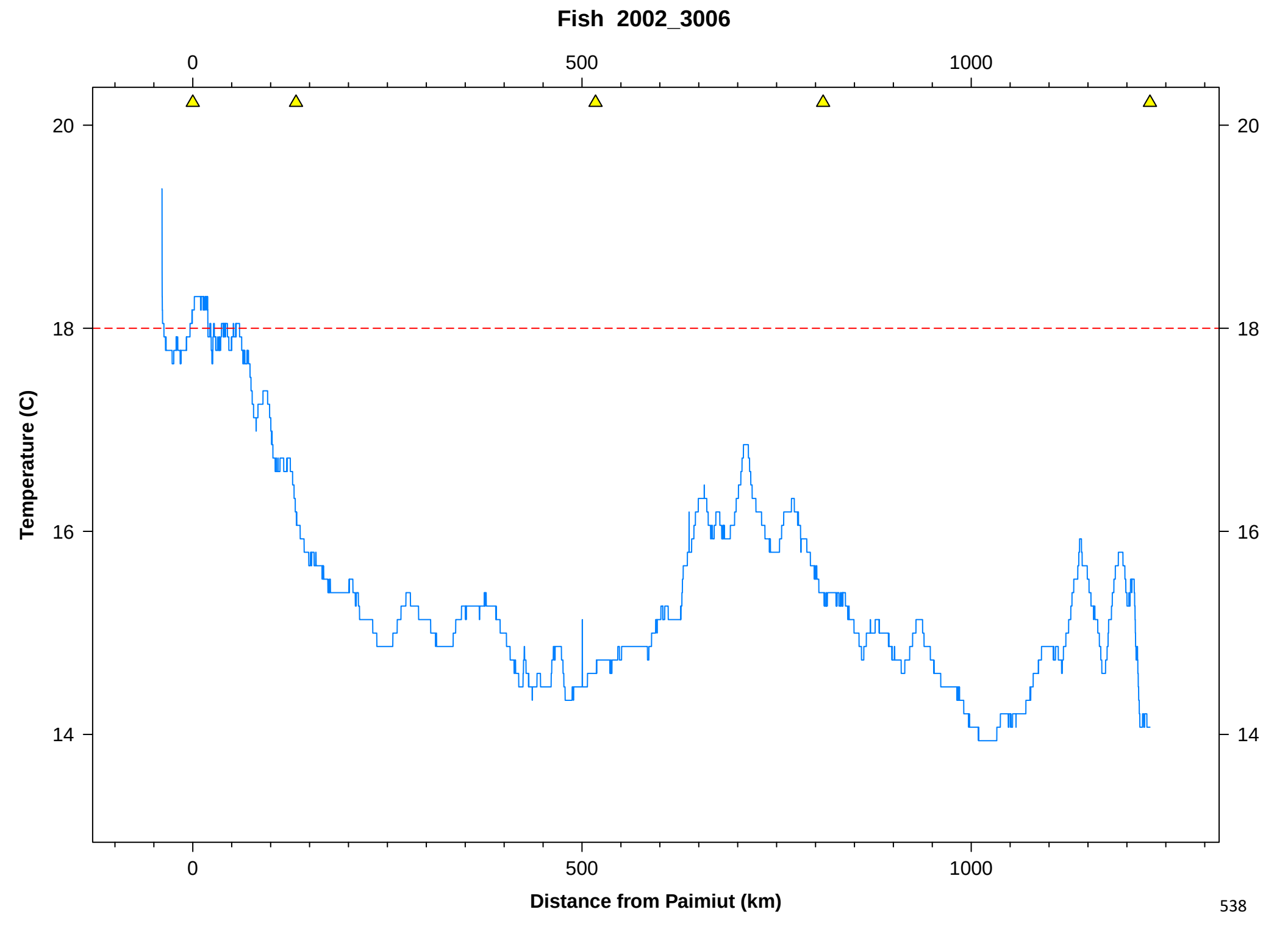

Chandalar Stock
2002
2003
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock

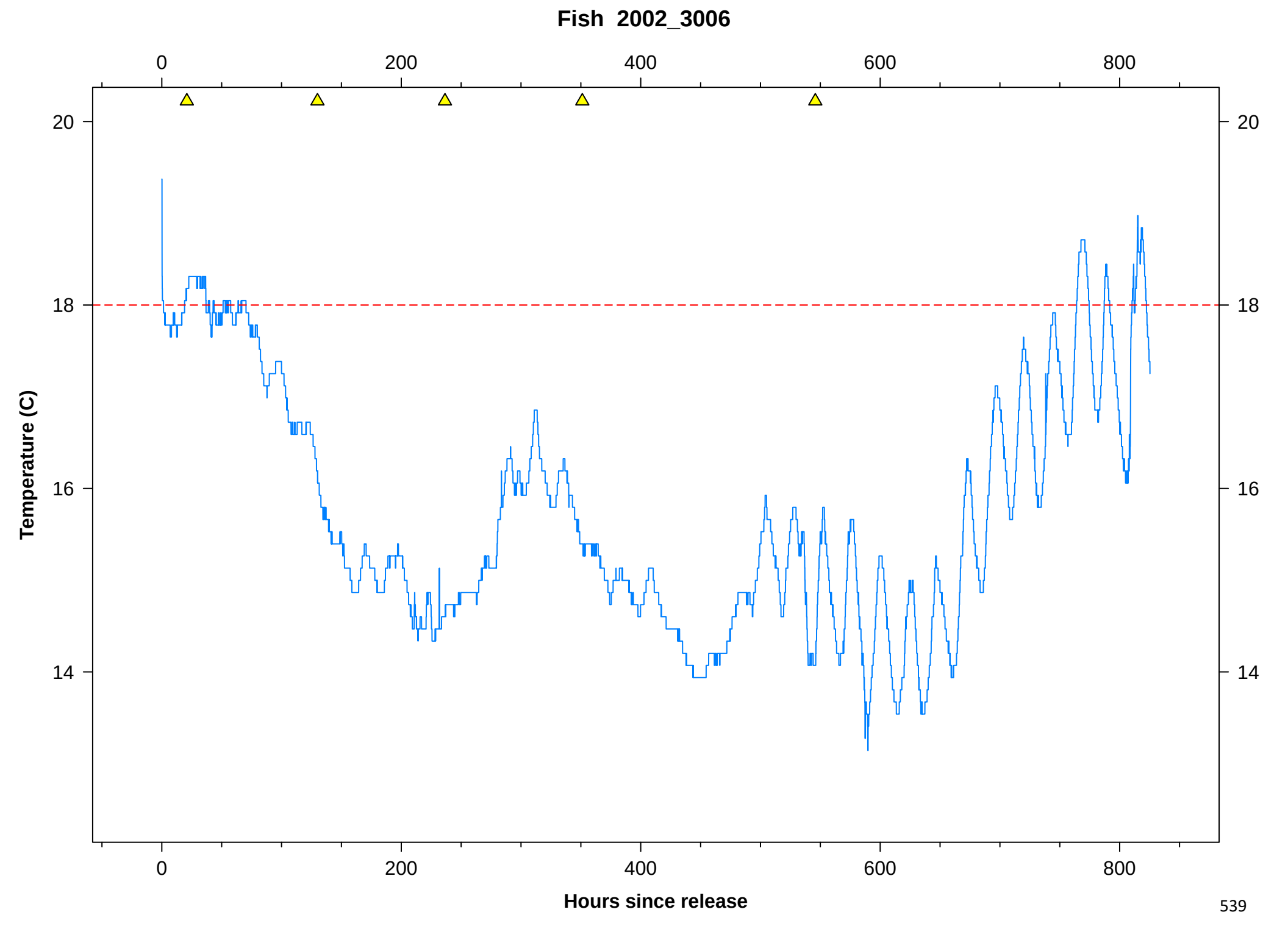

Fish 2002_3006
0
500
1000
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

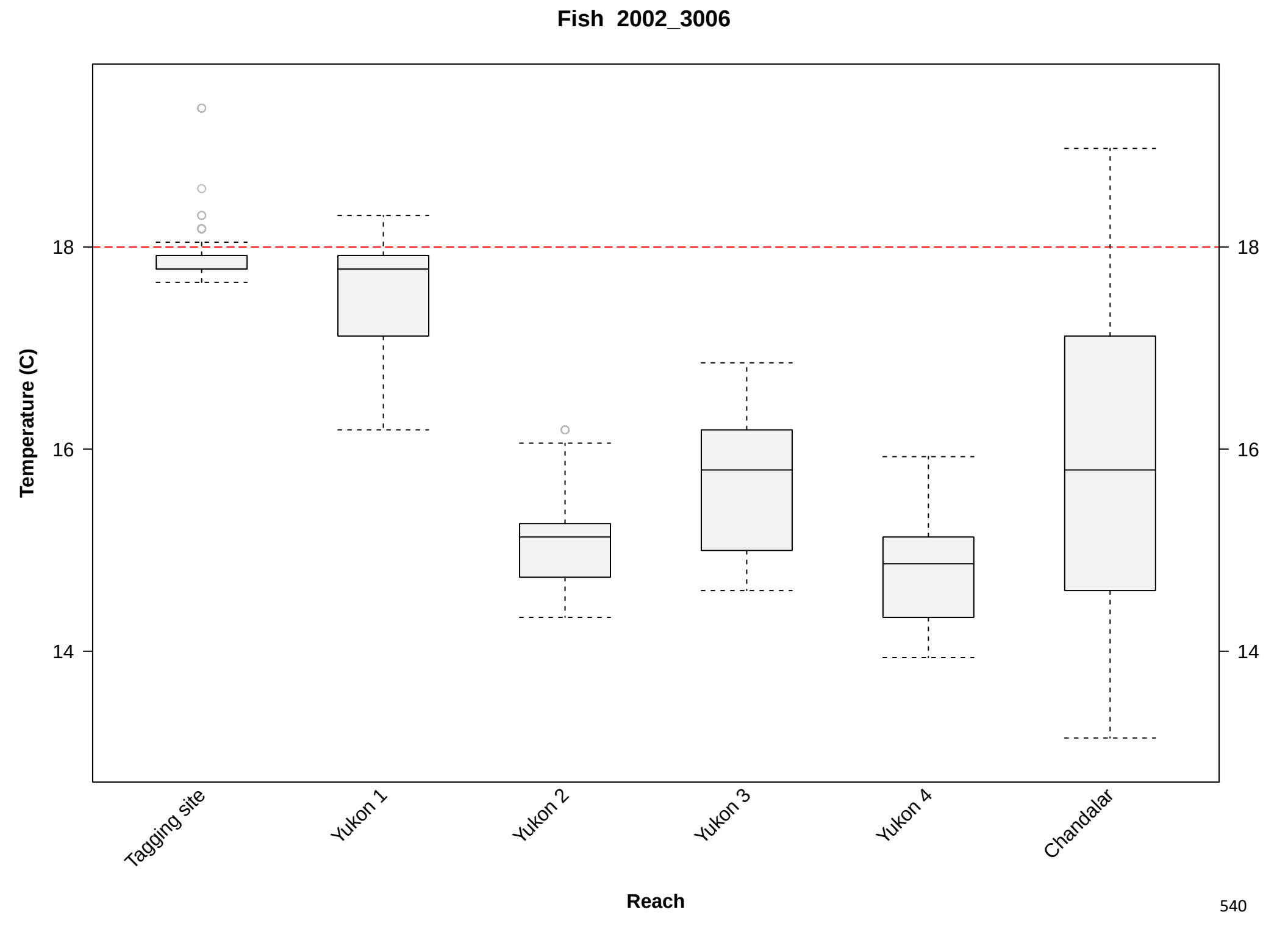

Fish 2002_3006
0
200
400
600
800
0
5
10
15
20
Depth (m)
Hours since release

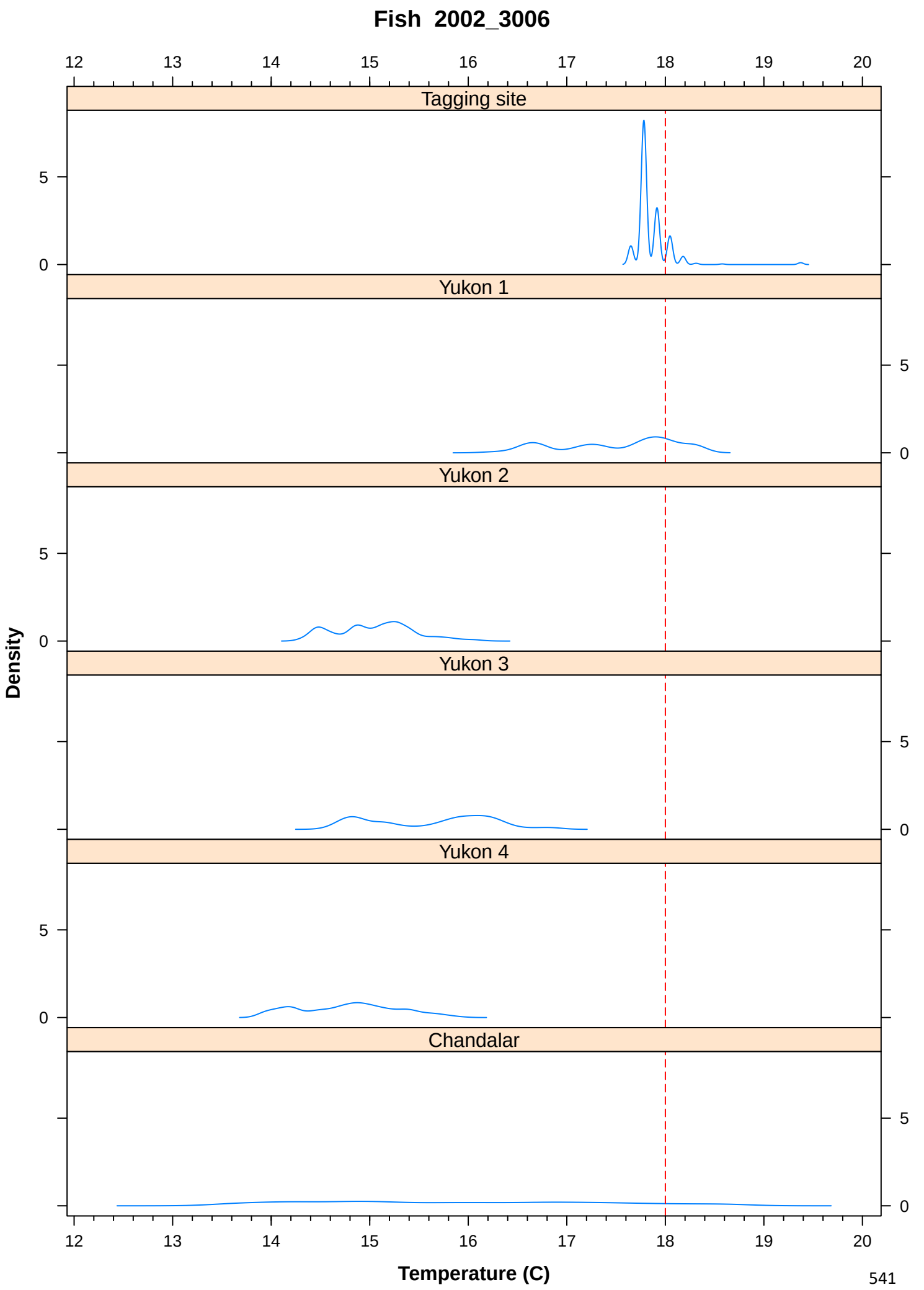

Fish 2002_3006
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Reach

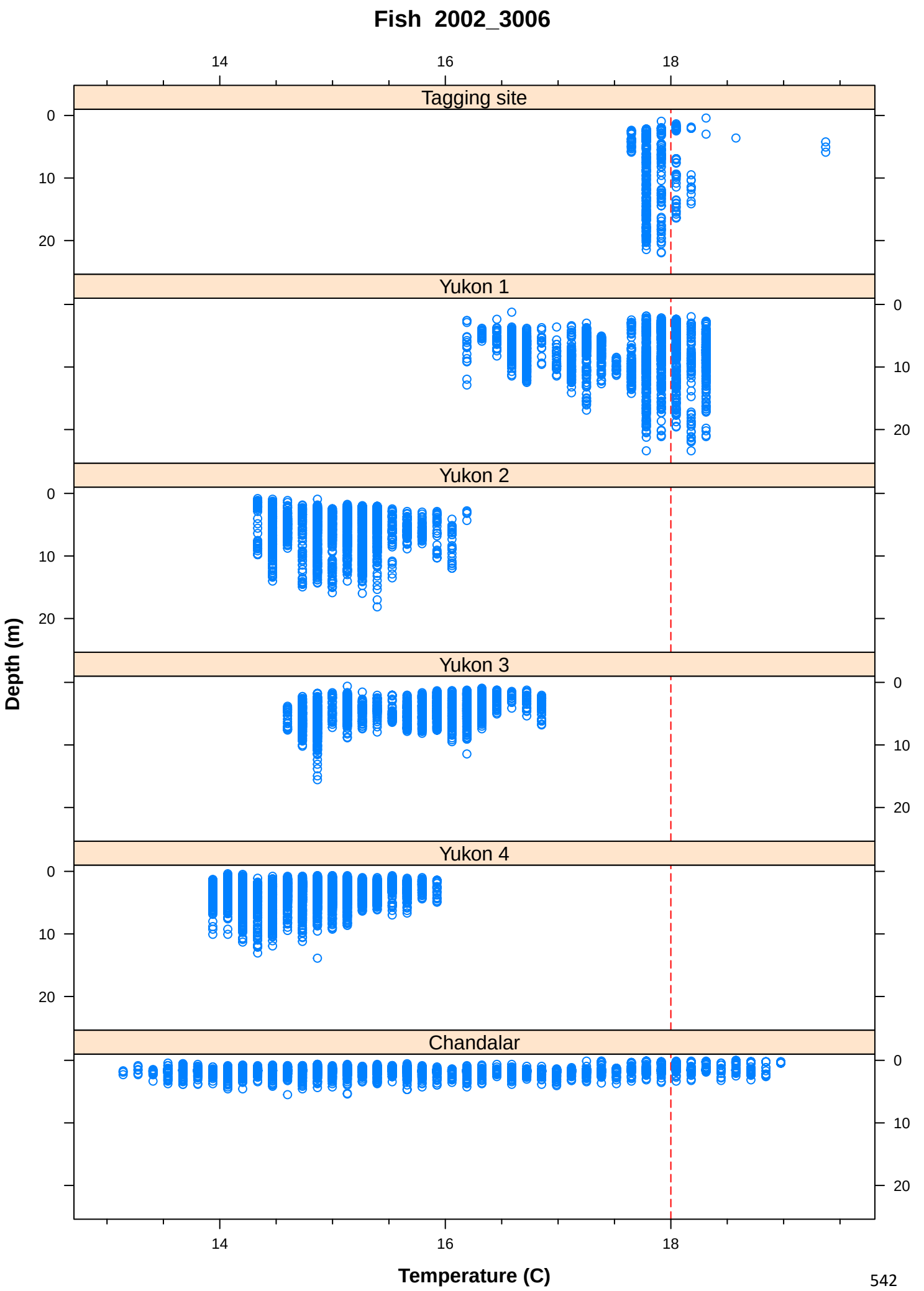

Fish 2002_3006
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Density
Depth (m)
0
5
10
15
20
25
2
0

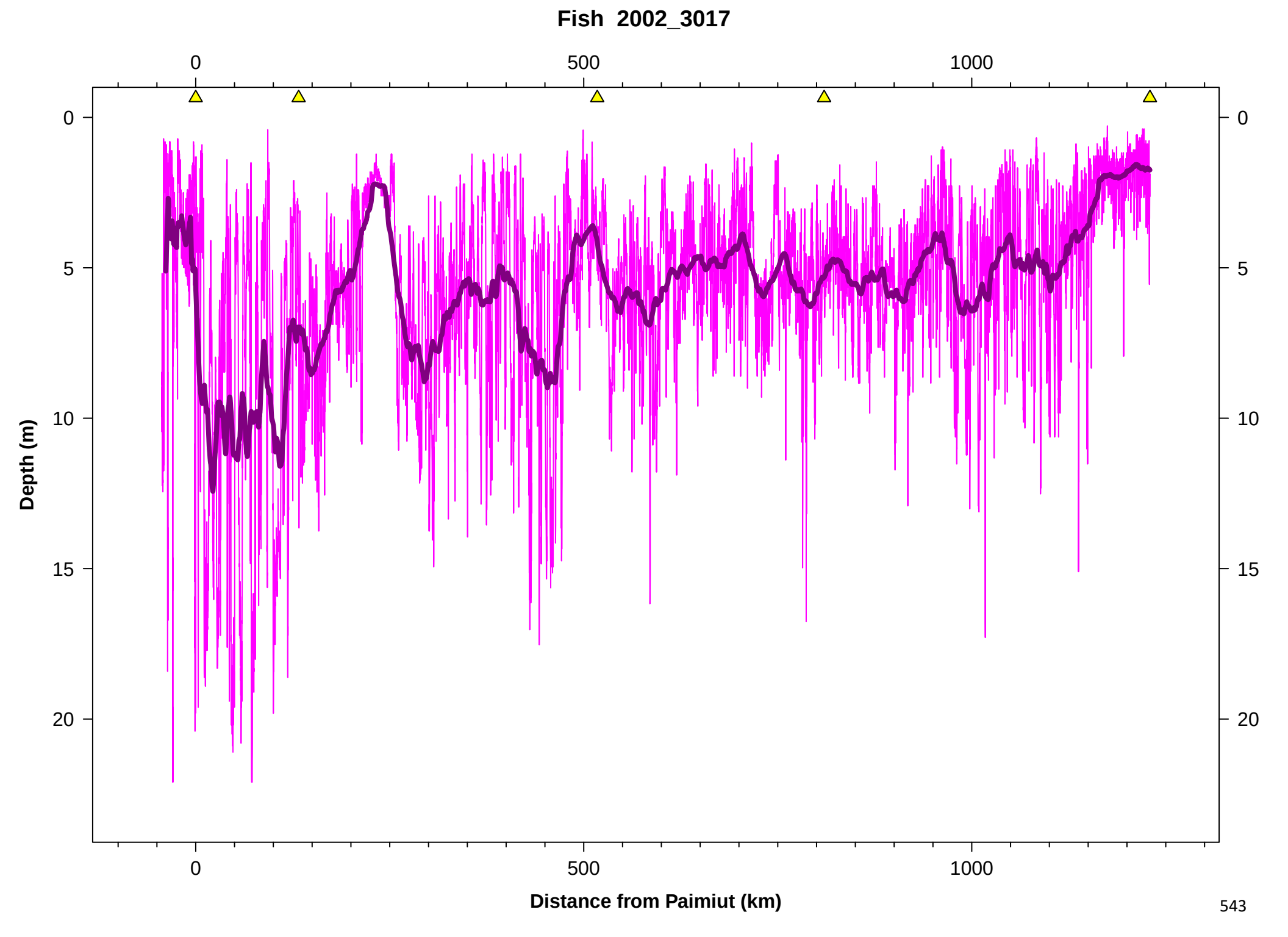

Fish 2002_3006
0
500
1000
20
18
16
14
Temperature (C)
Distance from Paimiut (km)

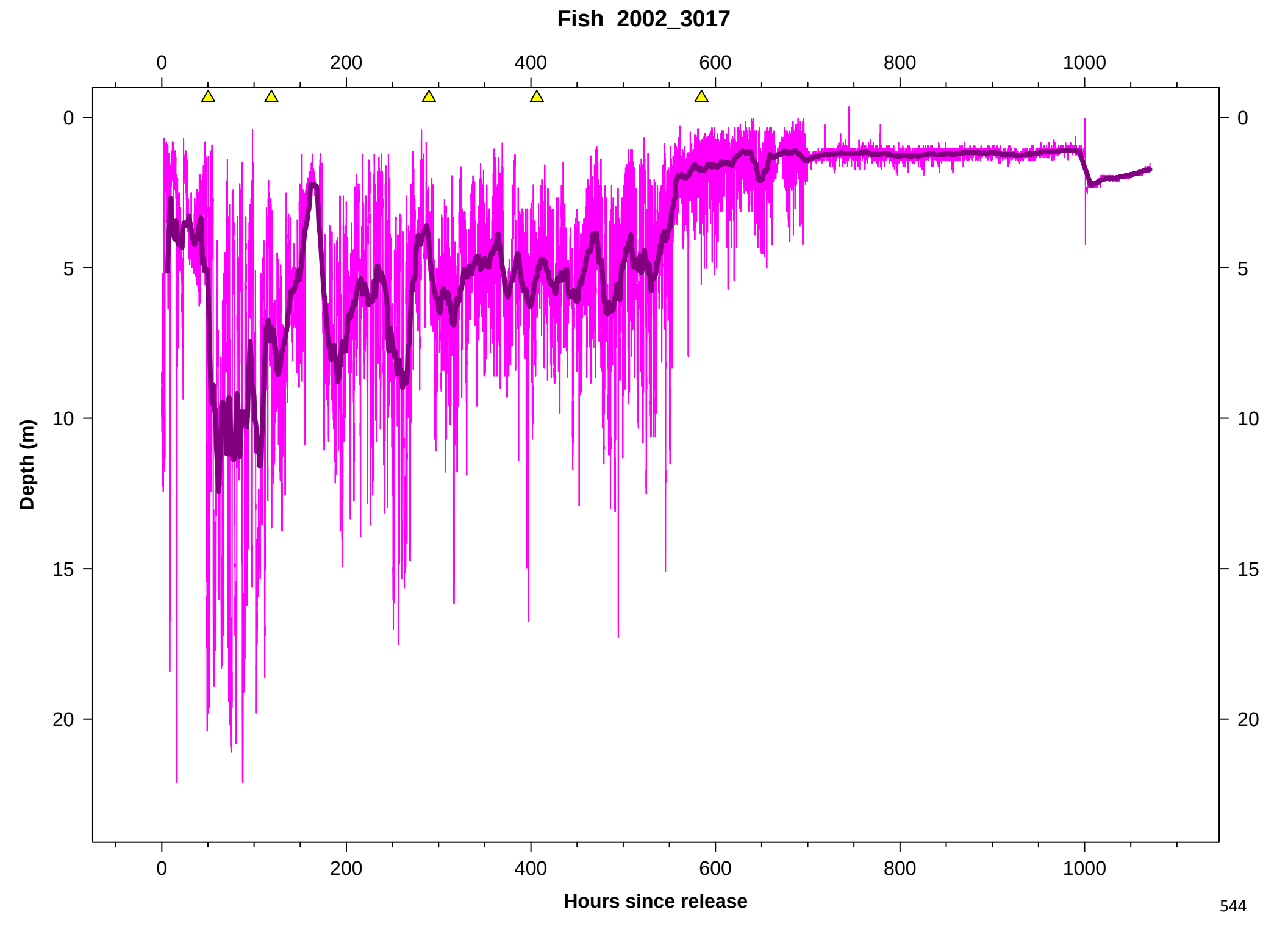

Fish 2002_3006
0
200
400
600
800
20
18
16
14
Temperature (C)
Hours since release

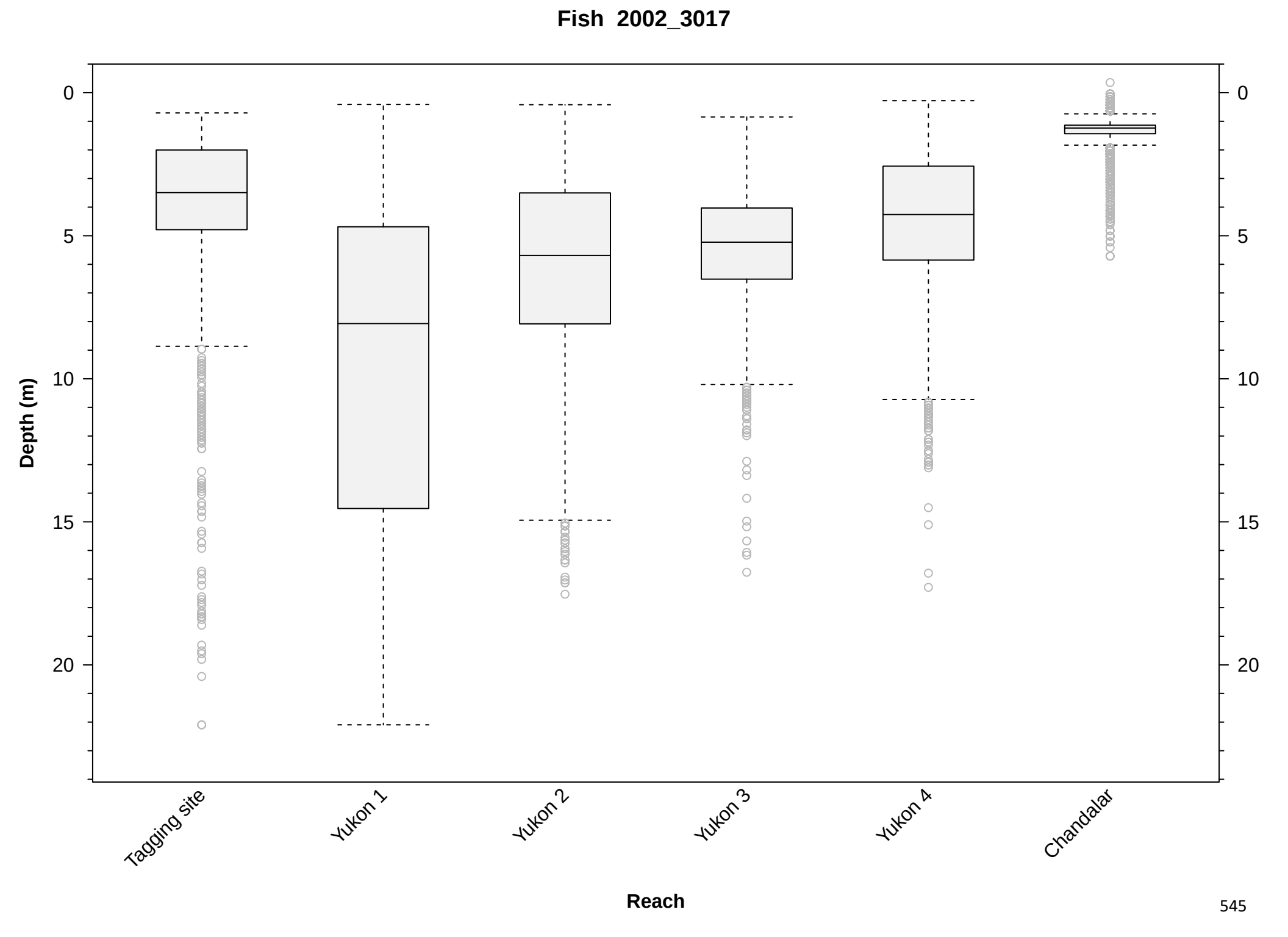

Fish 2002_3006
Temperature (C)
18
16
14
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Reach

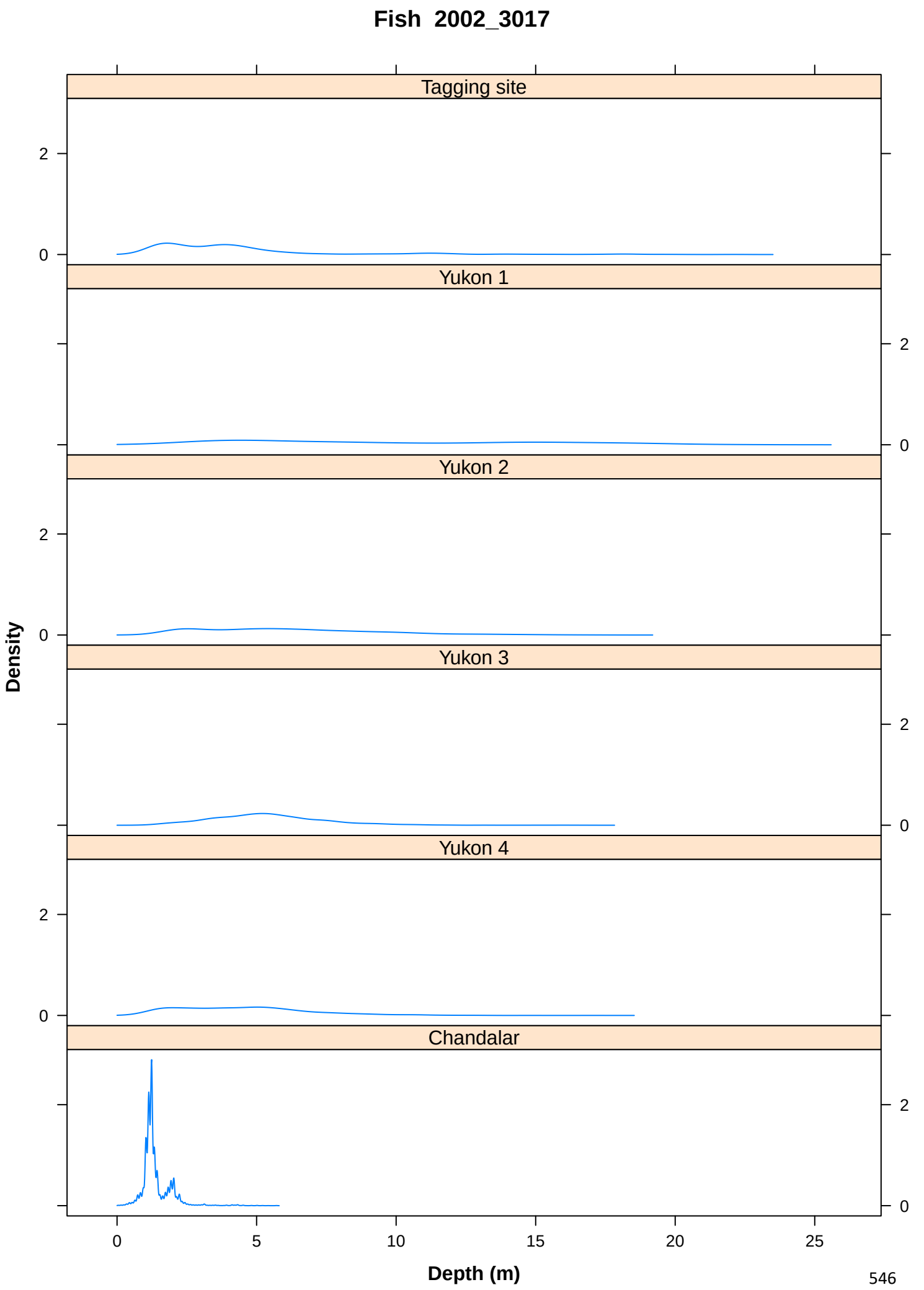

Fish 2002_3006
12
13
14
15
16
17
18
19
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
5
0
Density
Temperature (C)

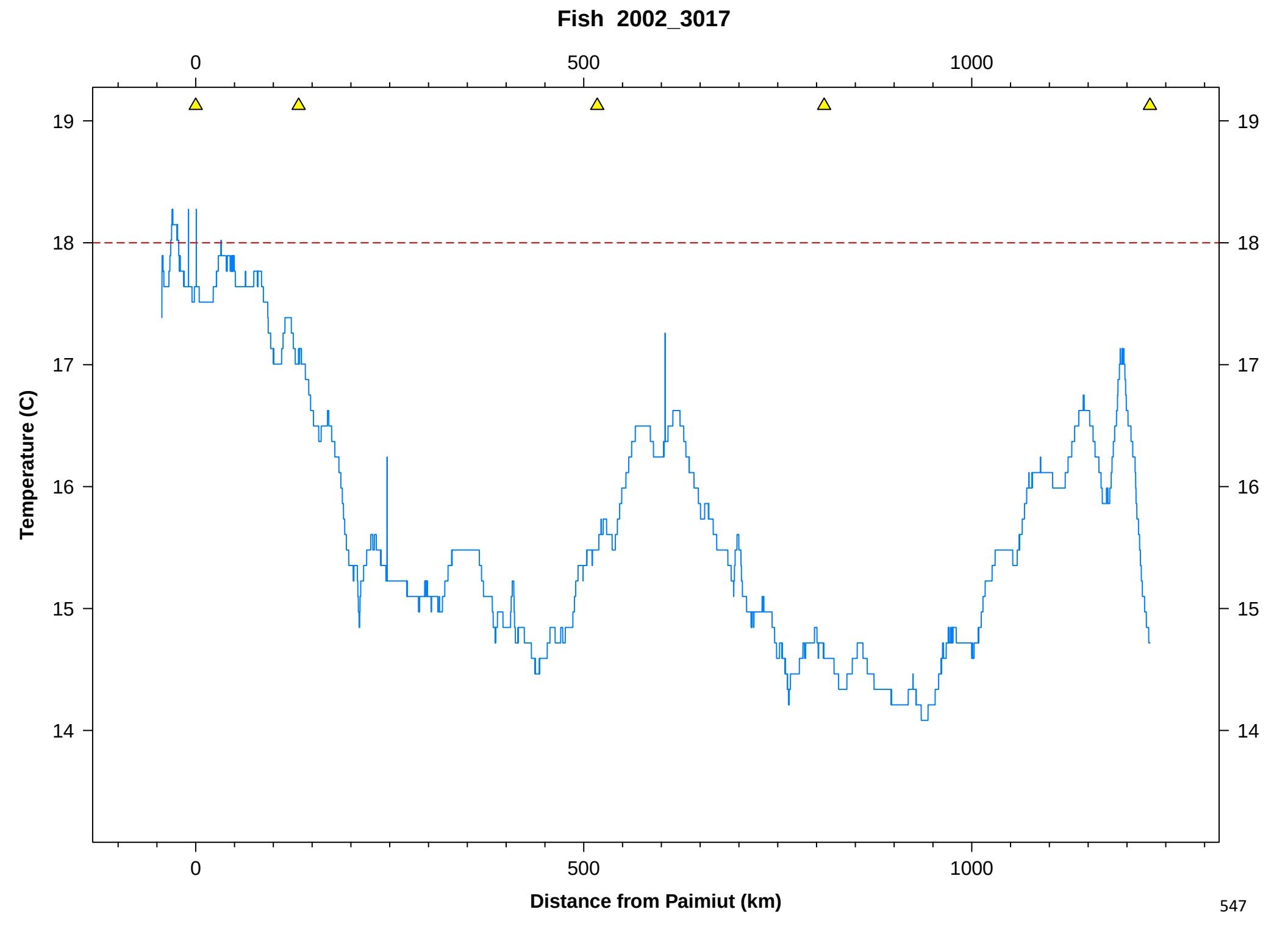

Fish 2002_3006
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Depth (m)
Temperature (C)
14
16
18
0
10
20

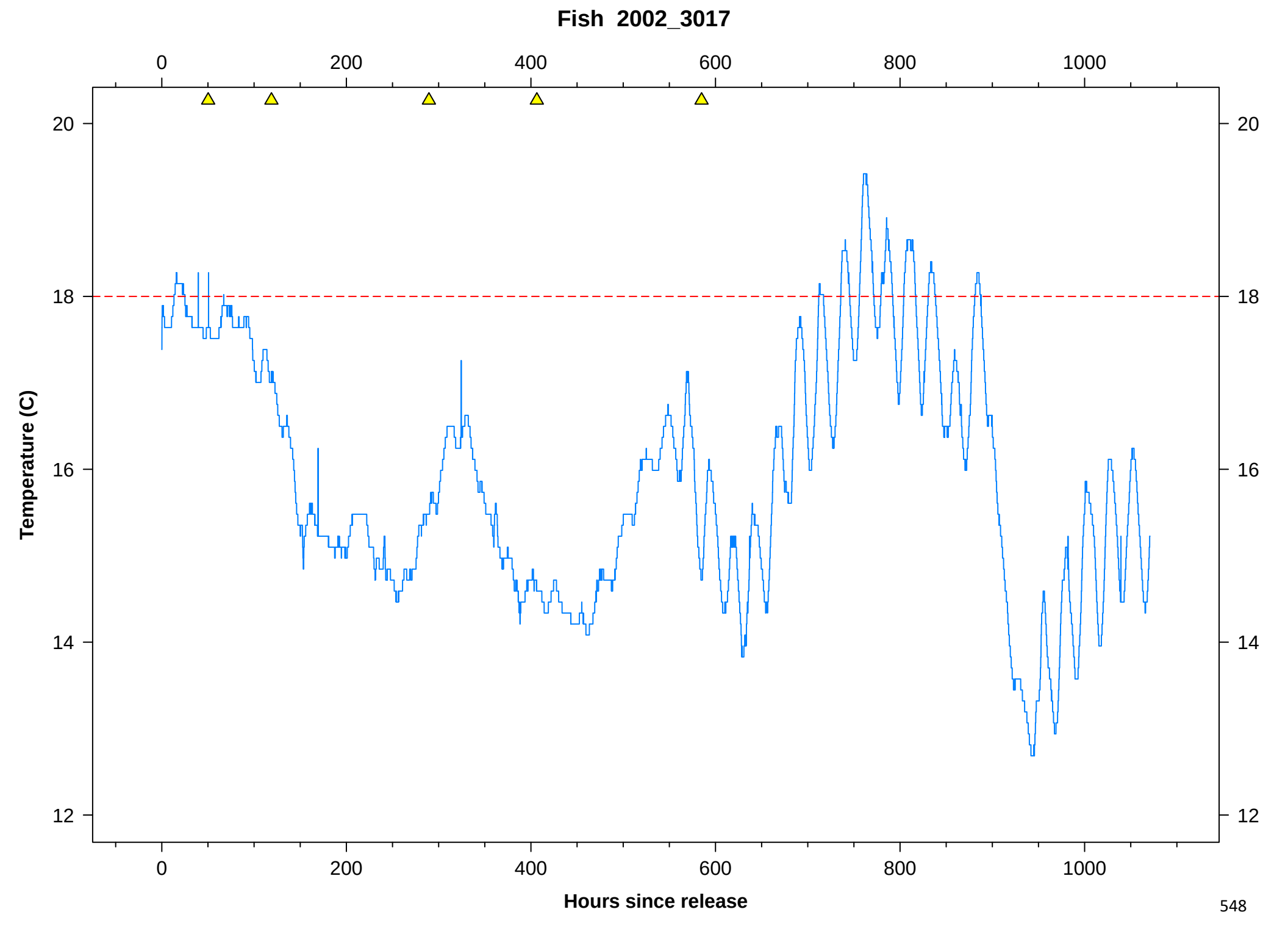

Fish 2002_3017
0
500
1000
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

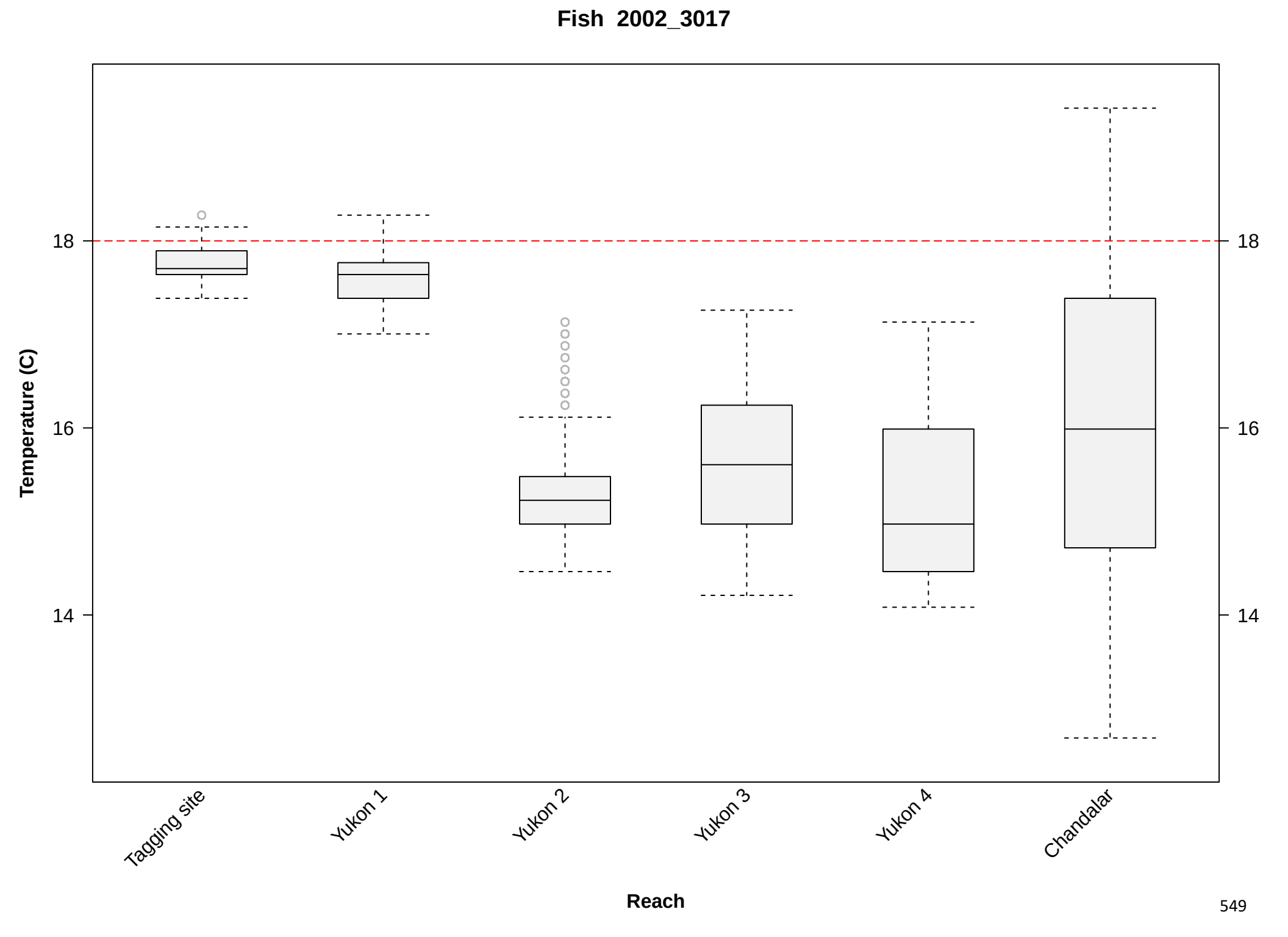

Fish 2002_3017
0
200
400
600
800
1000
0
5
10
15
20
Depth (m)
Hours since release

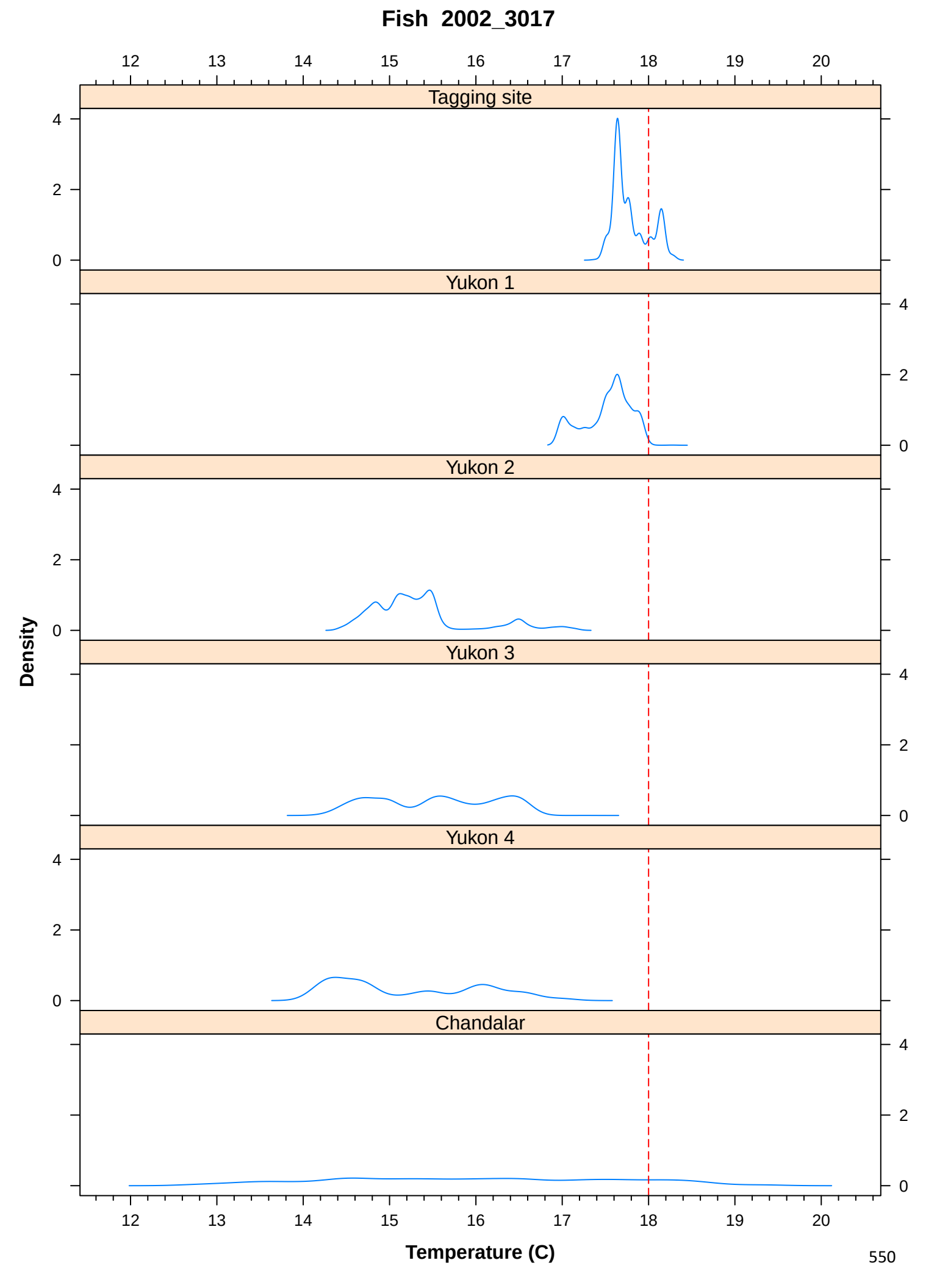

Fish 2002_3017
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Reach

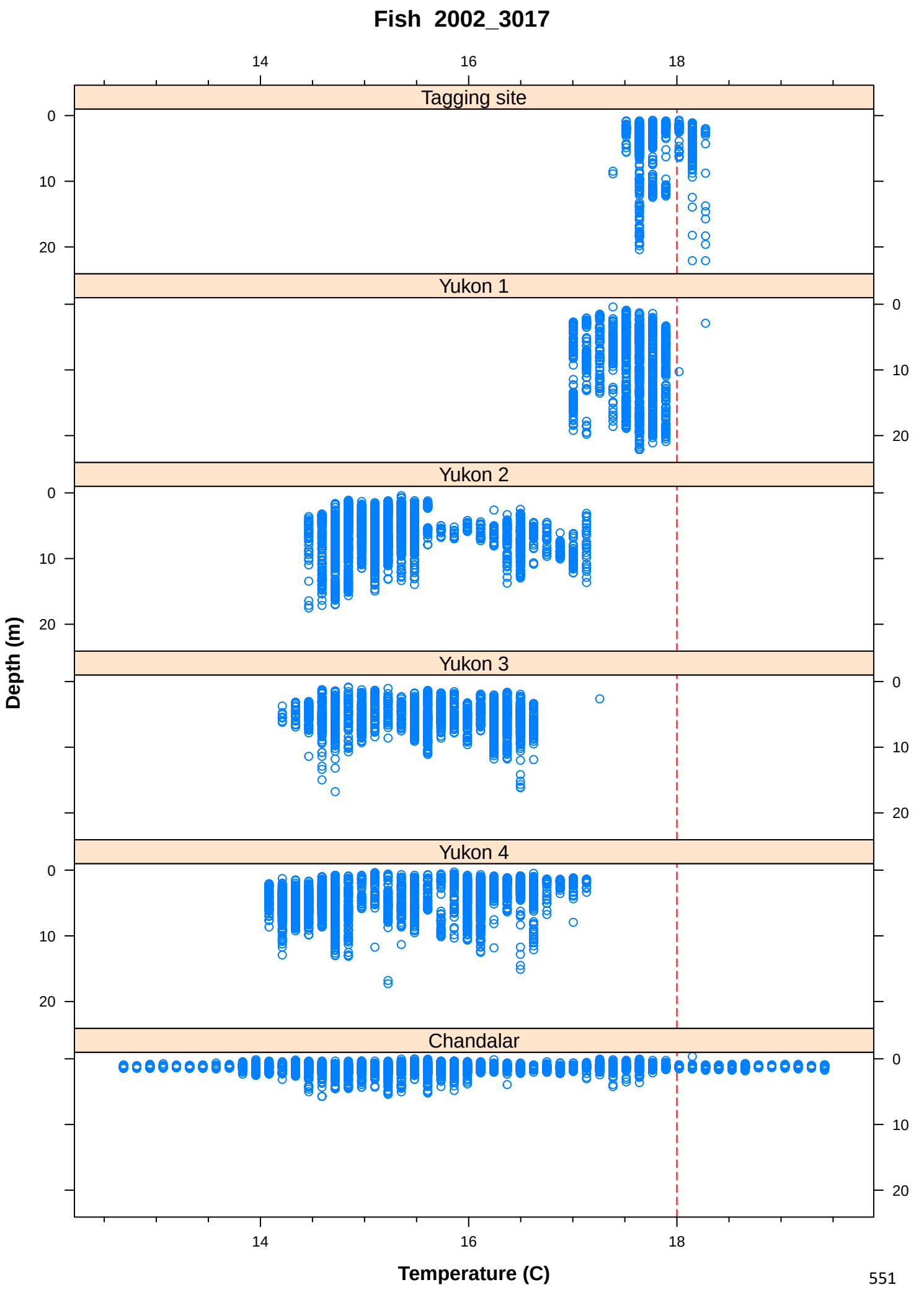

Fish 2002_3017
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Density
Depth (m)
0
5
10
15
20
25
2
0

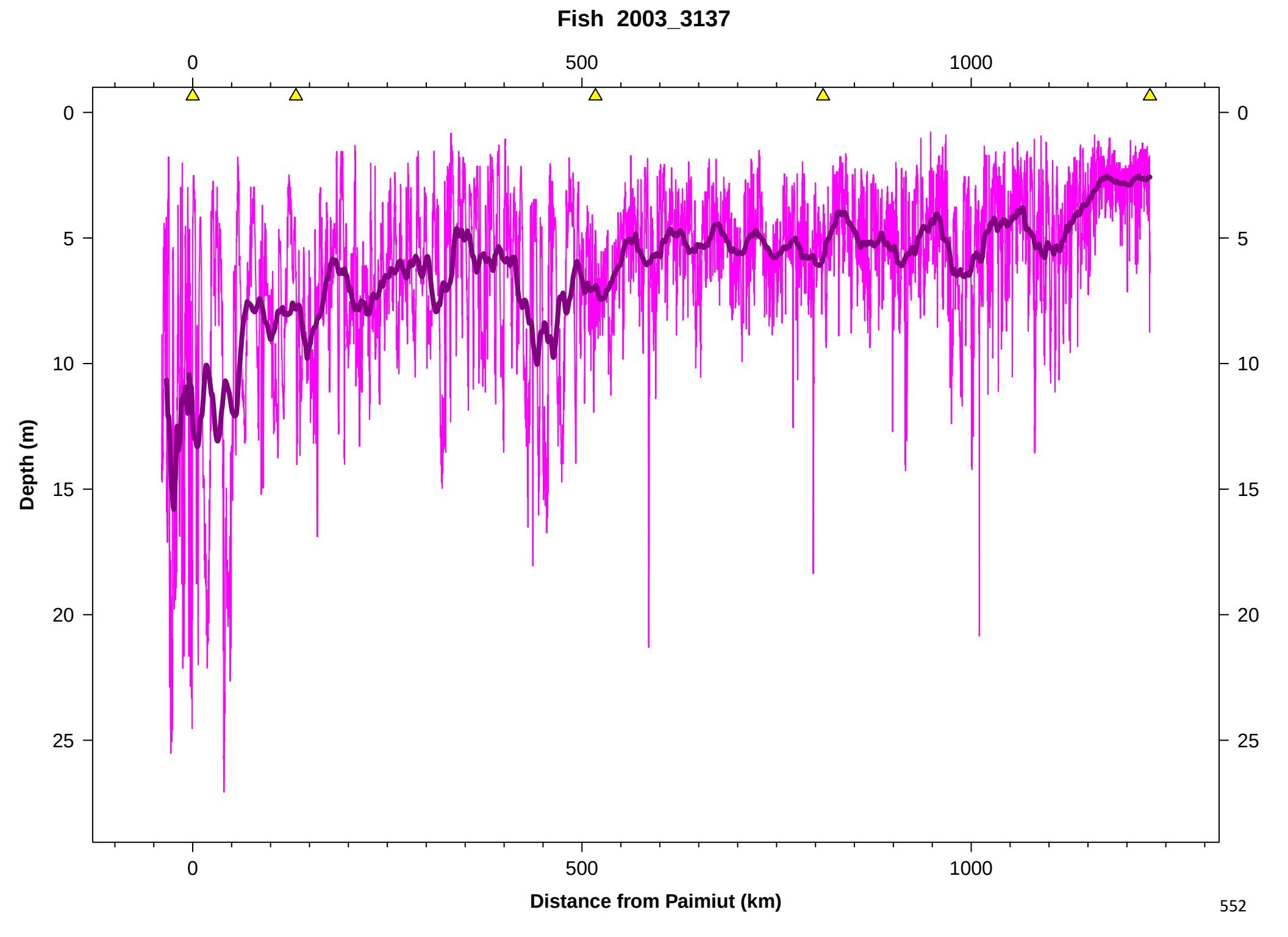

Fish 2002_3017
0
500
1000
19
18
17
16
15
14
Temperature (C)
Distance from Paimiut (km)

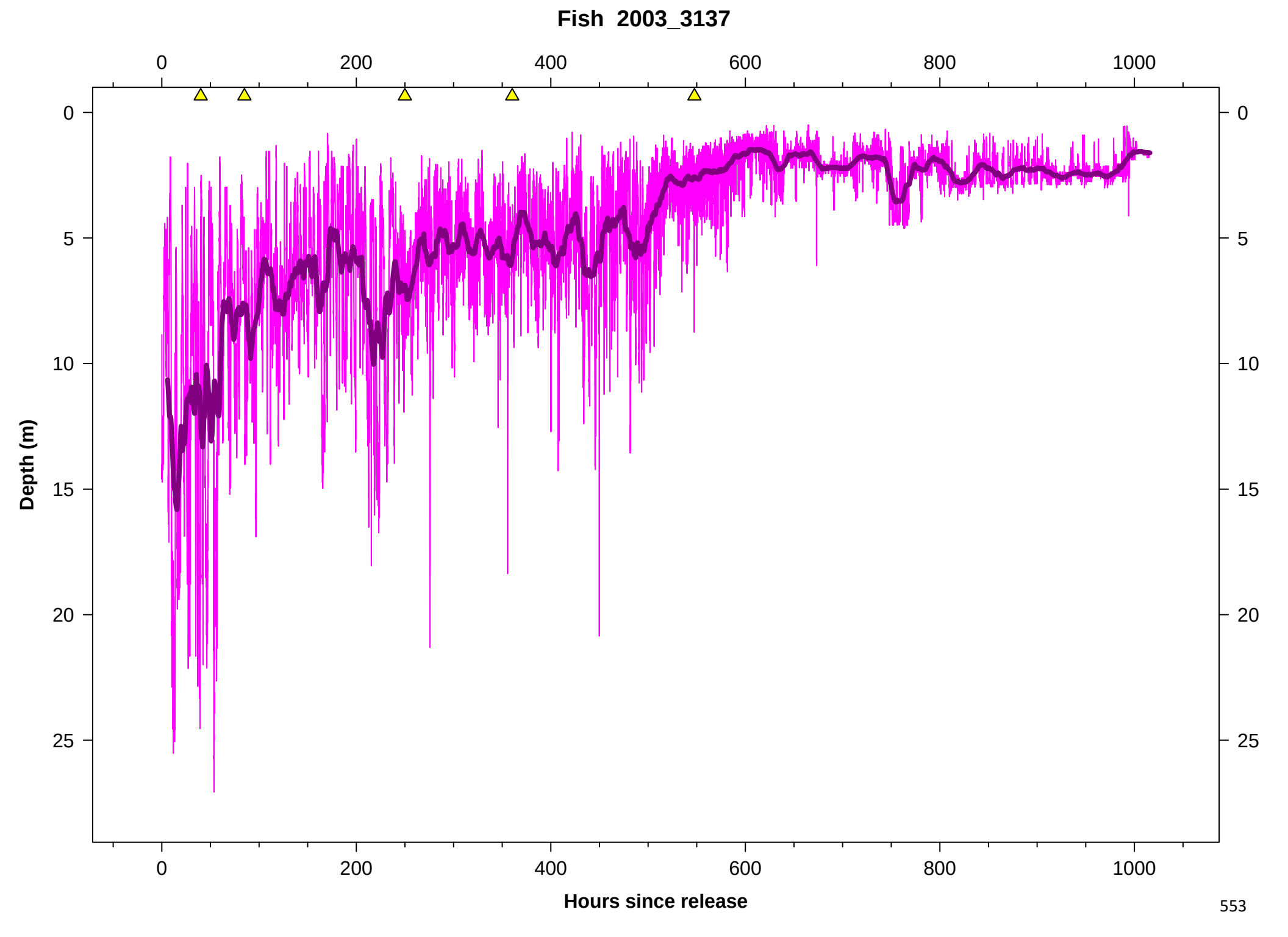

Fish 2002_3017
0
200
400
600
800
1000
20
18
16
14
12
Temperature (C)
Hours since release

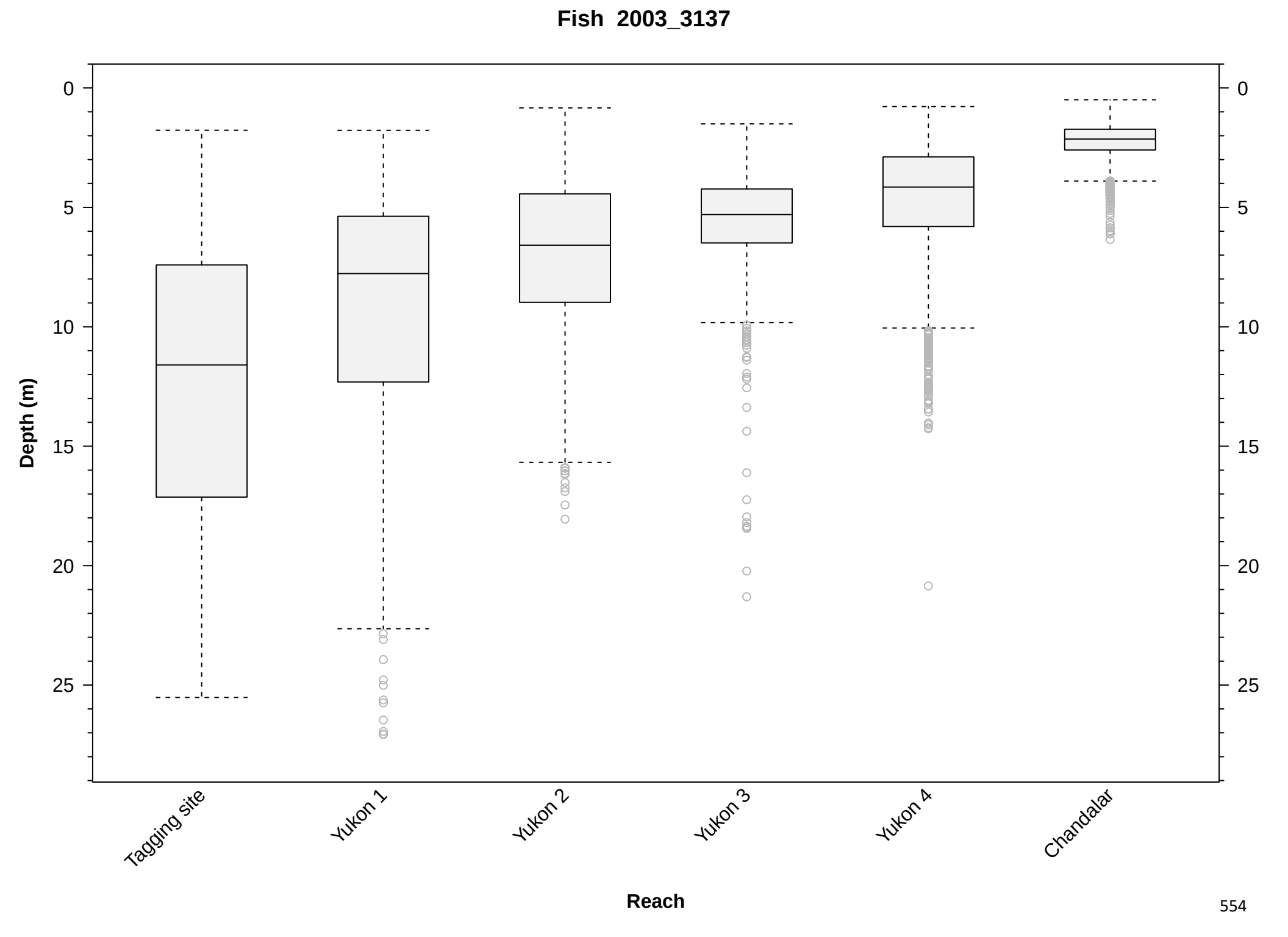

Fish 2002_3017
Temperature (C)
18
16
14
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Reach

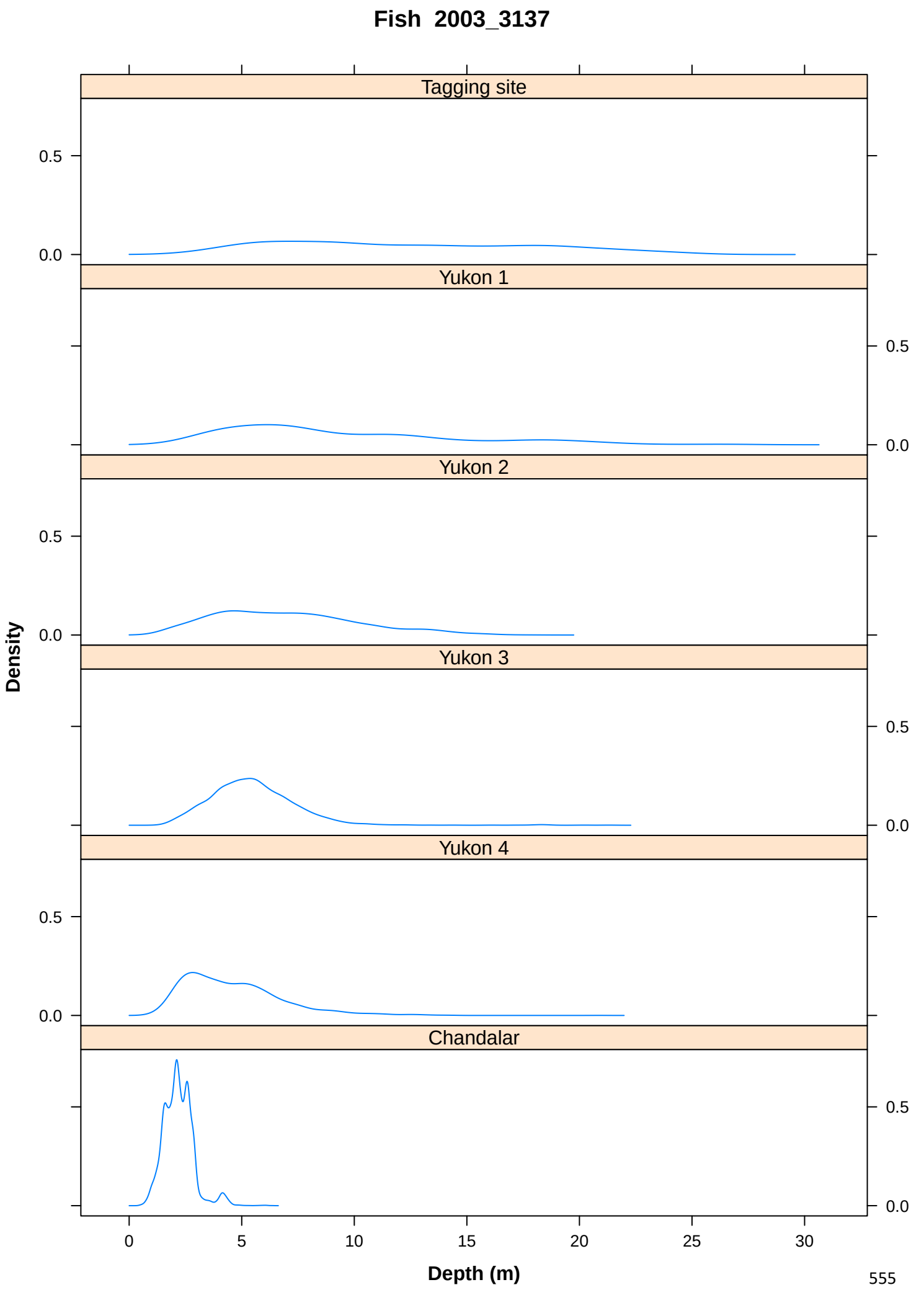

Fish 2002_3017
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Density
Temperature (C)
12
13
14
15
16
17
18
19
20
0
2
4

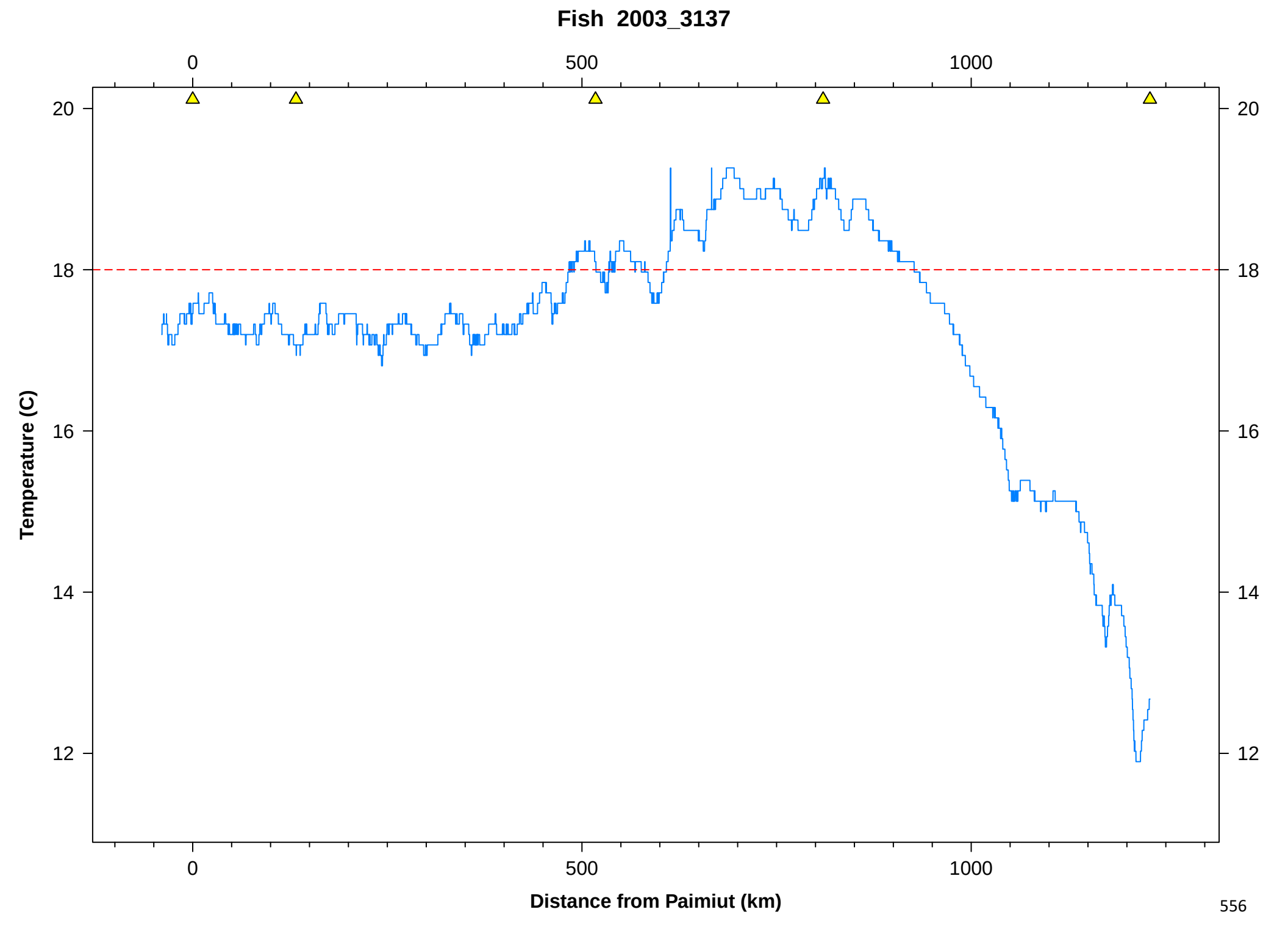

Fish 2002_3017
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Depth (m)
Temperature (C)
14
16
18
0
10
20

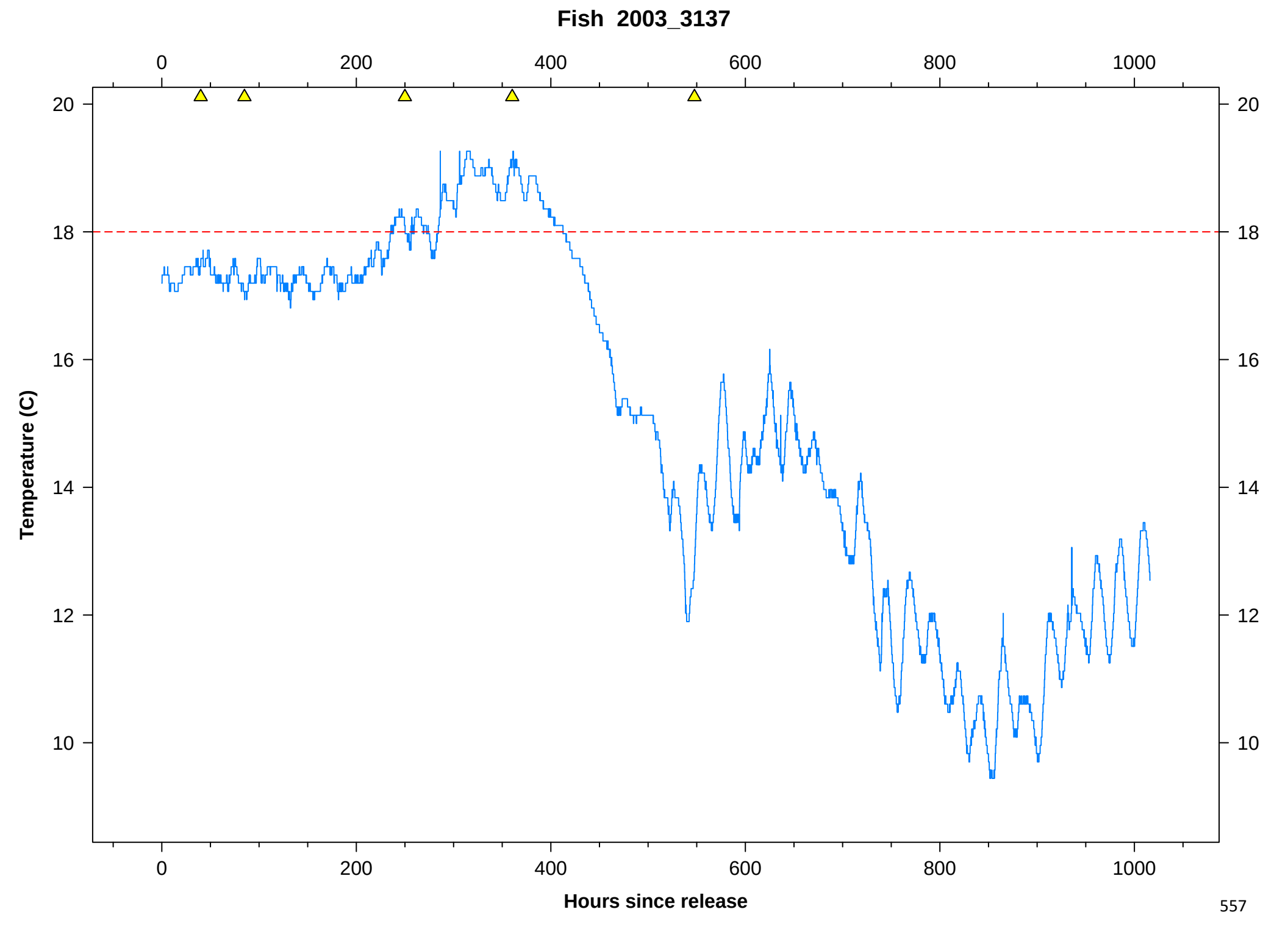

Fish 2003_3137
0
500
1000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

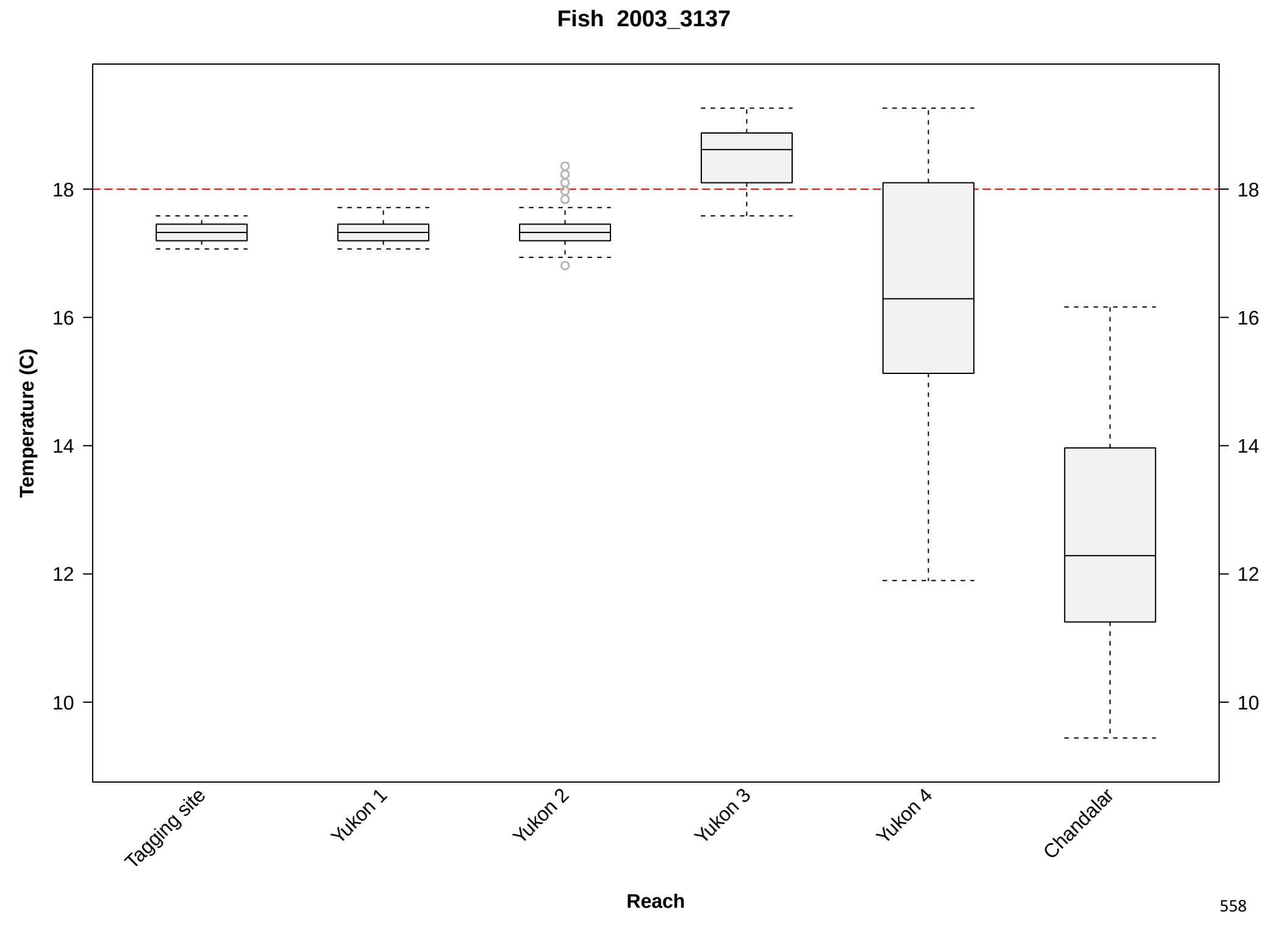

Fish 2003_3137
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release

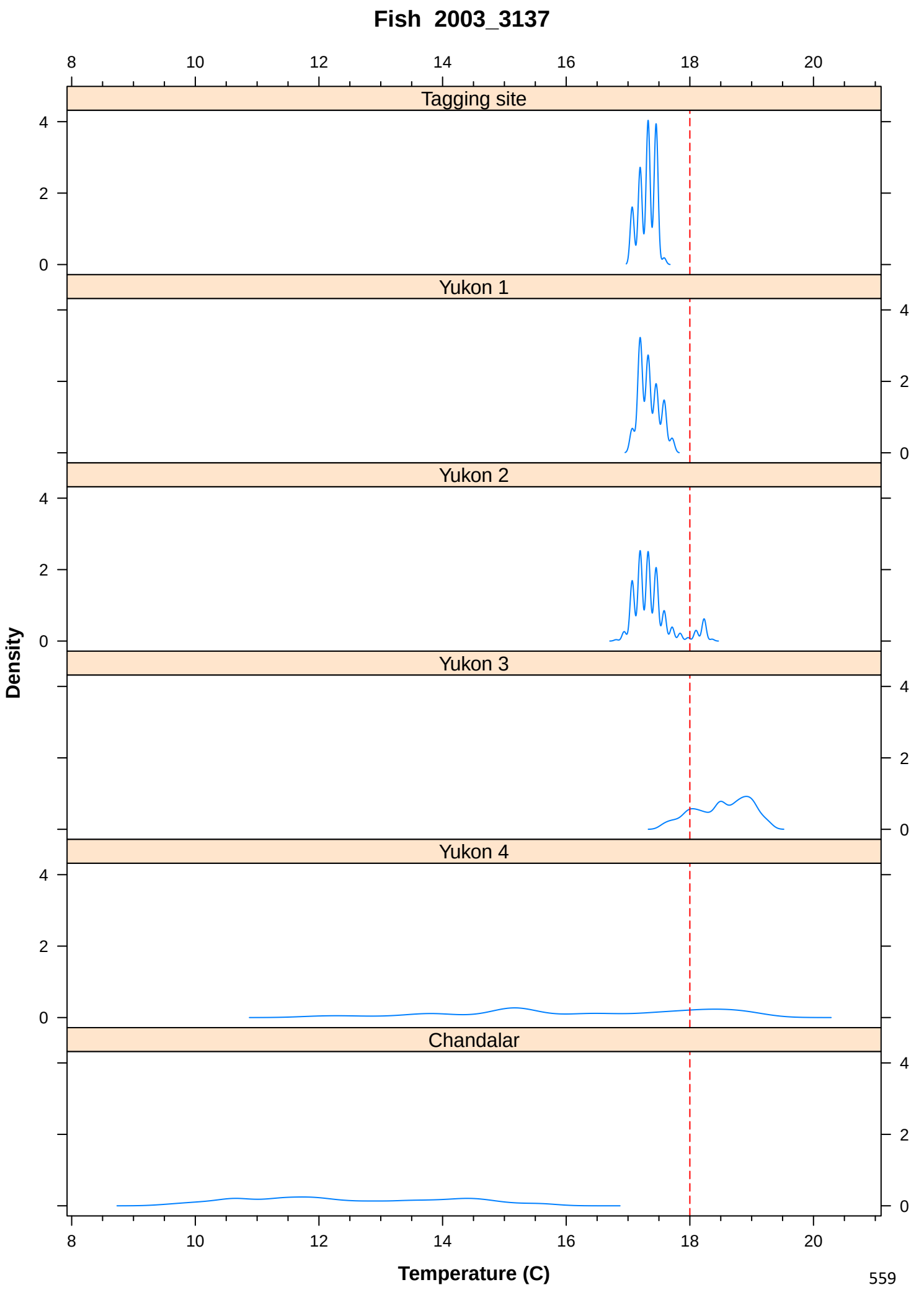

Fish 2003_3137
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Reach

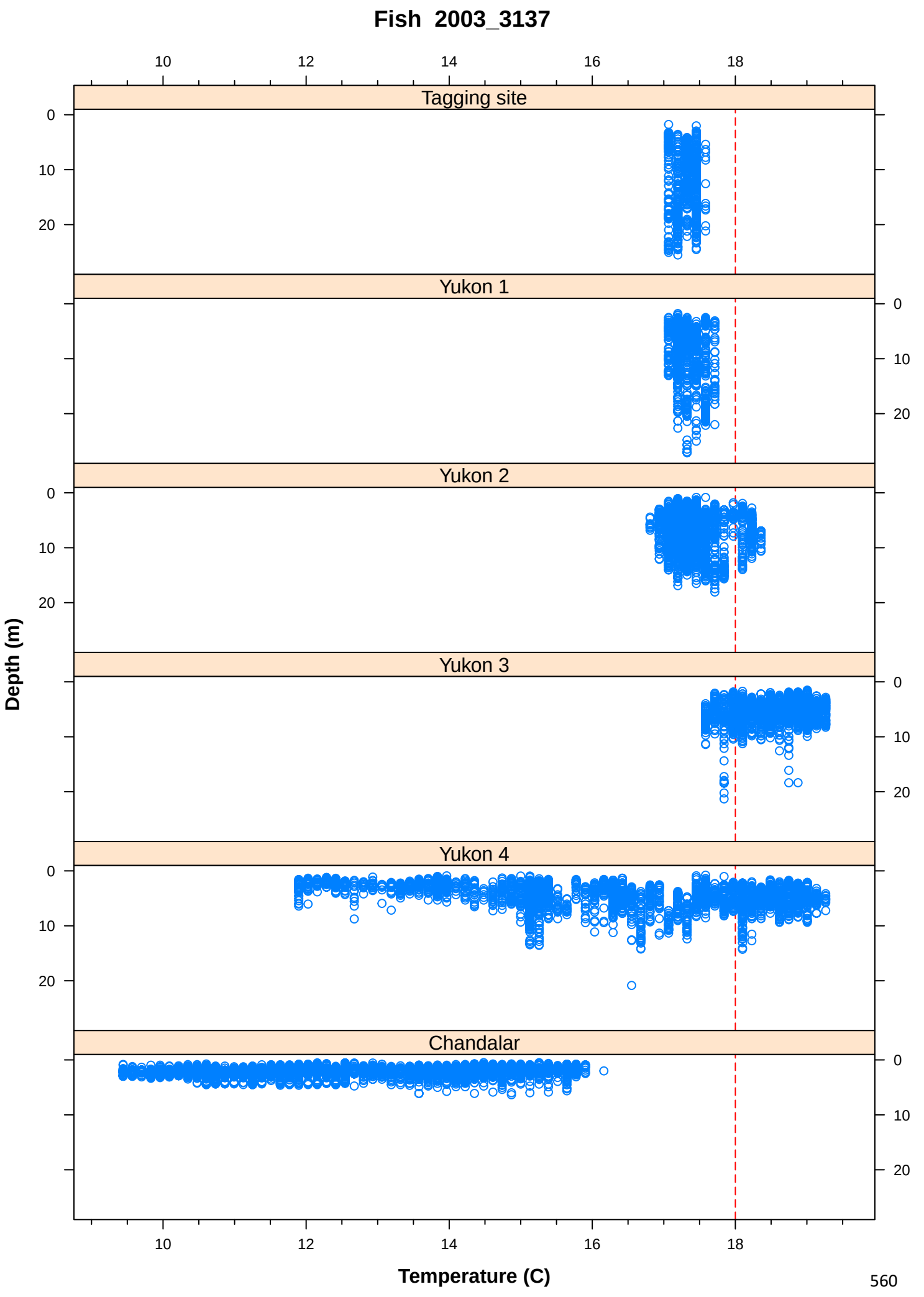

Fish 2003_3137
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Density
0.5
0.0
0
5
10
15
20
25
30
Depth (m)


Fish 2003_3137
0
500
1000
20
18
16
14
12
Temperature (C)
Distance from Paimiut (km)

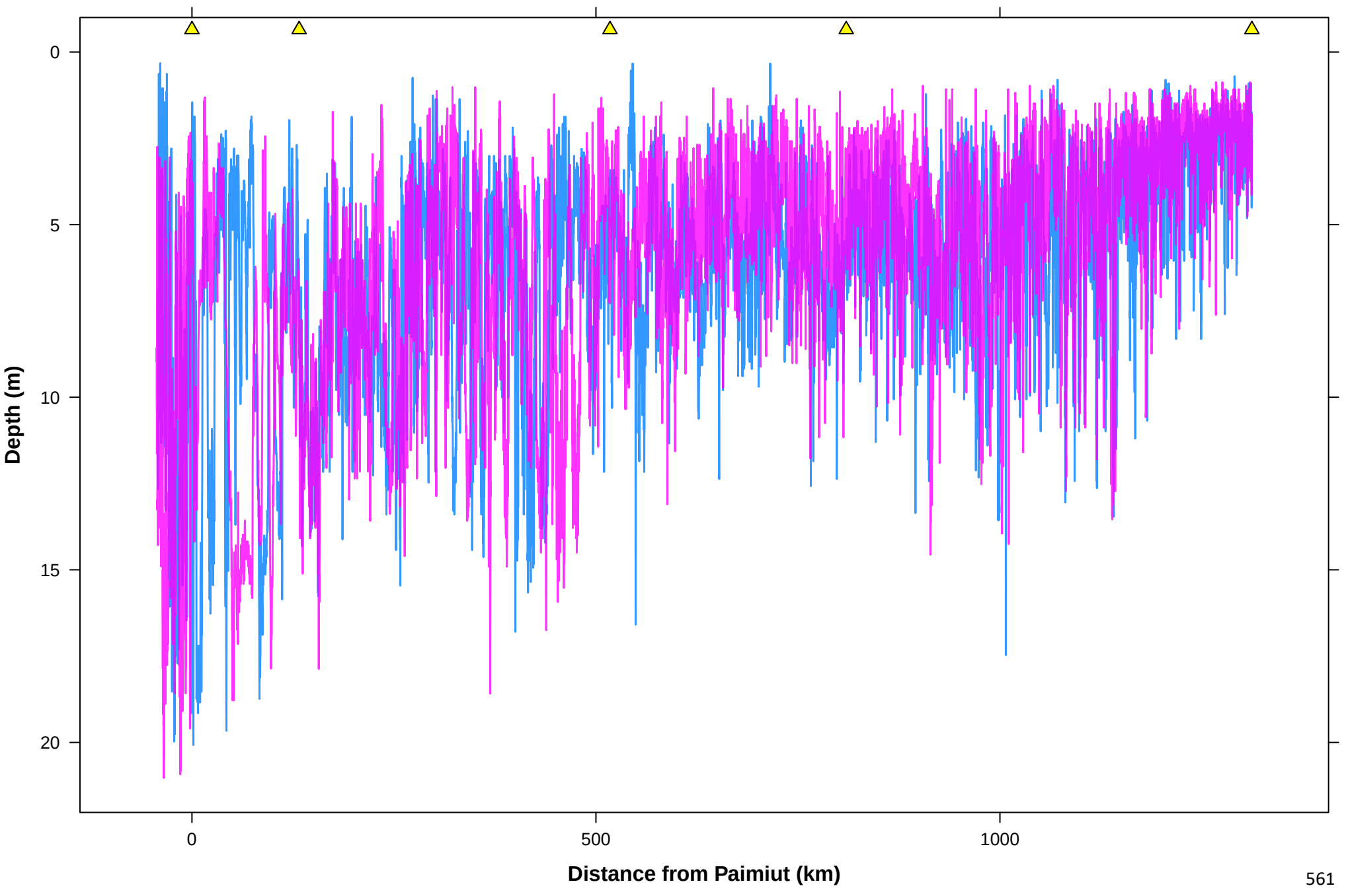

Fish 2003_3137
0
200
400
600
800
1000
20
18
16
14
12
10
Temperature (C)
Hours since release

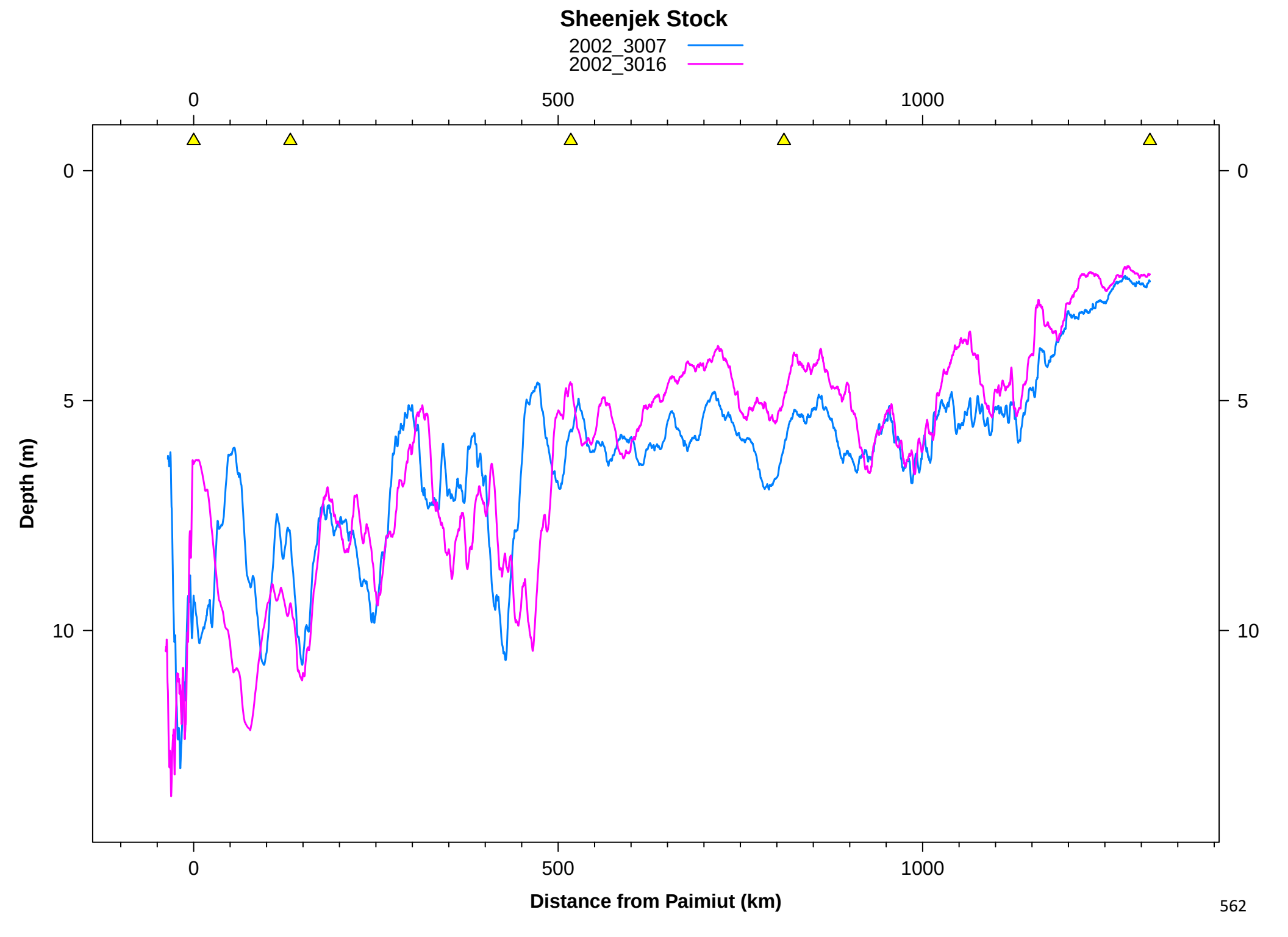

Fish 2003_3137
Temperature (C)
18
16
14
12
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Reach

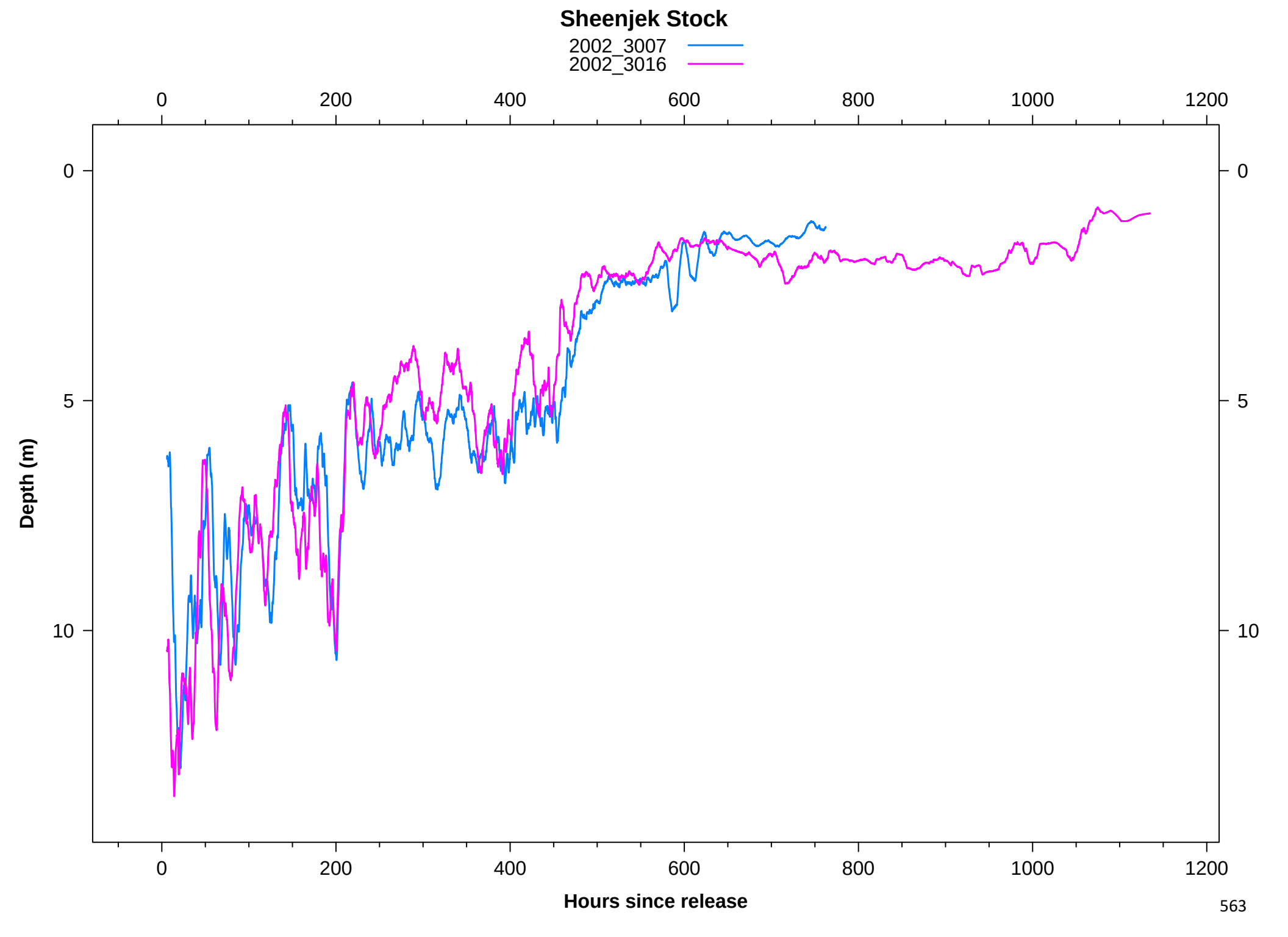

Fish 2003_3137
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Density
Temperature (C)
8
10
12
14
16
18
20
0
2
4

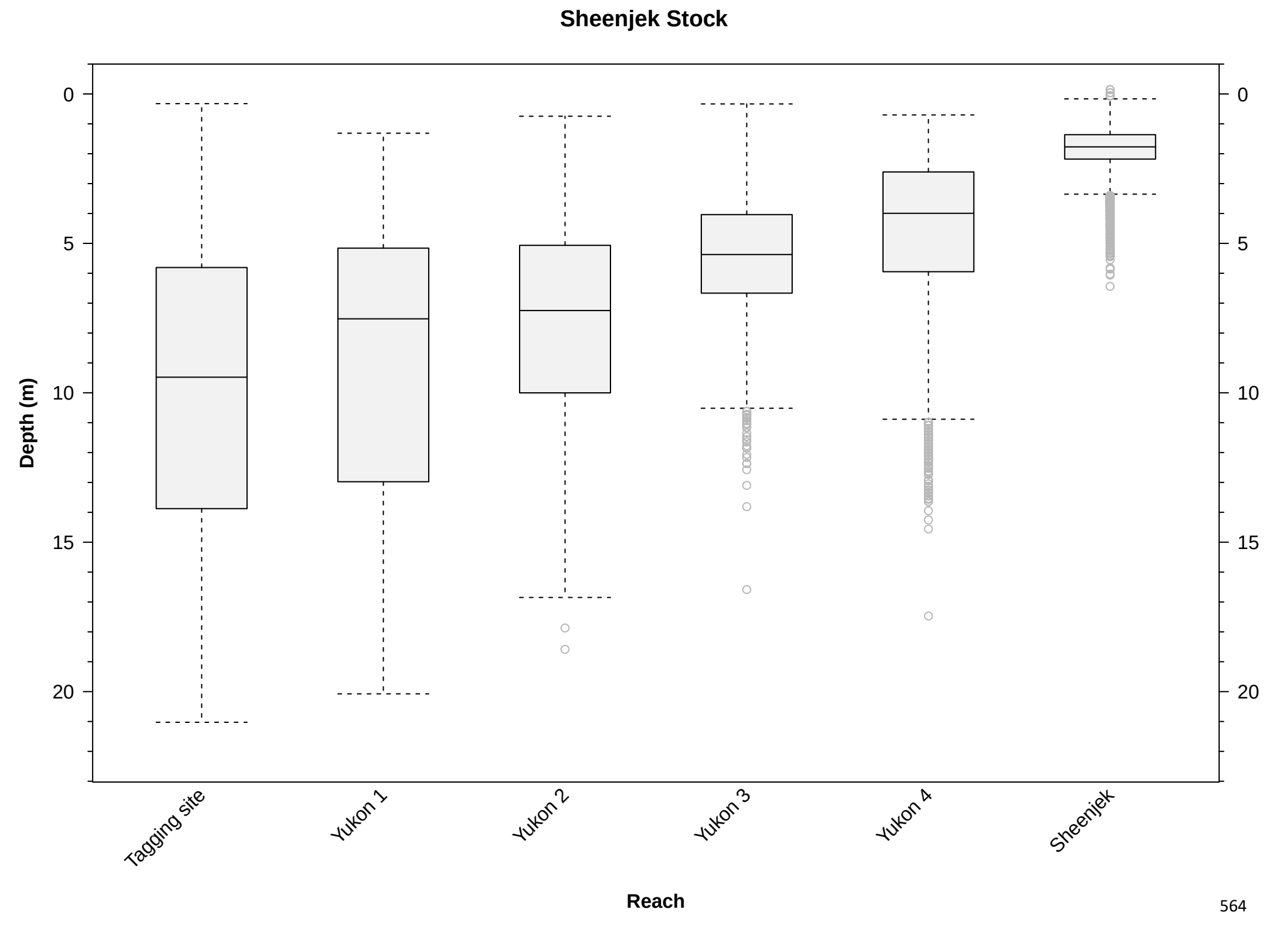

Fish 2003_3137
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Chandalar
Depth (m)
Temperature (C)
10
12
14
16
18
0
10
20

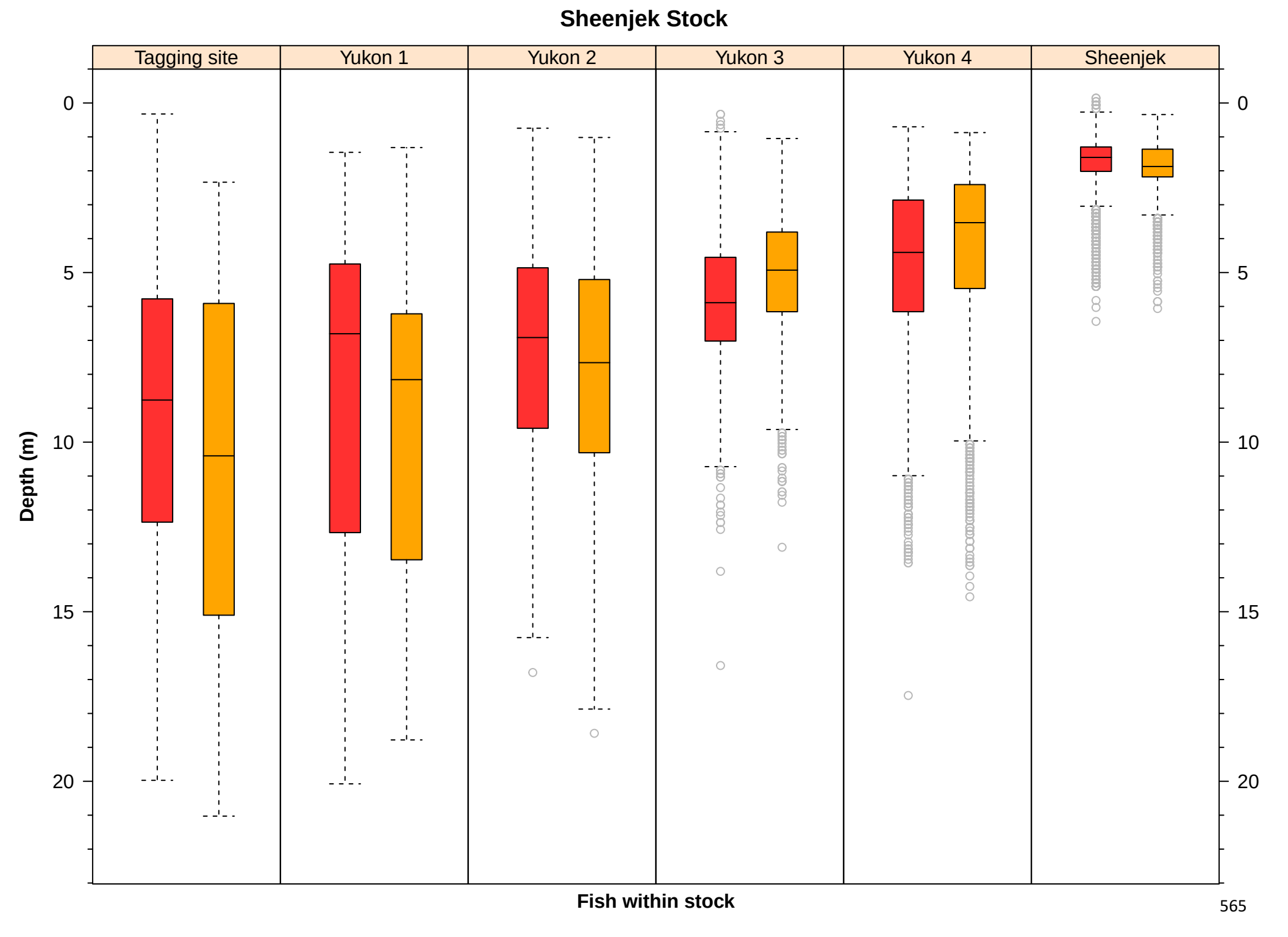
Back to Appendix 6 TOC

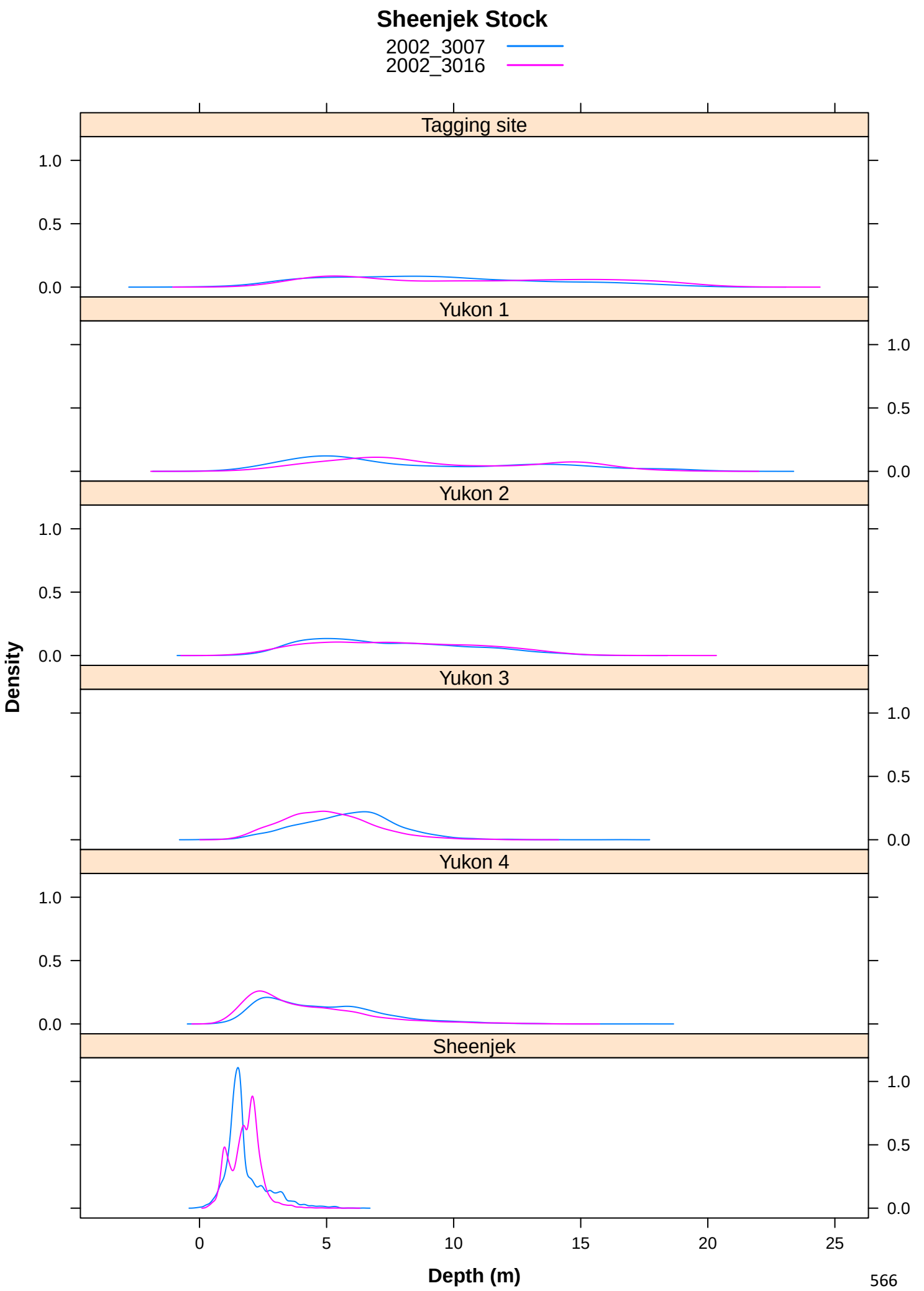


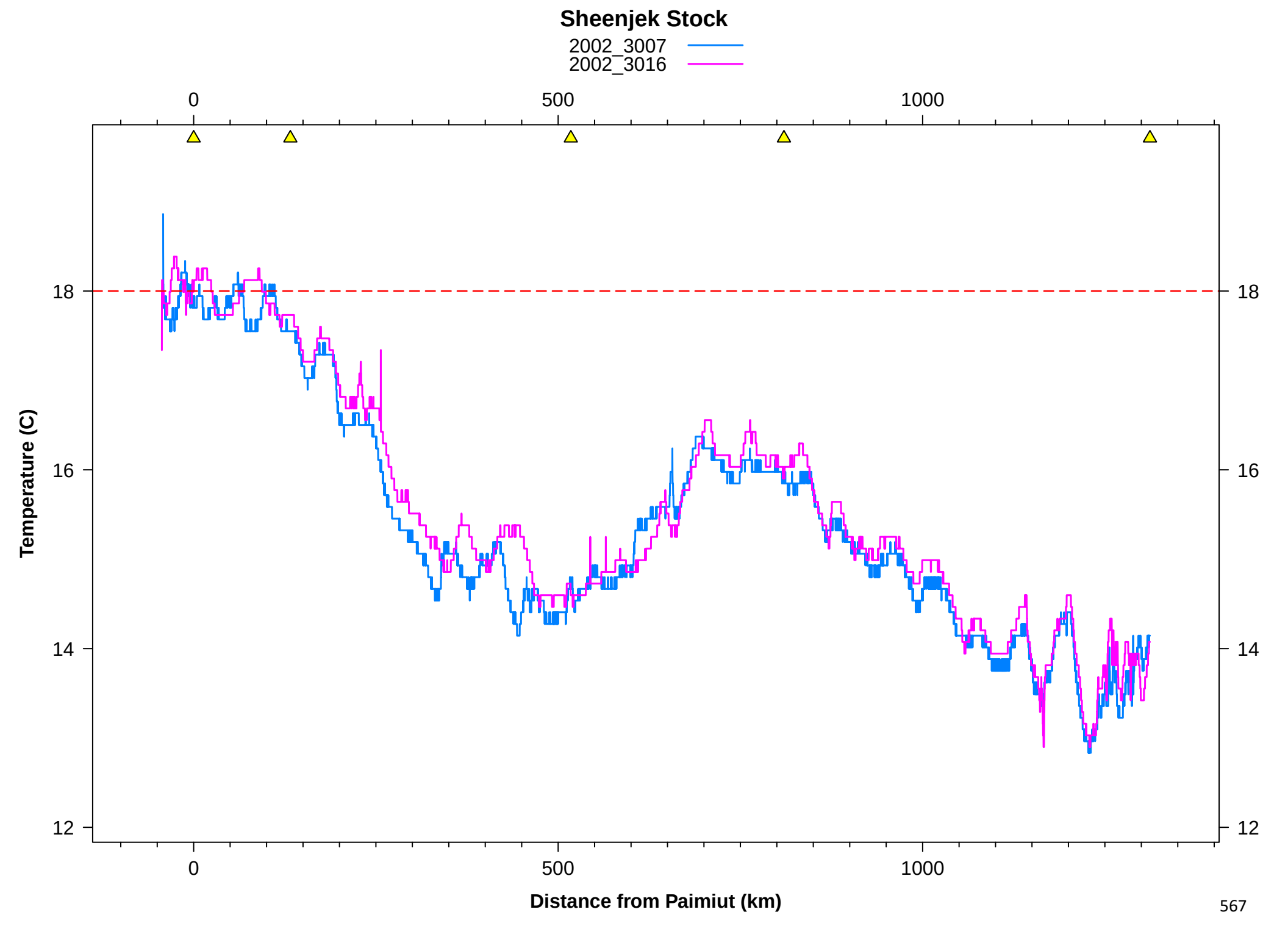

Sheenjek Stock
2002_3007
2002_3016
0
500
1000
0
5
10
Depth (m)
Distance from Paimiut (km)

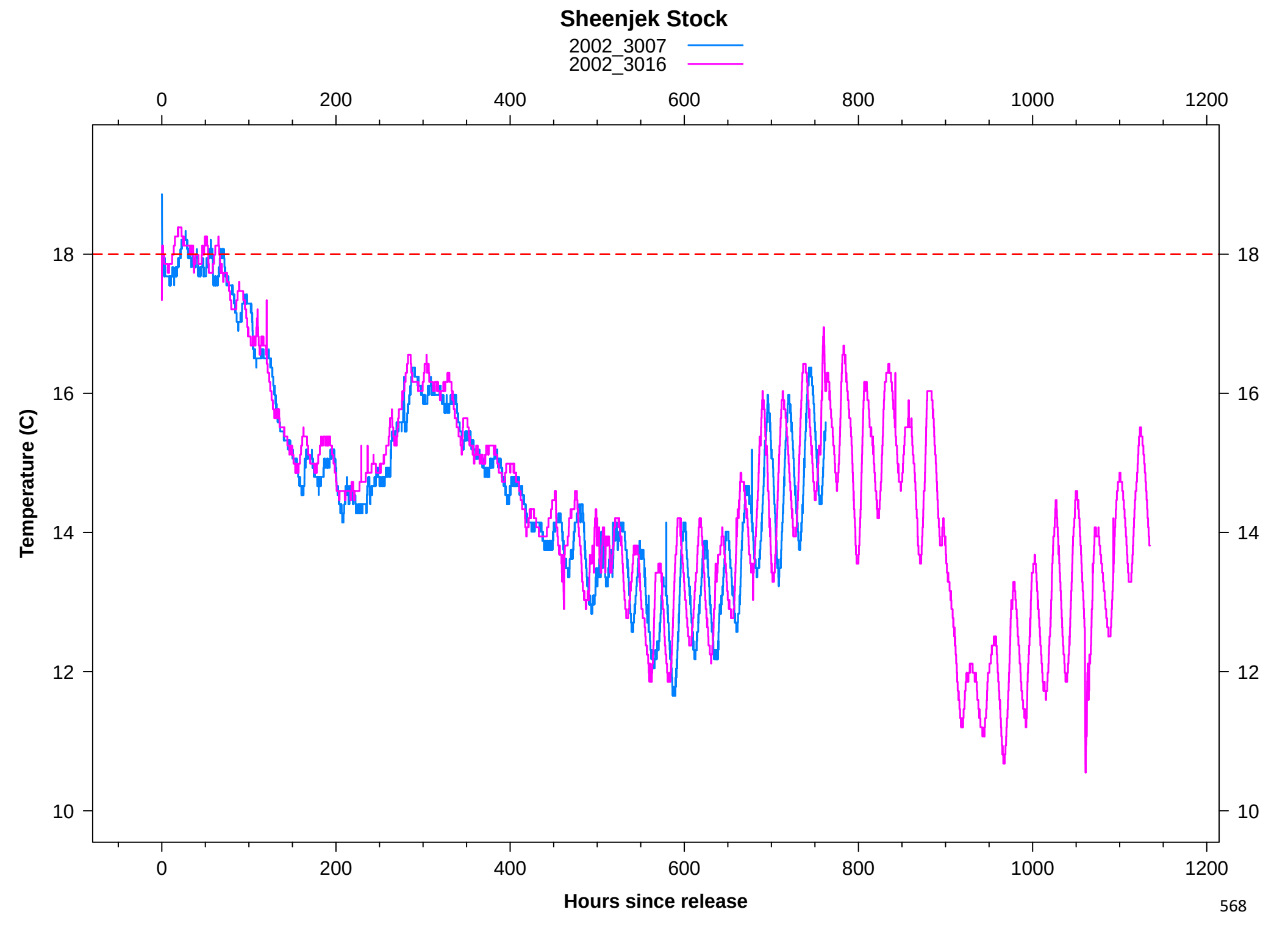

Sheenjek Stock
2002_3007
2002_3016
0
200
400
600
800
1000
1200
0
5
10
Depth (m)
Hours since release

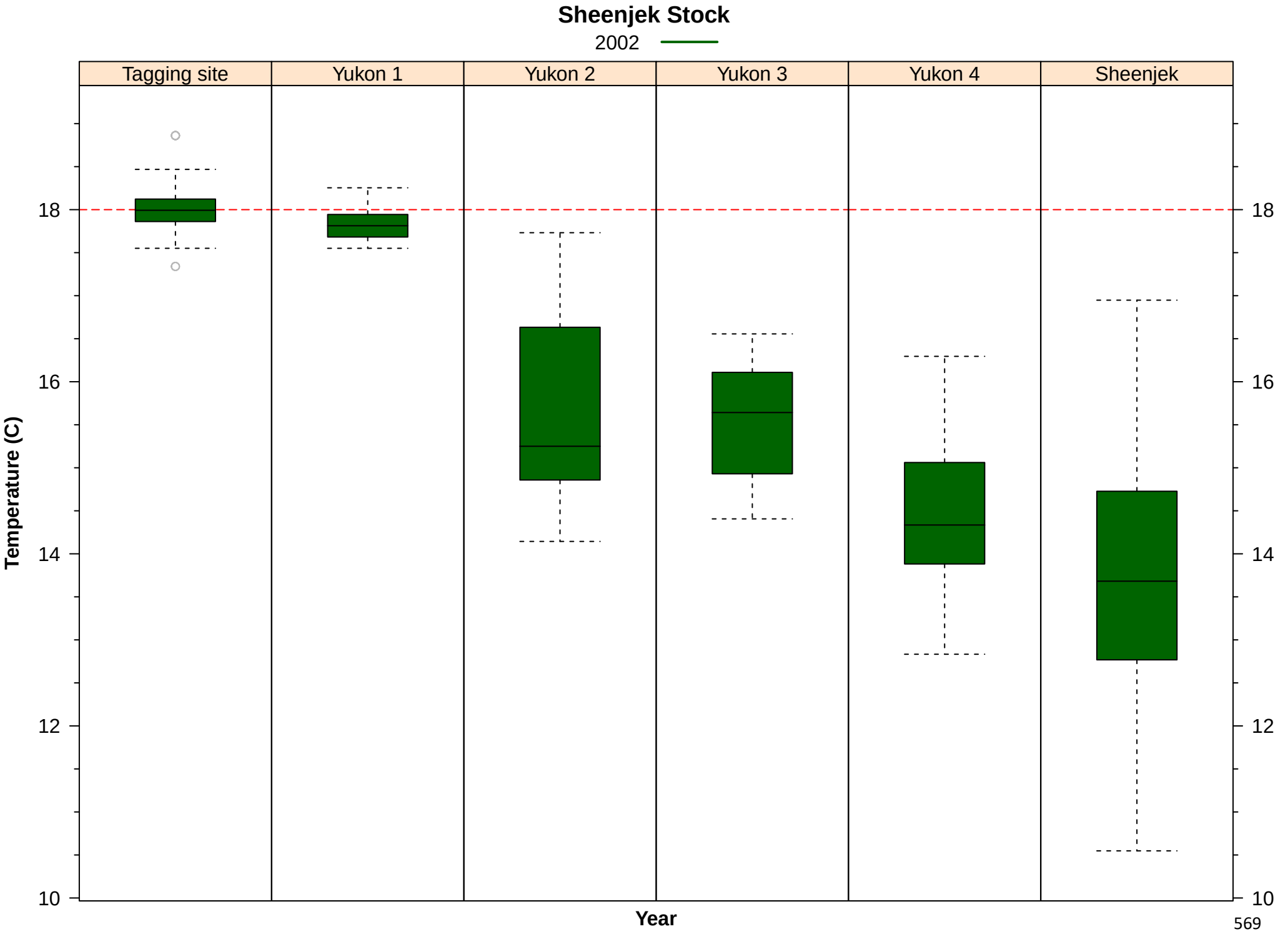

Sheenjek Stock
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Reach

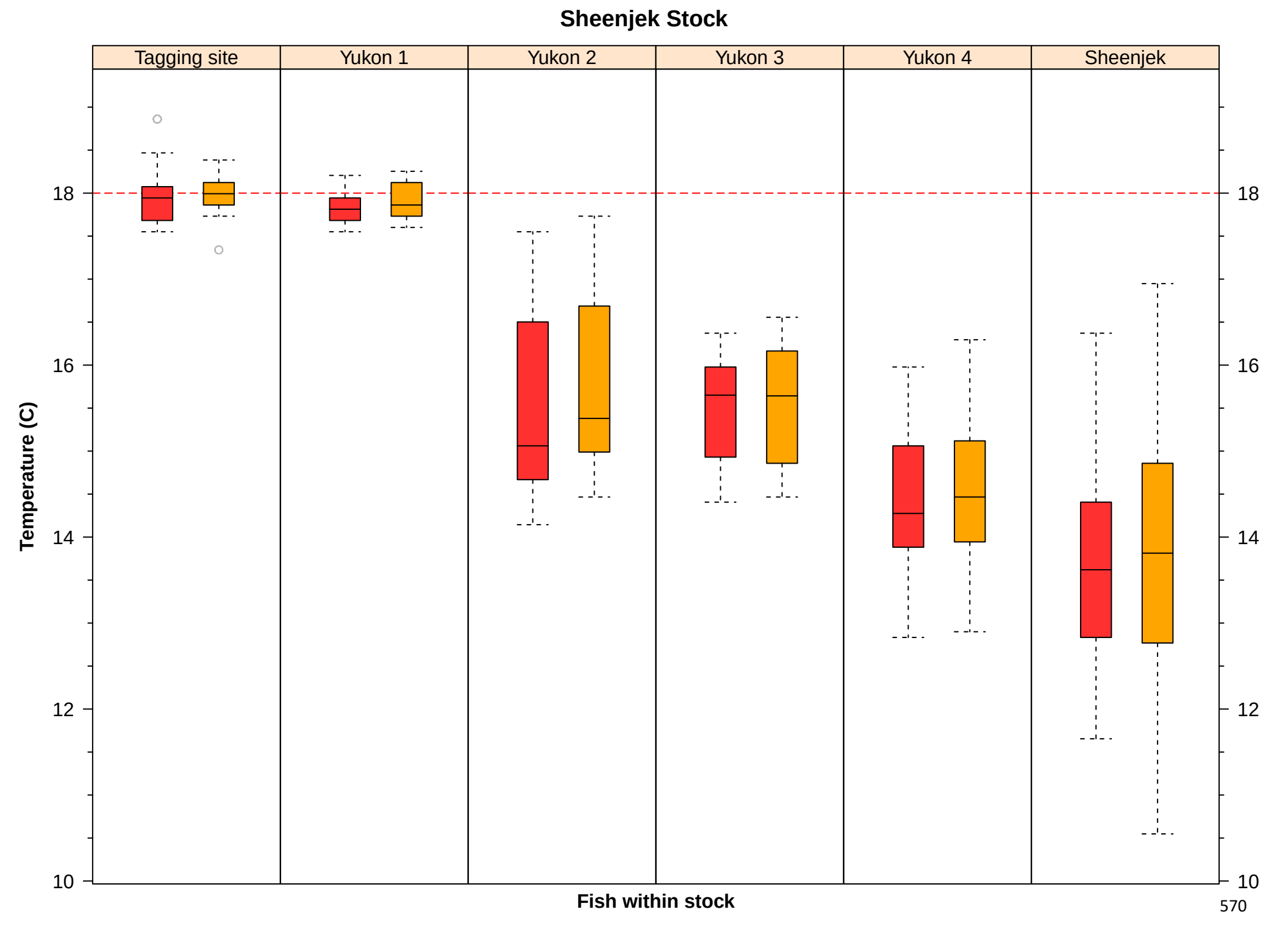

Sheenjek Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Depth (m)
0
5
10
15
20
Fish within stock

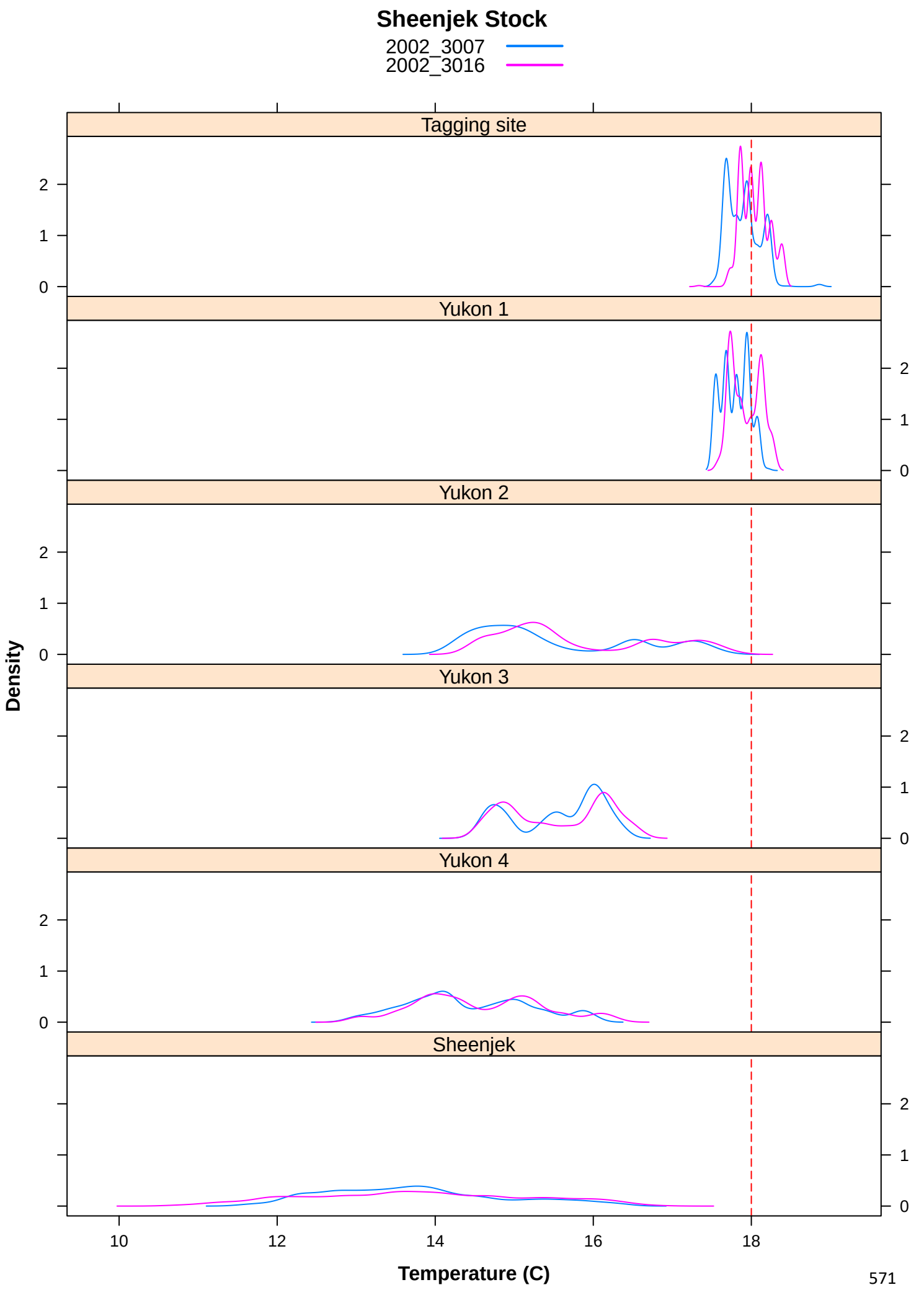

Sheenjek Stock
2002_3007
2002_3016
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Density
1.0
0.5
0.0
0
5
10
15
20
25
Depth (m)

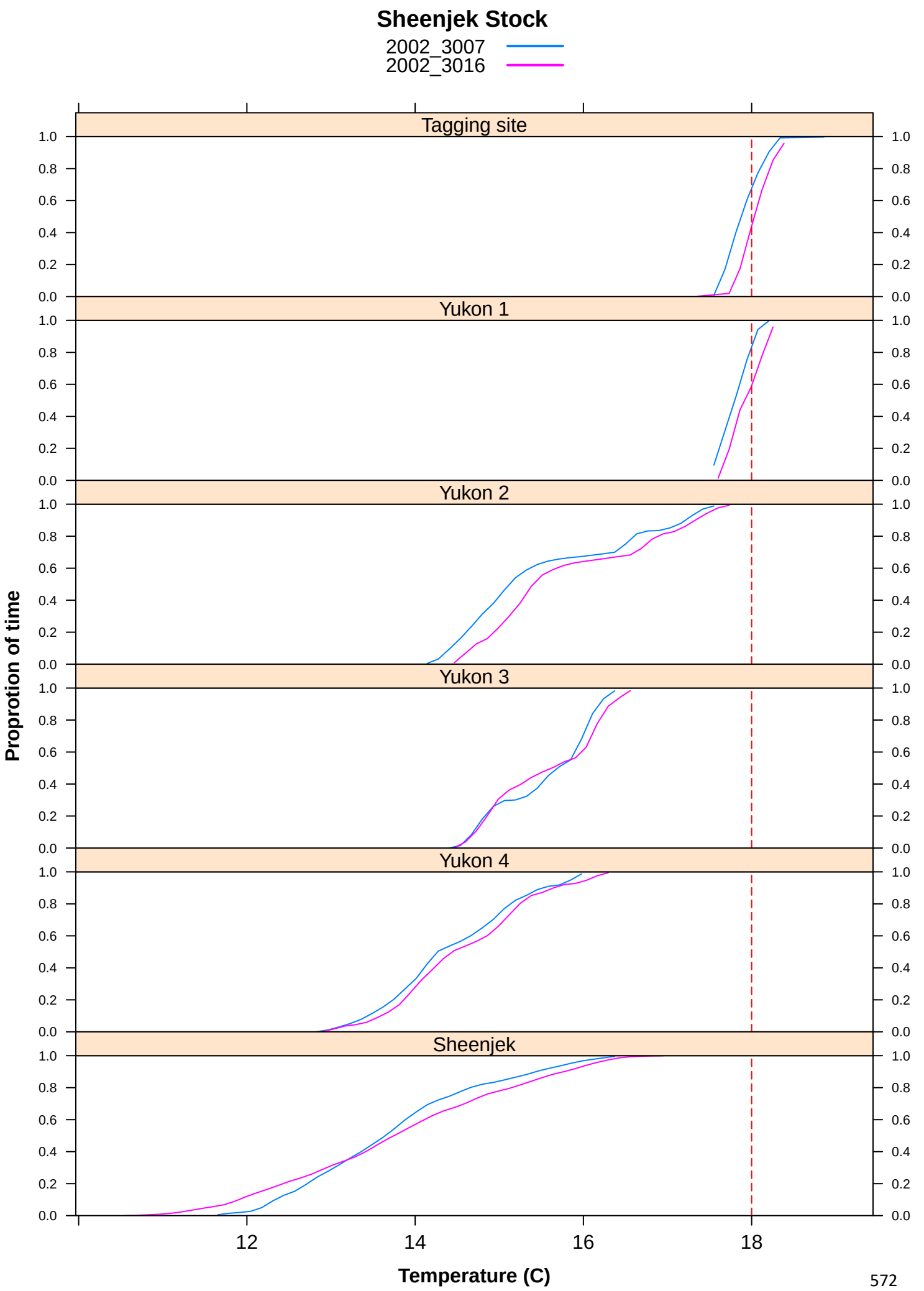

Sheenjek Stock
2002_3007
2002_3016
0
500
1000
18
16
14
12
Temperature (C)
Distance from Paimiut (km)

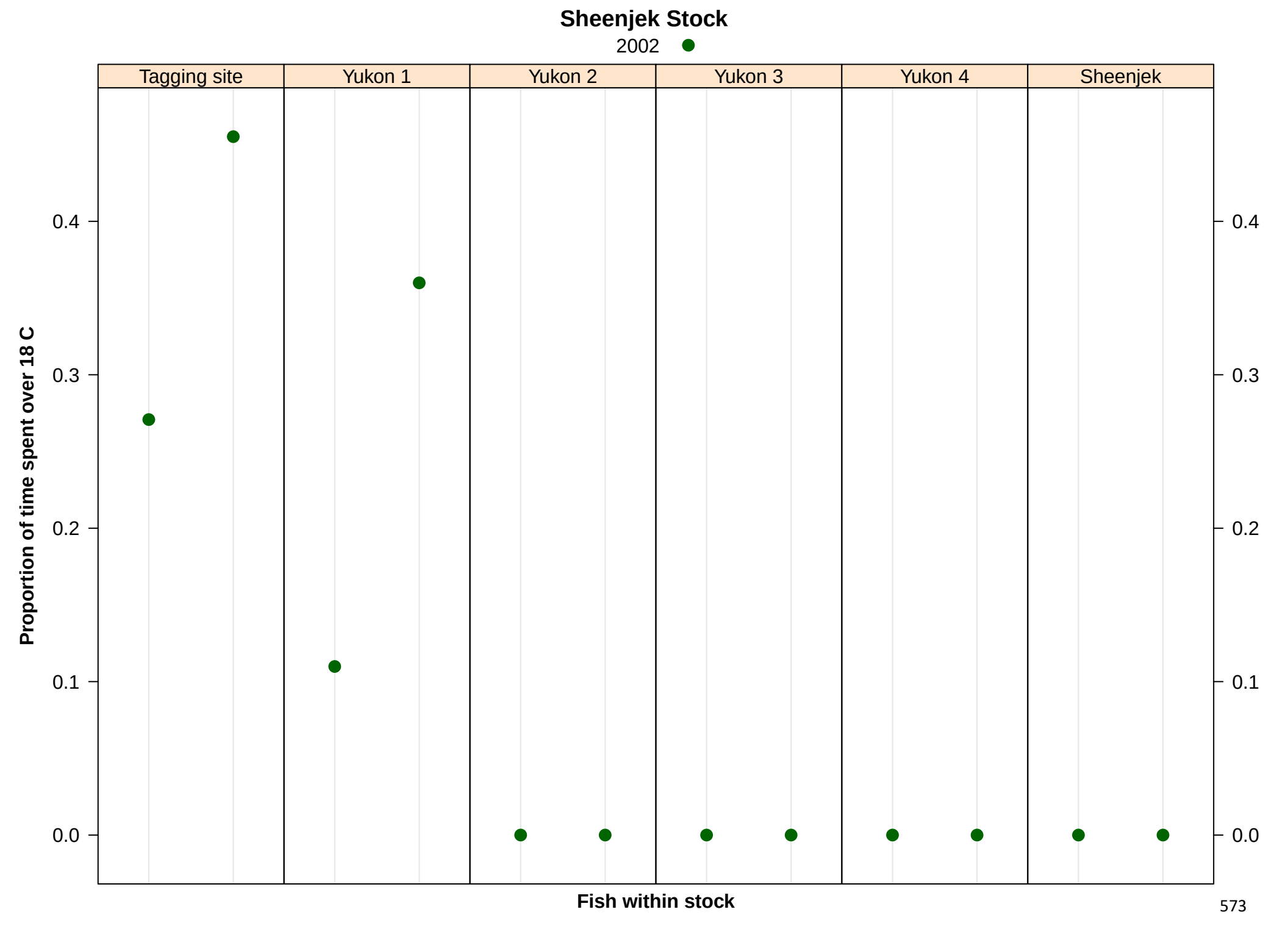

Sheenjek Stock
2002_3007
2002_3016
0
200
400
600
800
1000
1200
18
16
14
12
10
Temperature (C)
Hours since release

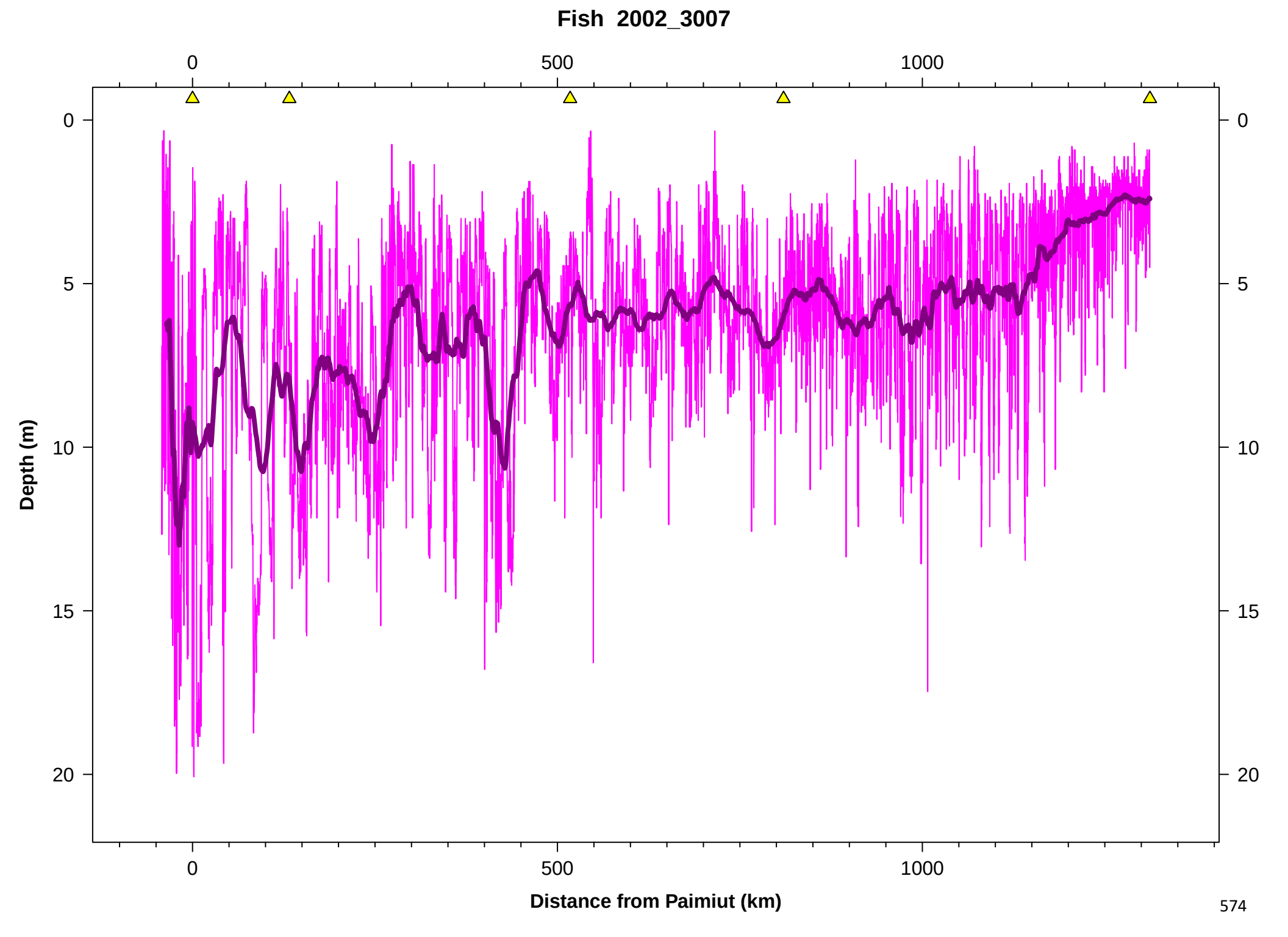

Sheenjek Stock
2002
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Temperature (C)
10
12
14
16
18
Year

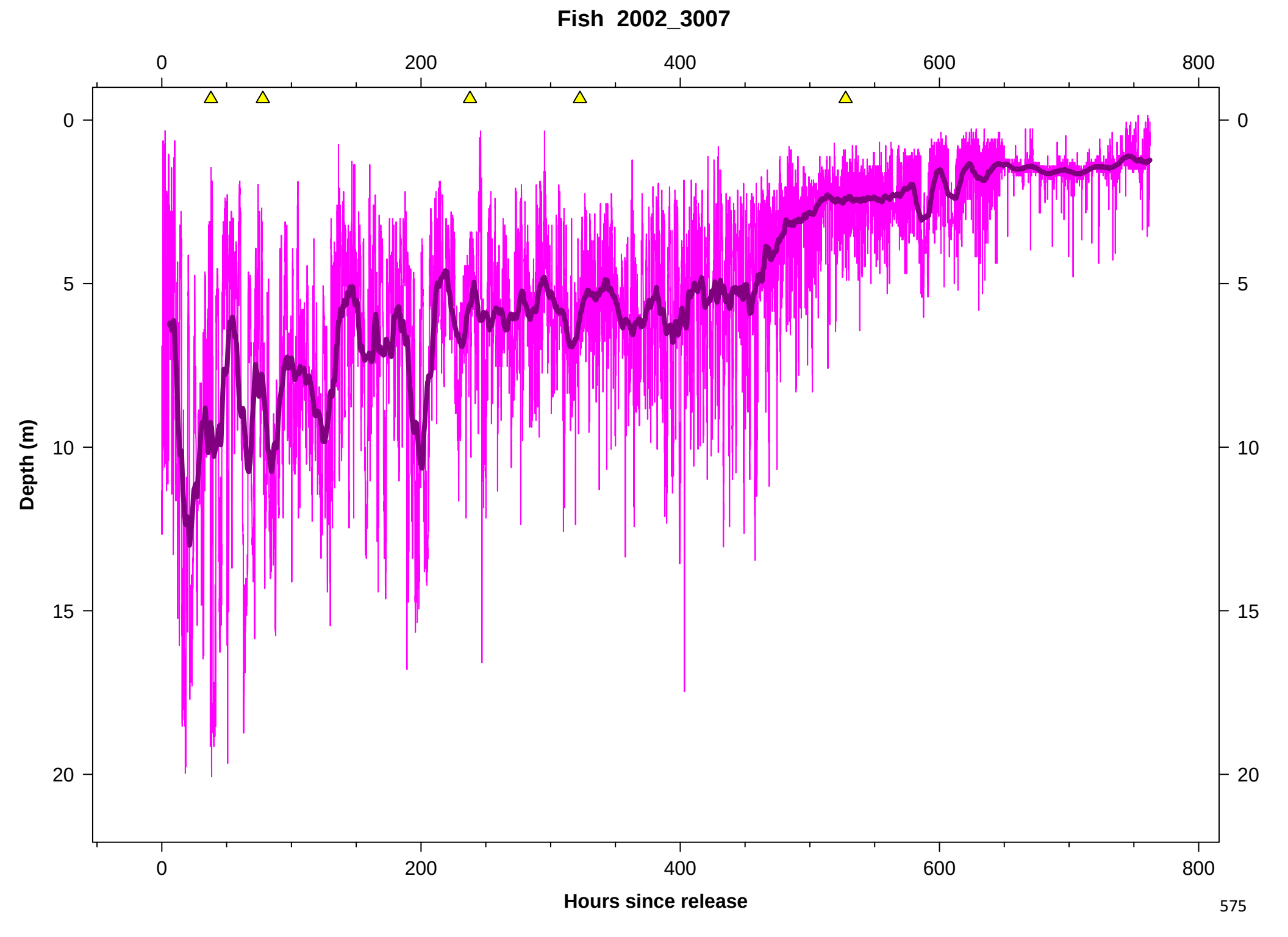

Sheenjek Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Temperature (C)
18
16
14
12
10
Fish within stock
570

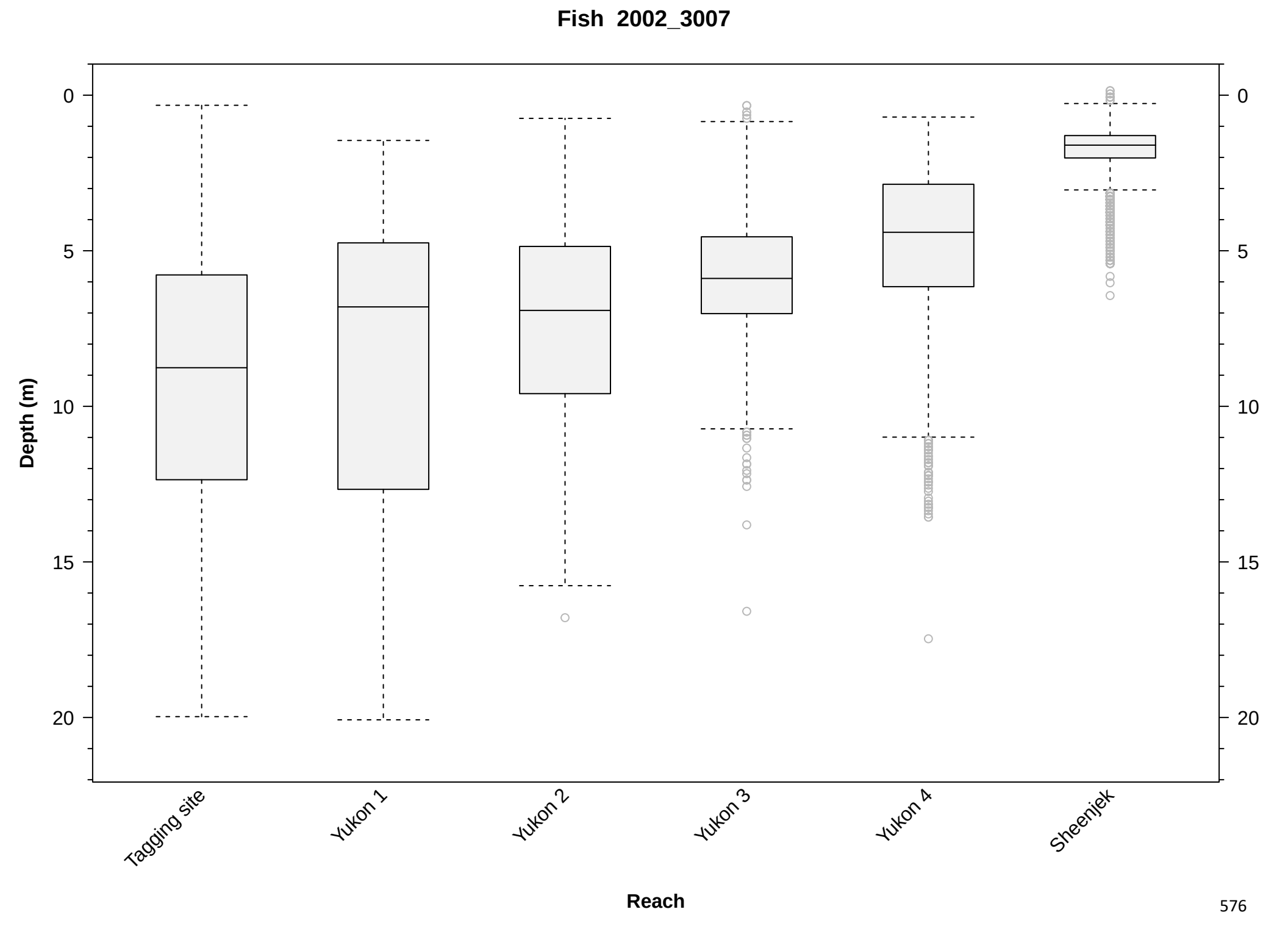

Sheenjek Stock
2002_3007
2002_3016
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Density
Temperature (C)
10
12
14
16
18
0
1
2

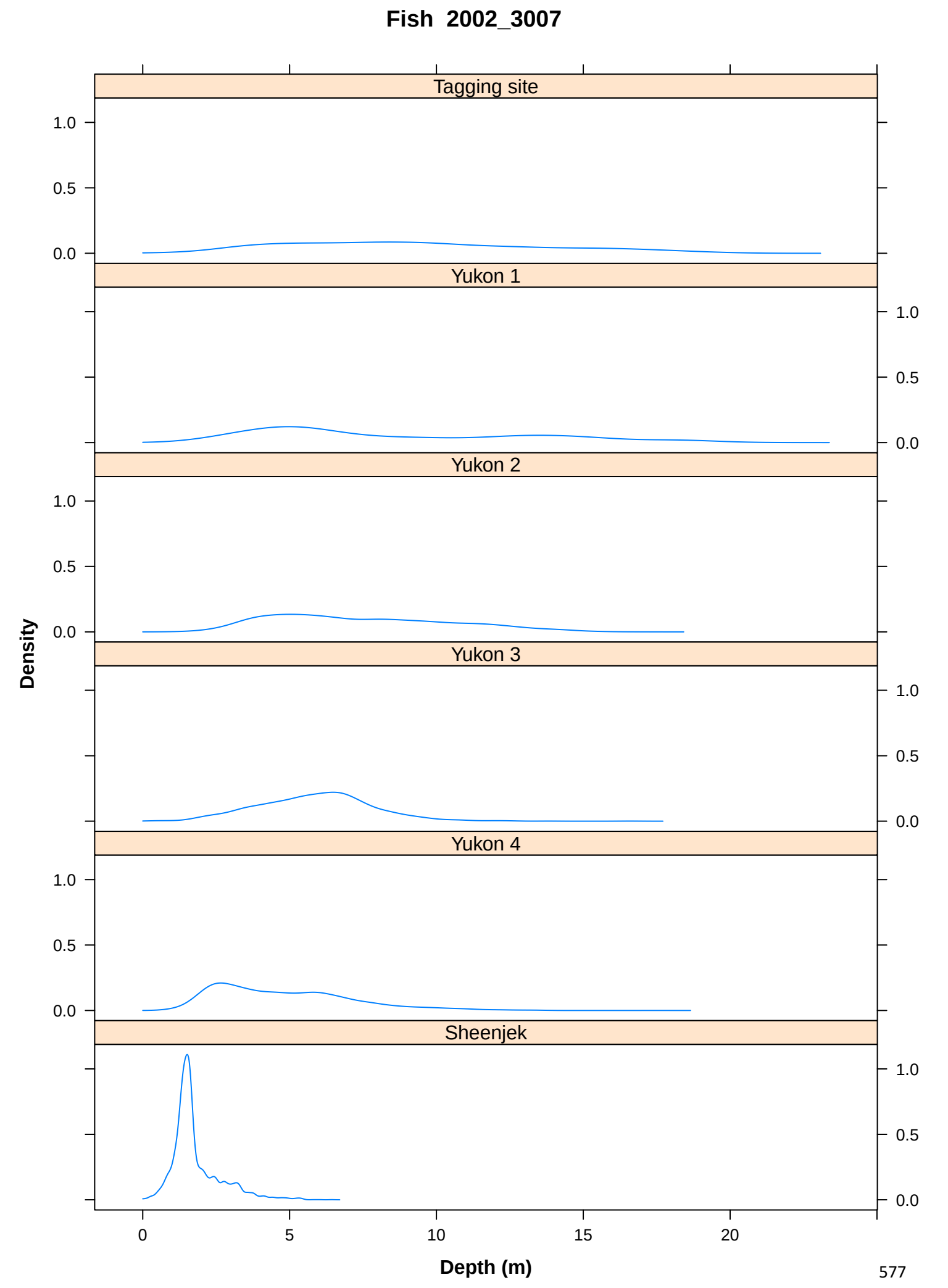

Sheenjek Stock
2002_3007
2002_3016
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Proprotion of time
0.0
0.2
0.4
0.6
0.8
1.0
12
14
16
18
Temperature (C)

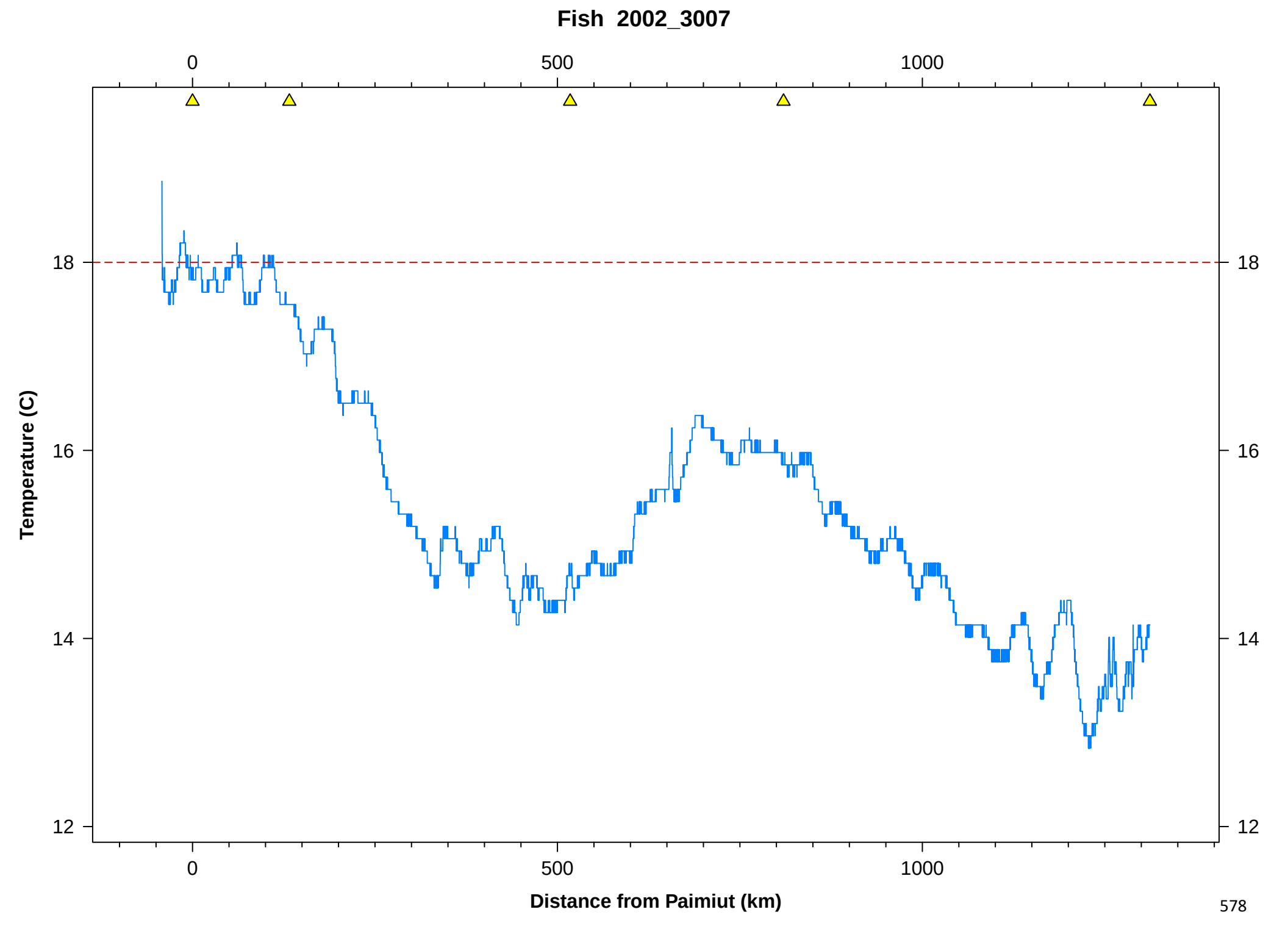

Sheenjek Stock
2002
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Proportion of time spent over 18 C
0.0
0.1
0.2
0.3
0.4
Fish within stock

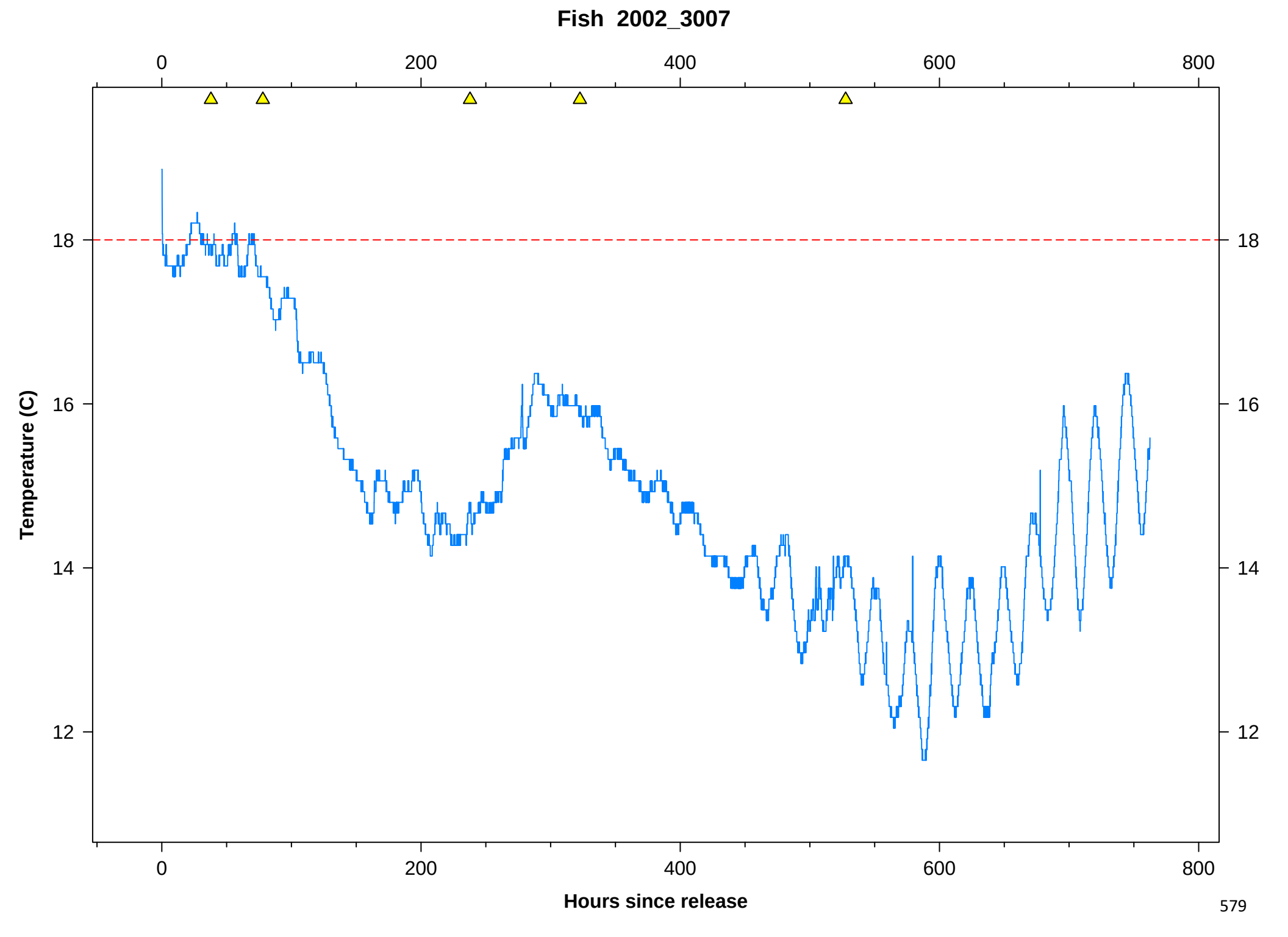

Fish 2002_3007
0
500
1000
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

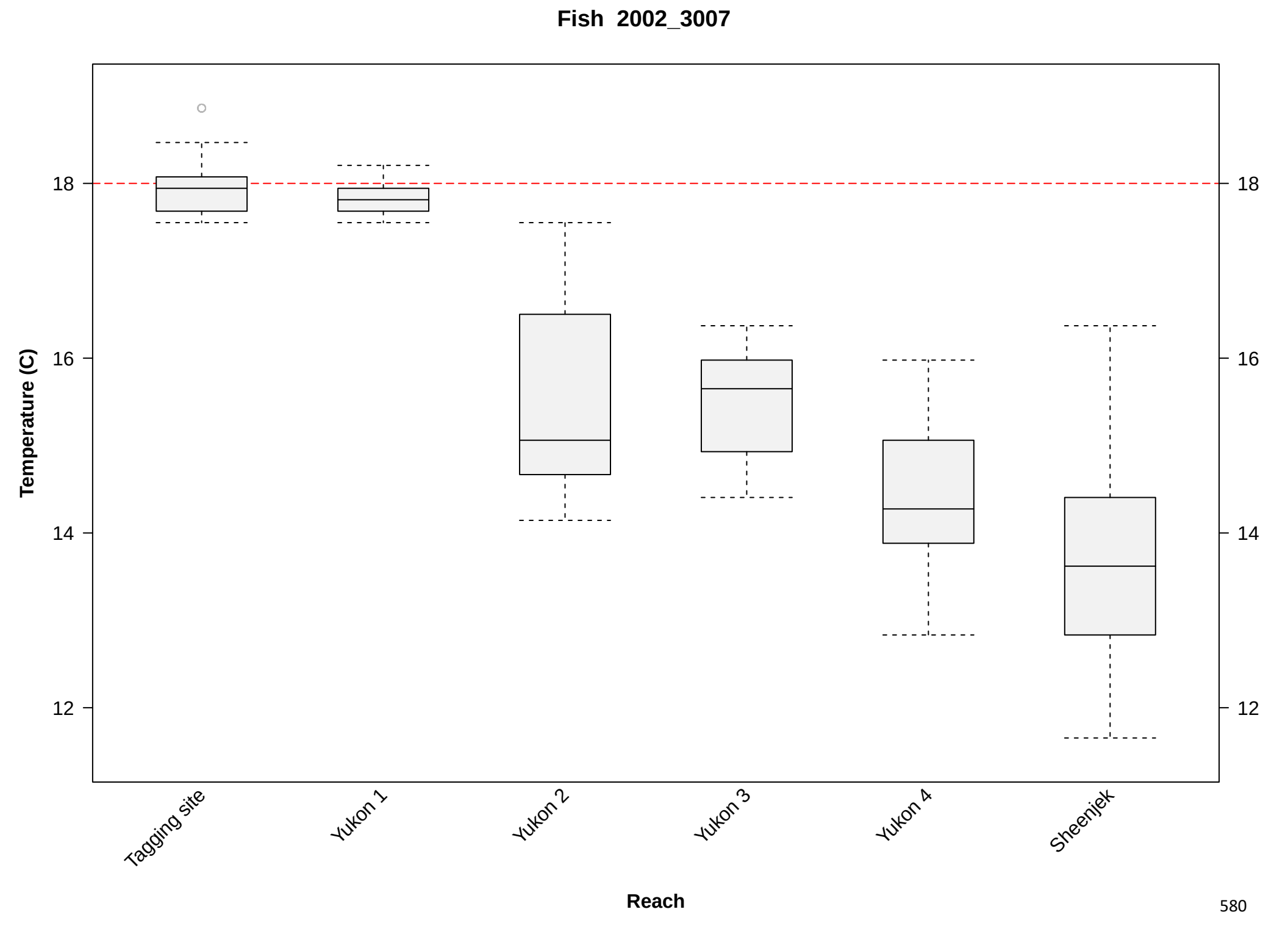

Fish 2002_3007
0
200
400
600
800
0
5
10
15
20
Depth (m)
Hours since release

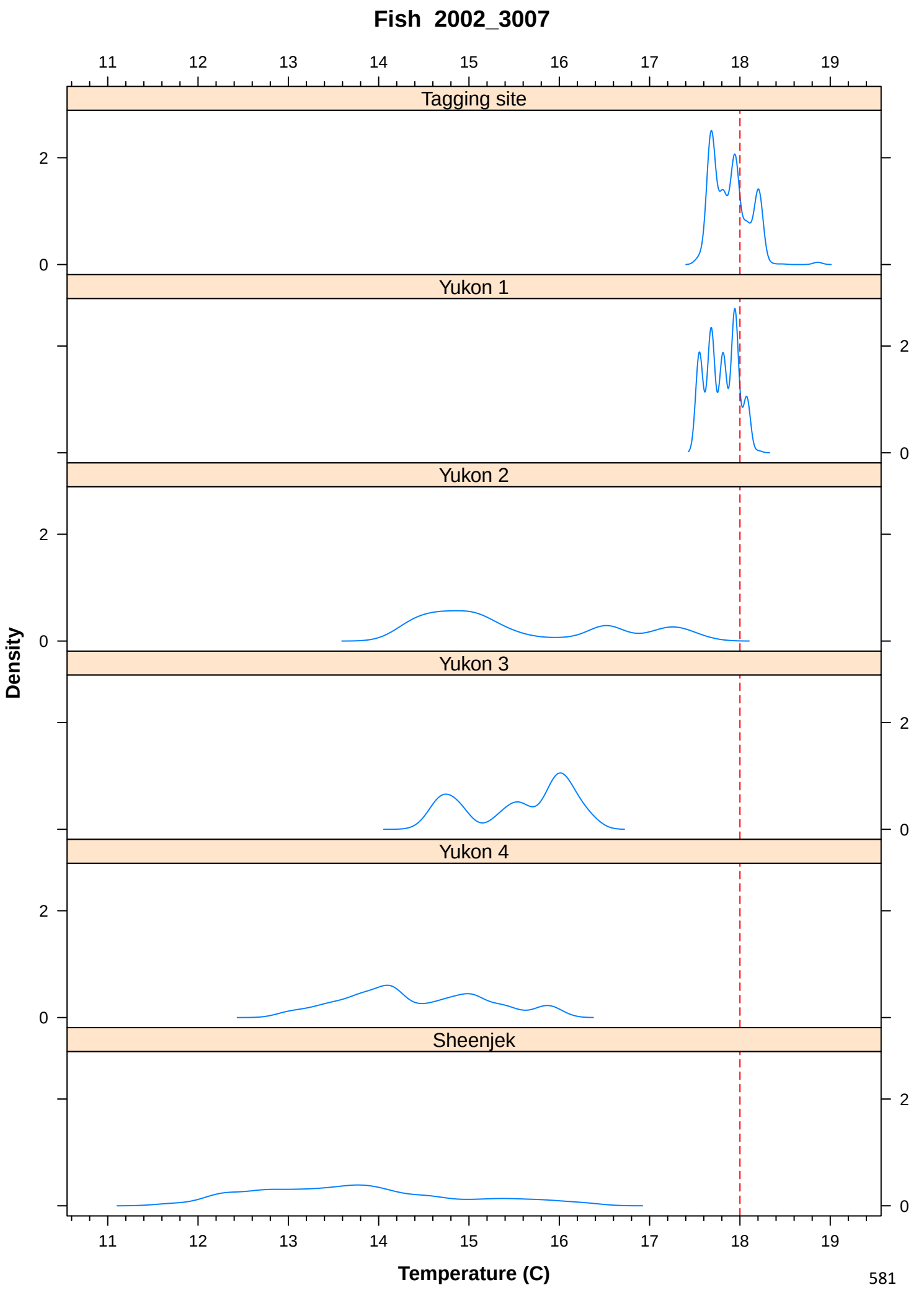

Fish 2002_3007
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Reach

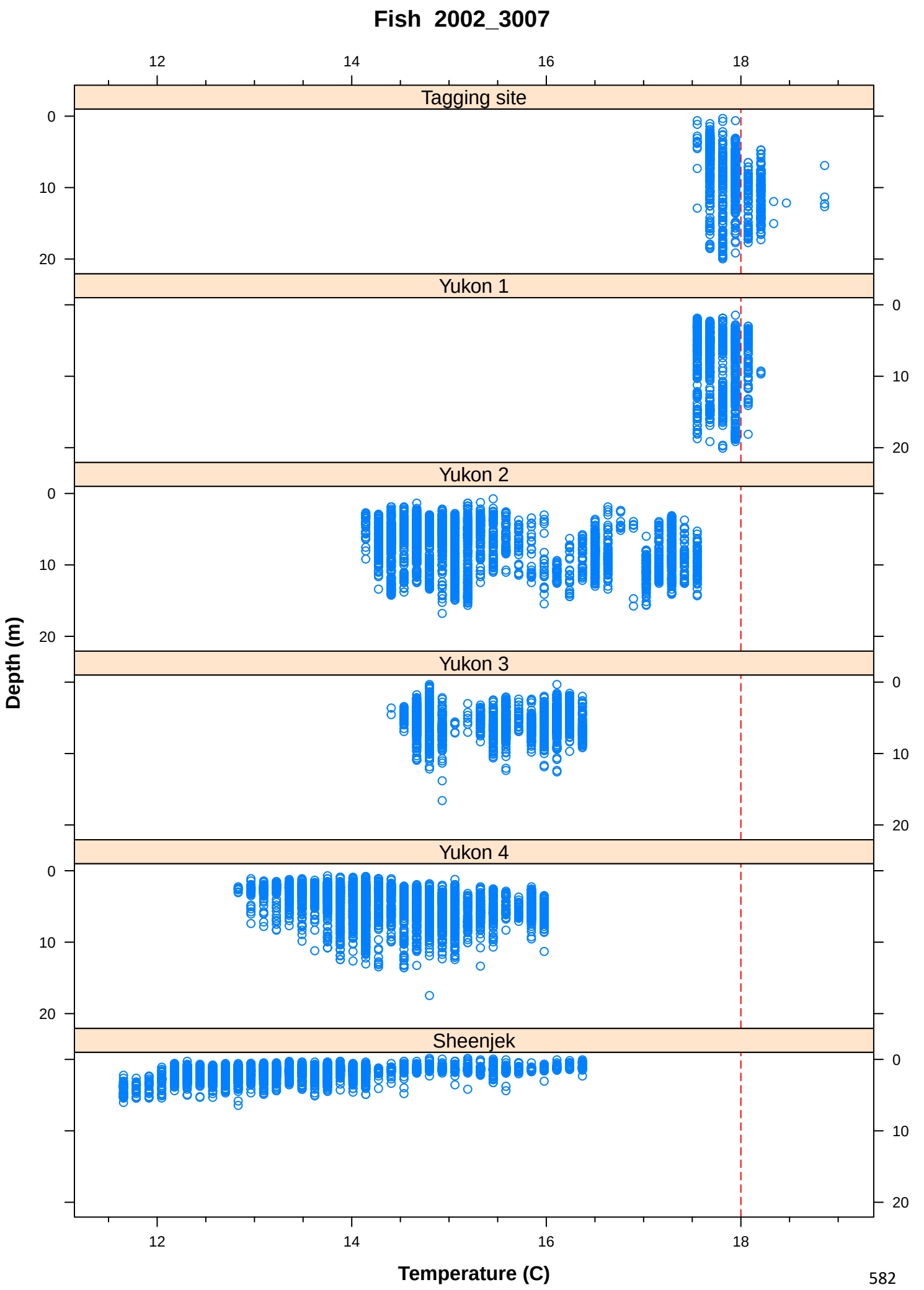

Fish 2002_3007
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Density
1.0
0.5
0.0
0
5
10
15
20
Depth (m)

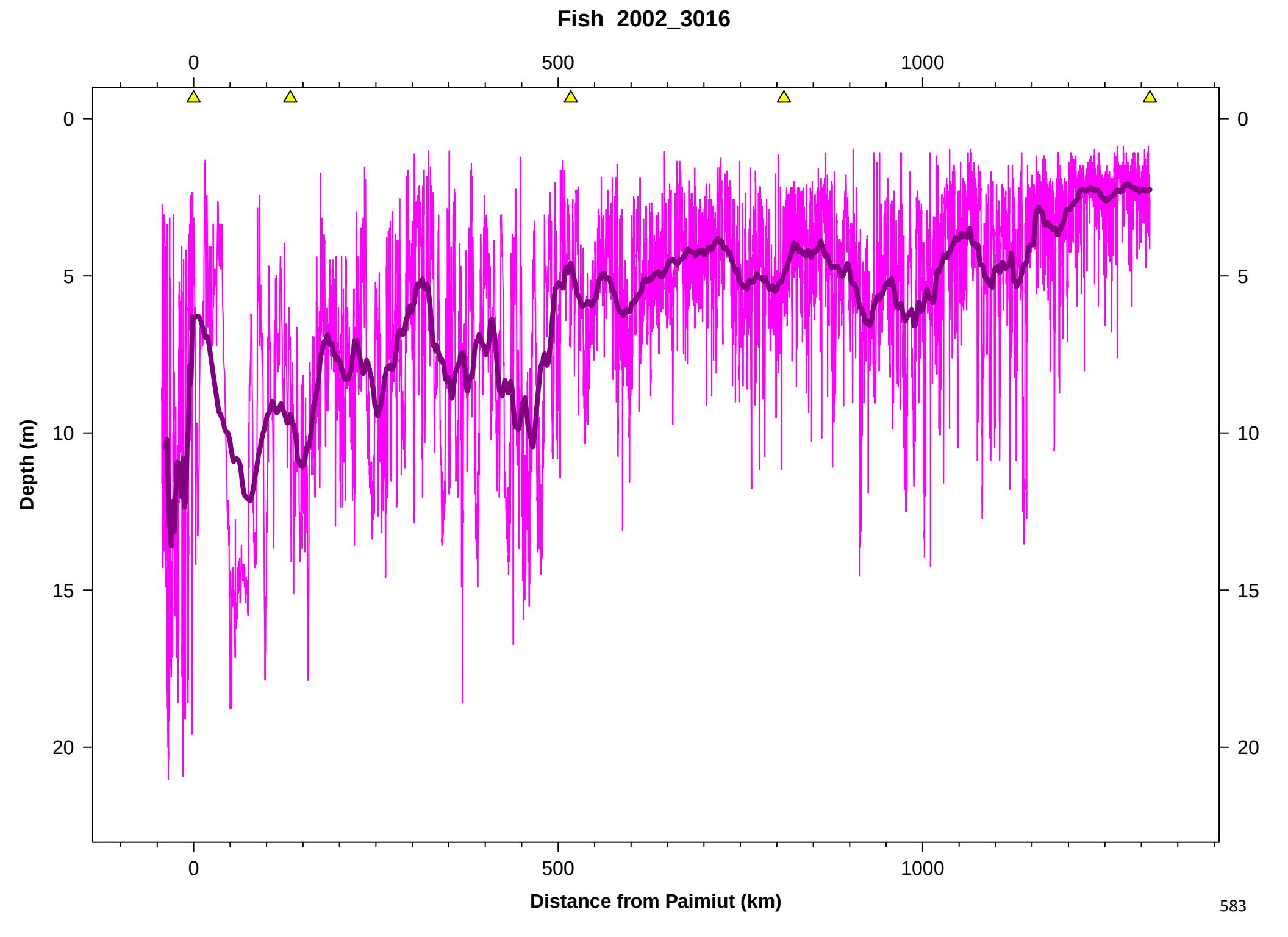

Fish 2002_3007
0
500
1000
18
16
14
12
Temperature (C)
Distance from Paimiut (km)

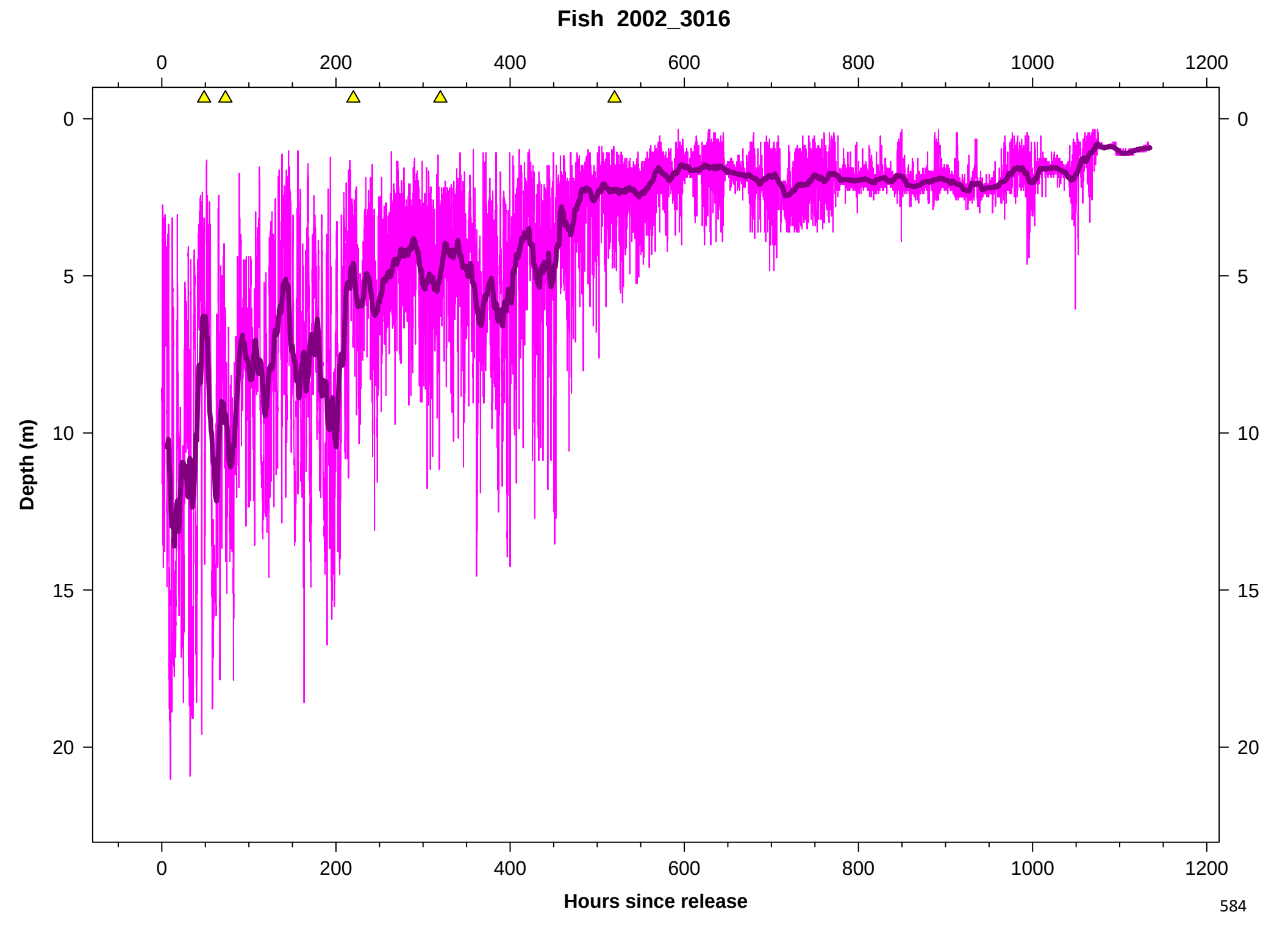

Fish 2002_3007
0
200
400
600
800
18
16
14
12
Temperature (C)
Hours since release

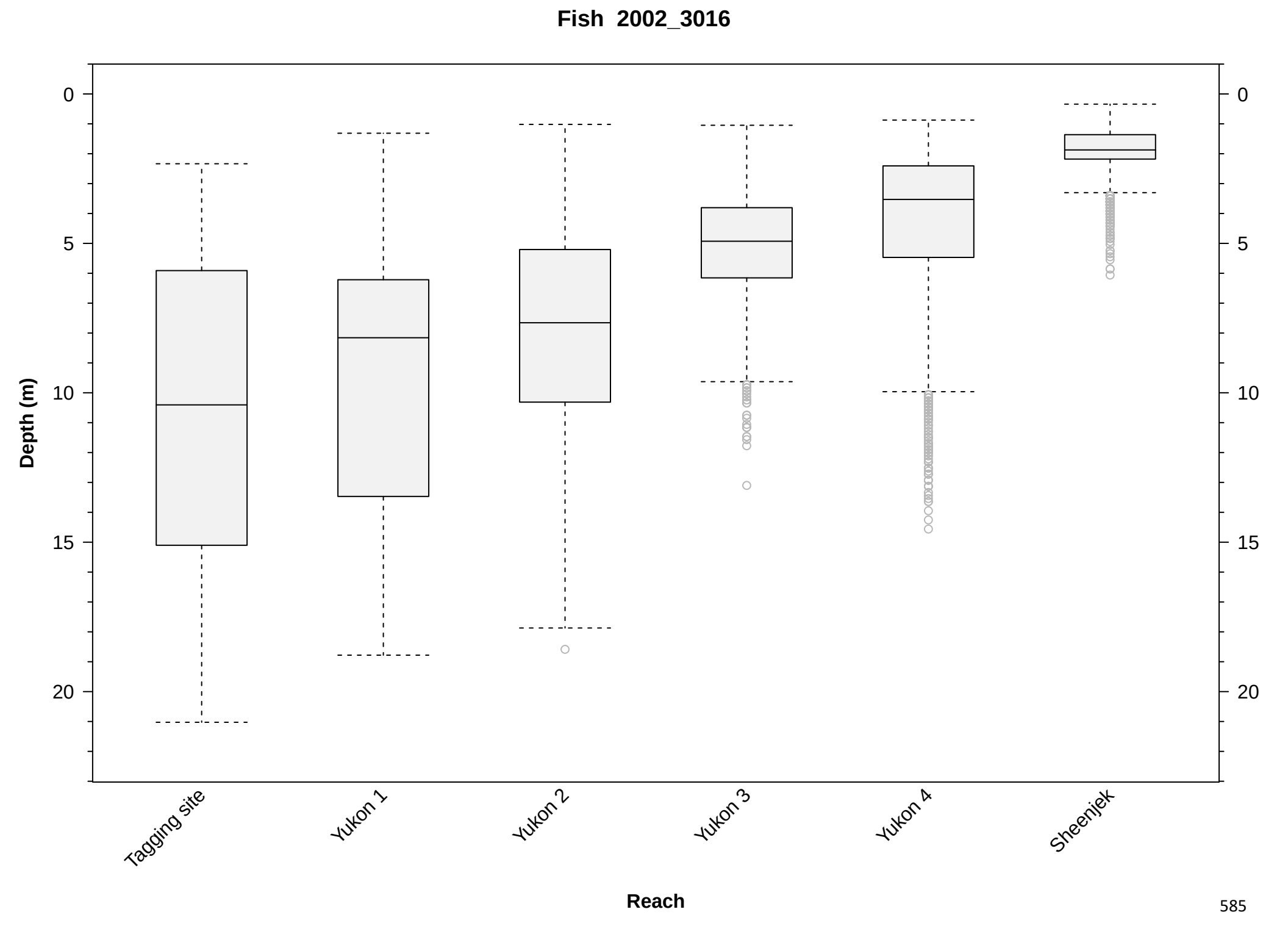

Fish 2002_3007
Temperature (C)
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Reach

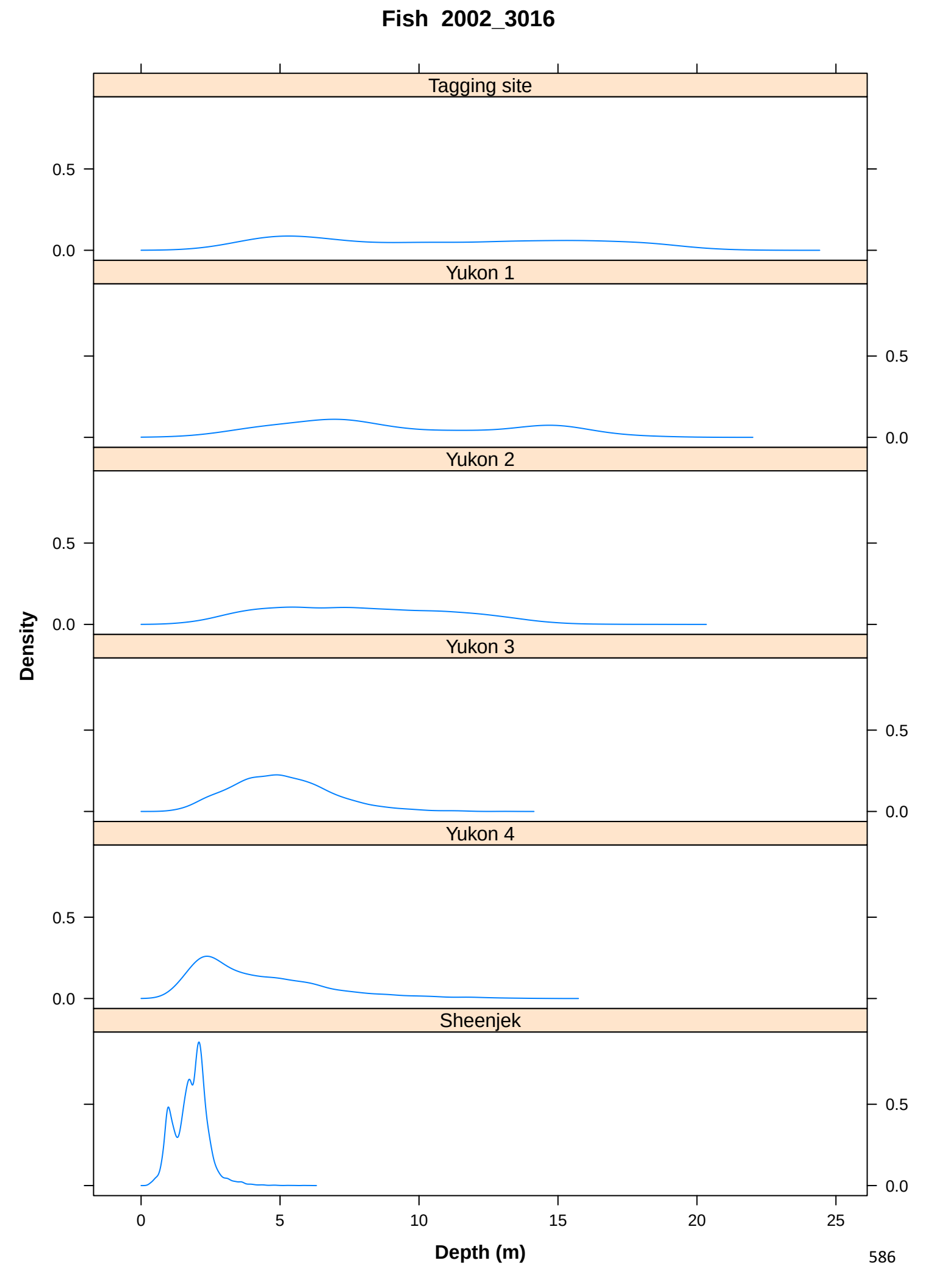

Fish 2002_3007
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Density
Temperature (C)
11
12
13
14
15
16
17
18
19
0
2

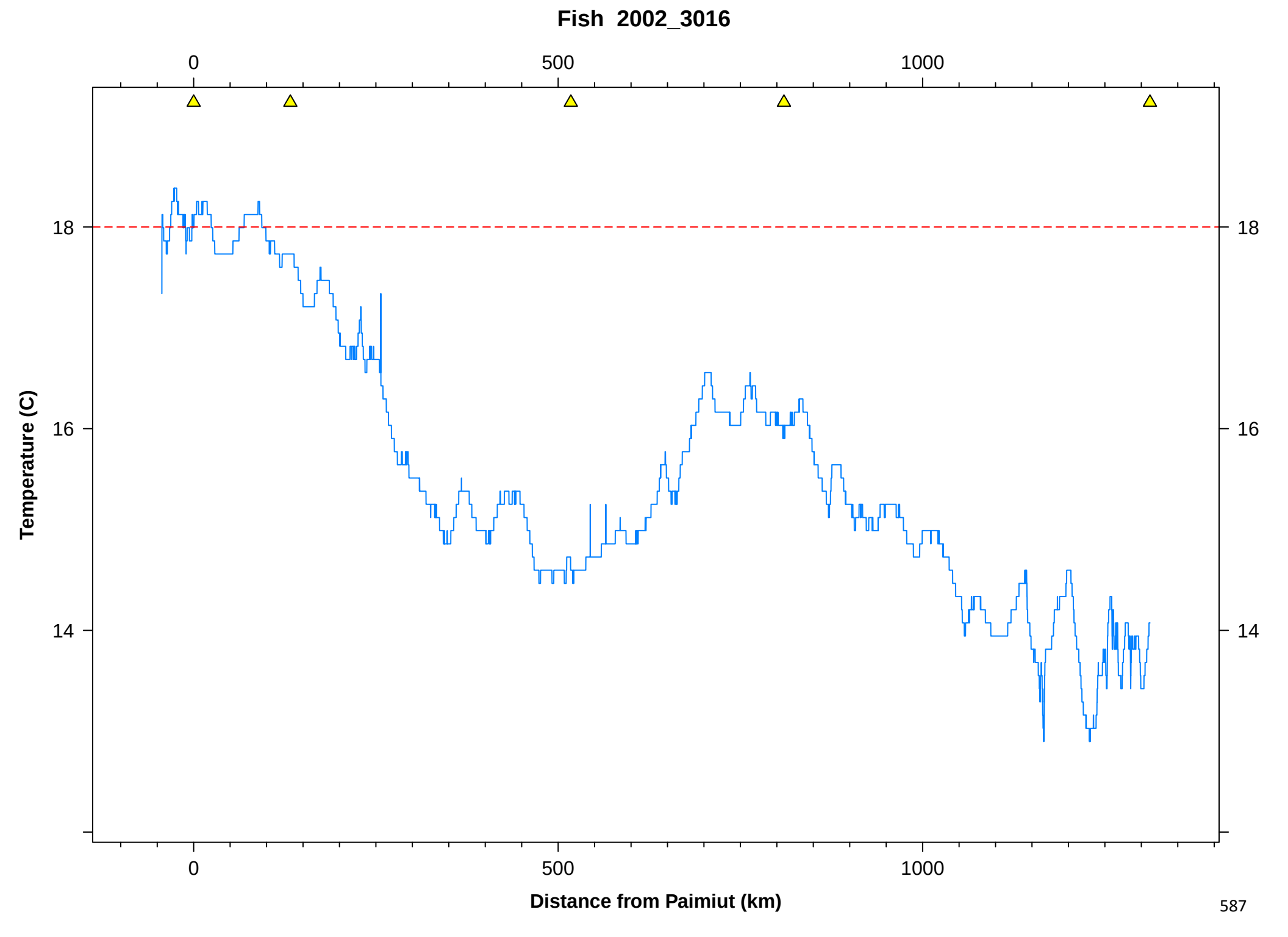

Fish 2002_3007
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Depth (m)
Temperature (C)
12
14
16
18
0
10
20

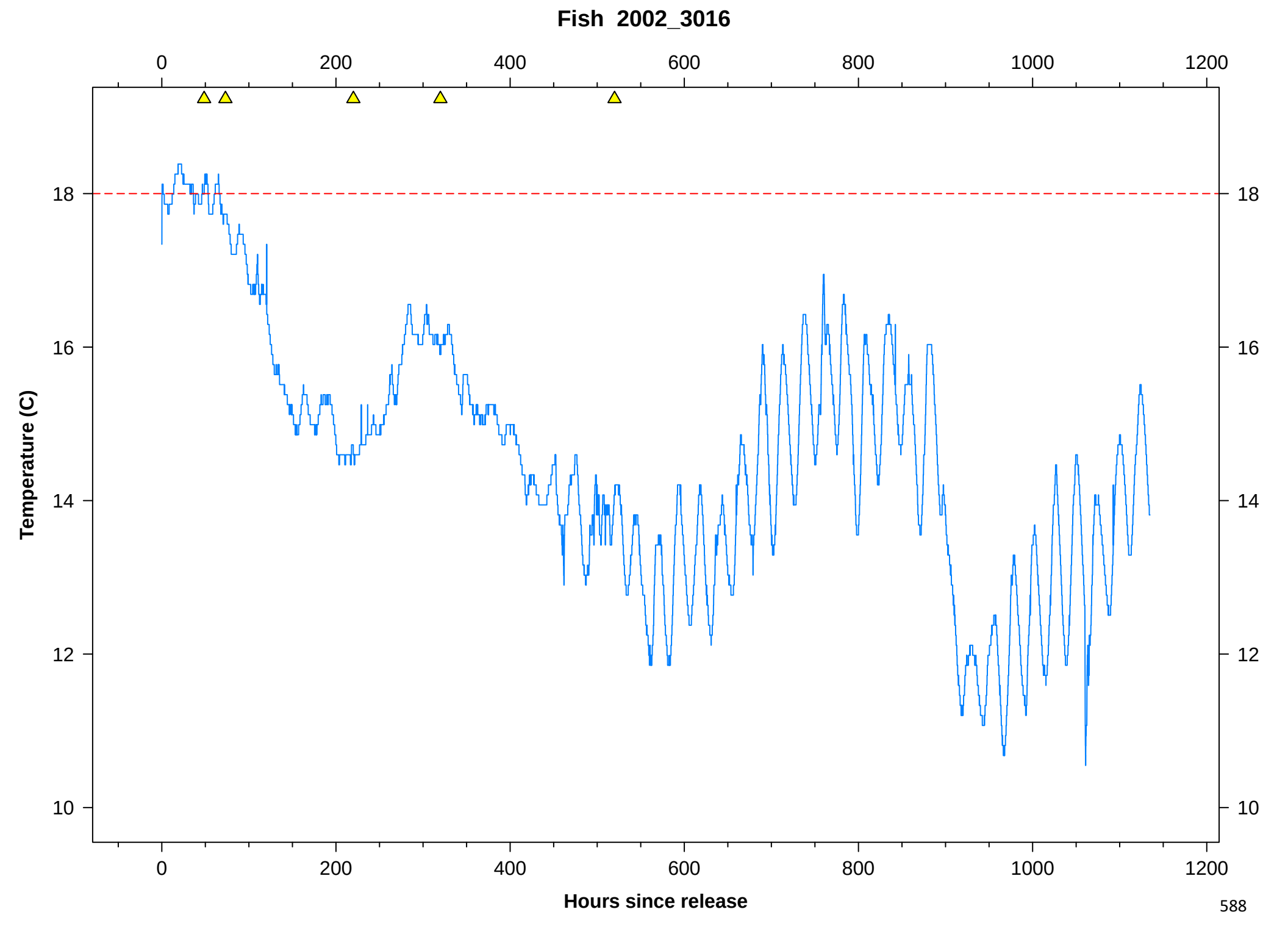

Fish 2002_3016
0
500
1000
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

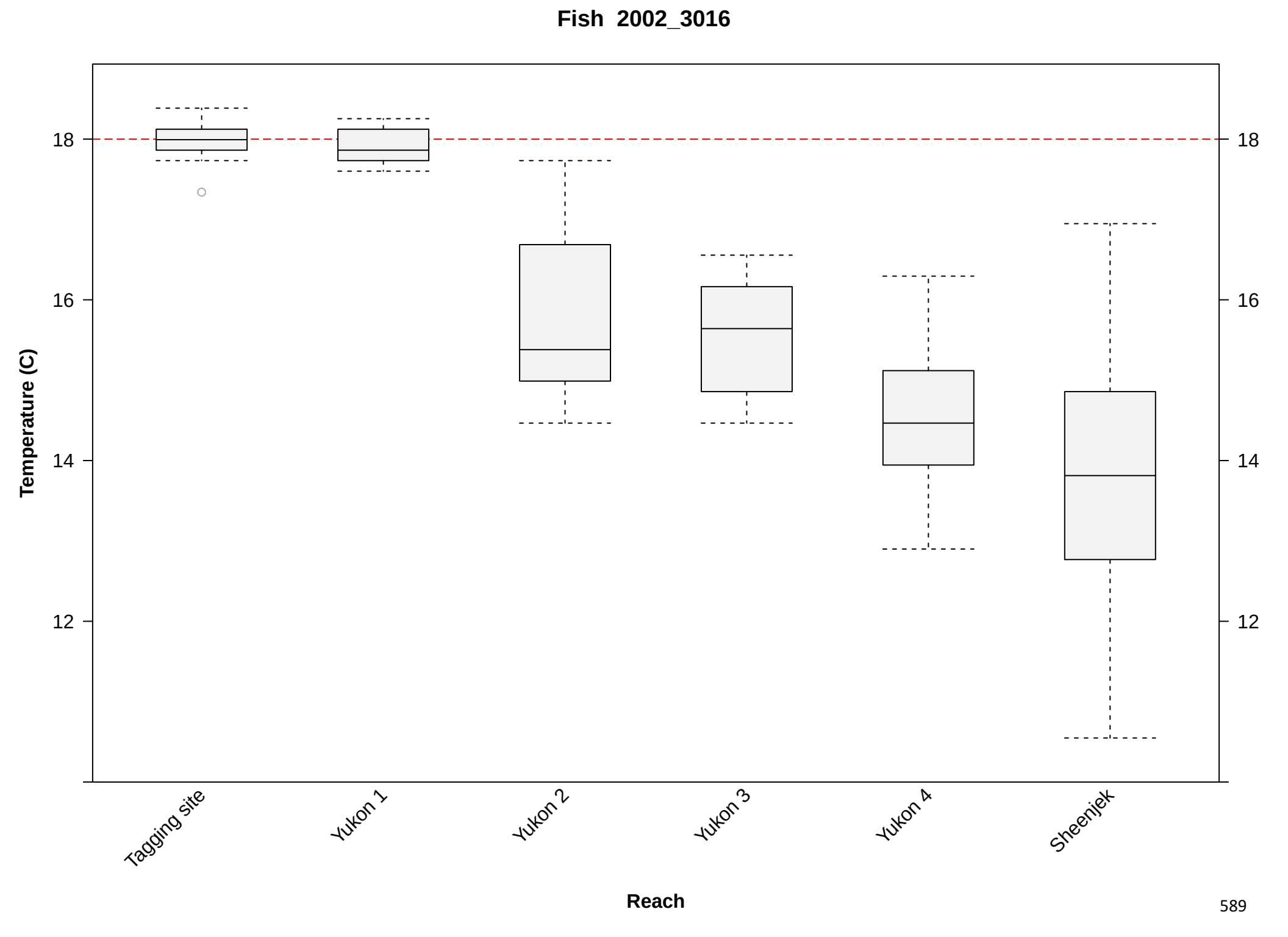

Fish 2002_3016
0
200
400
600
800
1000
1200
0
5
10
15
20
Depth (m)
Hours since release

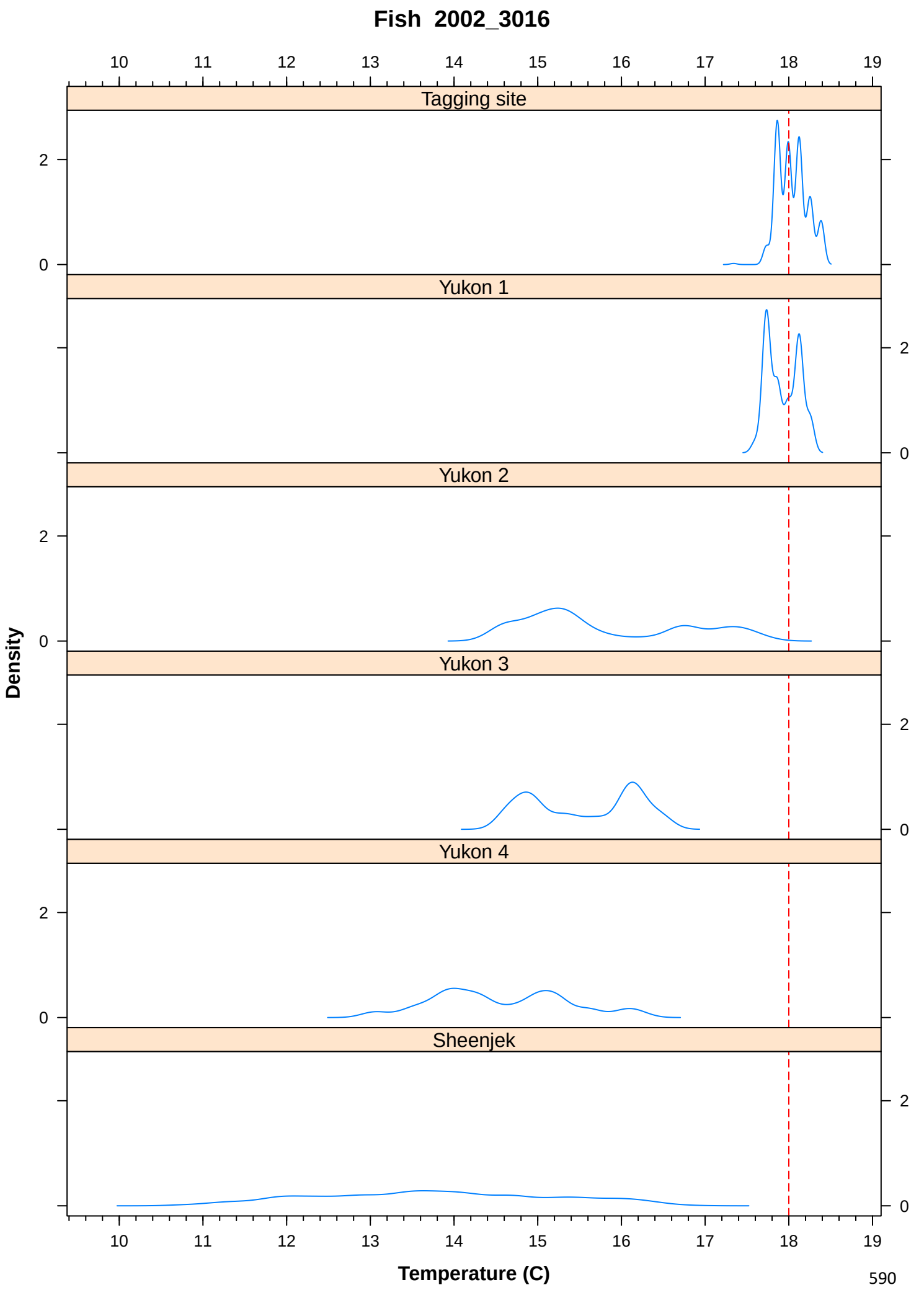

Fish 2002_3016
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Reach

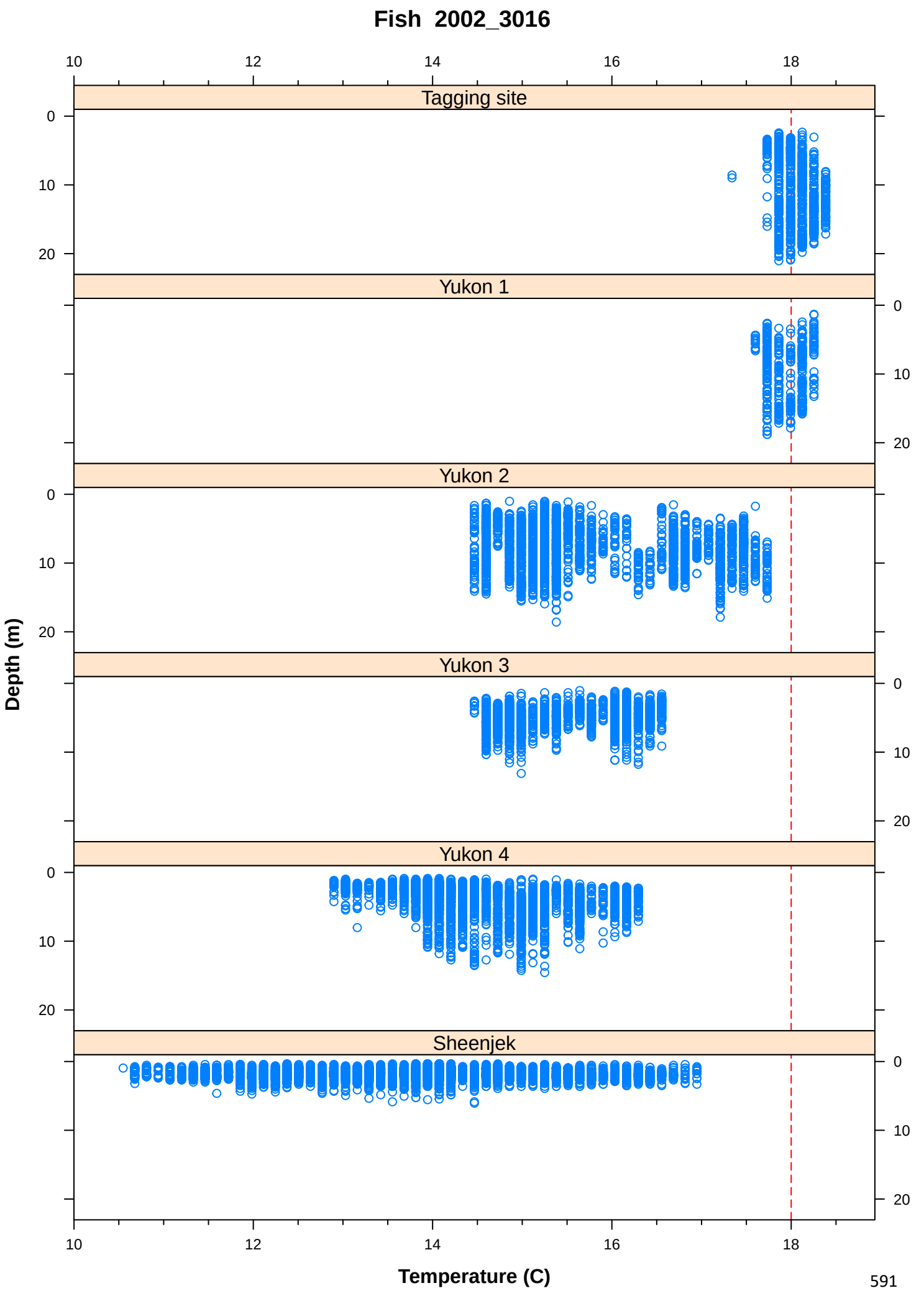

Fish 2002_3016
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Density
0.5
0.0
0
5
10
15
20
25
Depth (m)


Fish 2002_3016
0
500
1000
18
16
14
Temperature (C)
Distance from Paimiut (km)

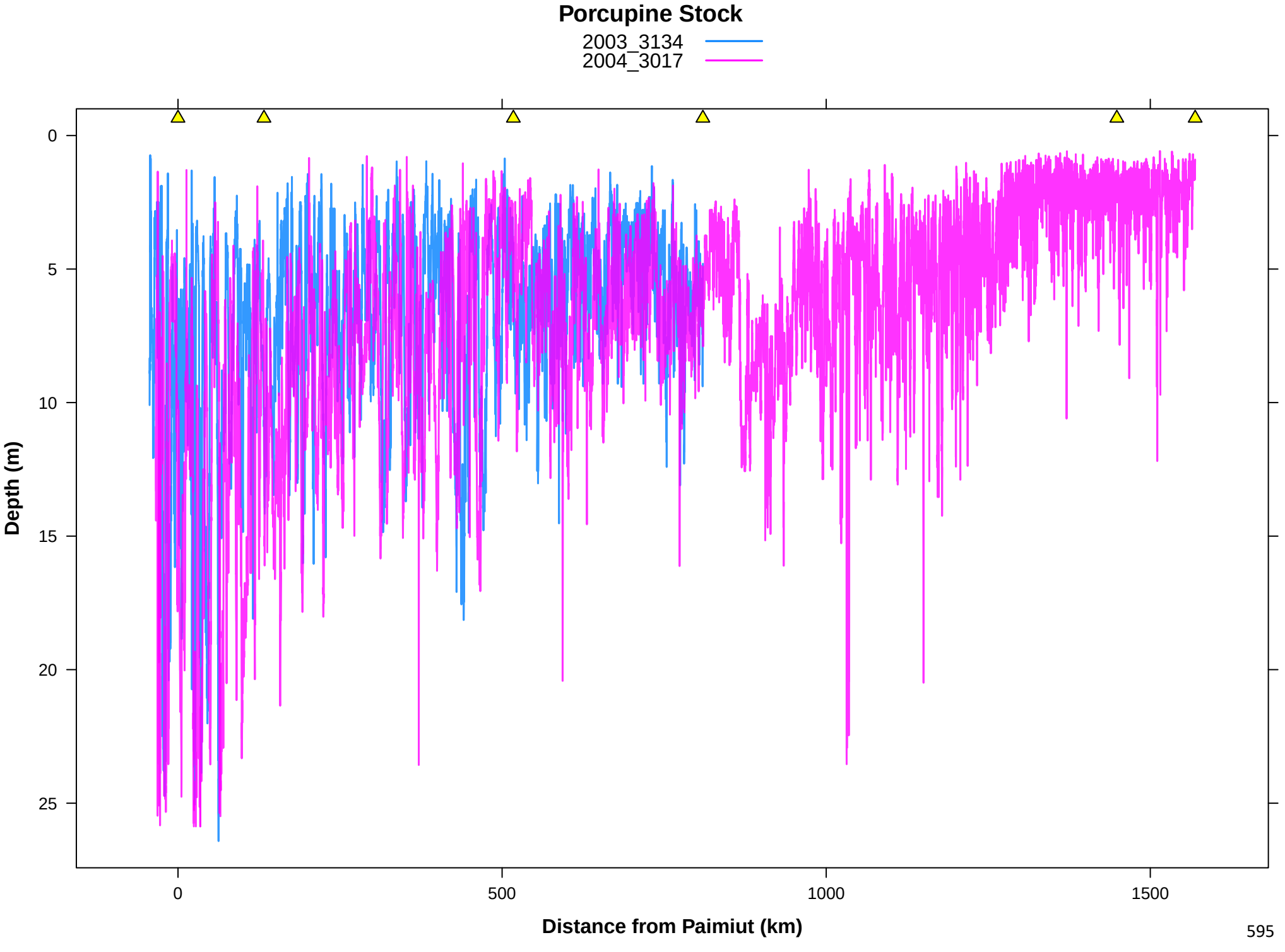

Fish 2002_3016
0
200
400
600
800
1000
1200
18
16
14
12
10
Temperature (C)
Hours since release

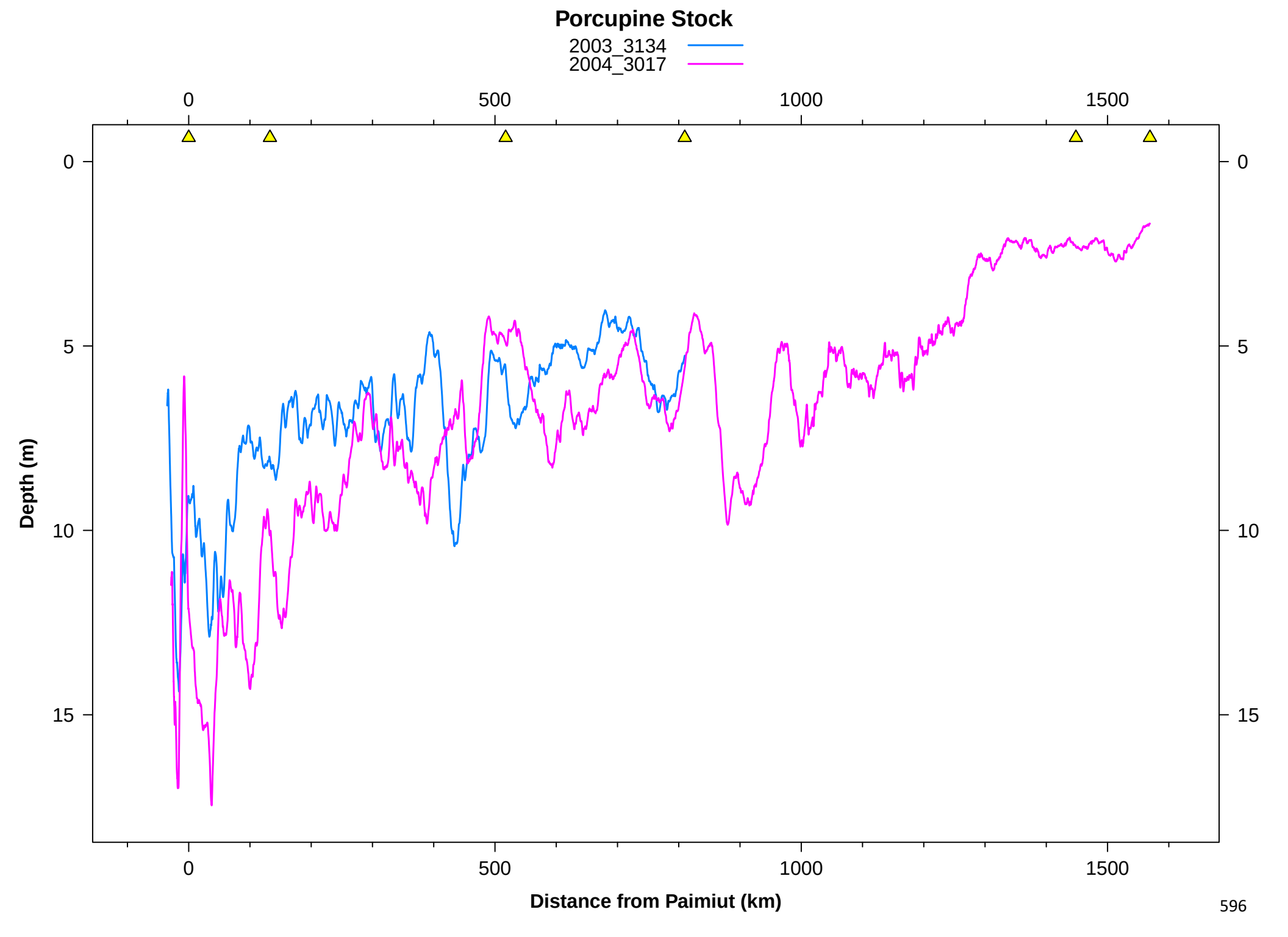

Fish 2002_3016
Temperature (C)
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Reach

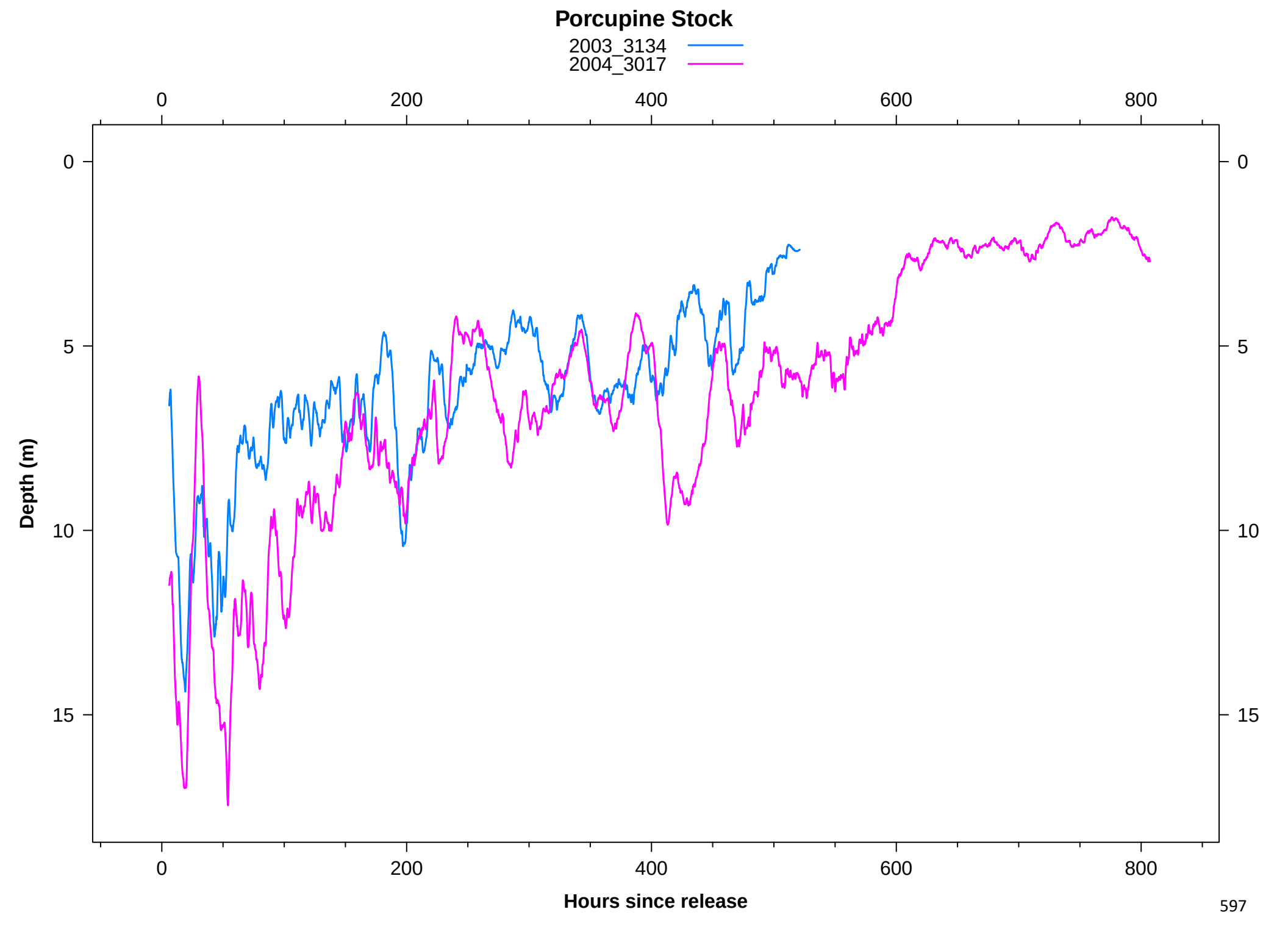

Fish 2002_3016
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Density
Temperature (C)
10
11
12
13
14
15
16
17
18
19
0
2

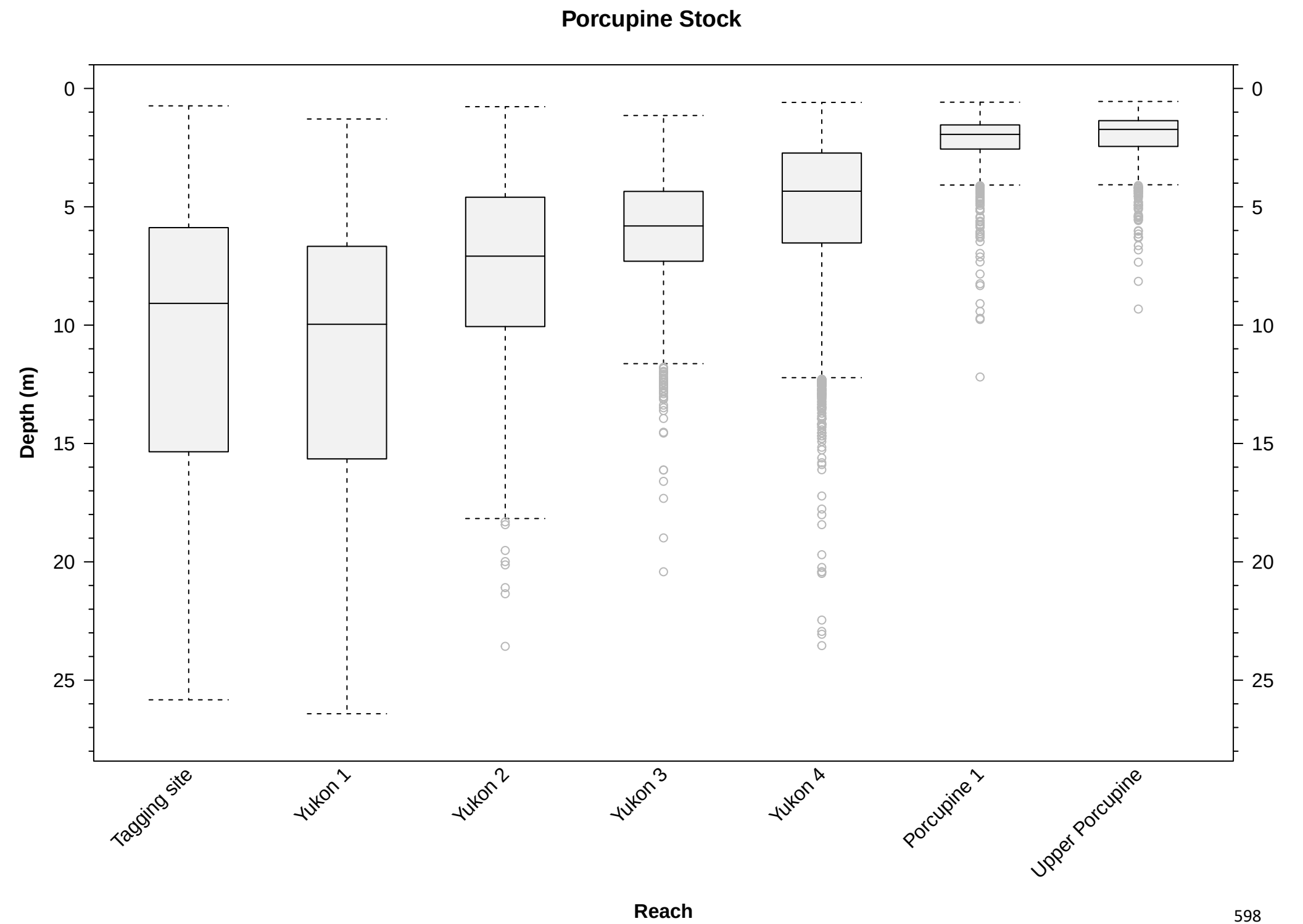

Fish 2002_3016
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Sheenjek
Depth (m)
Temperature (C)
10
12
14
16
18
0
10
20

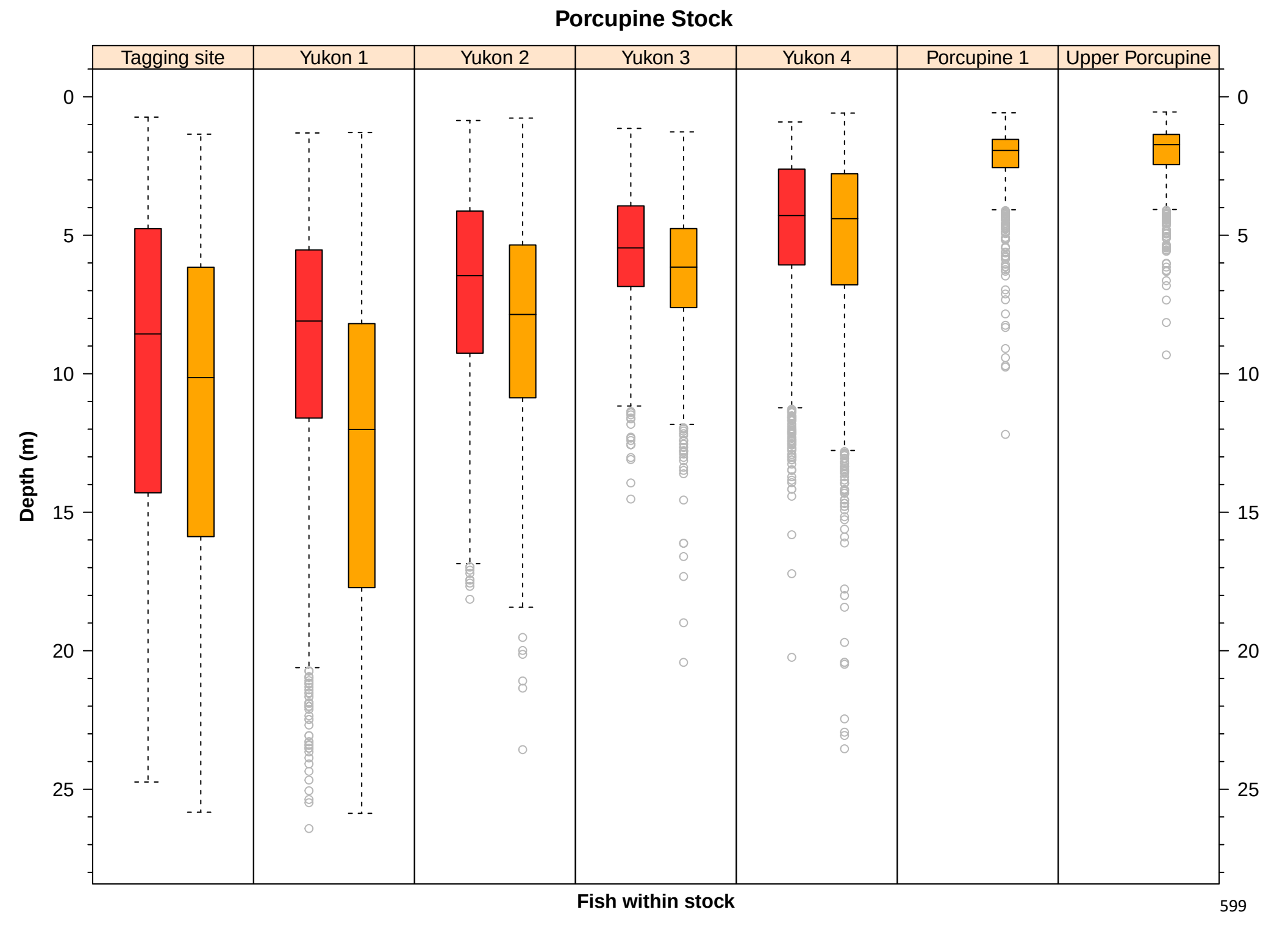
Appendix 7. -- Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Upper Porcupine in 2002-2004 595

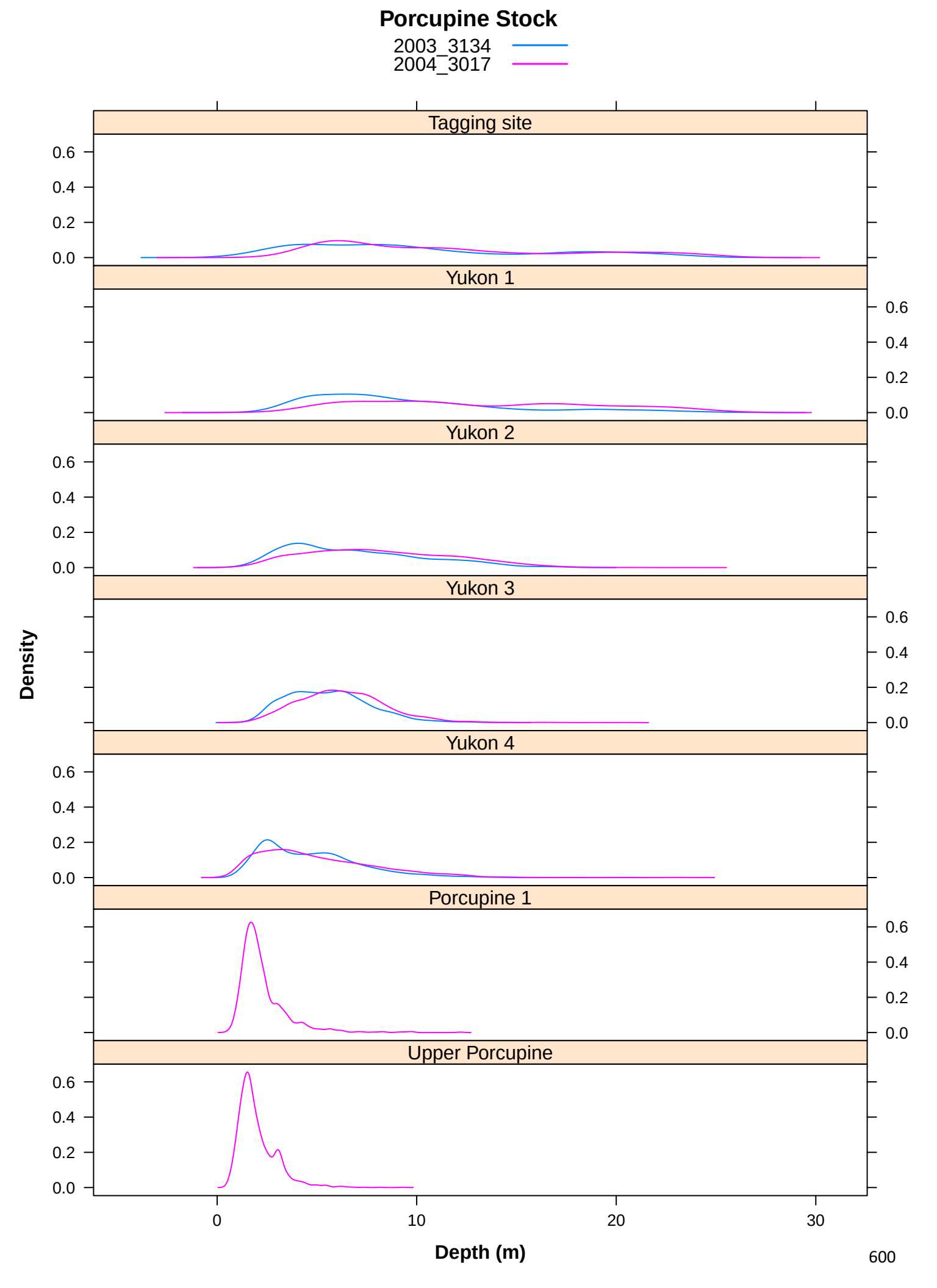

Porcupine Stock
2003_3134
2004_3017
Depth (m)
0
5
10
15
20
25
0
500
1000
1500
Distance from Paimiut (km)

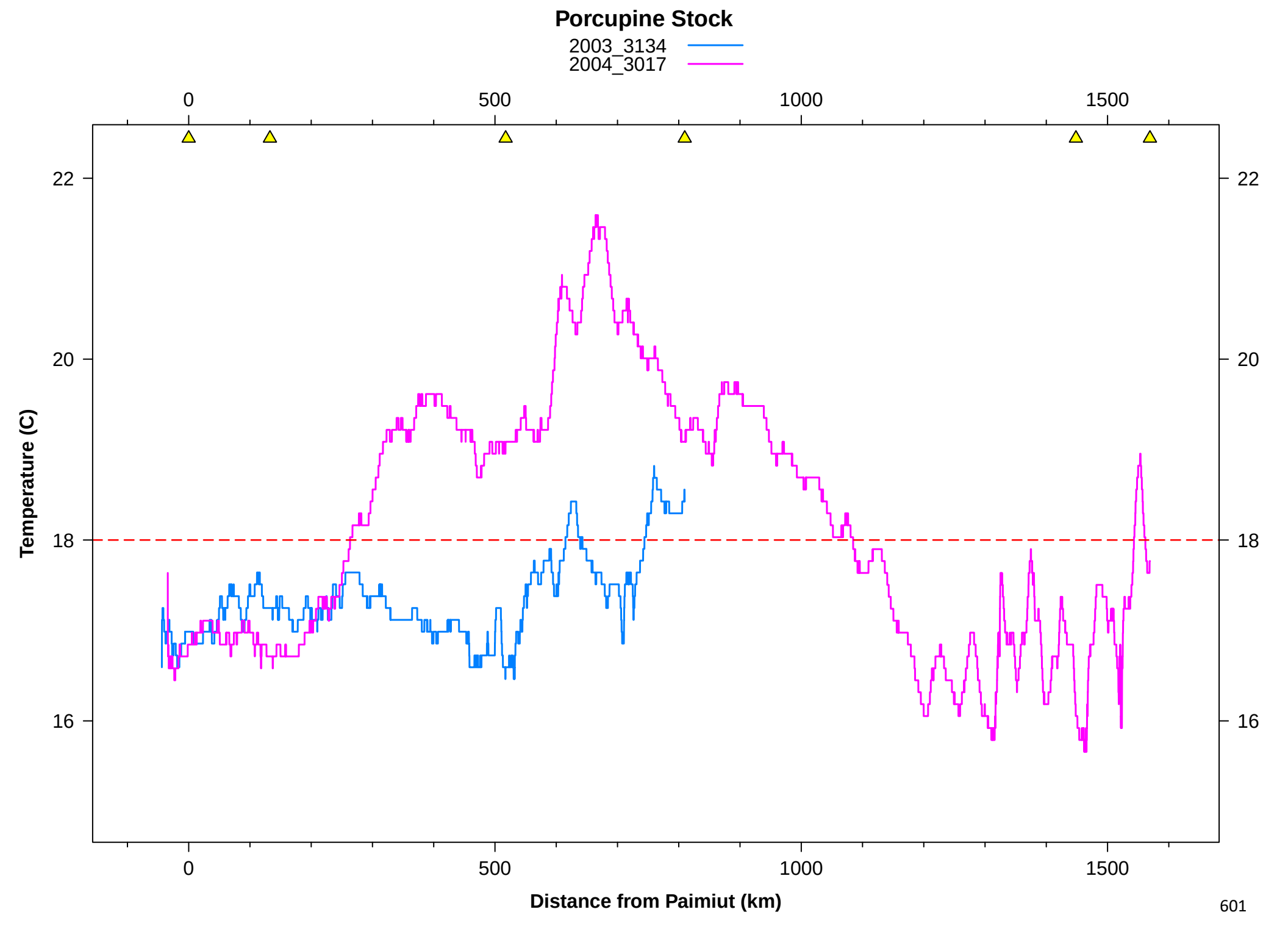

Porcupine Stock
2003_3134
2004_3017
0
500
1000
1500
0
5
10
15
Depth (m)
Distance from Paimiut (km)

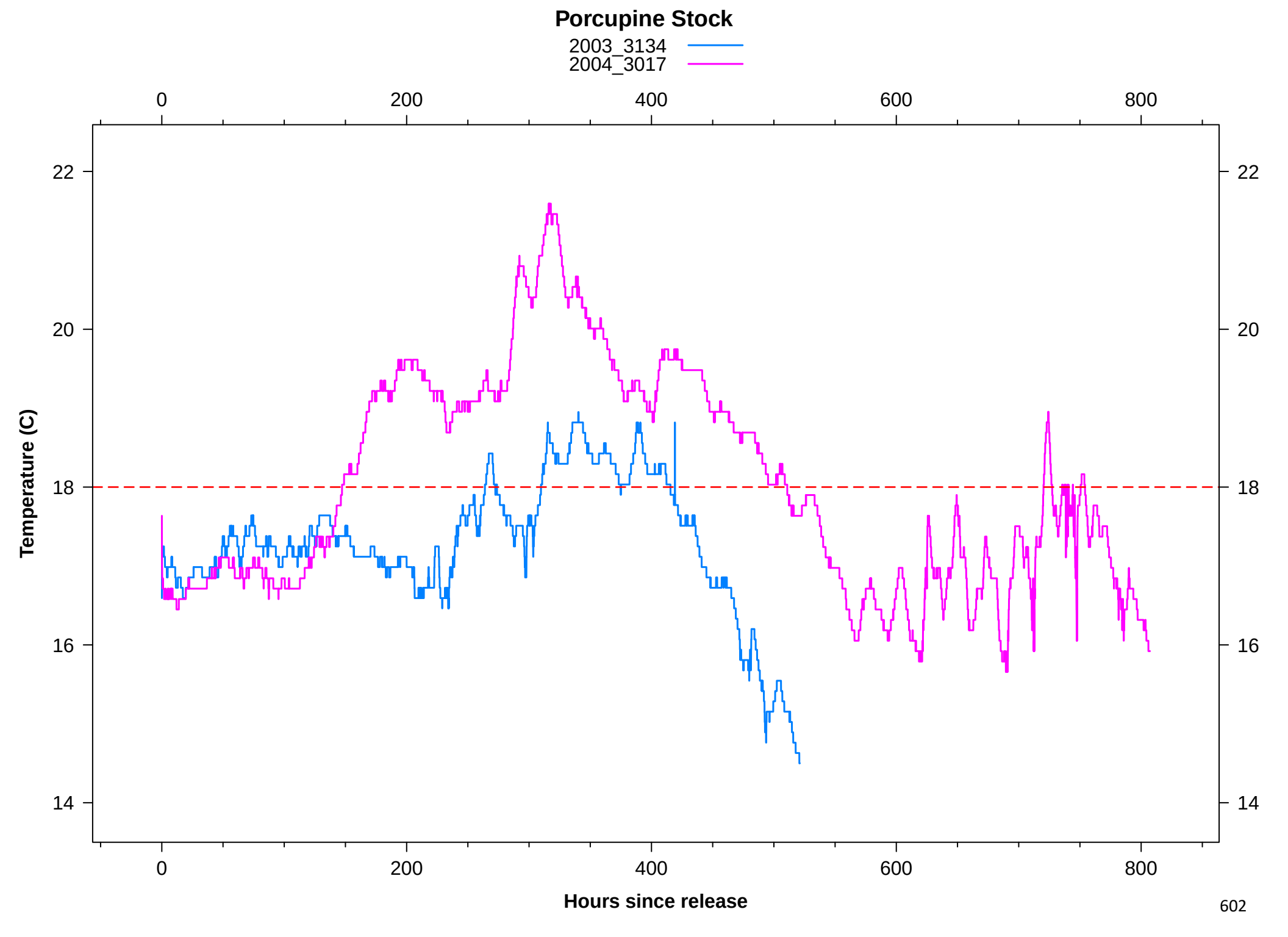

Porcupine Stock
2003_3134
2004_3017
0
200
400
600
800
0
5
10
15
Depth (m)
Hours since release

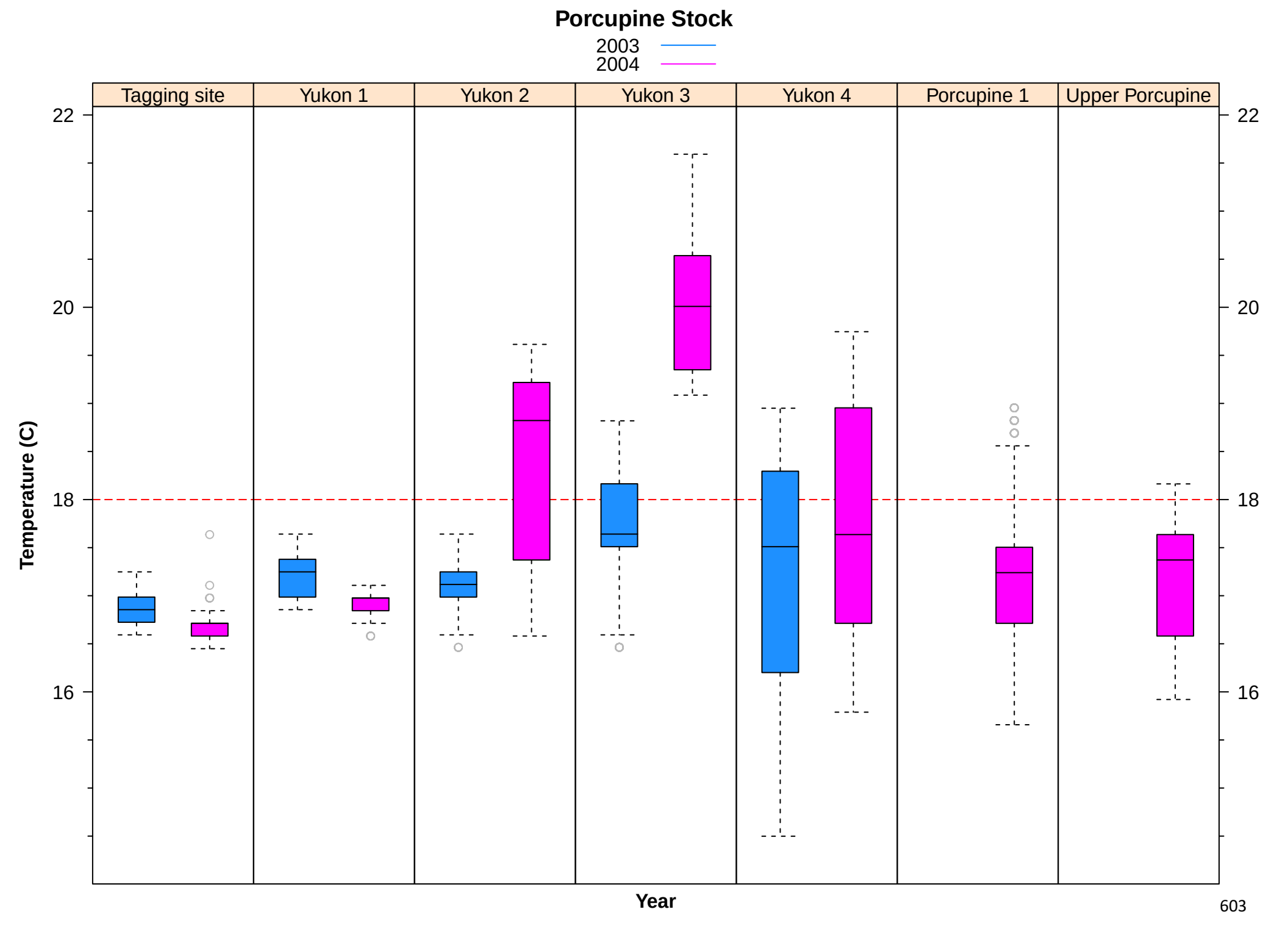

Porcupine Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
Reach

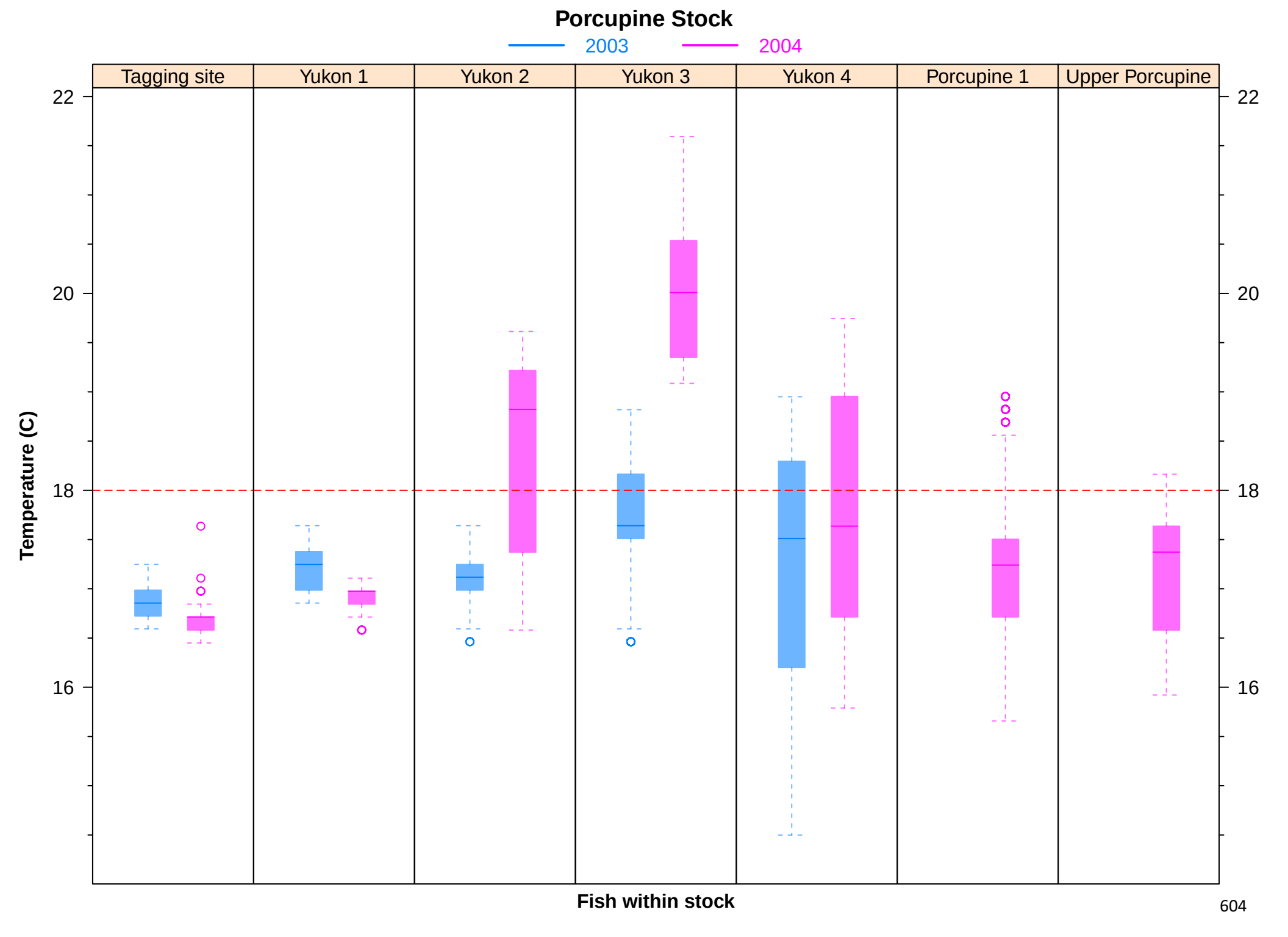

Porcupine Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
Depth (m)
0
5
10
15
20
25
Fish within stock
599

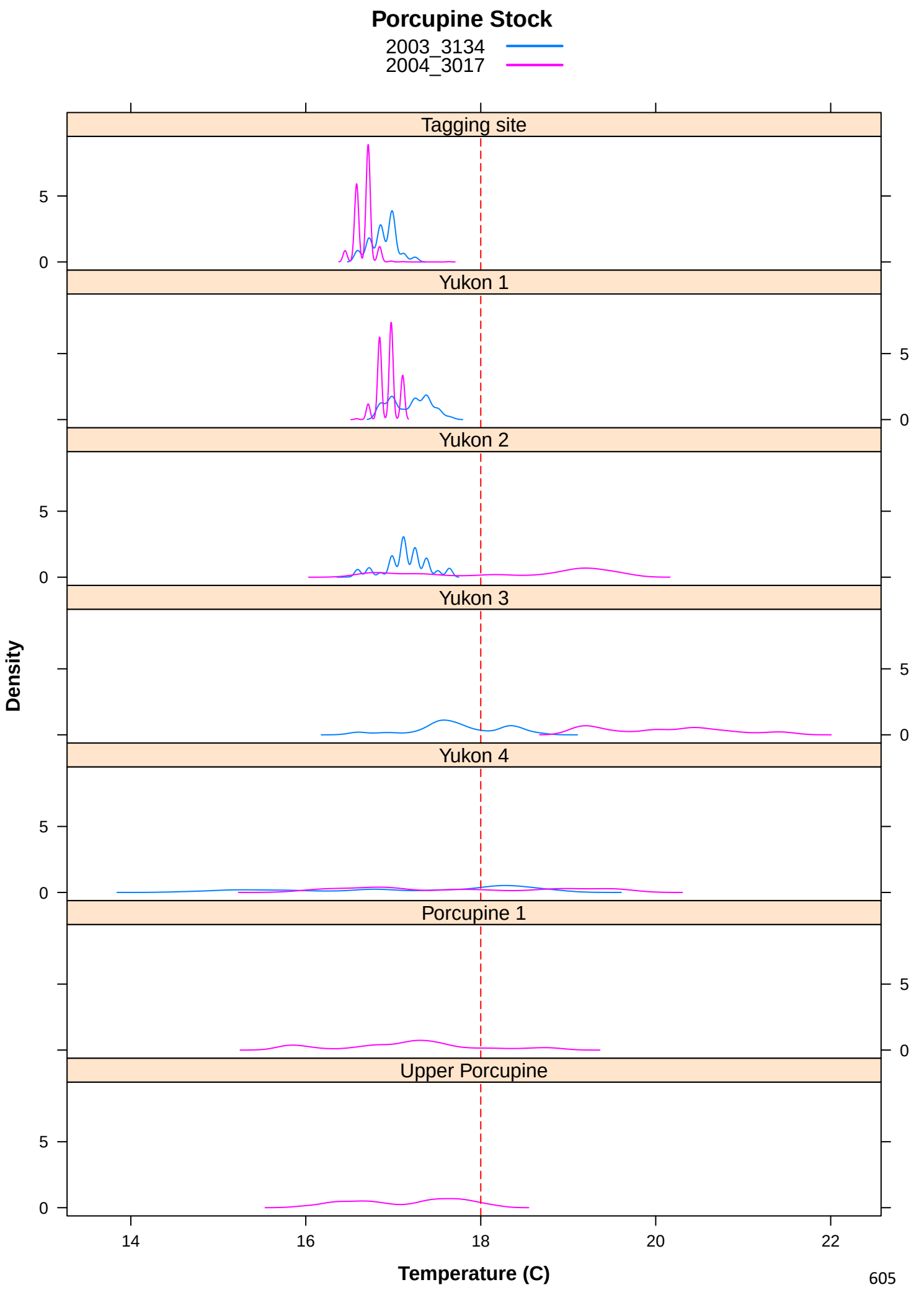

Porcupine Stock
2003_3134
2004_3017
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
Density
0.0
0.2
0.4
0.6
0
10
20
30
Depth (m)

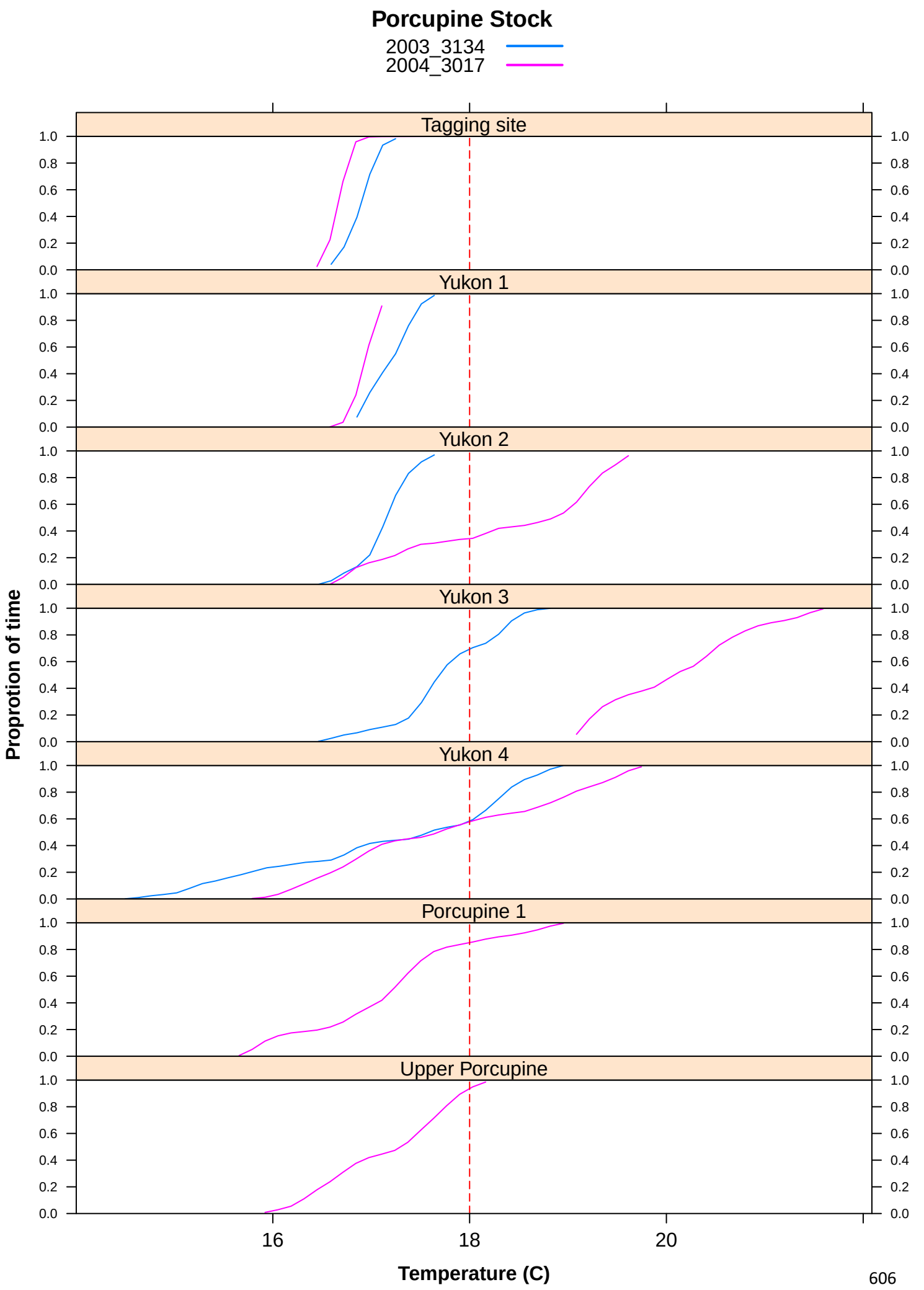

Porcupine Stock
2003_3134
2004_3017
0
500
1000
1500
22
20
18
16
Temperature (C)
Distance from Paimiut (km)
601

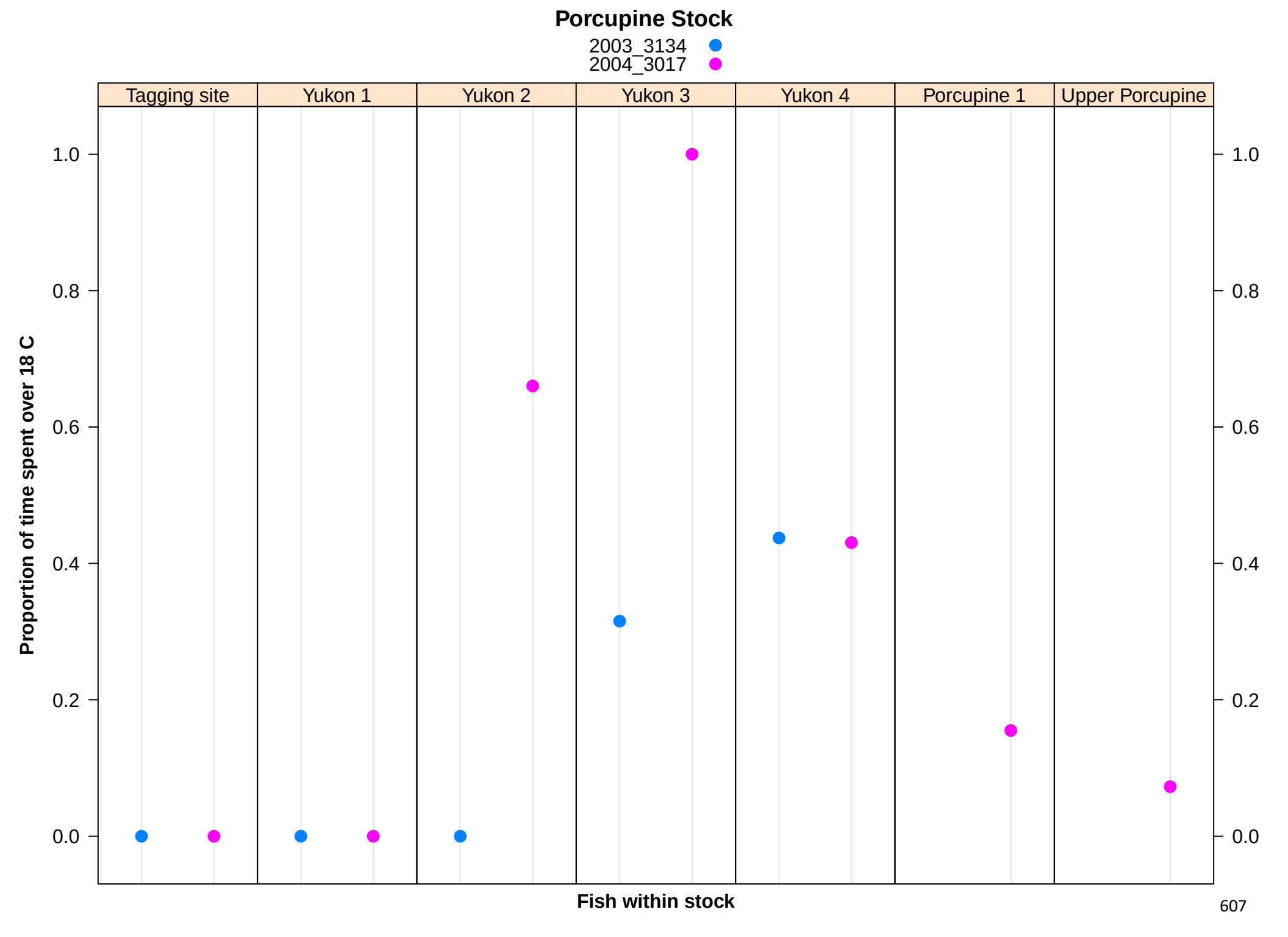

Porcupine Stock
2003_3134
2004_3017
0
200
400
600
800
22
20
18
16
14
Temperature (C)
Hours since release

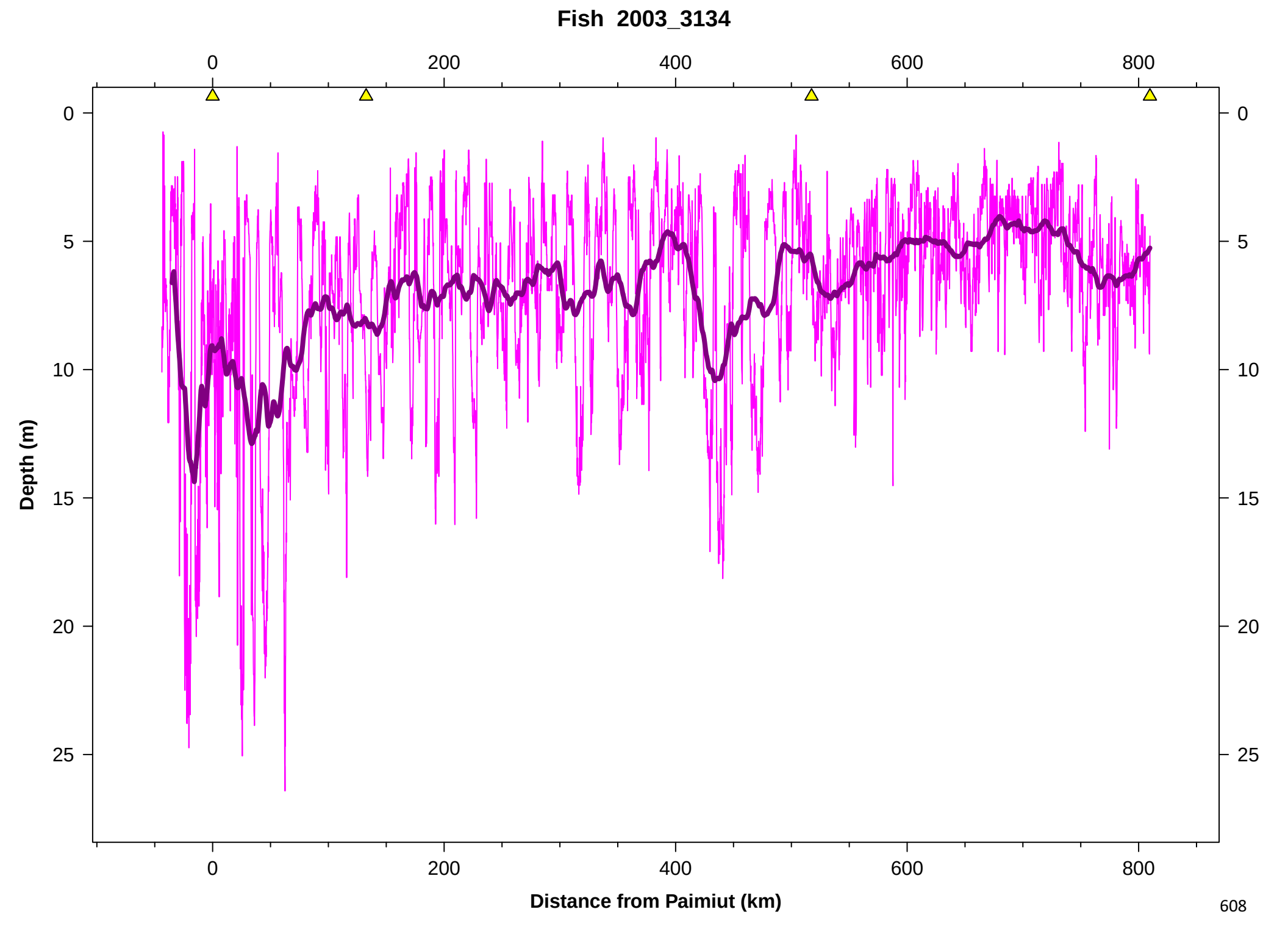

Porcupine Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
Temperature (C)
22
20
18
16
Year

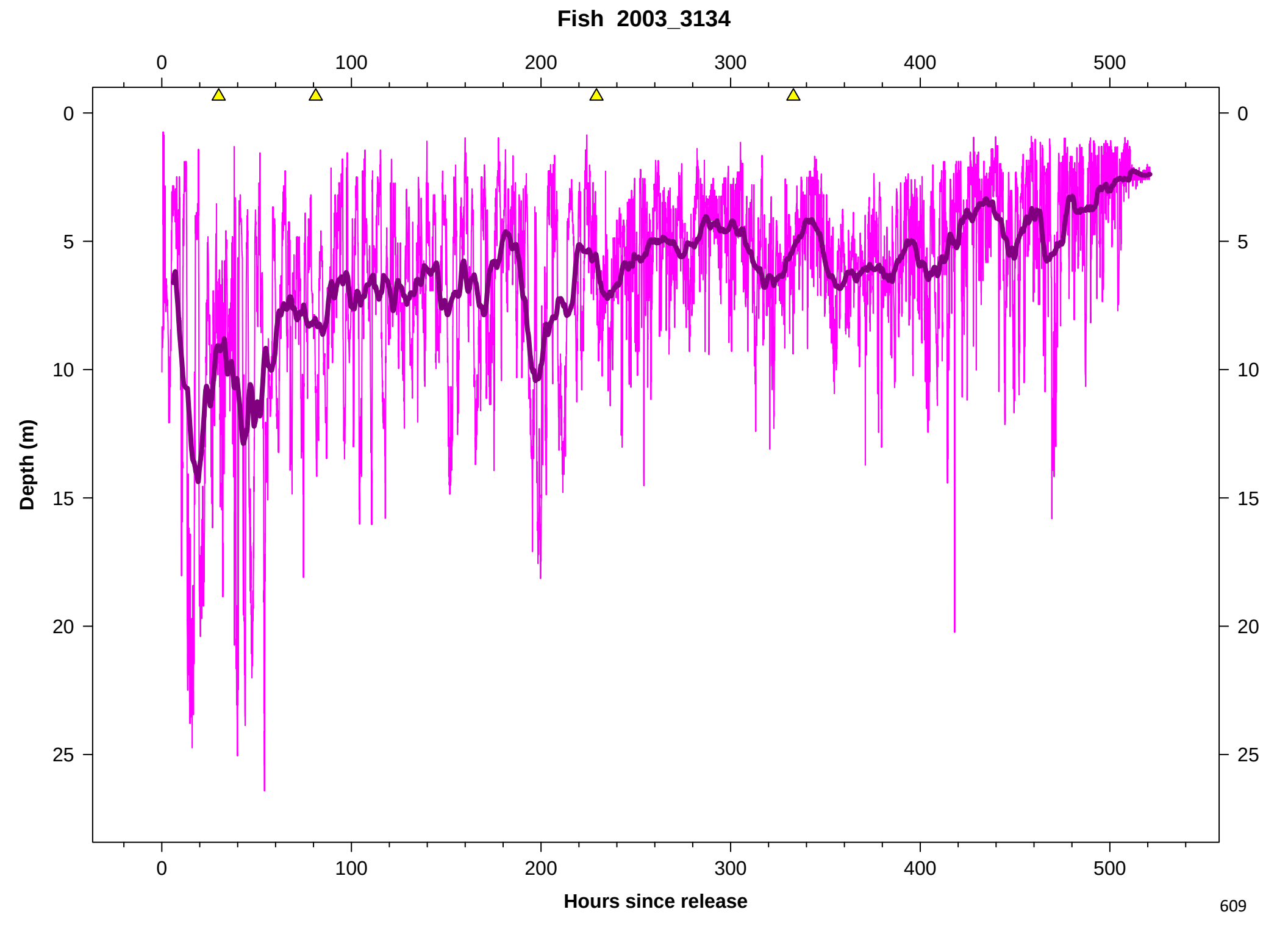

Porcupine Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
22
20
18
16
Temperature (C)
Fish within stock
604

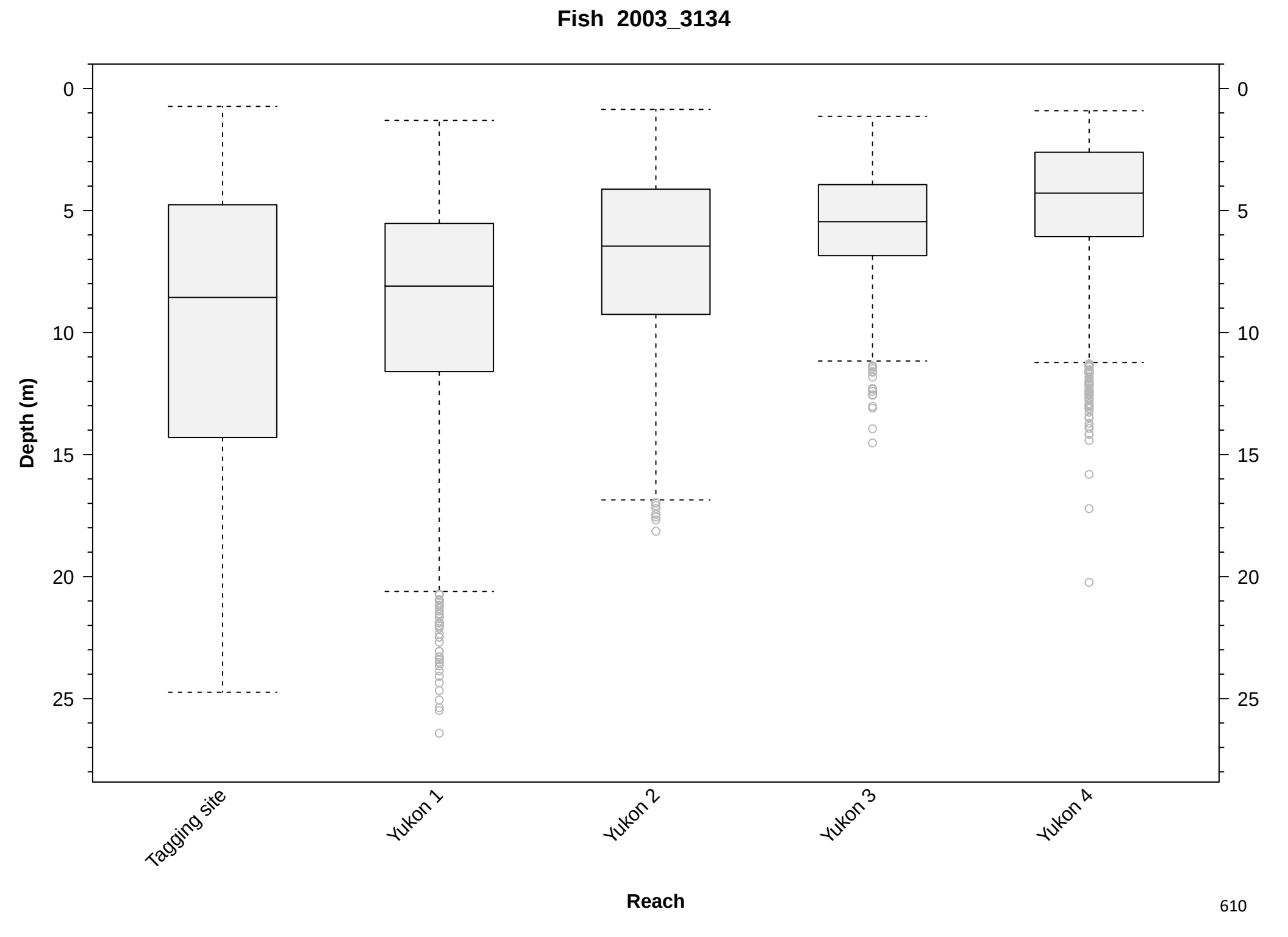

Porcupine Stock
2003_3134
2004_3017
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
Density
0
5
14
16
18
20
22
Temperature (C)

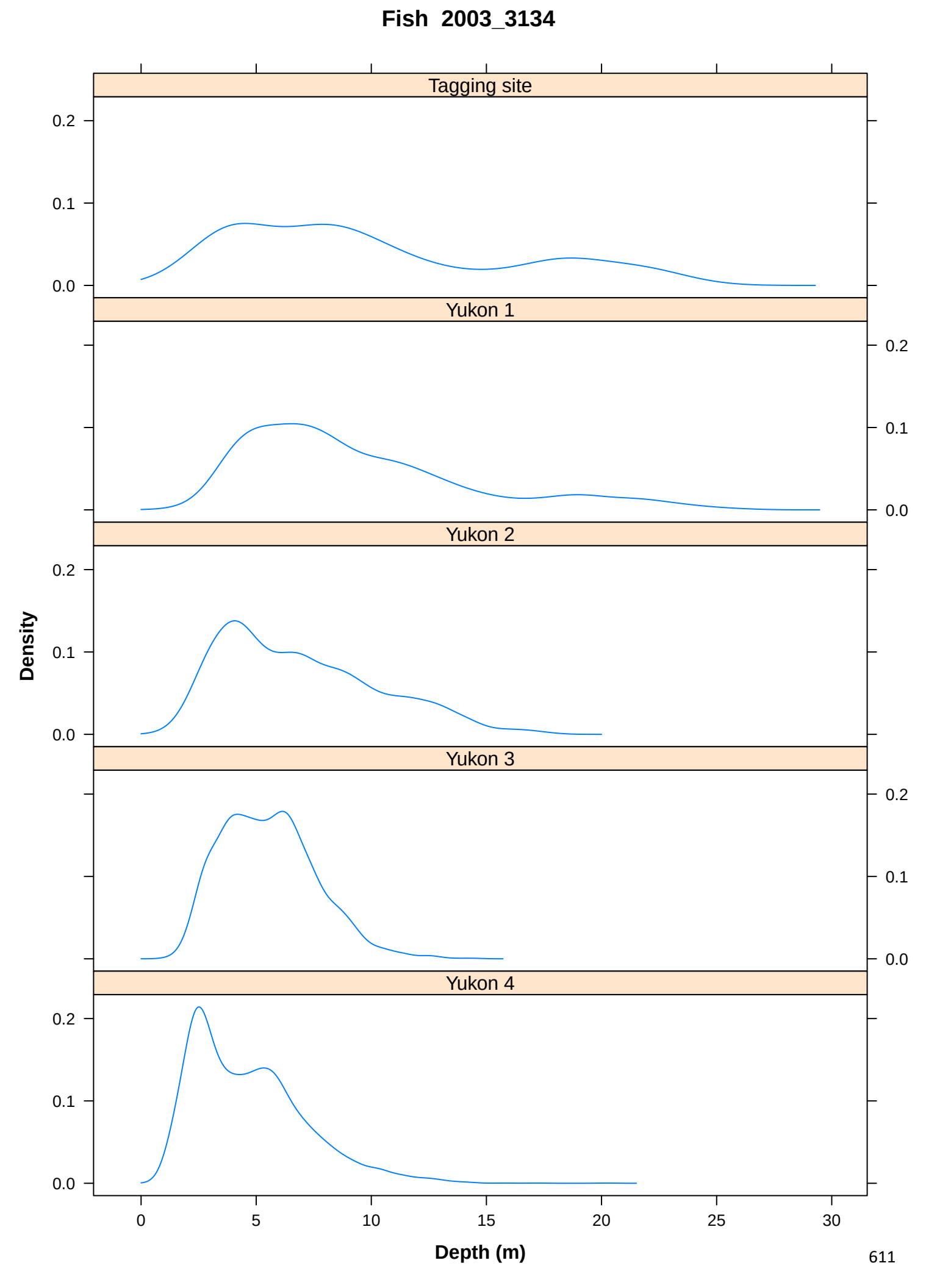

Porcupine Stock
2003_3134
2004_3017
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
Proprotion of time
Temperature (C)
16
18
20
0.0
0.2
0.4
0.6
0.8
1.0

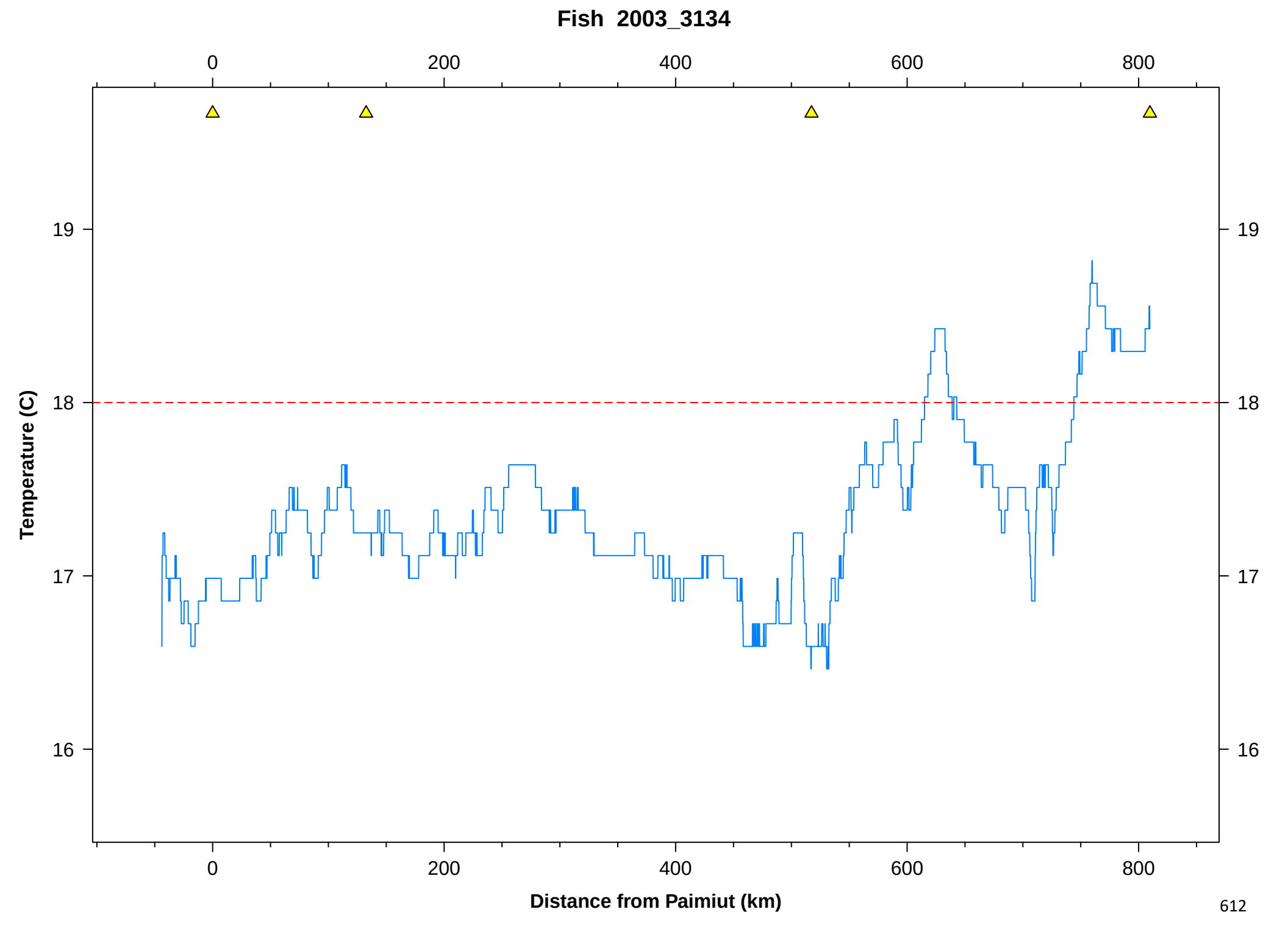

Porcupine Stock
2003_3134
2004_3017
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
Proportion of time spent over 18 C
0.0
0.2
0.4
0.6
0.8
1.0
Fish within stock
607

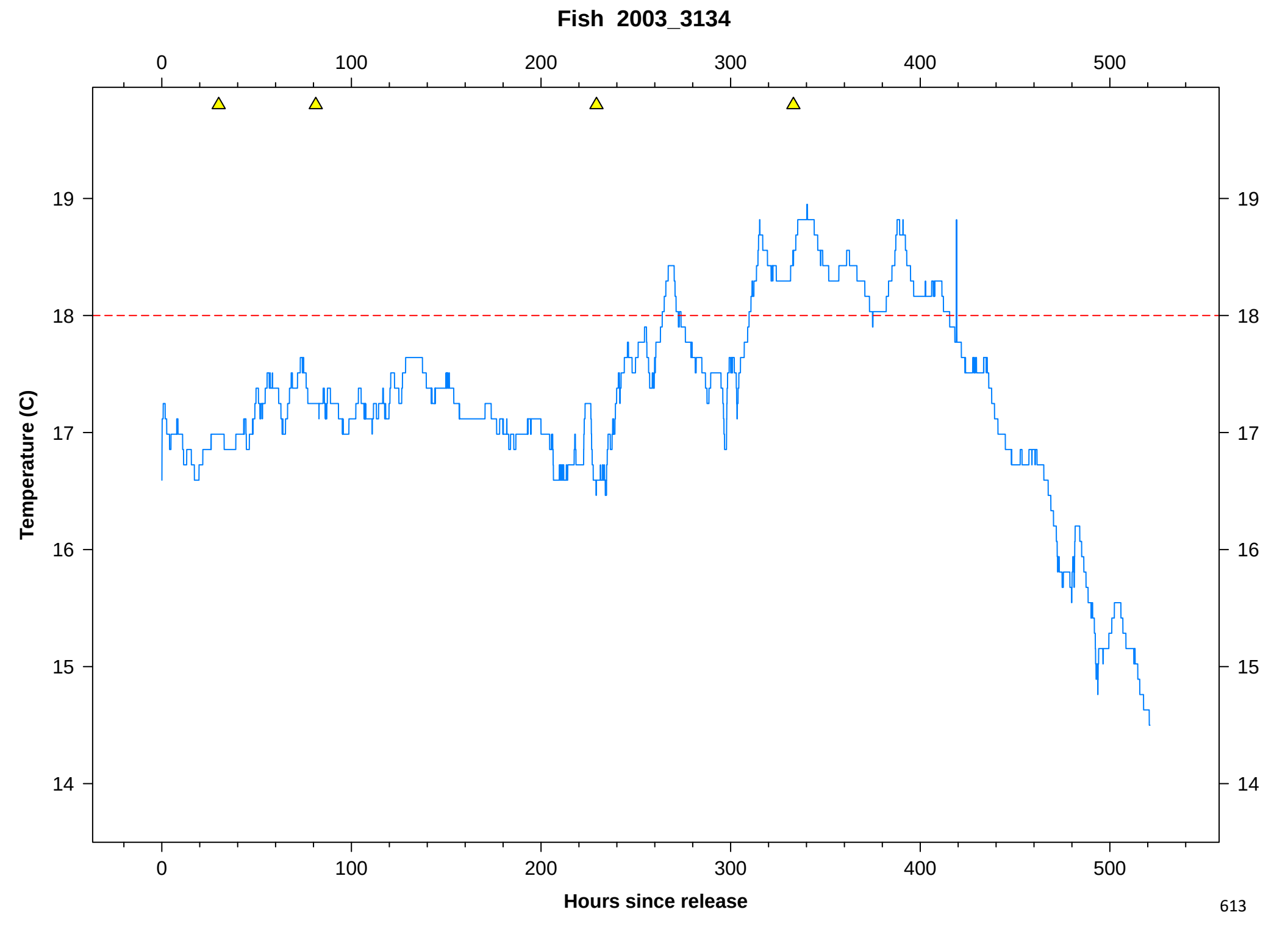

Fish 2003_3134
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

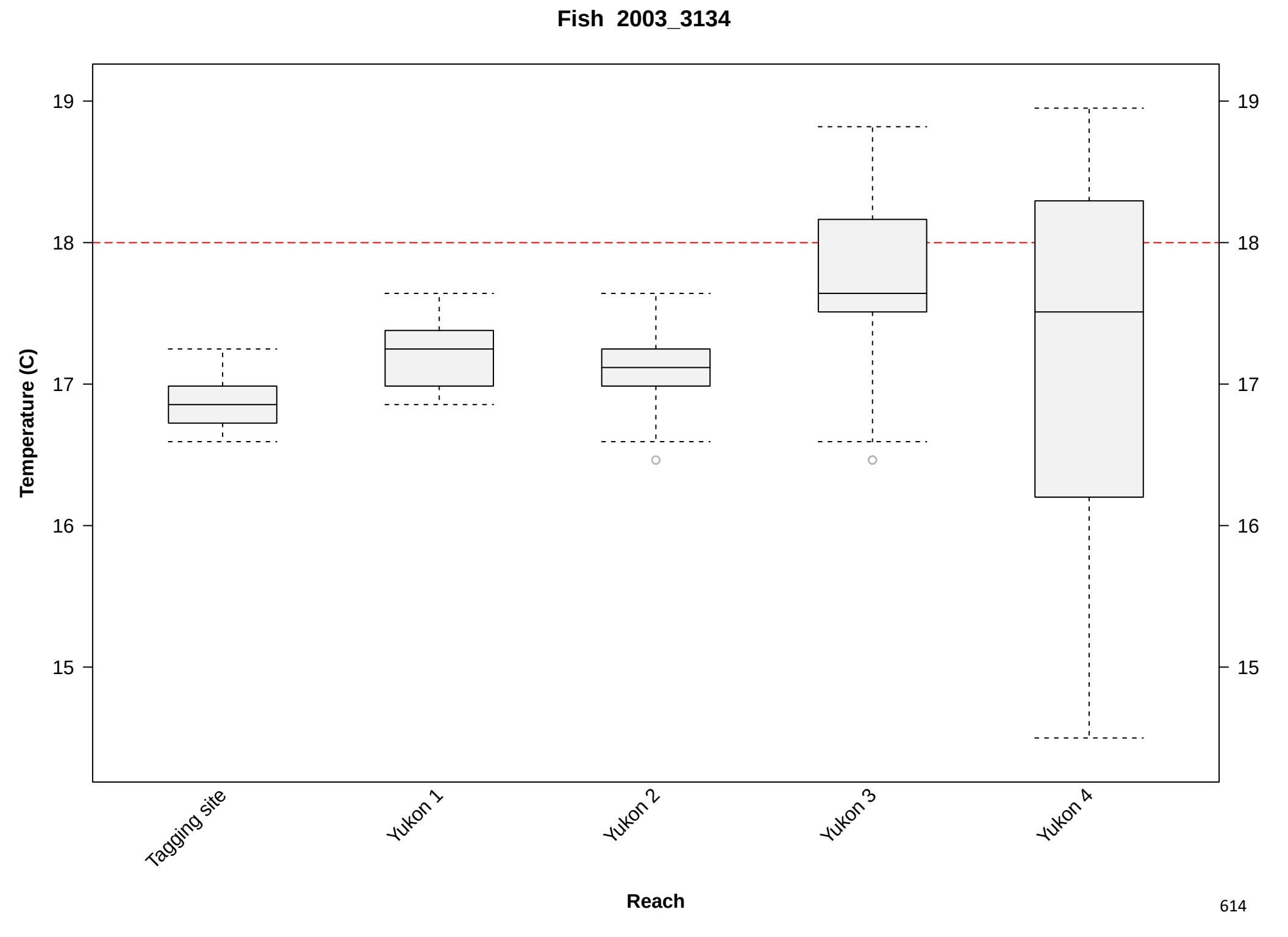

Fish 2003_3134
0
100
200
300
400
500
0
5
10
15
20
25
Depth (m)
Hours since release

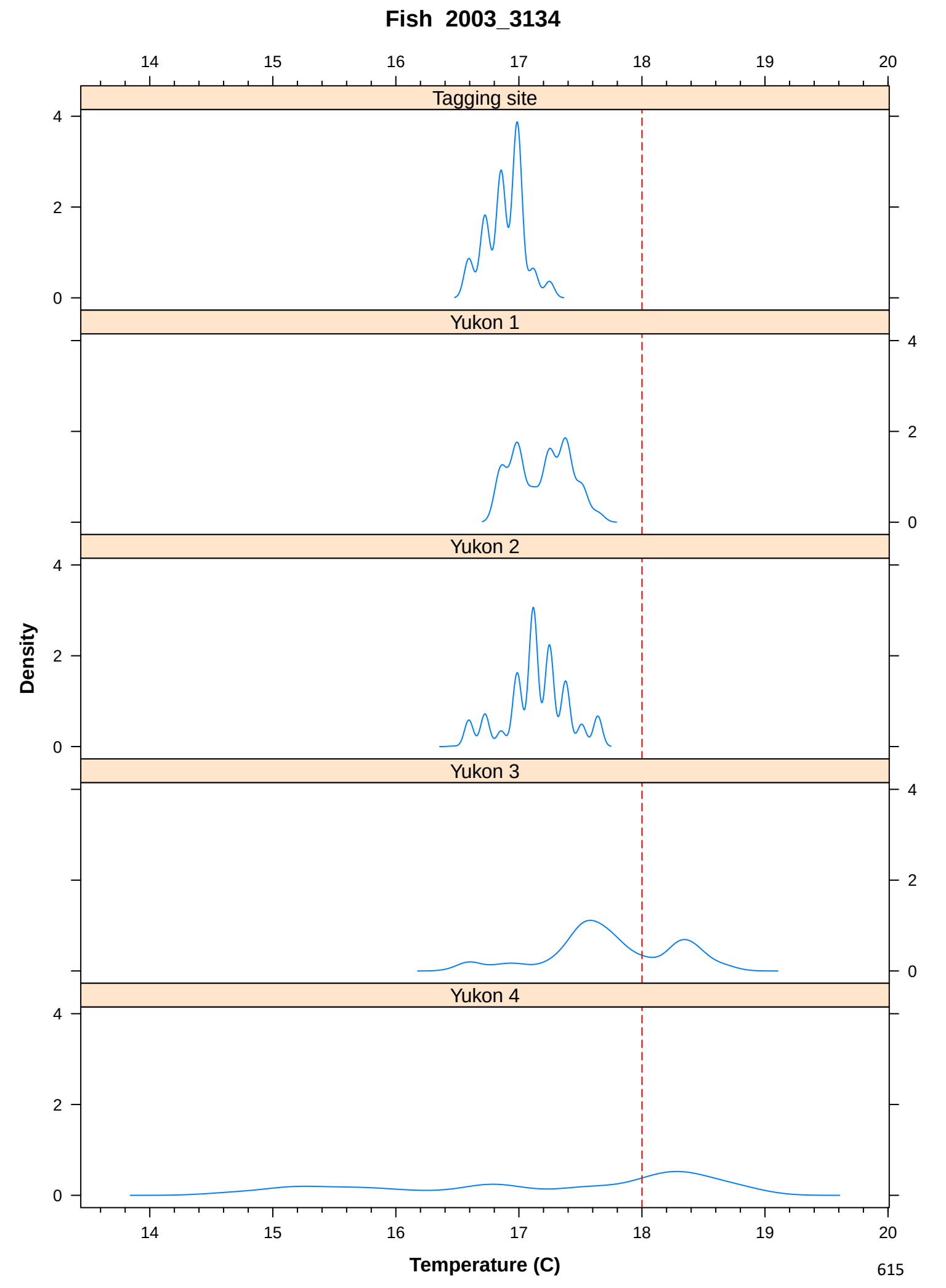

Fish 2003_3134
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach
610

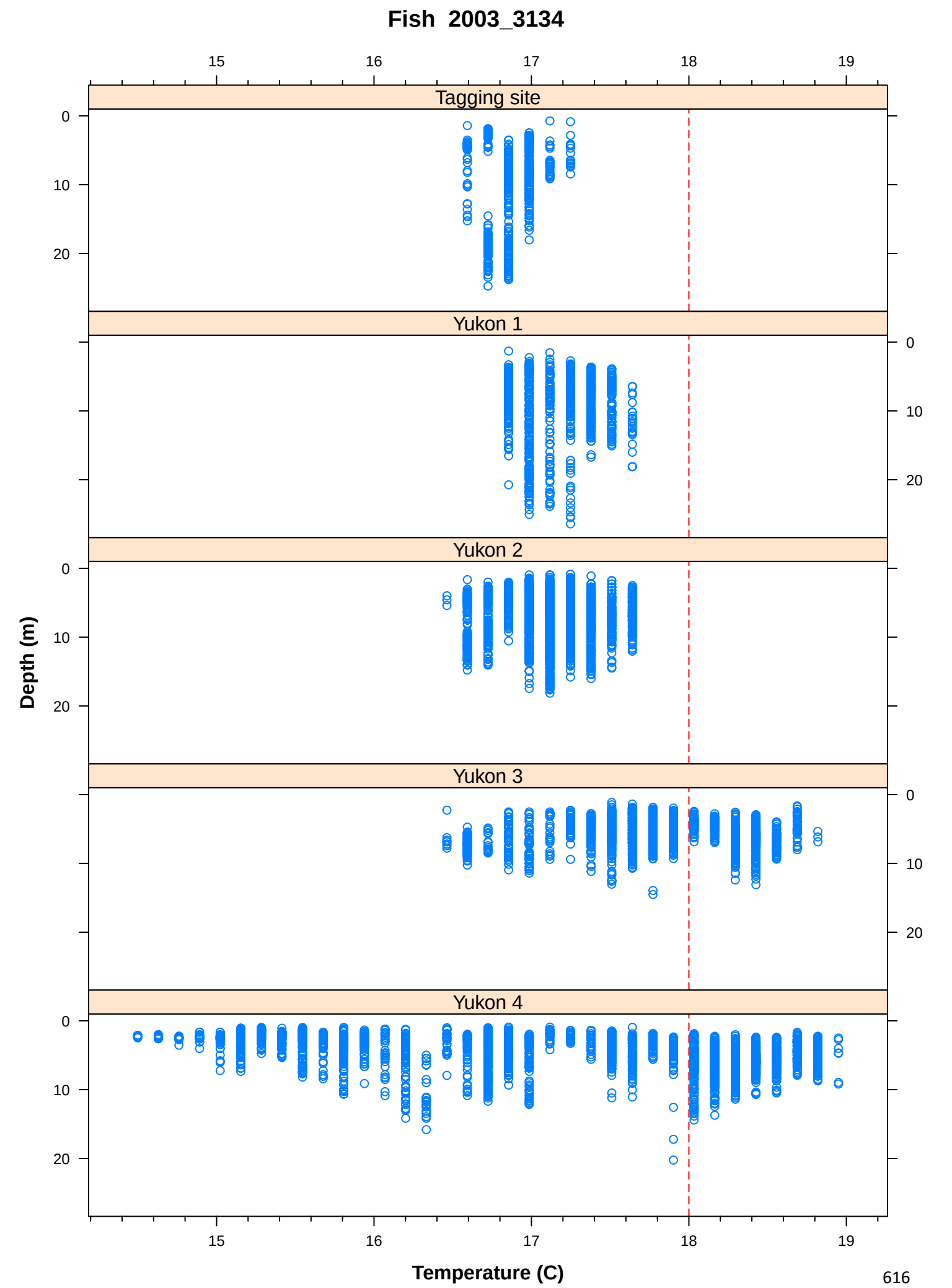

Fish 2003_3134
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
0.0
0.1
0.2
0
5
10
15
20
25
30
Depth (m)
611

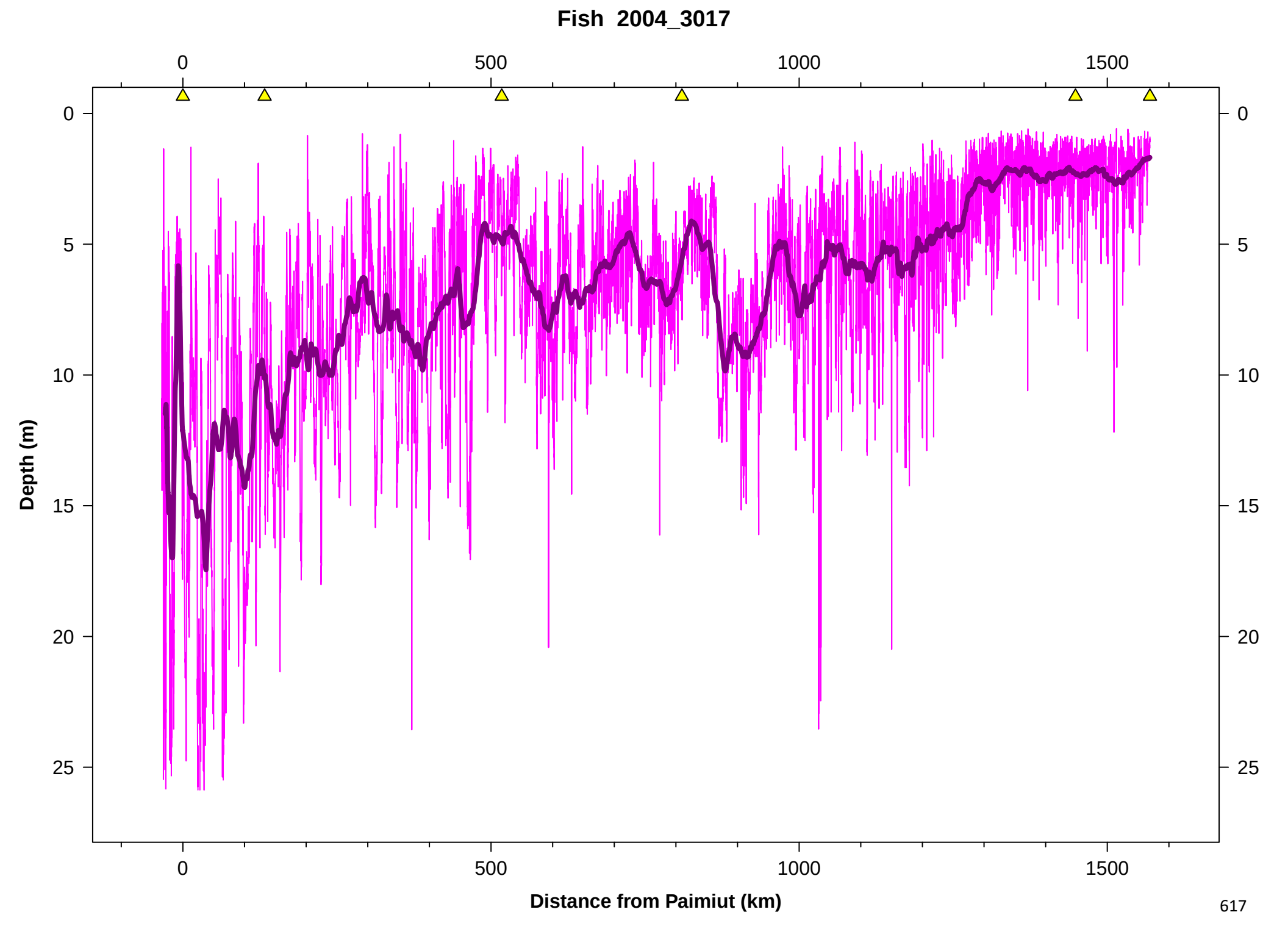

Fish 2003_3134
0
200
400
600
800
19
18
17
16
Temperature (C)
Distance from Paimiut (km)

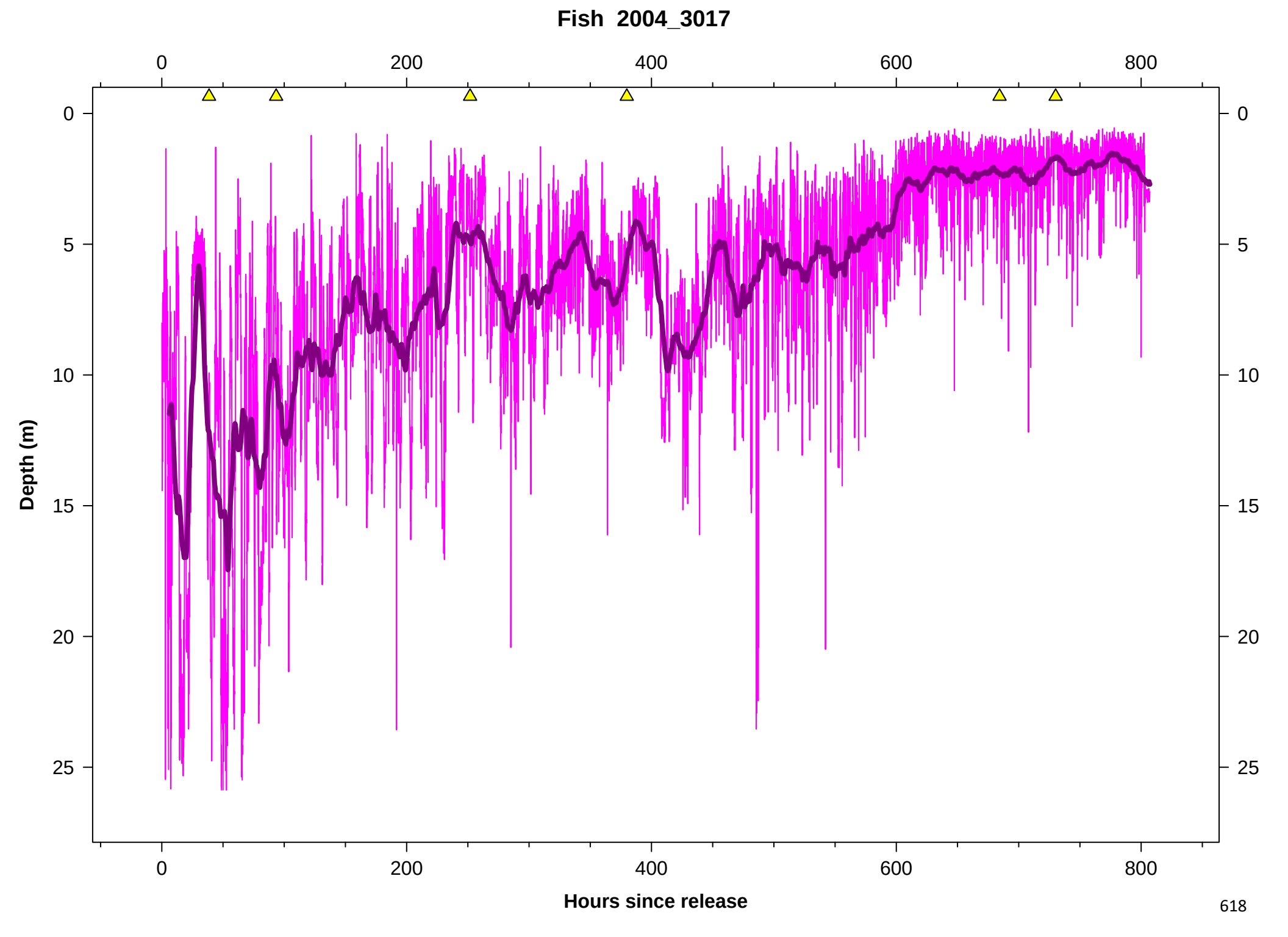

Fish 2003_3134
0
100
200
300
400
500
19
18
17
16
15
14
Temperature (C)
Hours since release

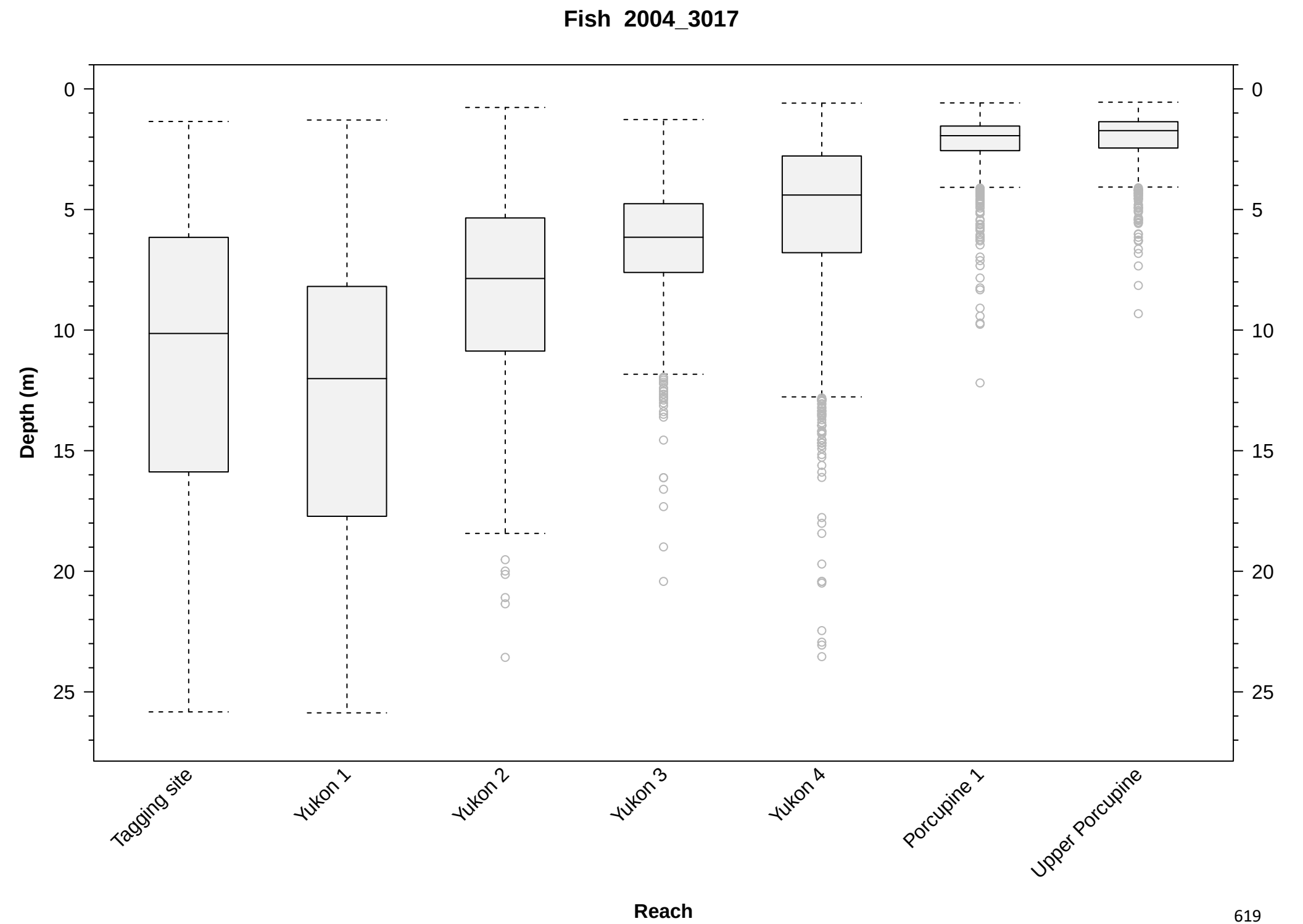

Fish 2003_3134
Temperature (C)
19
18
17
16
15
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach
614

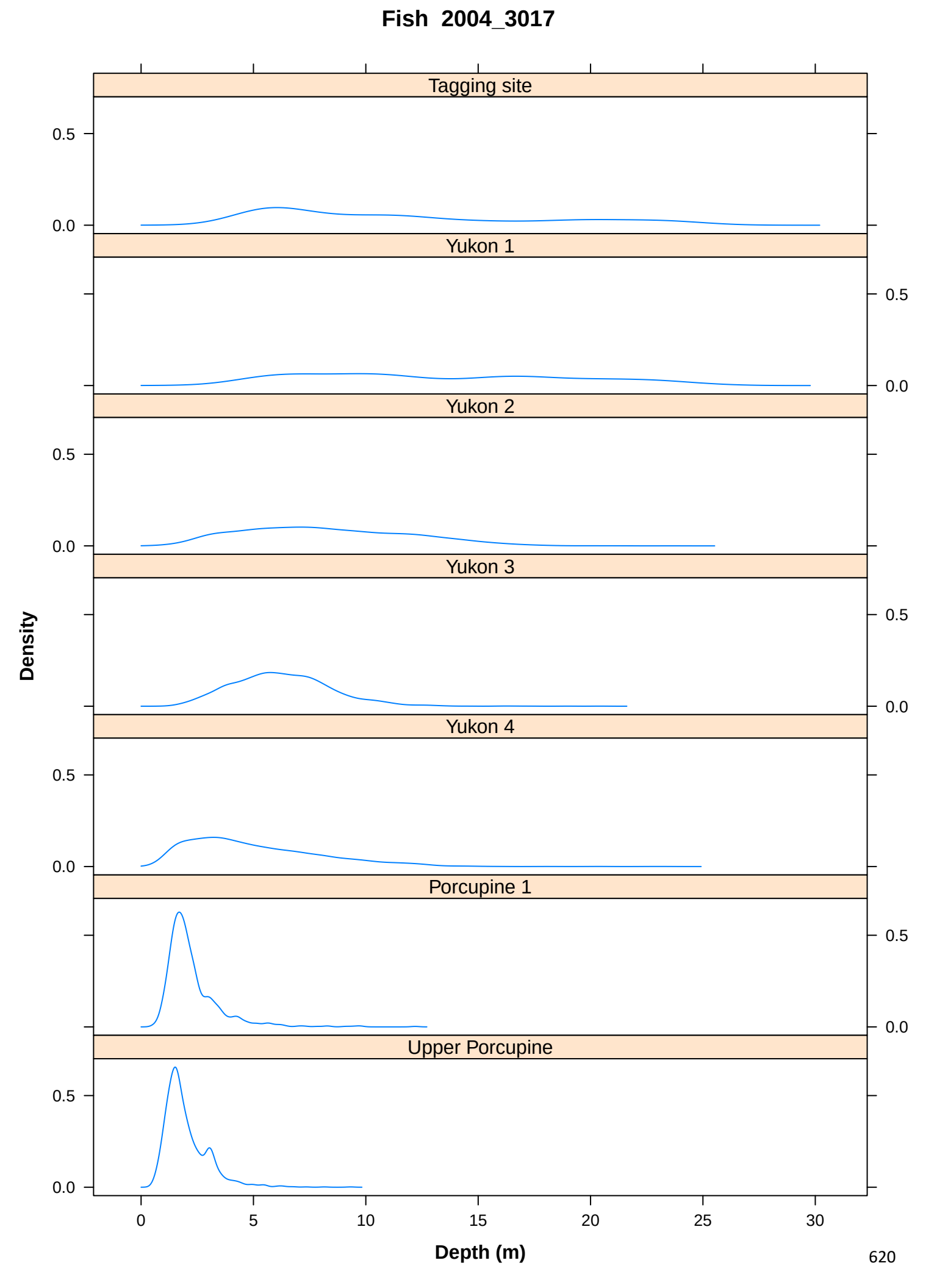

Fish 2003_3134
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
Temperature (C)
14
15
16
17
18
19
20
0
2
4

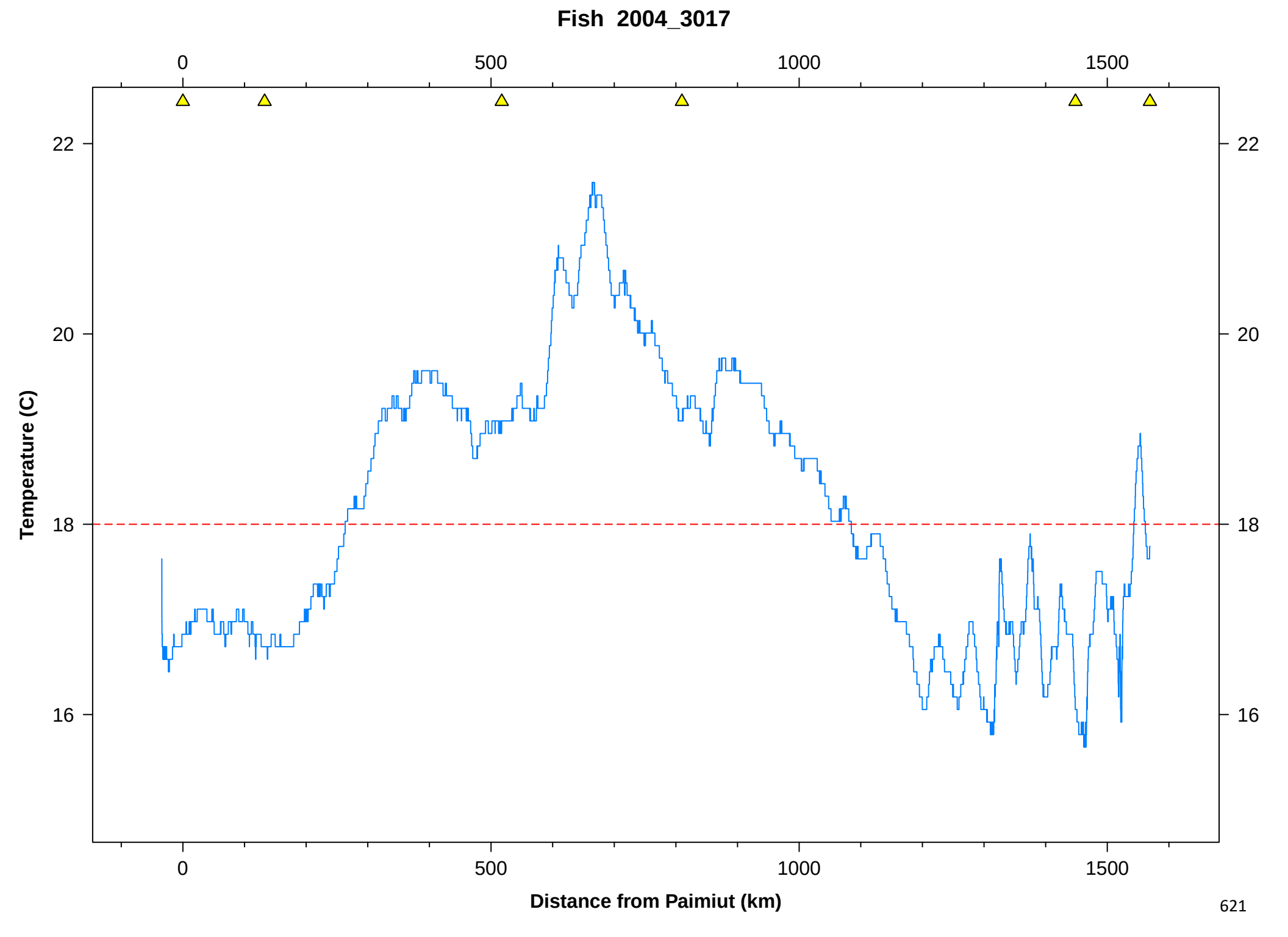

Fish 2003_3134
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Depth (m)
Temperature (C)
15
16
17
18
19
0
10
20

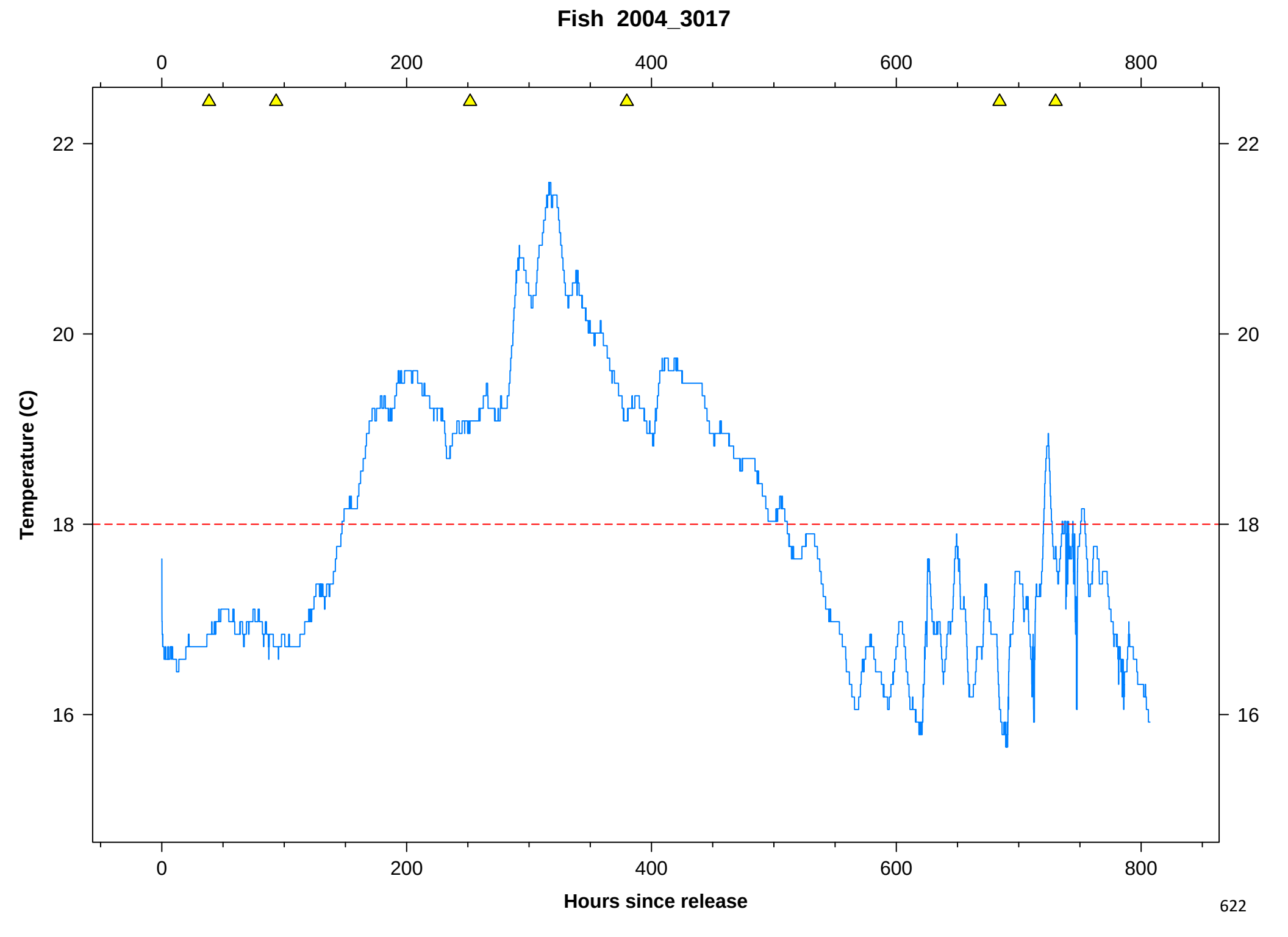

Fish 2004_3017
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

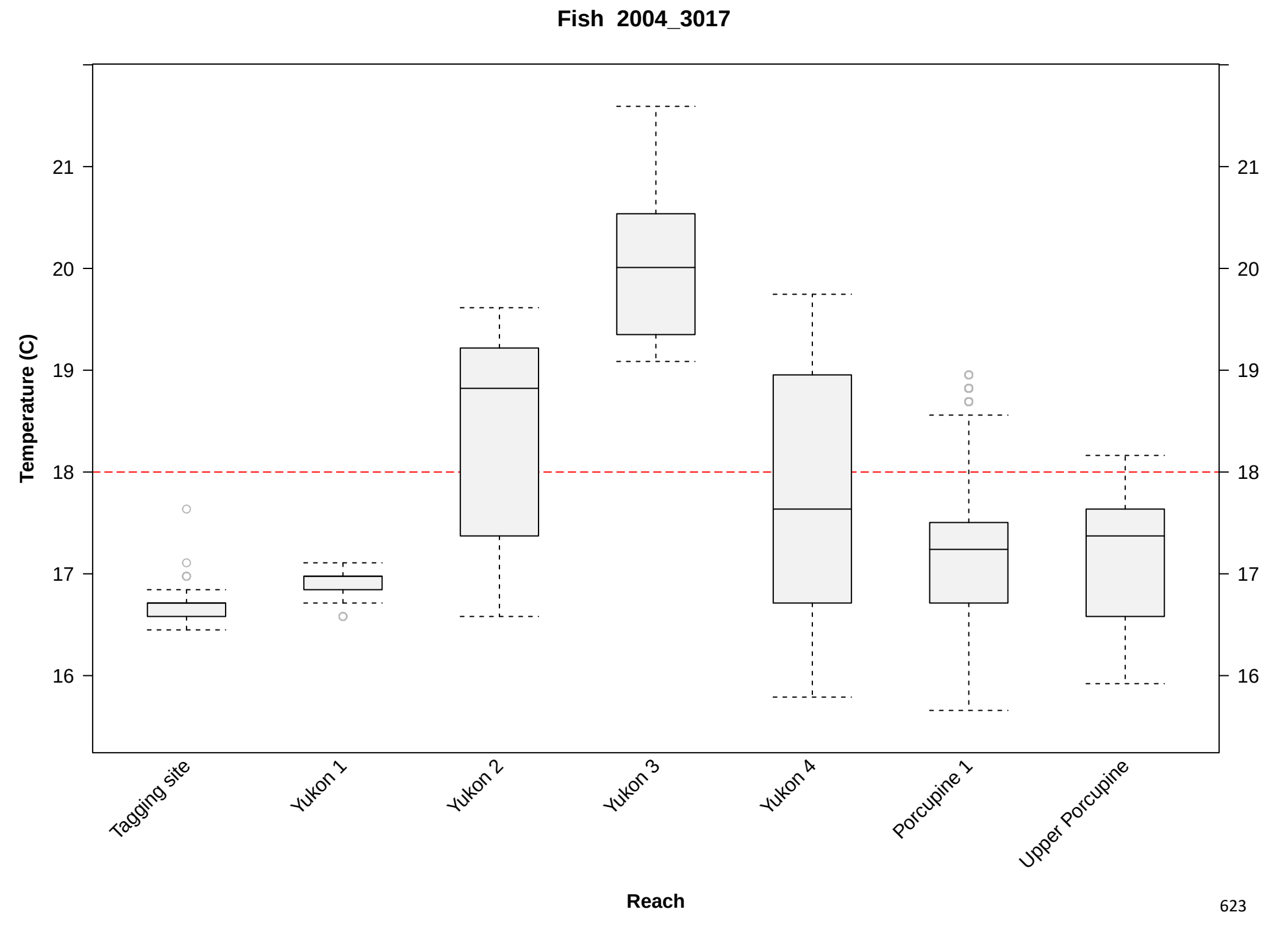

Fish 2004_3017
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Hours since release

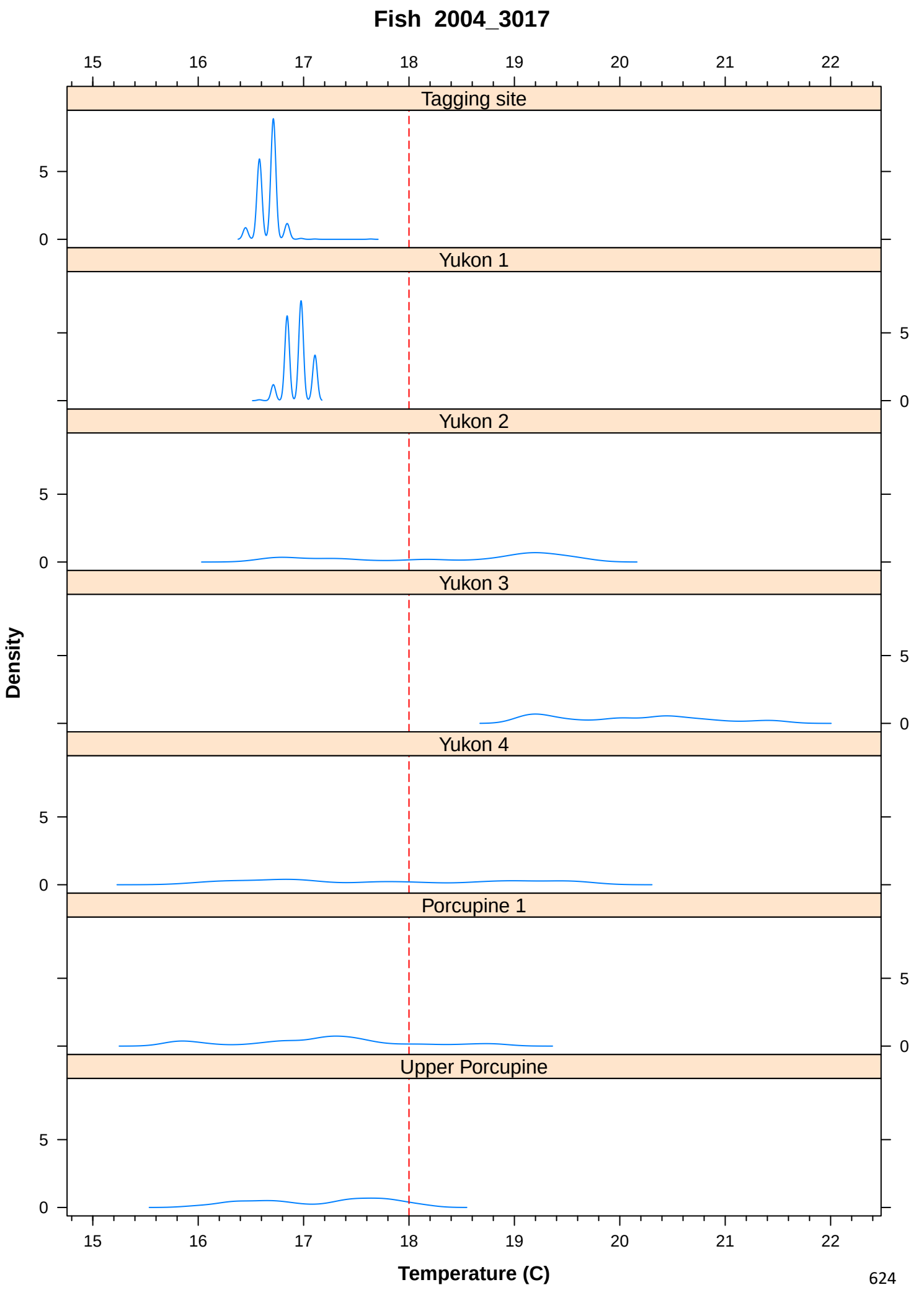

Fish 2004_3017
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
Reach

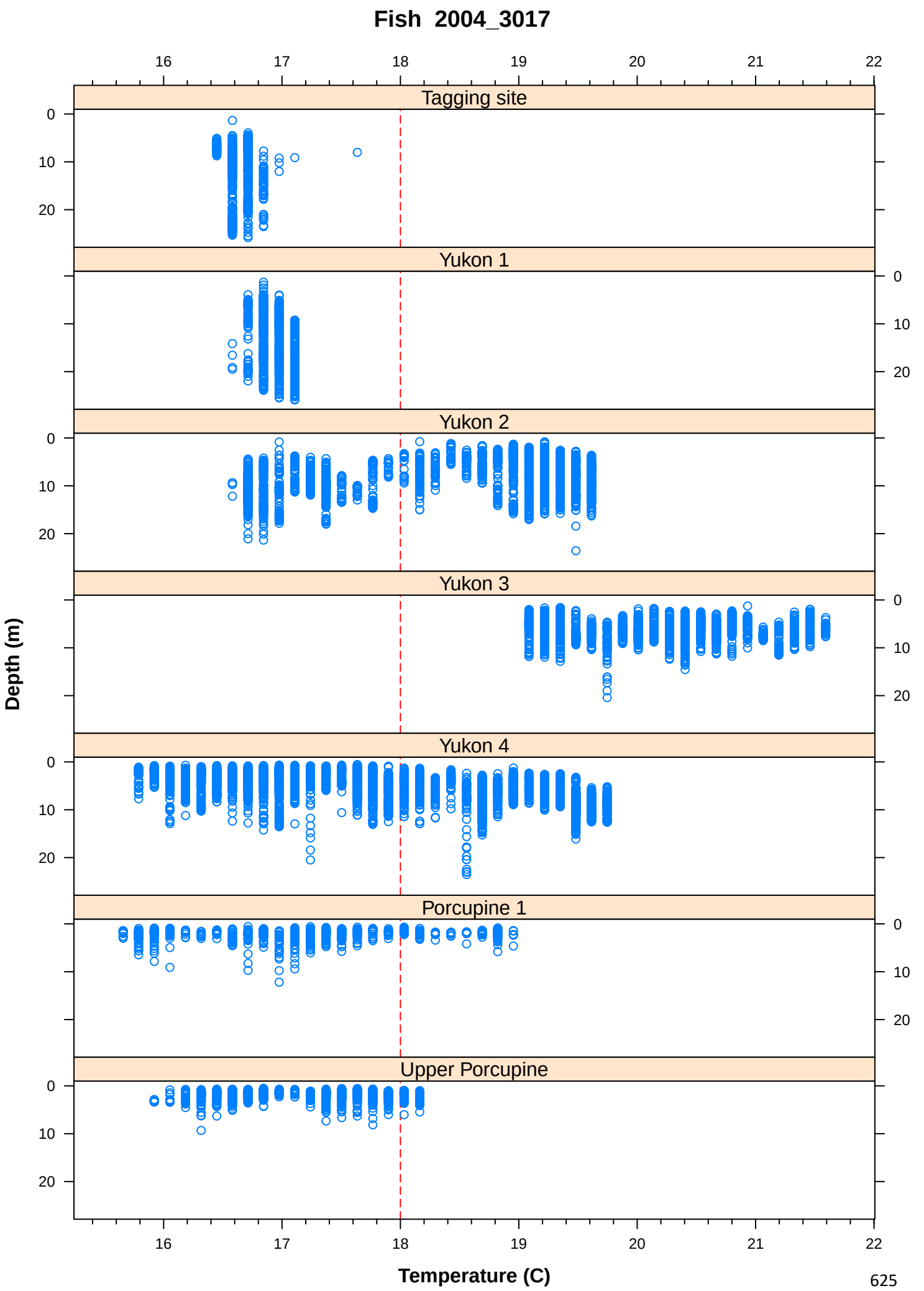

Fish 2004_3017
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
Density
0.5
0.0
0
5
10
15
20
25
30
Depth (m)
620


Fish 2004_3017
0
500
1000
1500
22
20
18
16
Temperature (C)
Distance from Paimiut (km)


Fish 2004_3017
0
200
400
600
800
22
20
18
16
Temperature (C)
Hours since release


Fish 2004_3017
Temperature (C)
21
20
19
18
17
16
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
Reach


Fish 2004_3017
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
Density
Temperature (C)
15
16
17
18
19
20
21
22
0
5


Fish 2004_3017
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Upper Porcupine
Depth (m)
Temperature (C)
16
17
18
19
20
21
22
0
10
20

Appendix 8. -- Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks harvested in mainstem fisheries in 2002-2004.

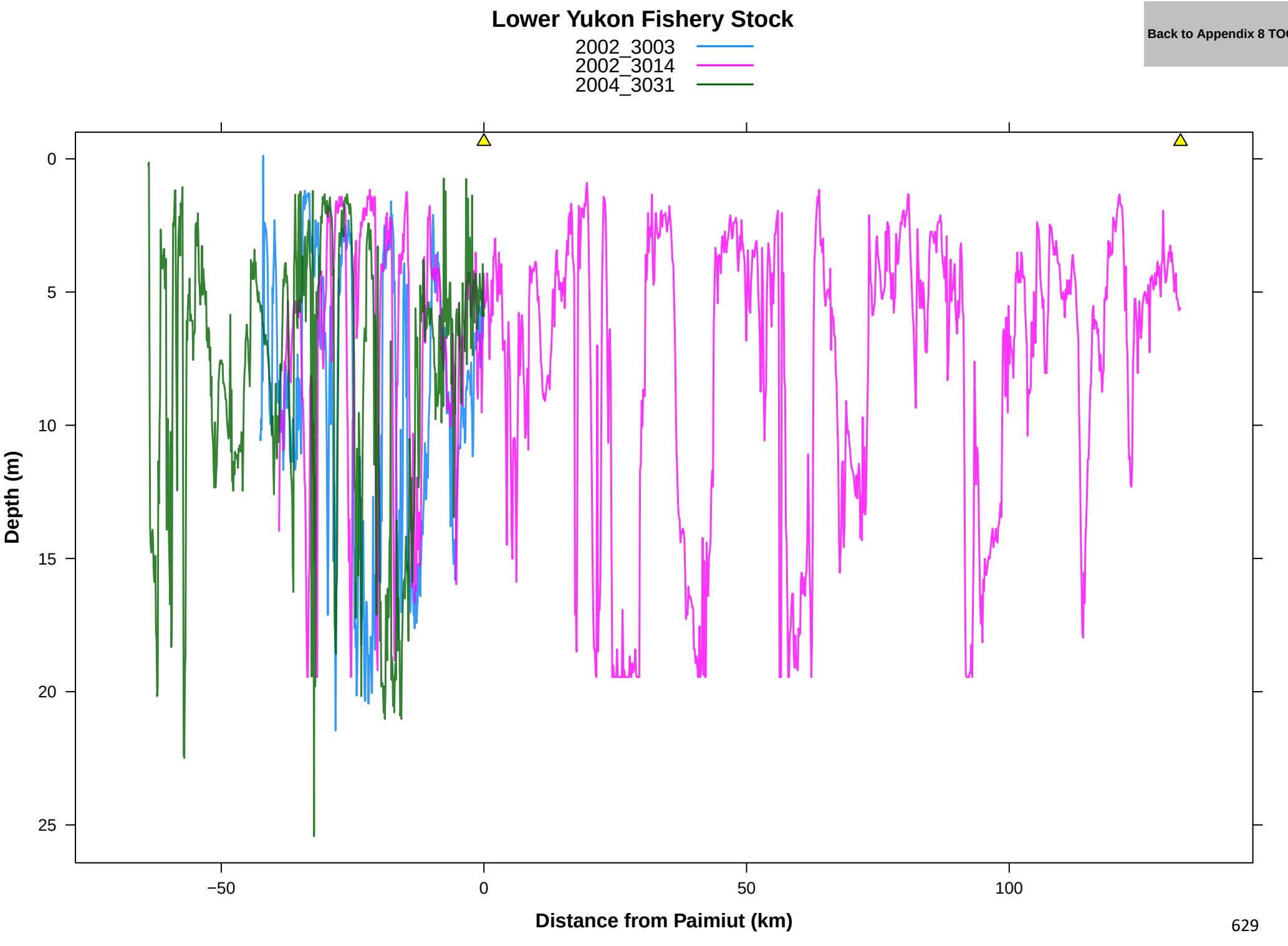
Lower Yukon fishery 629

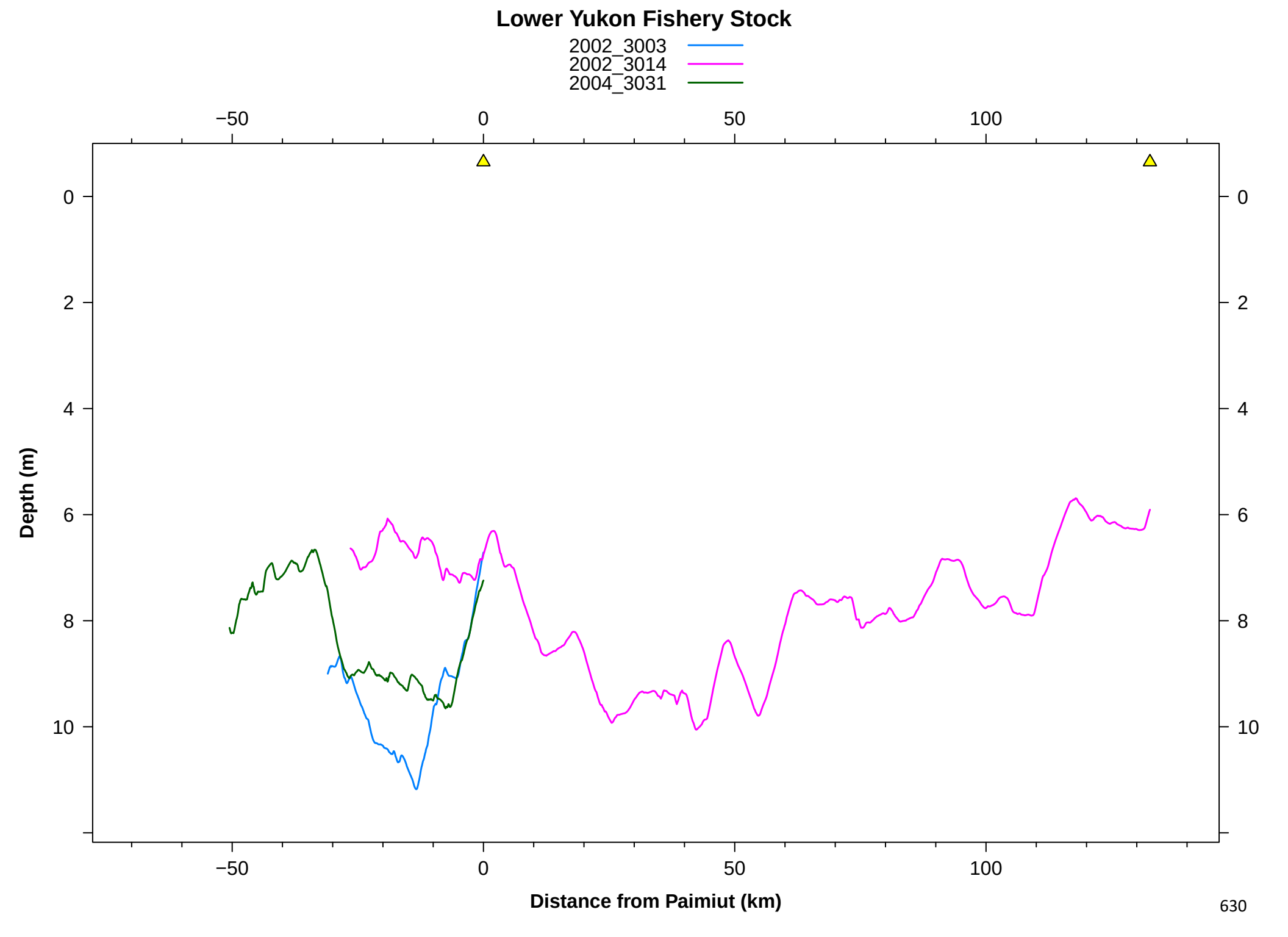
Middle Yukon fishery 669

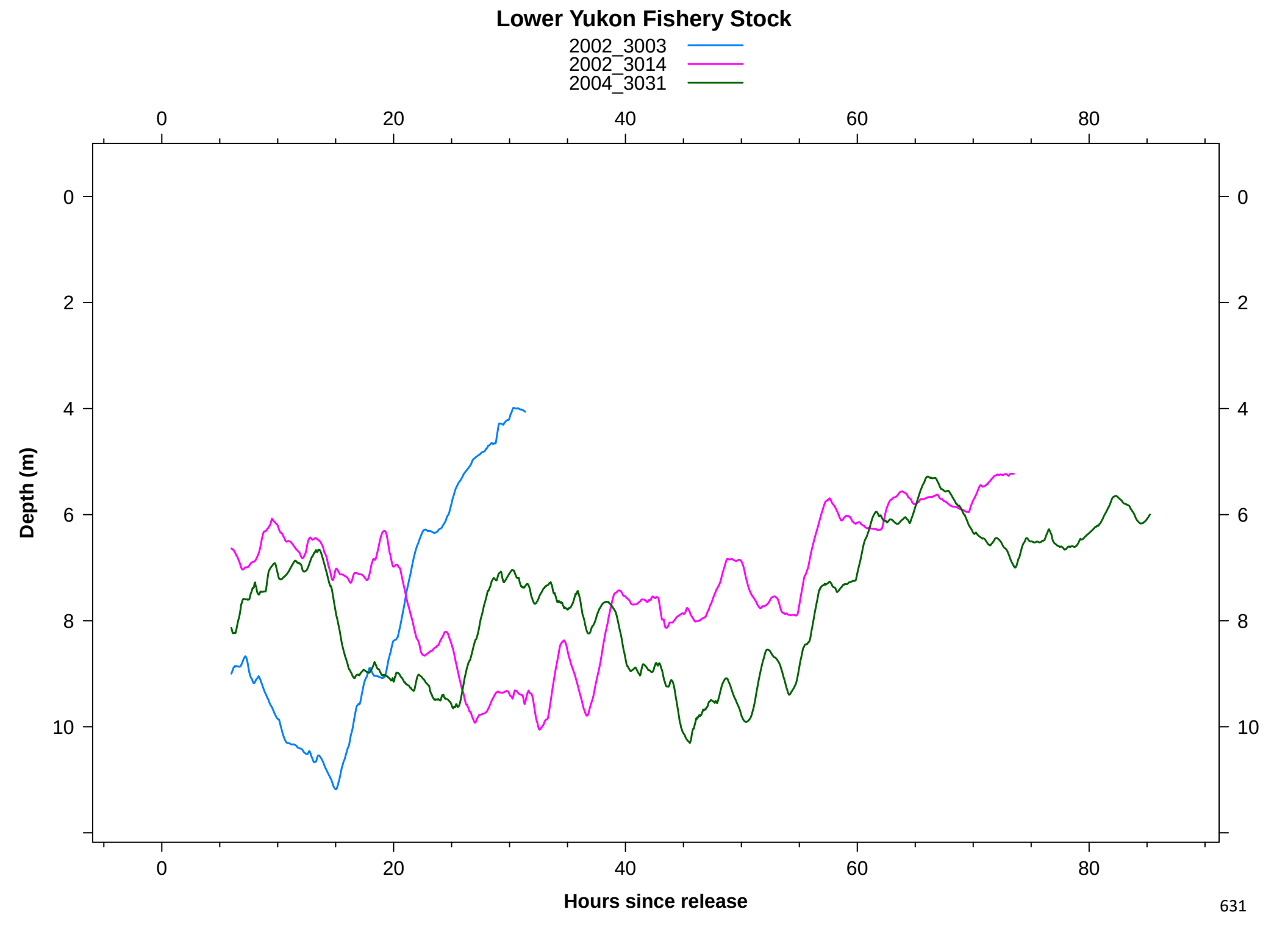
Yukon Flats fishery 781

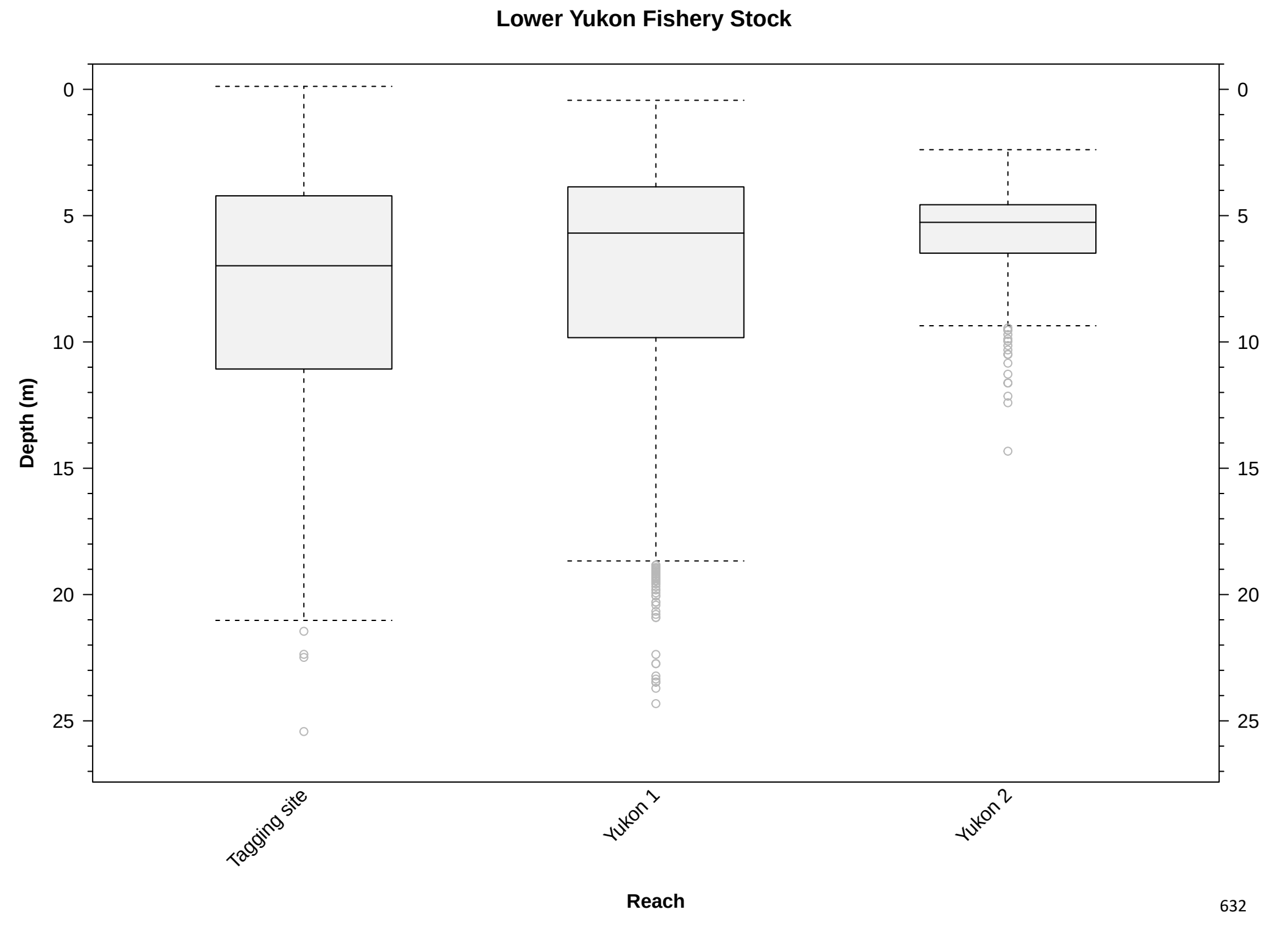
Upper Yukon fishery 884

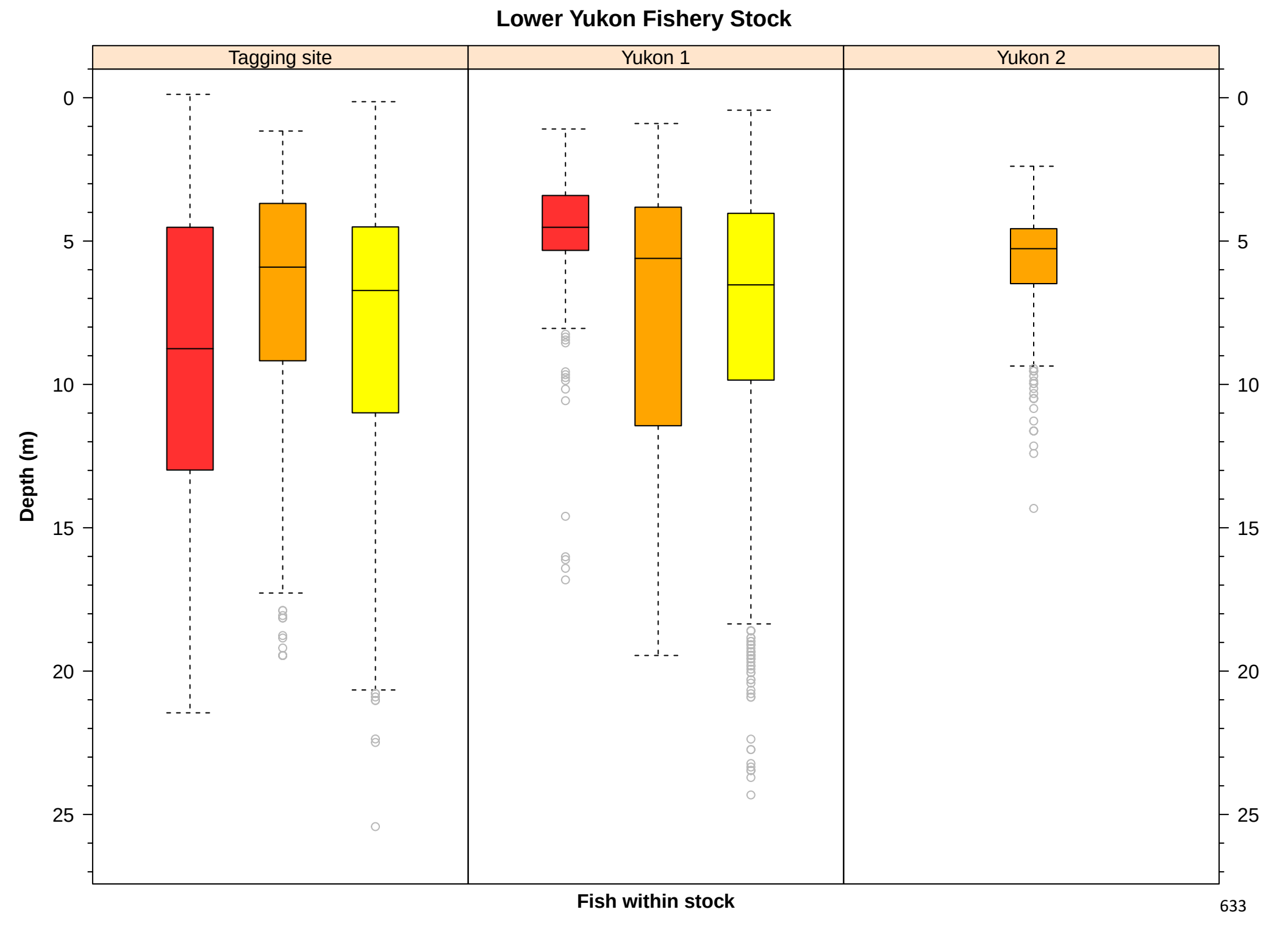
Back to Appendix 8 TOC

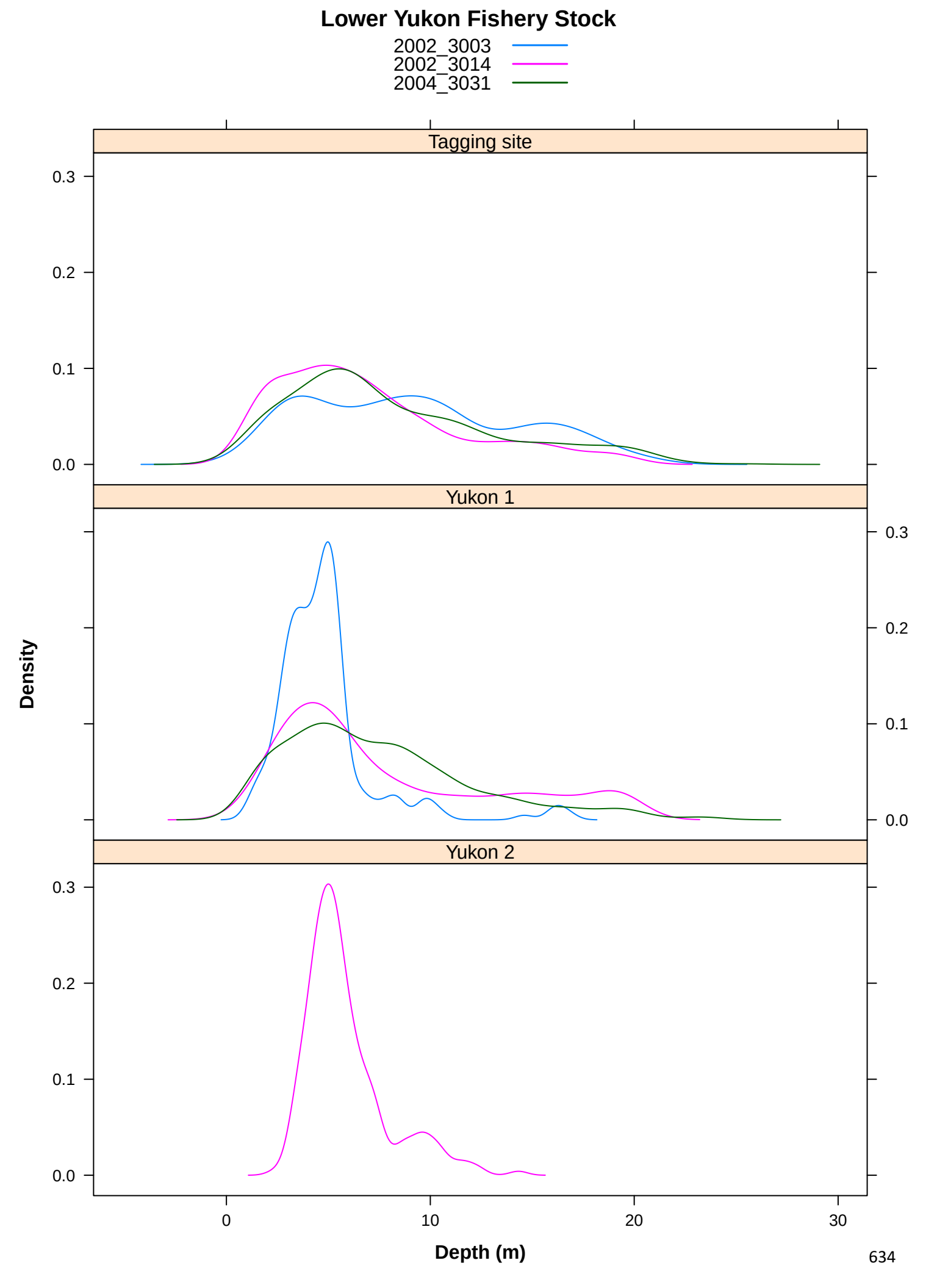


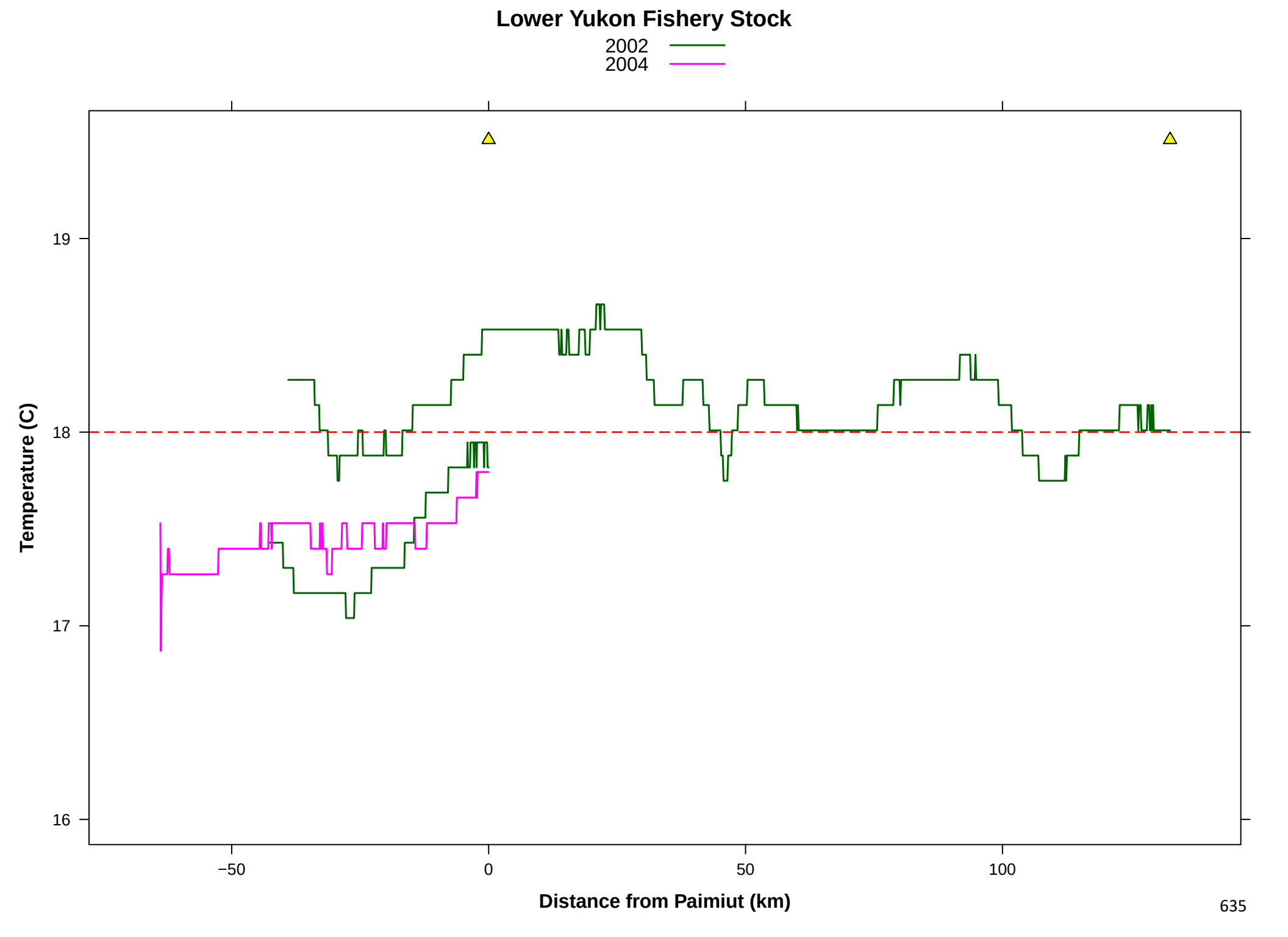

Lower Yukon Fishery Stock
2002_3003
2002_3014
2004_3031
−50
0
50
100
0
2
4
6
8
10
Depth (m)
Distance from Paimiut (km)

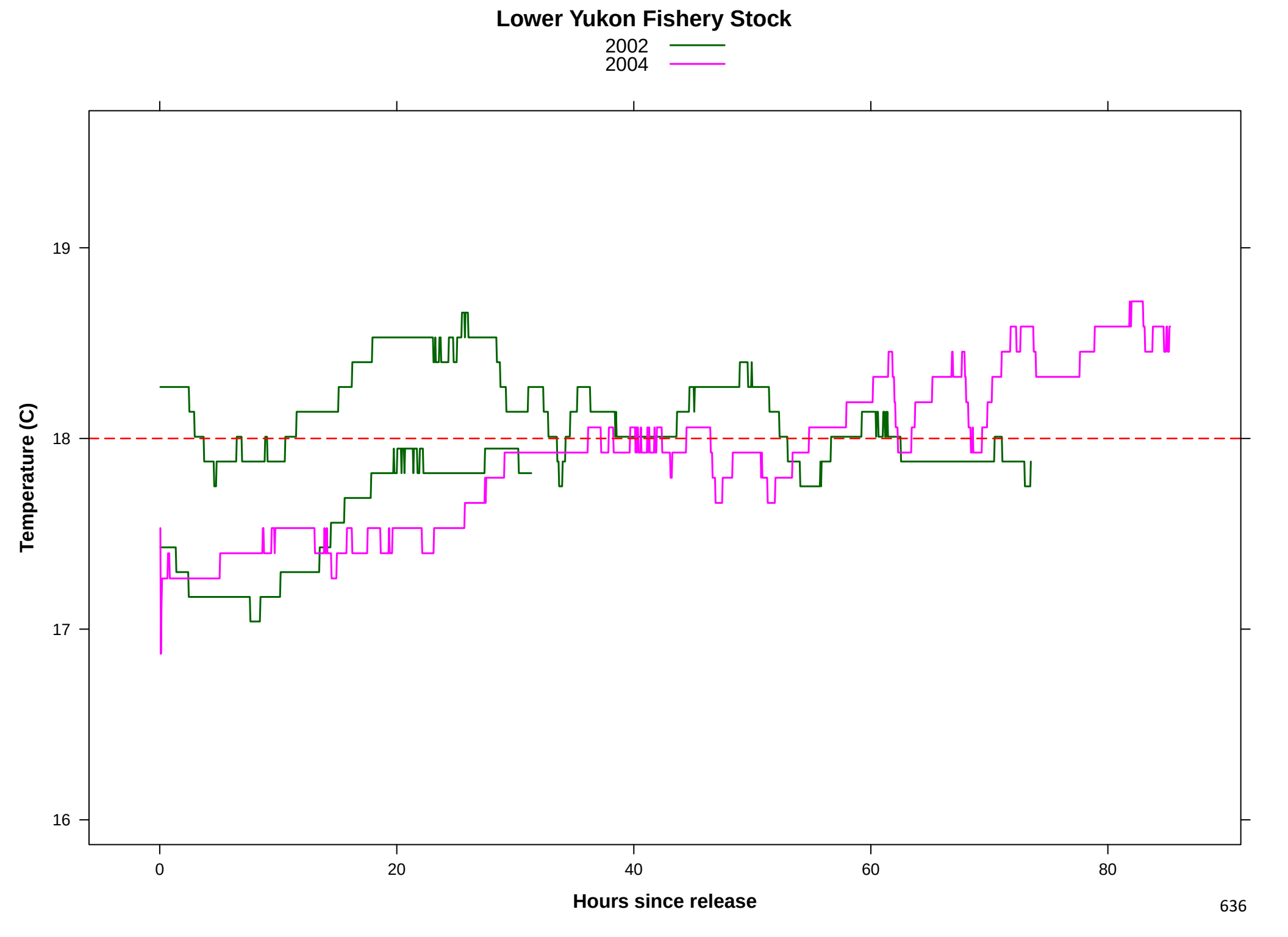

Lower Yukon Fishery Stock
2002_3003
2002_3014
2004_3031
0
20
40
60
80
Depth (m)
0
2
4
6
8
10
Hours since release

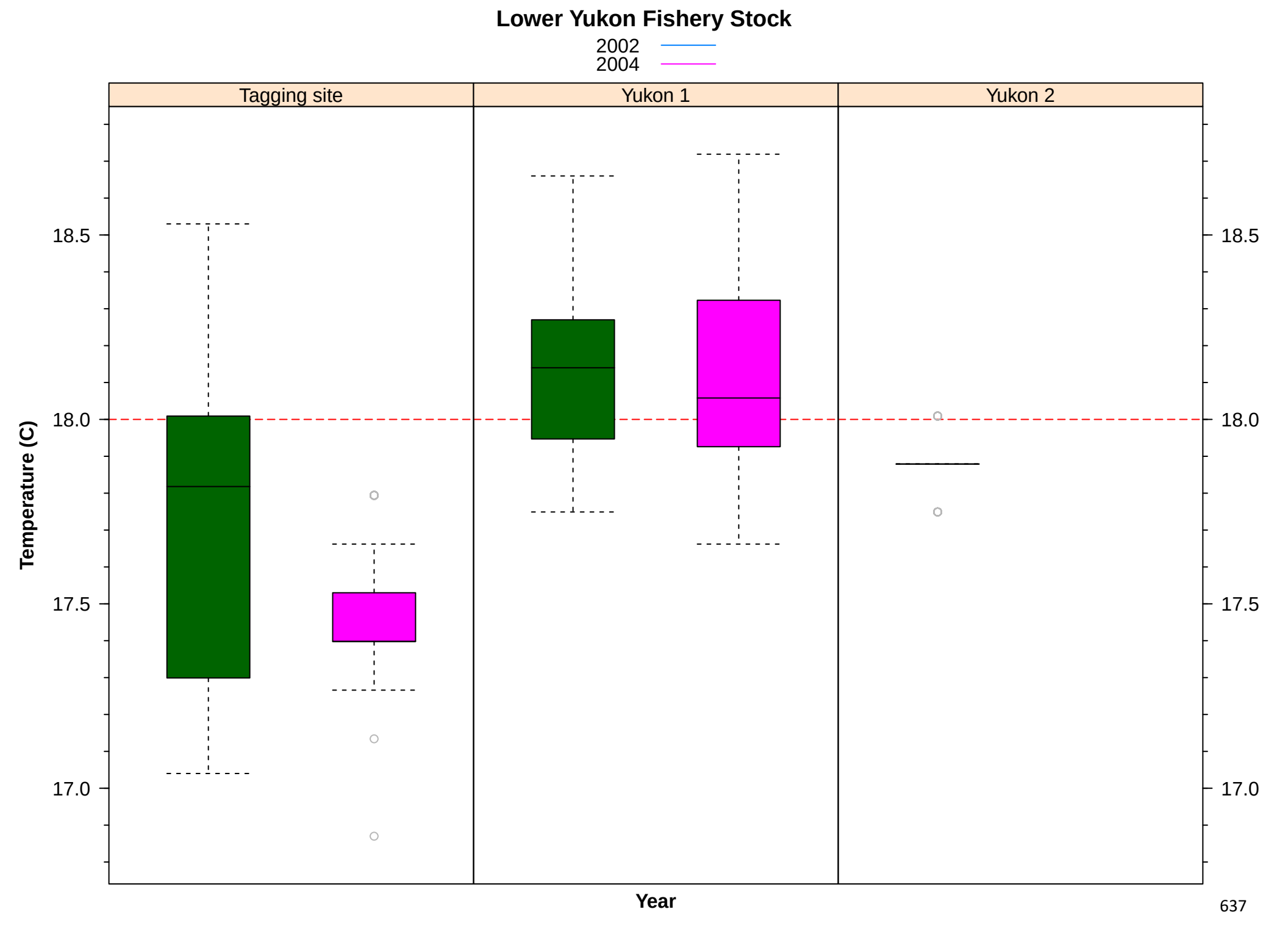

Lower Yukon Fishery Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Reach
632

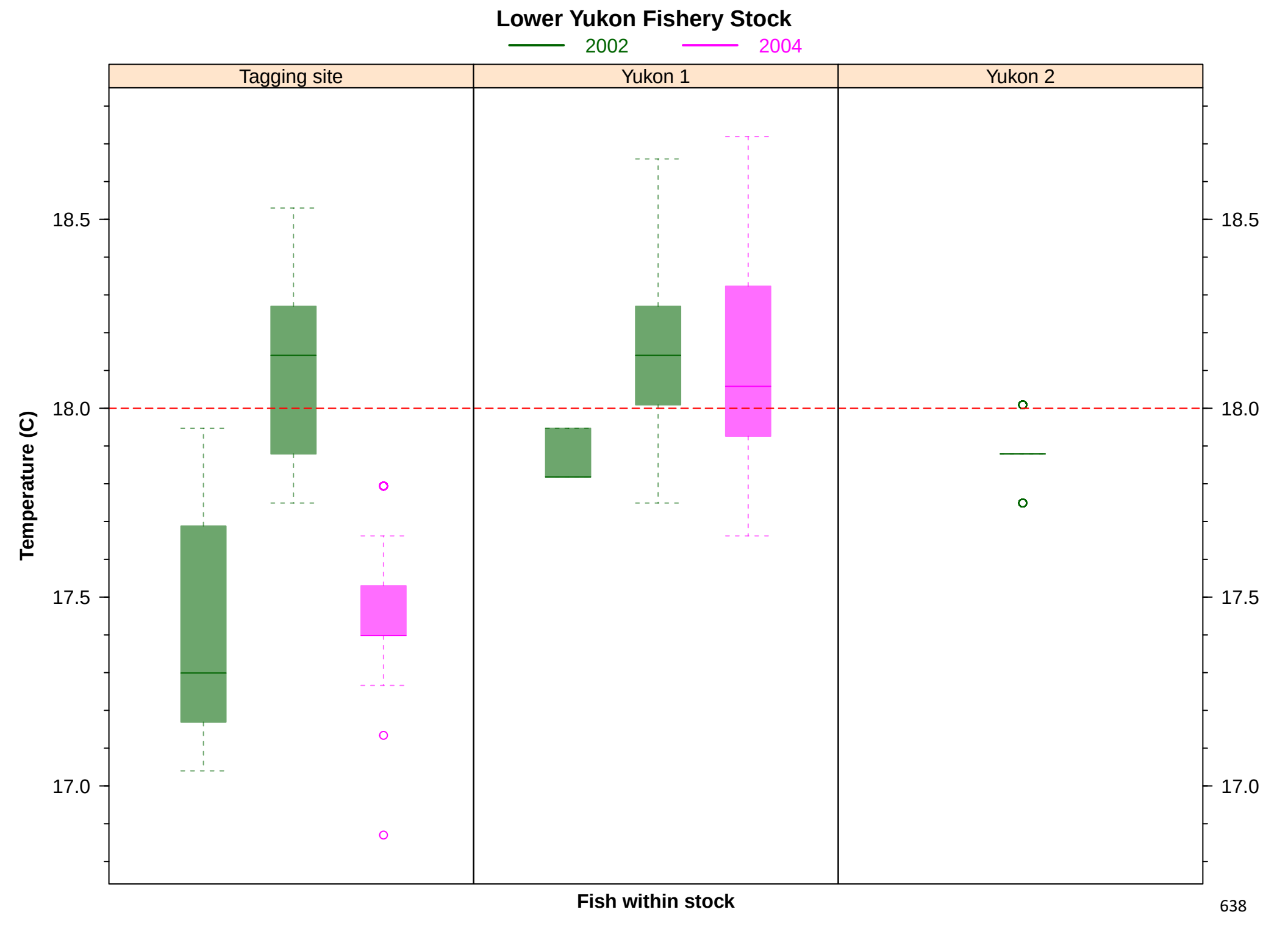

Lower Yukon Fishery Stock
Tagging site
Yukon 1
Yukon 2
Depth (m)
0
5
10
15
20
25
Fish within stock
633

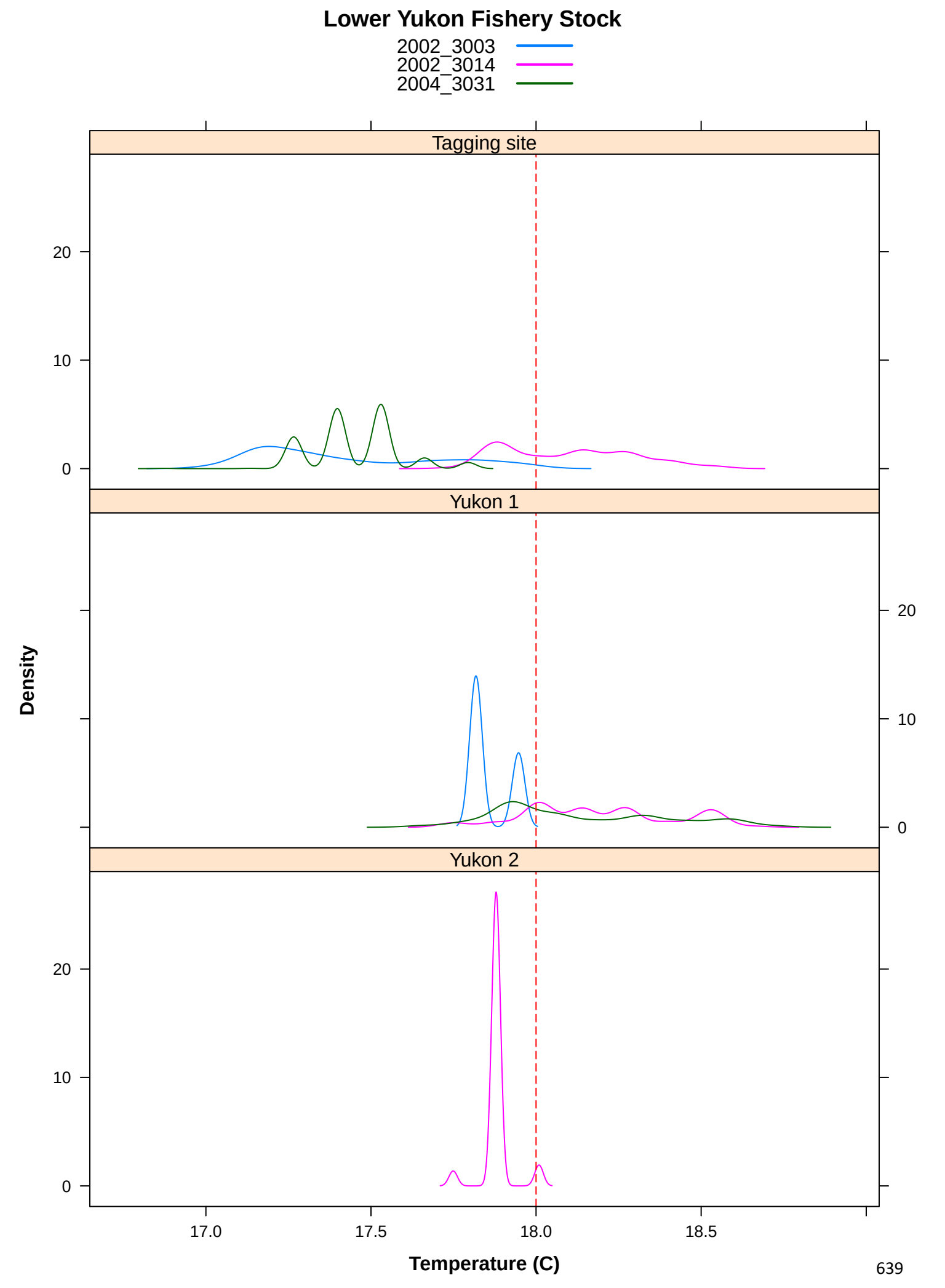

Lower Yukon Fishery Stock
2002_3003
2002_3014
2004_3031
Tagging site
Yukon 1
Yukon 2
Density
0.0
0.1
0.2
0.3
0
10
20
30
Depth (m)

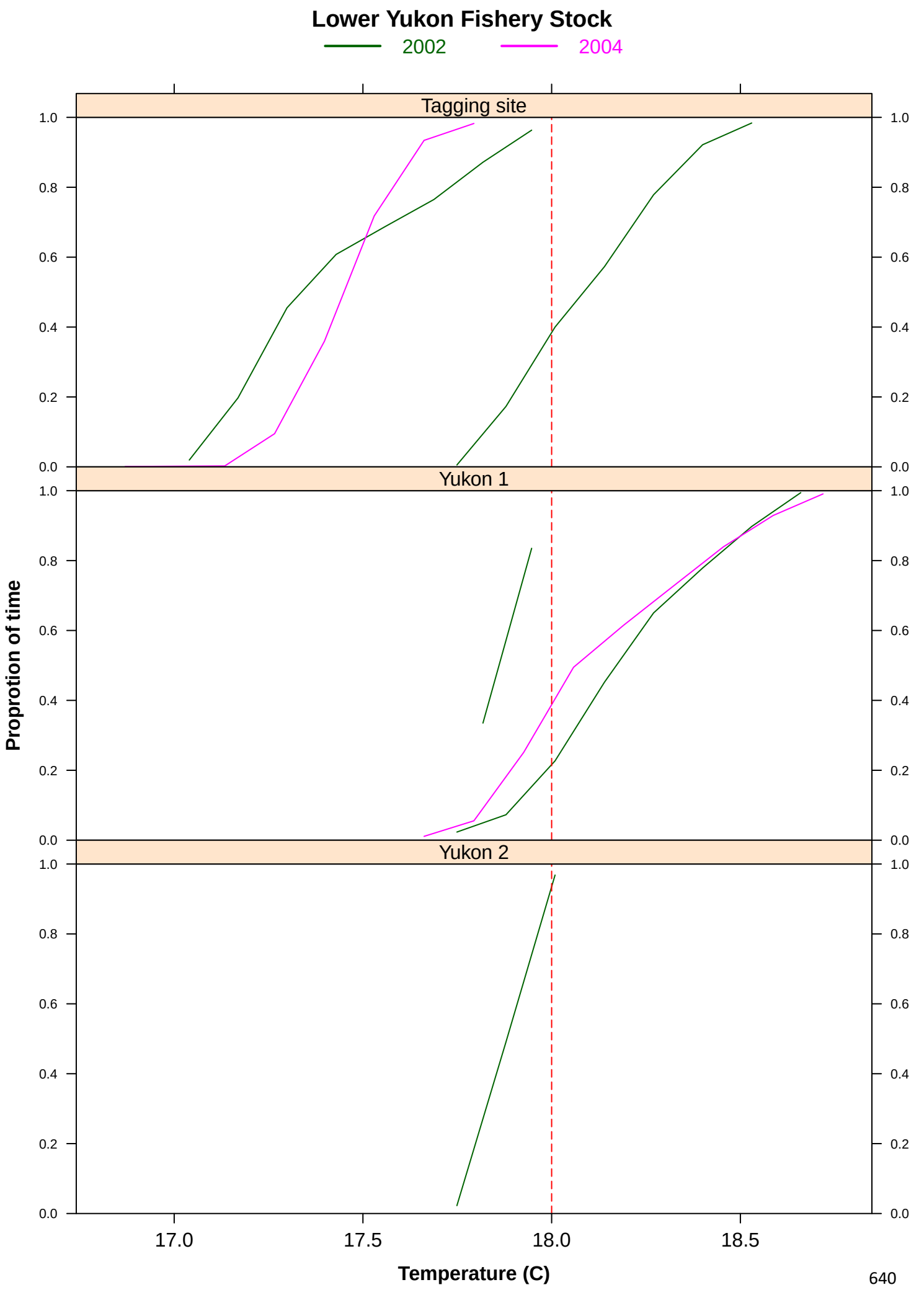

Lower Yukon Fishery Stock
2002
2004
Temperature (C)
19
18
17
16
−50
0
50
100
Distance from Paimiut (km)

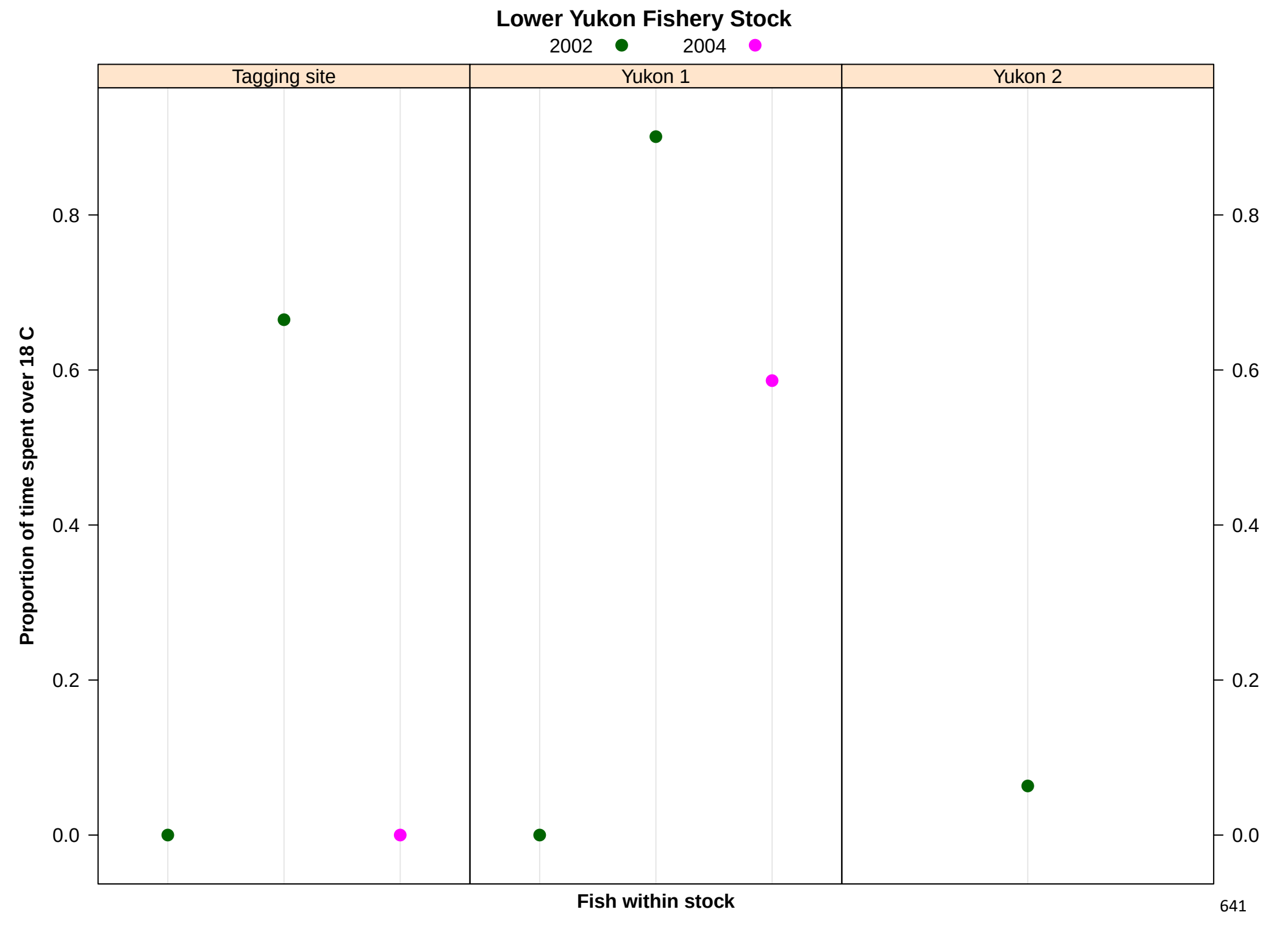

Lower Yukon Fishery Stock
2002
2004
Temperature (C)
19
18
17
16
0
20
40
60
80
Hours since release
636

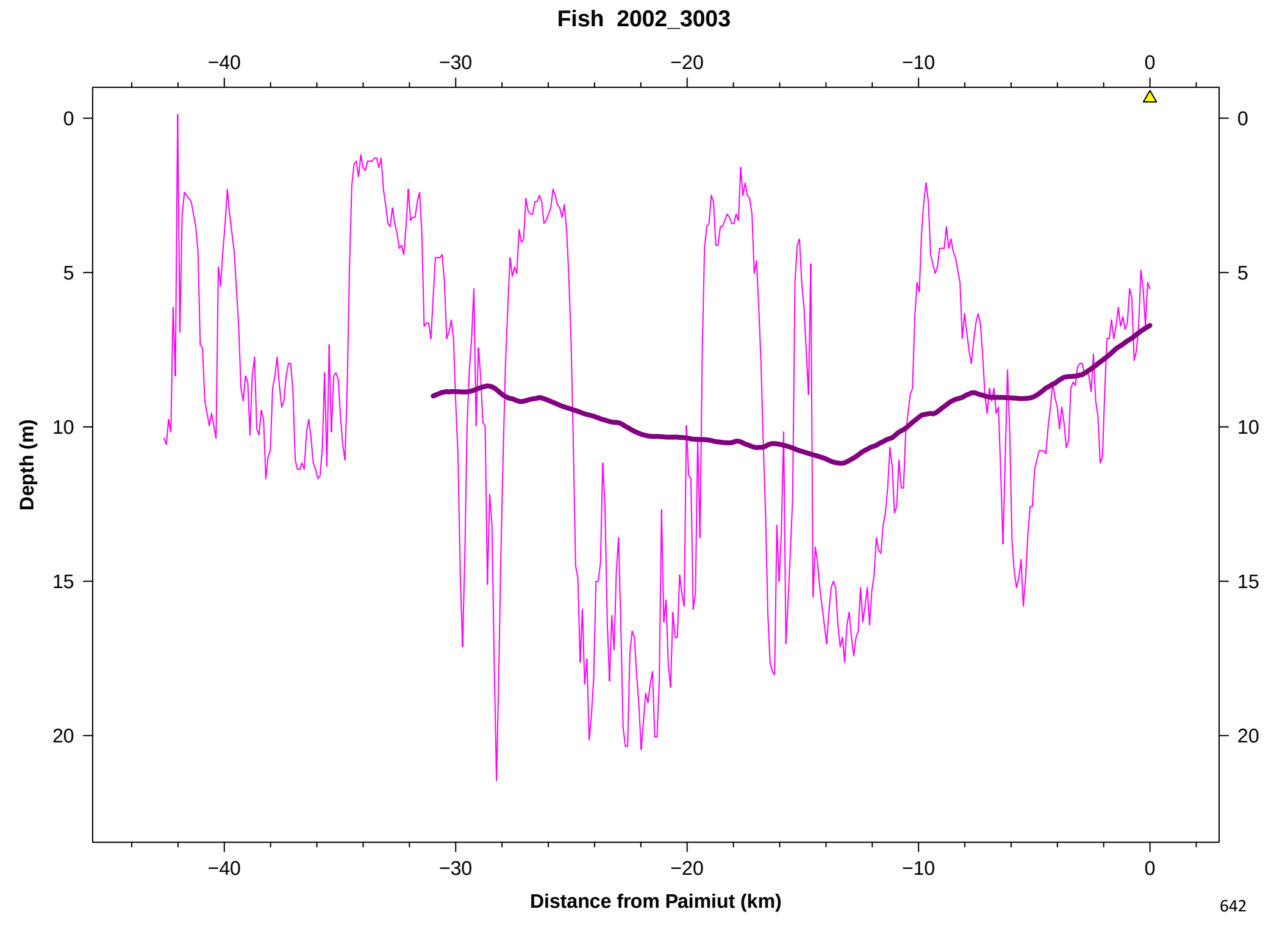

Lower Yukon Fishery Stock
2002
2004
Tagging site
Yukon 1
Yukon 2
18.5
18.0
17.5
17.0
Temperature (C)
Year

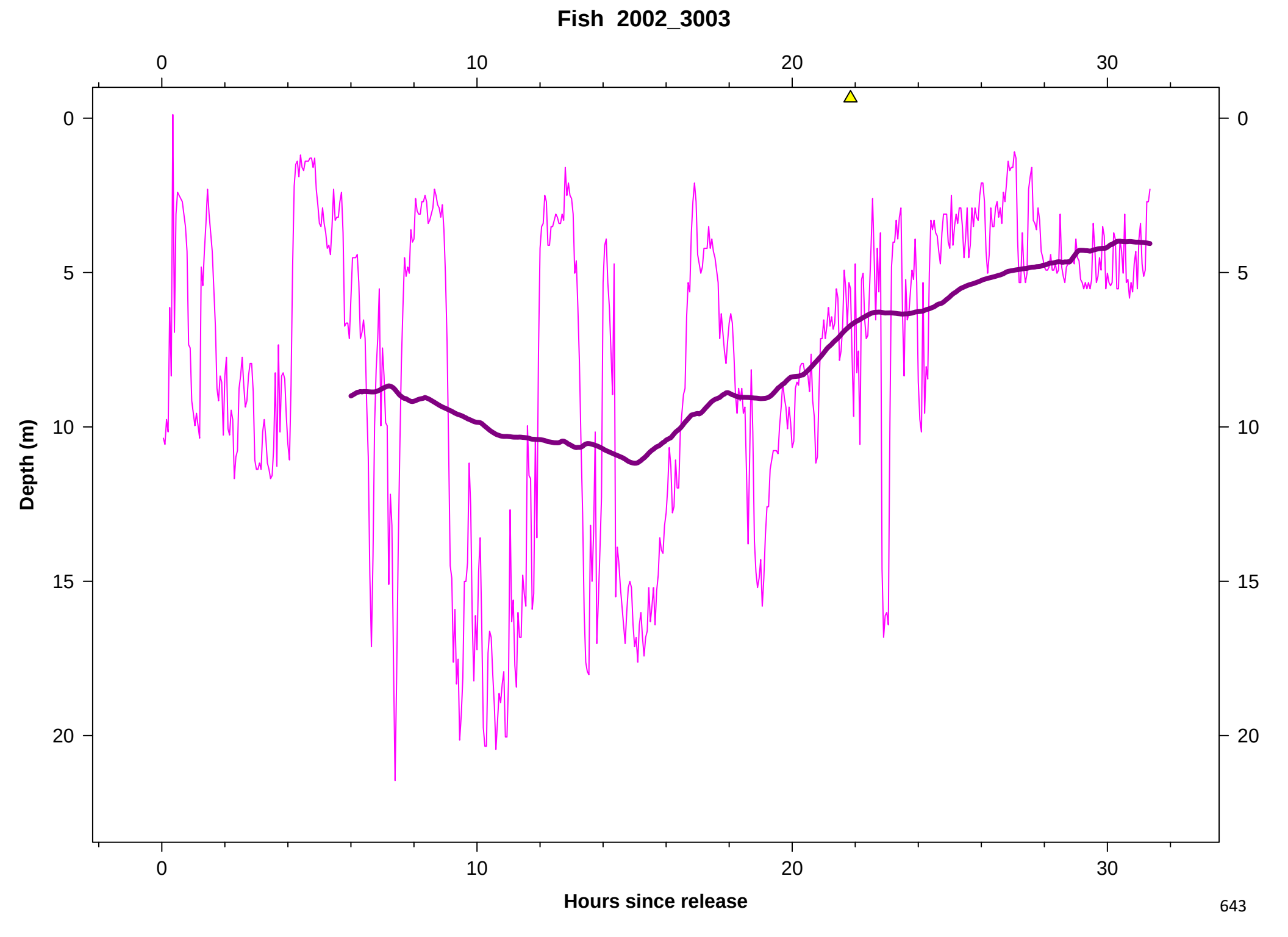

Lower Yukon Fishery Stock
2002
2004
Tagging site
Yukon 1
Yukon 2
18.5
18.0
17.5
17.0
Temperature (C)
Fish within stock
638

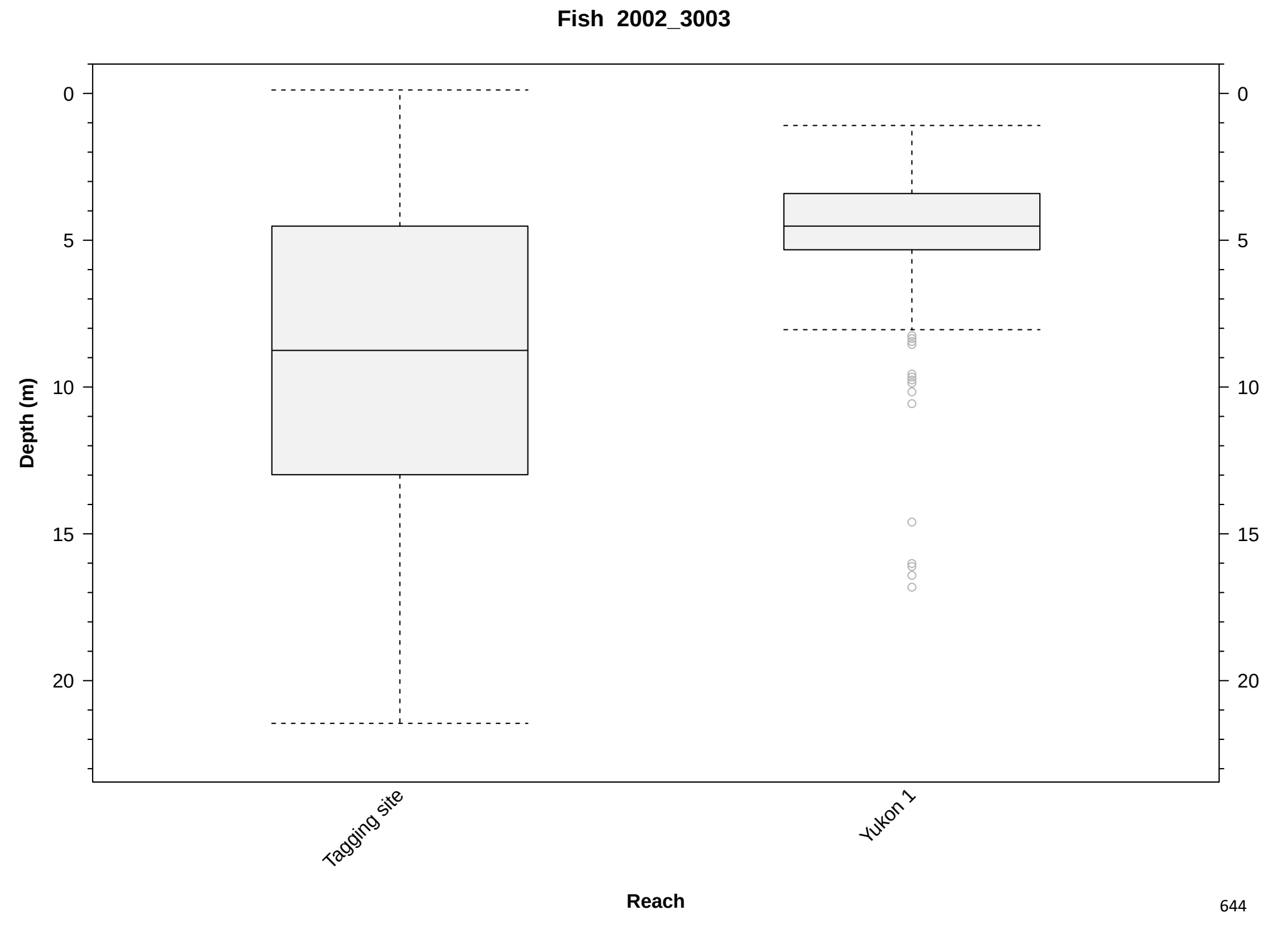

Lower Yukon Fishery Stock
2002_3003
2002_3014
2004_3031
Tagging site
Yukon 1
Yukon 2
Density
0
10
20
17.0
17.5
18.0
18.5
Temperature (C)

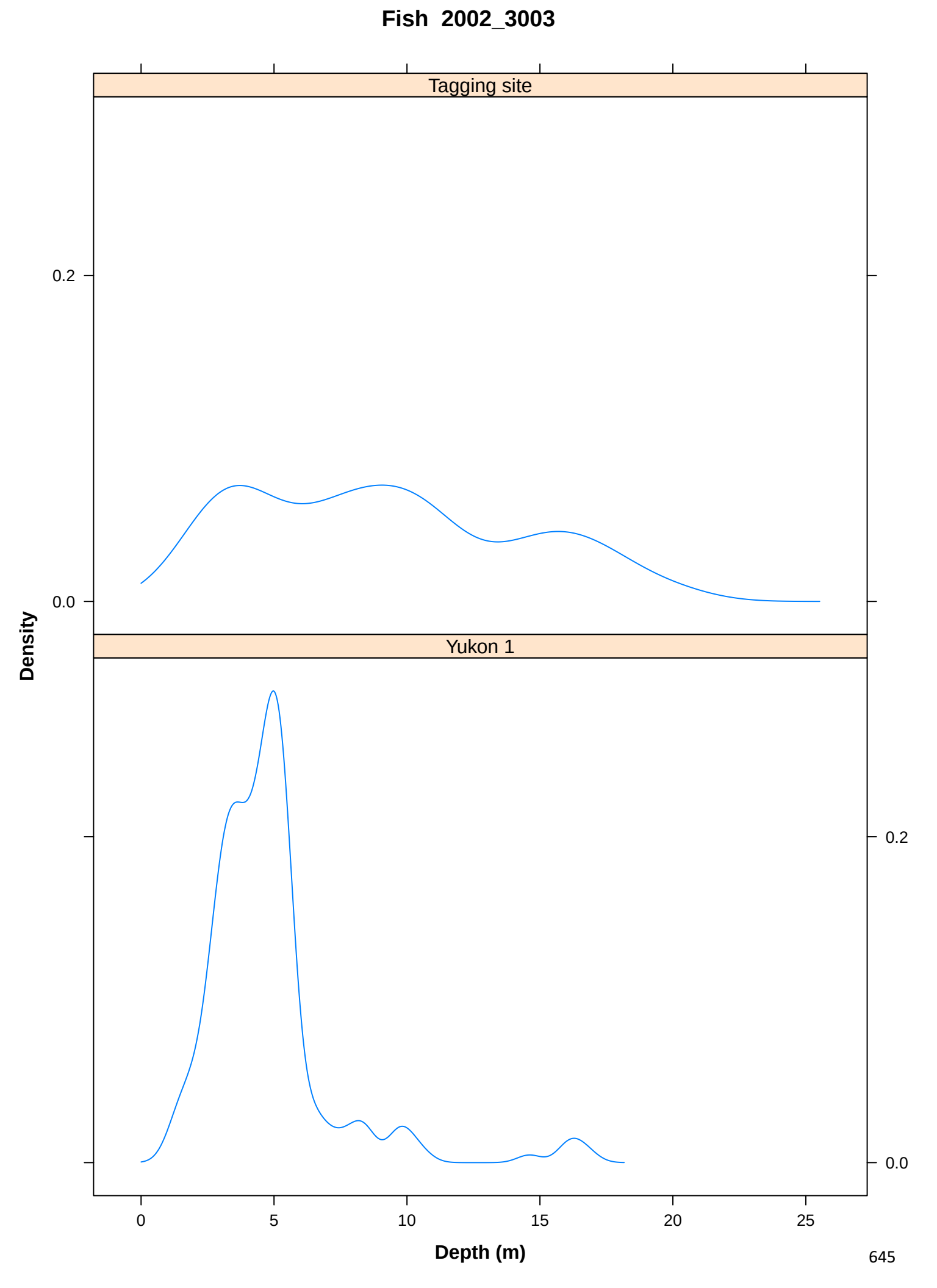

Lower Yukon Fishery Stock
2002
2004
Tagging site
Yukon 1
Yukon 2
Proprotion of time
0.0
0.2
0.4
0.6
0.8
1.0
17.0
17.5
18.0
18.5
Temperature (C)

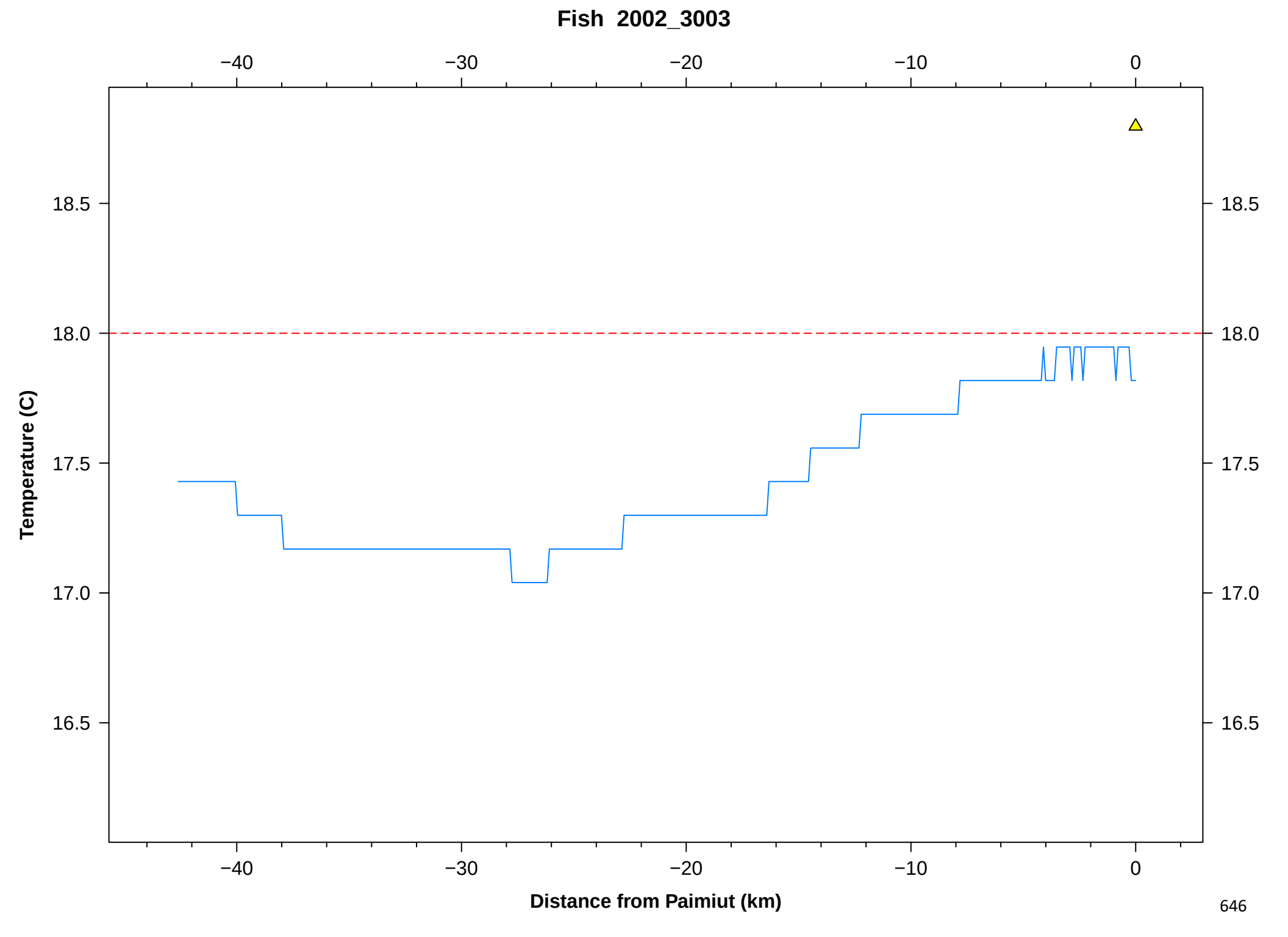

Lower Yukon Fishery Stock
2002
2004
Tagging site
Yukon 1
Yukon 2
Proportion of time spent over 18 C
0.0
0.2
0.4
0.6
0.8
Fish within stock
641

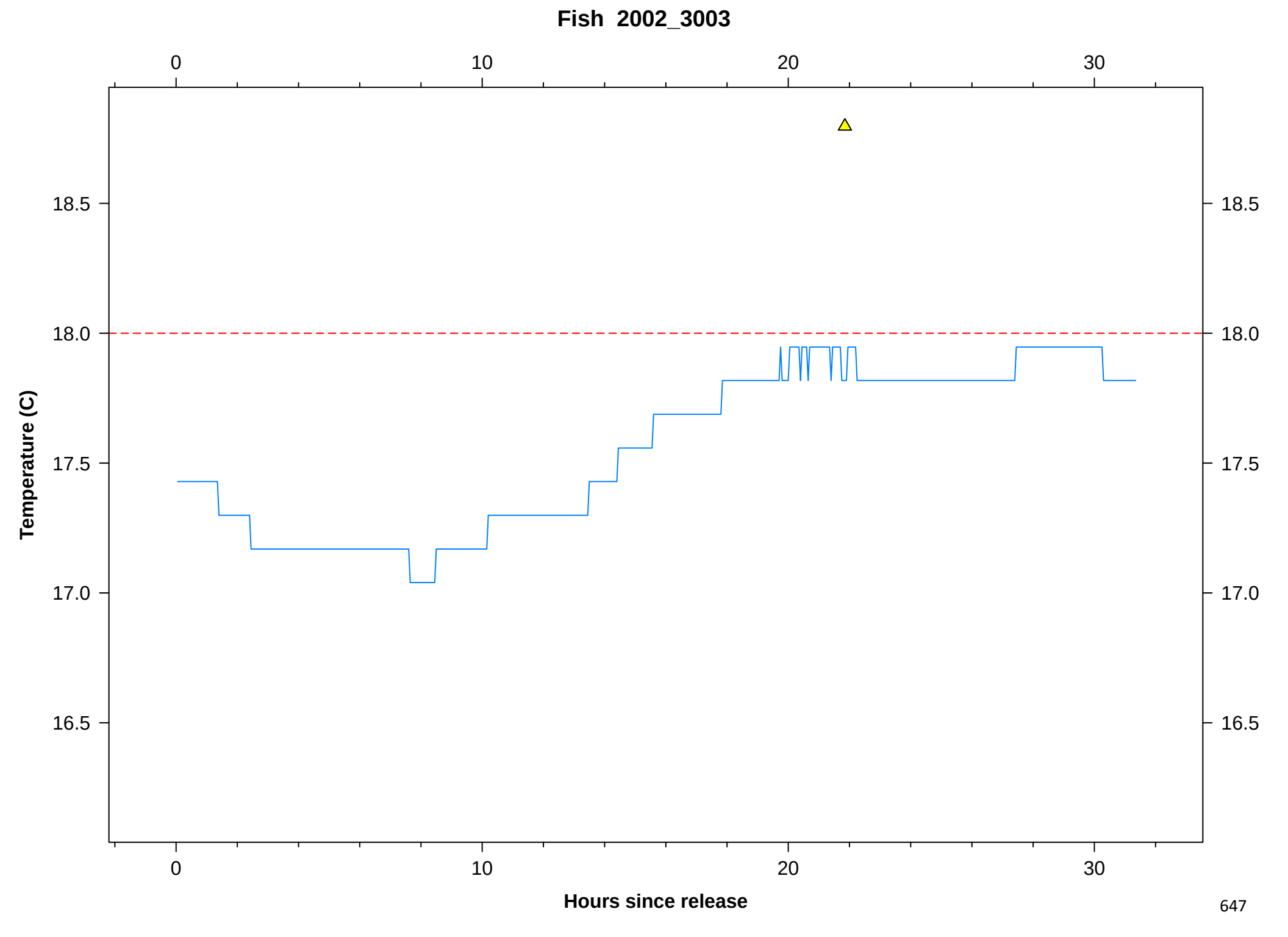

Fish 2002_3003
−40
−30
−20
−10
0
Depth (m)
0
5
10
15
20
Distance from Paimiut (km)

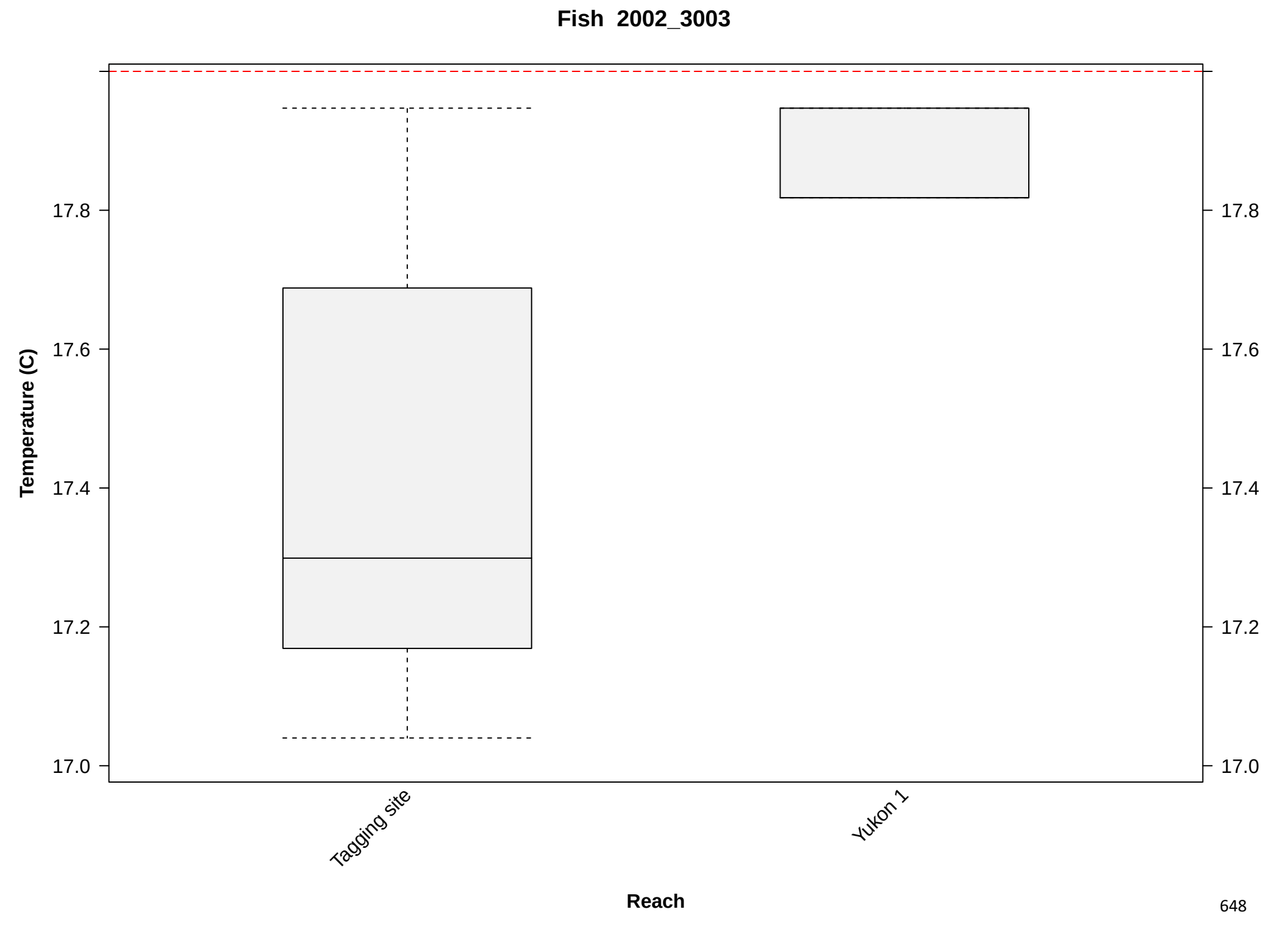

Fish 2002_3003
0
10
20
30
0
5
10
15
20
Depth (m)
Hours since release

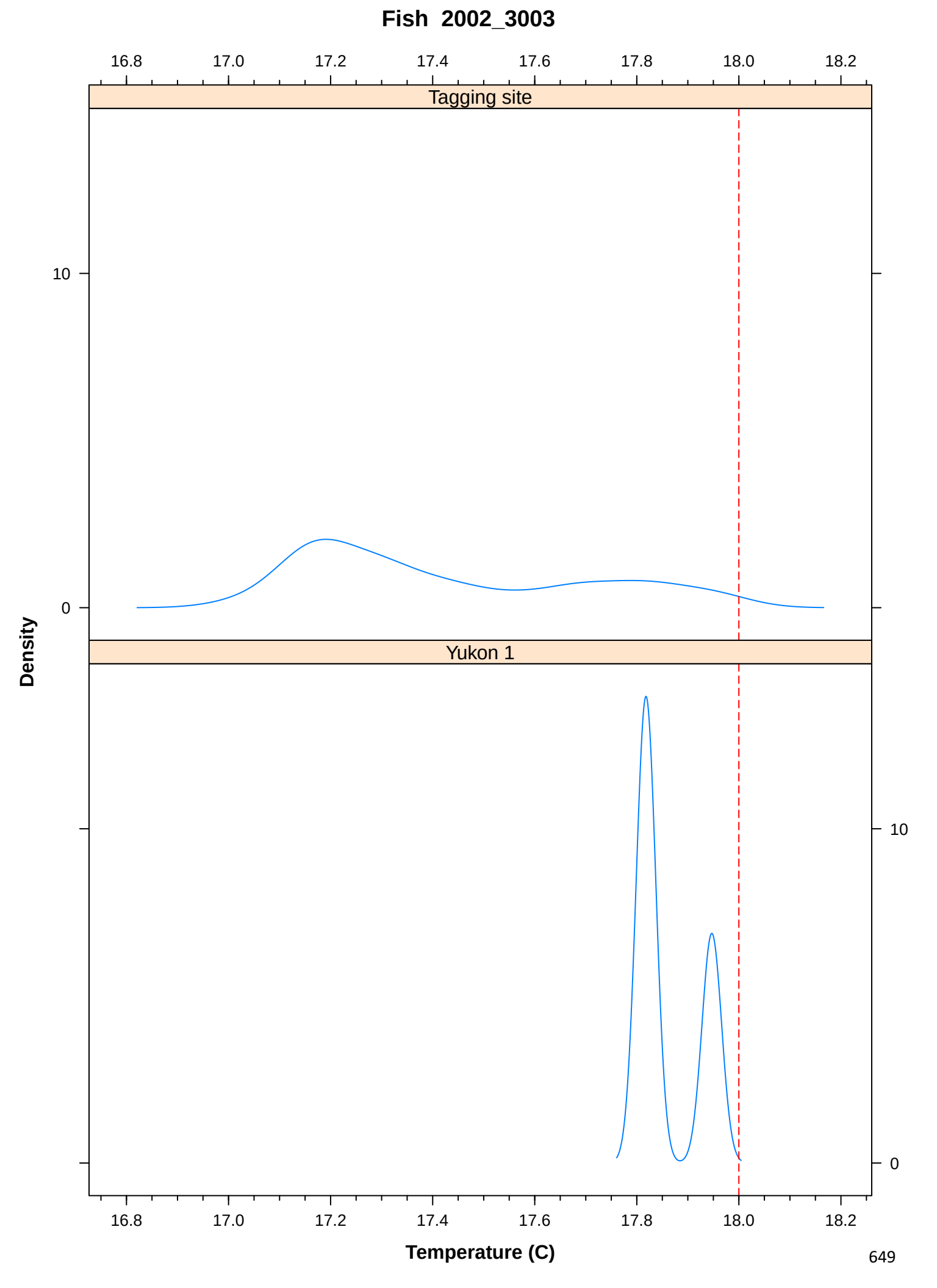

Fish 2002_3003
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Reach

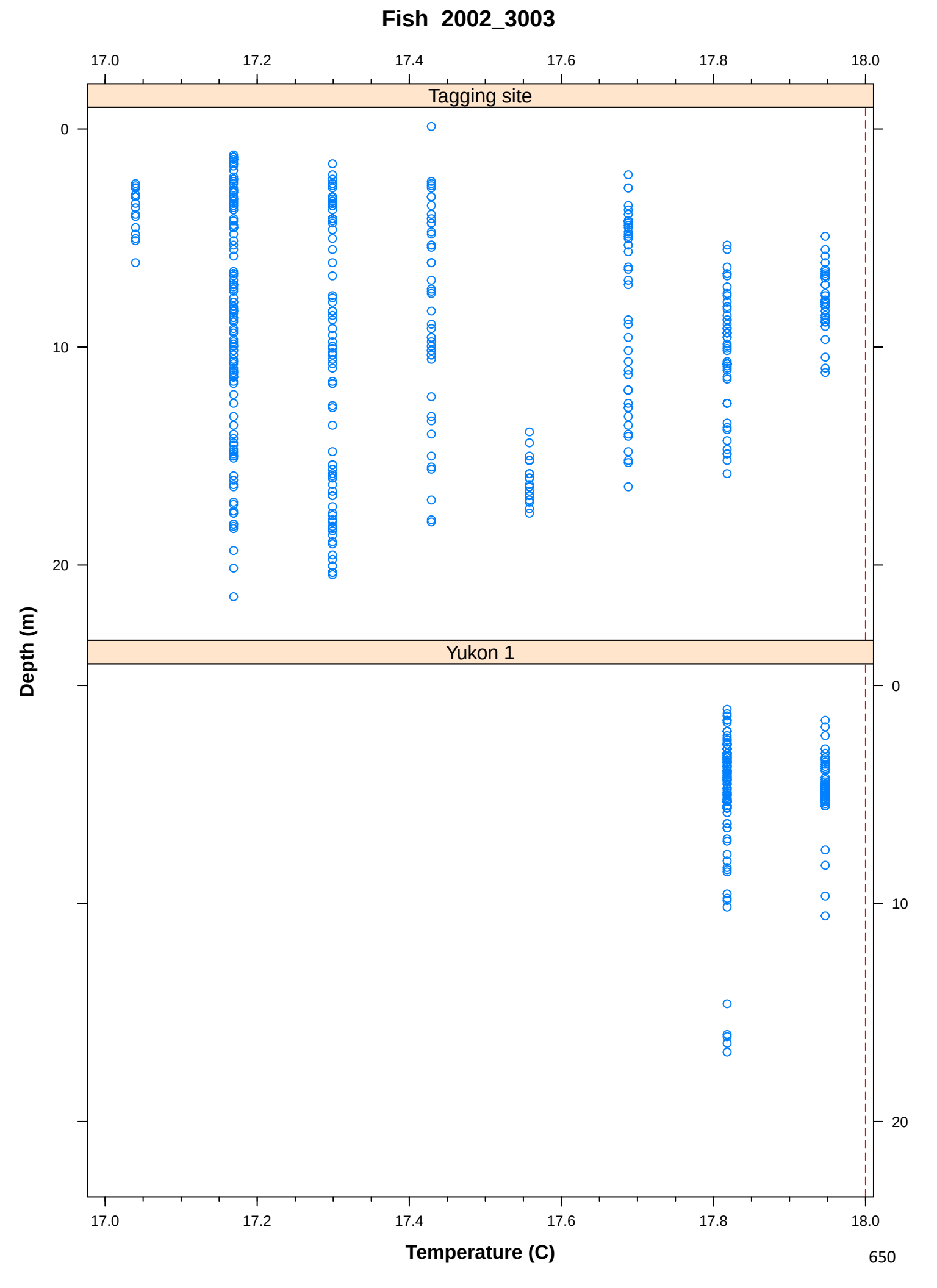

Fish 2002_3003
Tagging site
Yukon 1
Density
0.2
0.0
0.2
0.0
0
5
10
15
20
25
Depth (m)

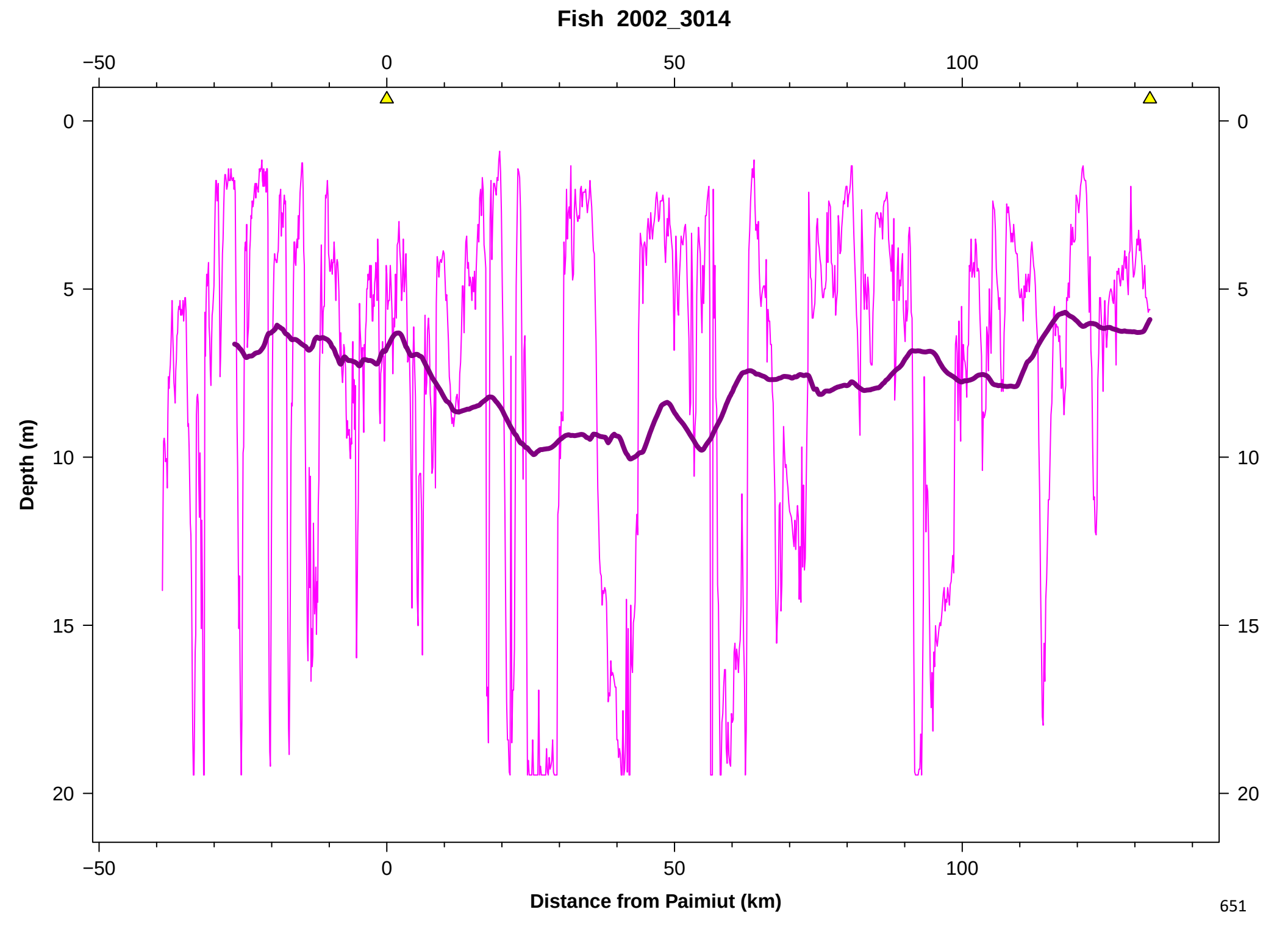

Fish 2002_3003
−40
−30
−20
−10
0
18.5
18.0
17.5
17.0
16.5
Temperature (C)
Distance from Paimiut (km)

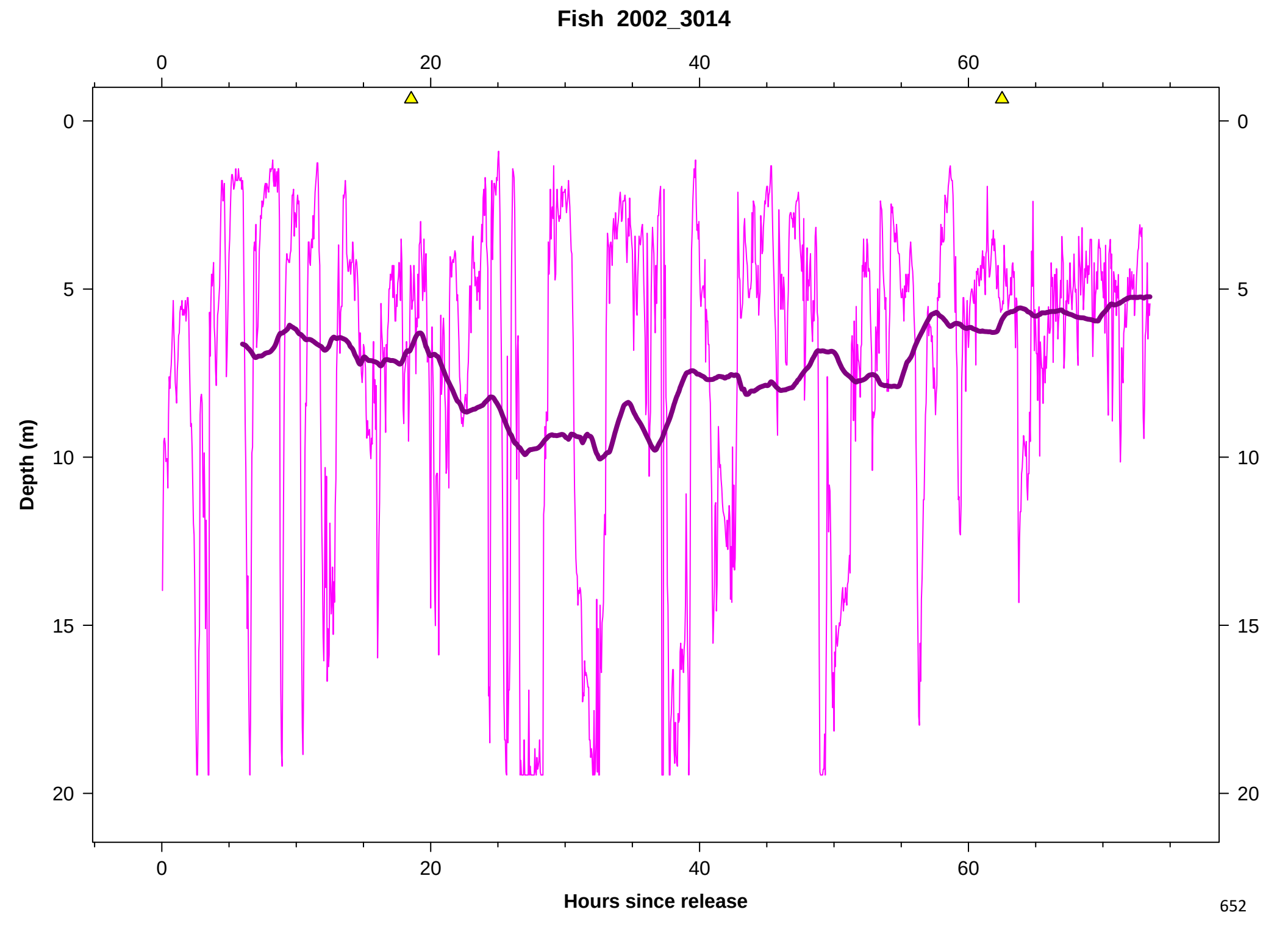

Fish 2002_3003
0
10
20
30
18.5
18.0
17.5
17.0
16.5
Temperature (C)
Hours since release
647

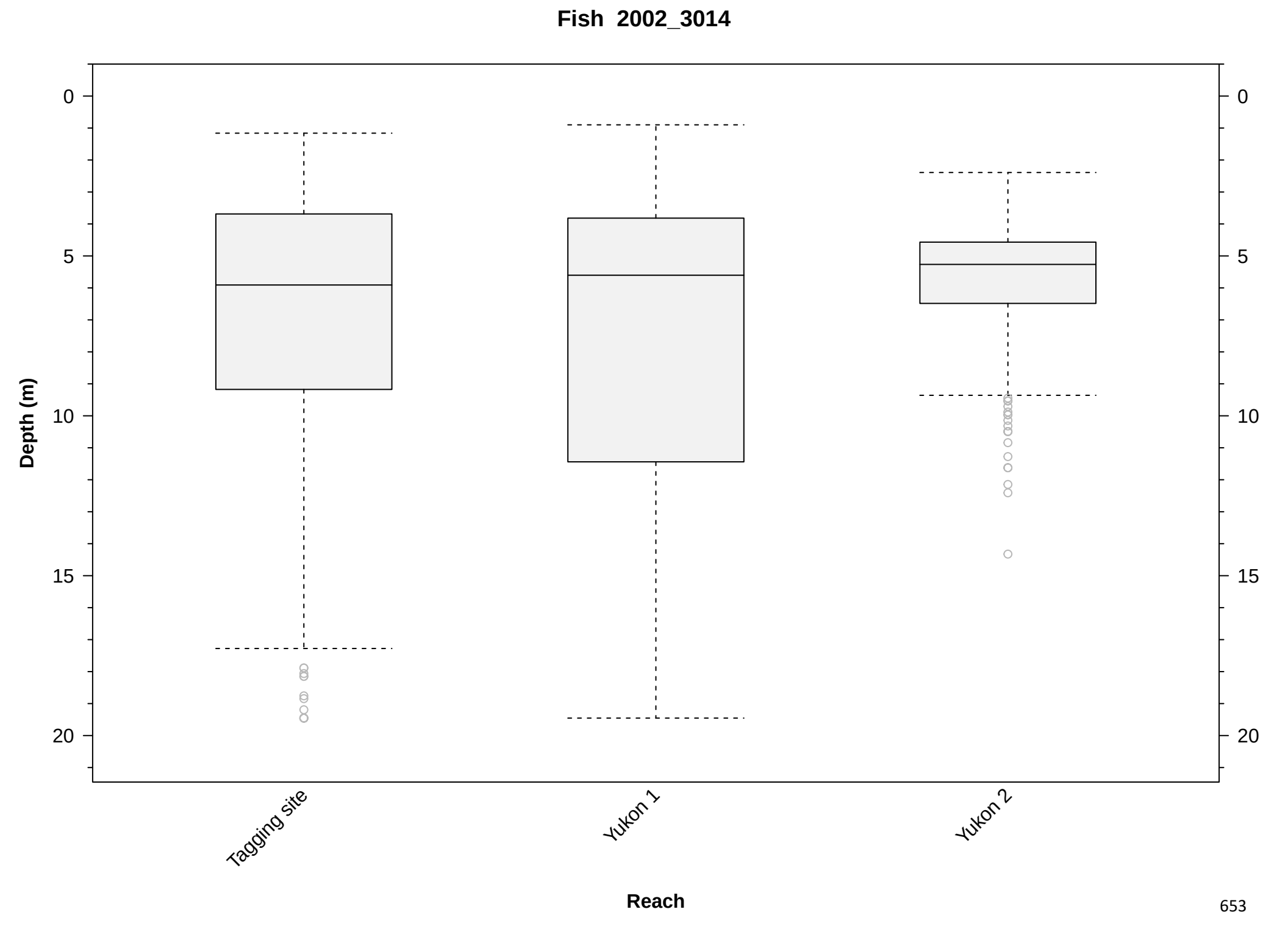

Fish 2002_3003
Temperature (C)
17.8
17.6
17.4
17.2
17.0
Tagging site
Yukon 1
Reach

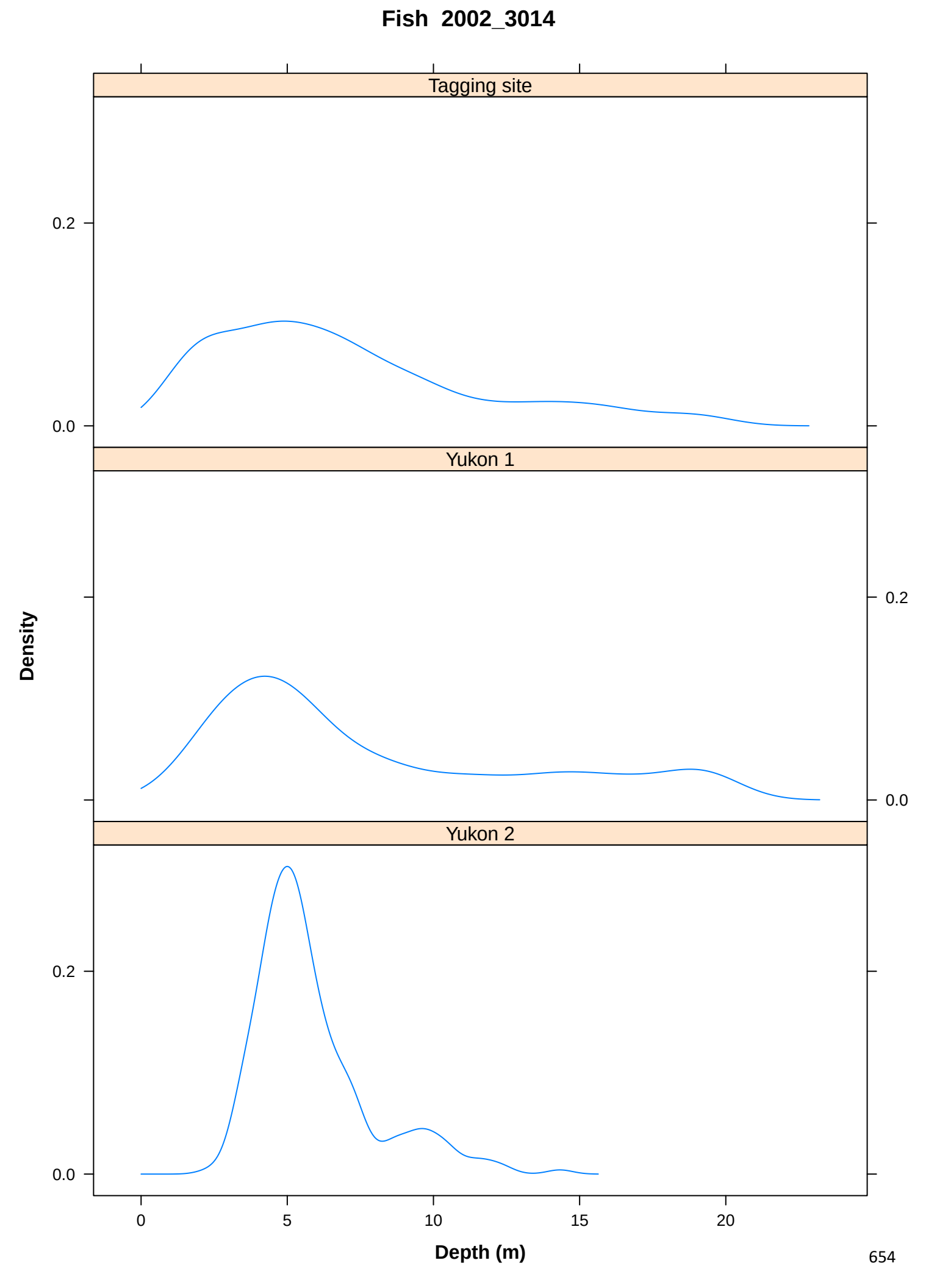

Fish 2002_3003
16.8
17.0
17.2
17.4
17.6
17.8
18.0
18.2
Tagging site
10
0
Yukon 1
10
0
Density
16.8
17.0
17.2
17.4
17.6
17.8
18.0
18.2
Temperature (C)
649

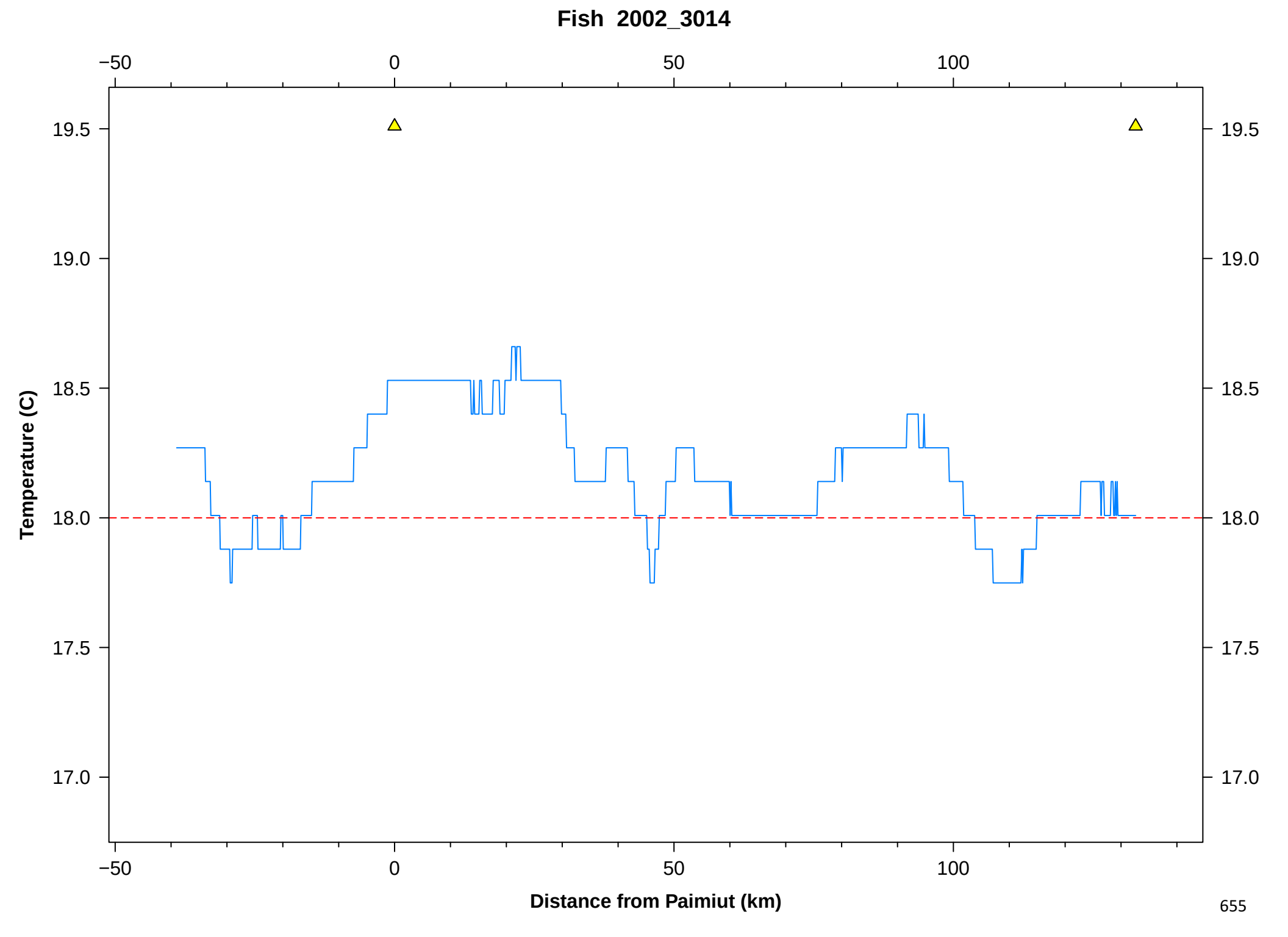

Fish 2002_3003
Tagging site
Yukon 1
Depth (m)
Temperature (C)
17.0
17.2
17.4
17.6
17.8
18.0
0
10
20

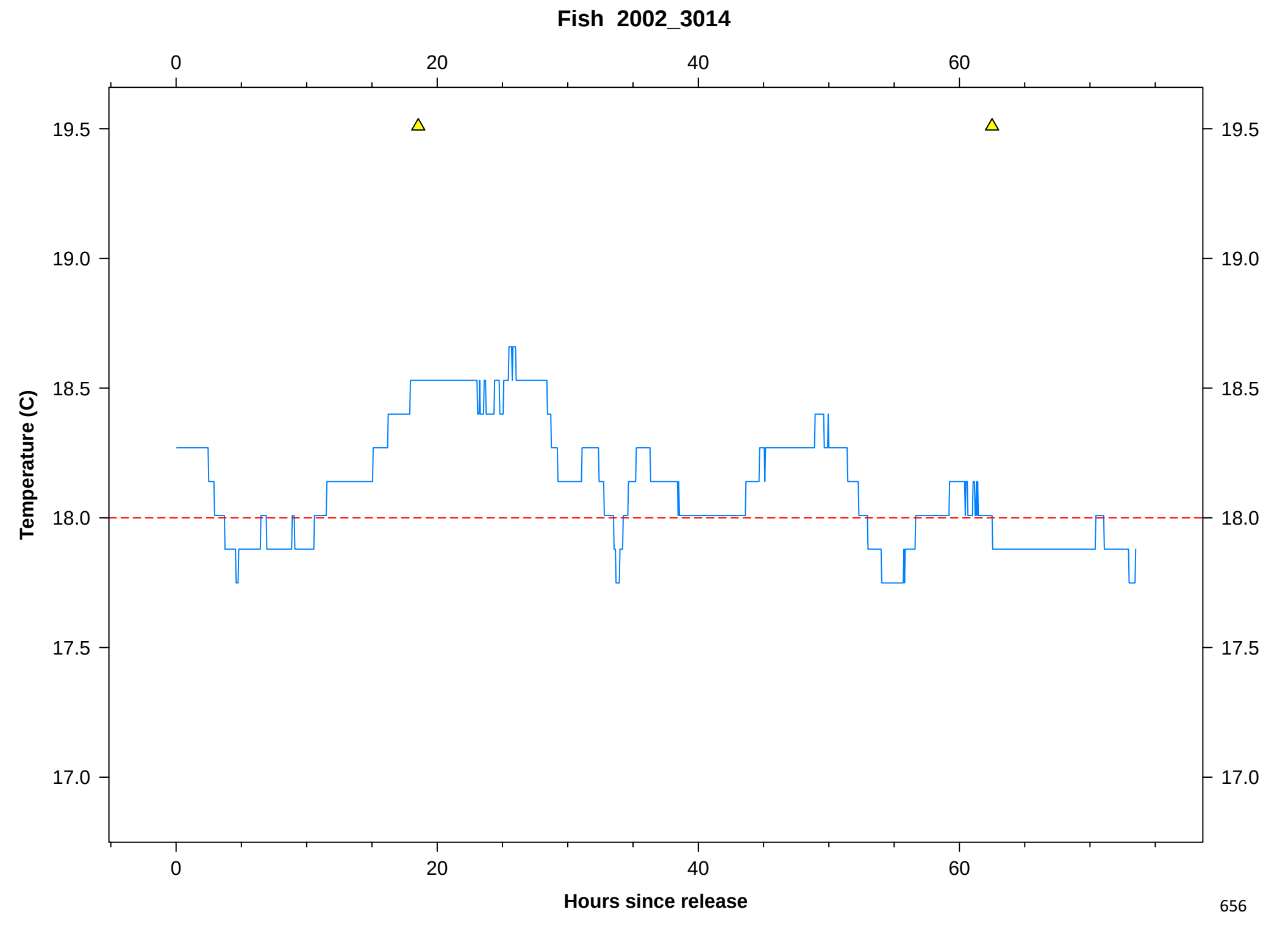

Fish 2002_3014
−50
0
50
100
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

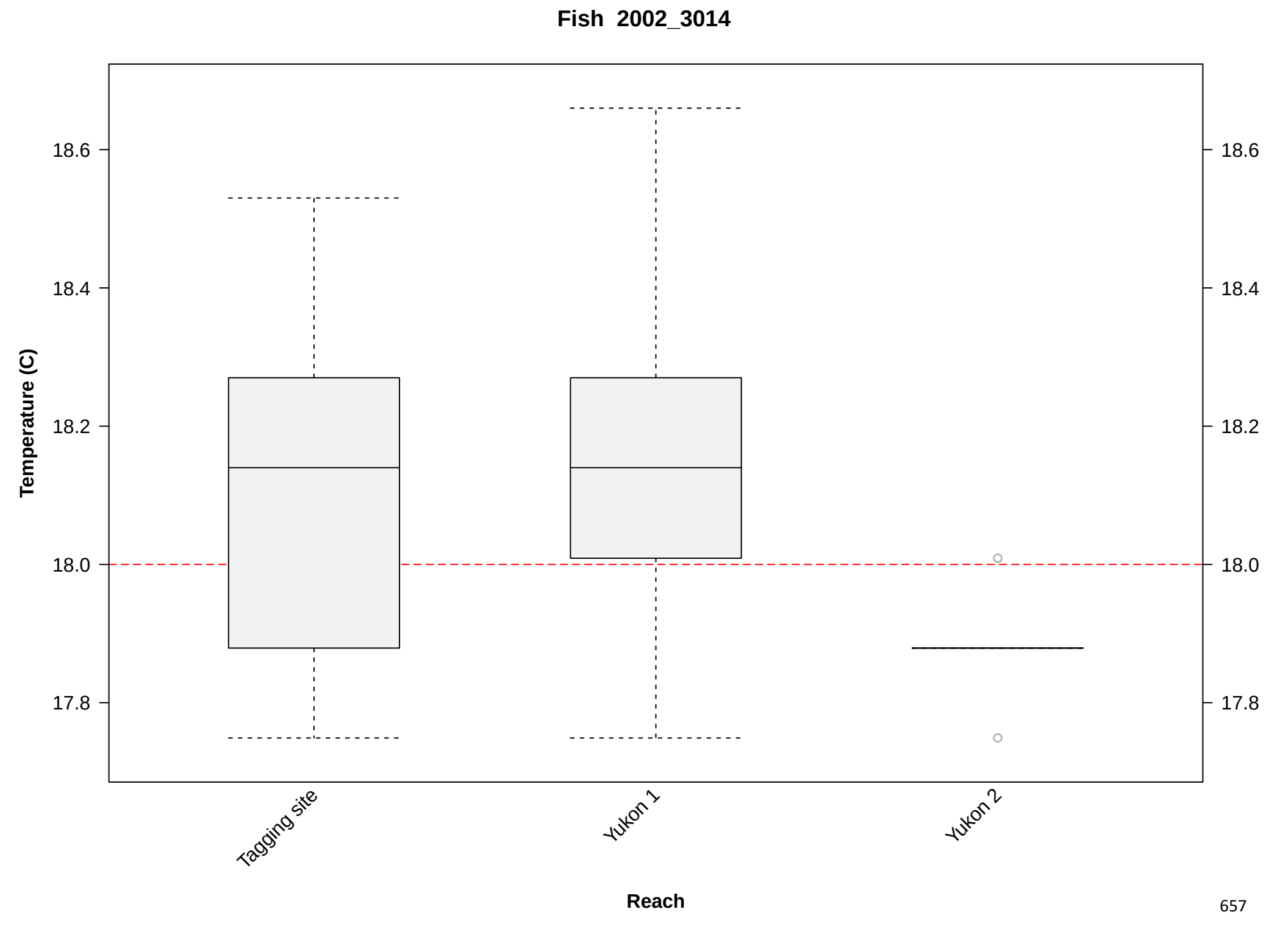

Fish 2002_3014
0
20
40
60
0
5
10
15
20
Depth (m)
Hours since release

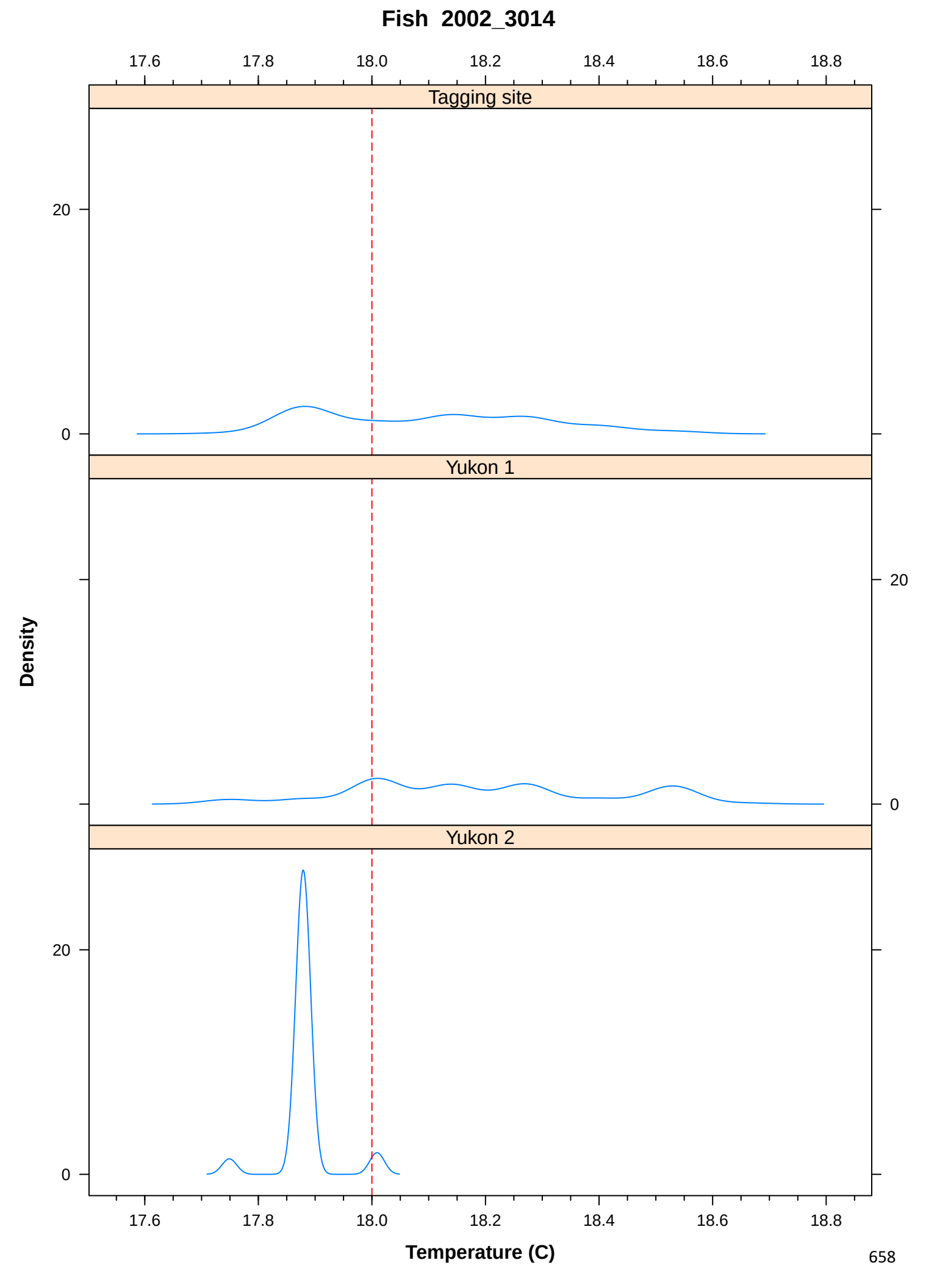

Fish 2002_3014
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Reach

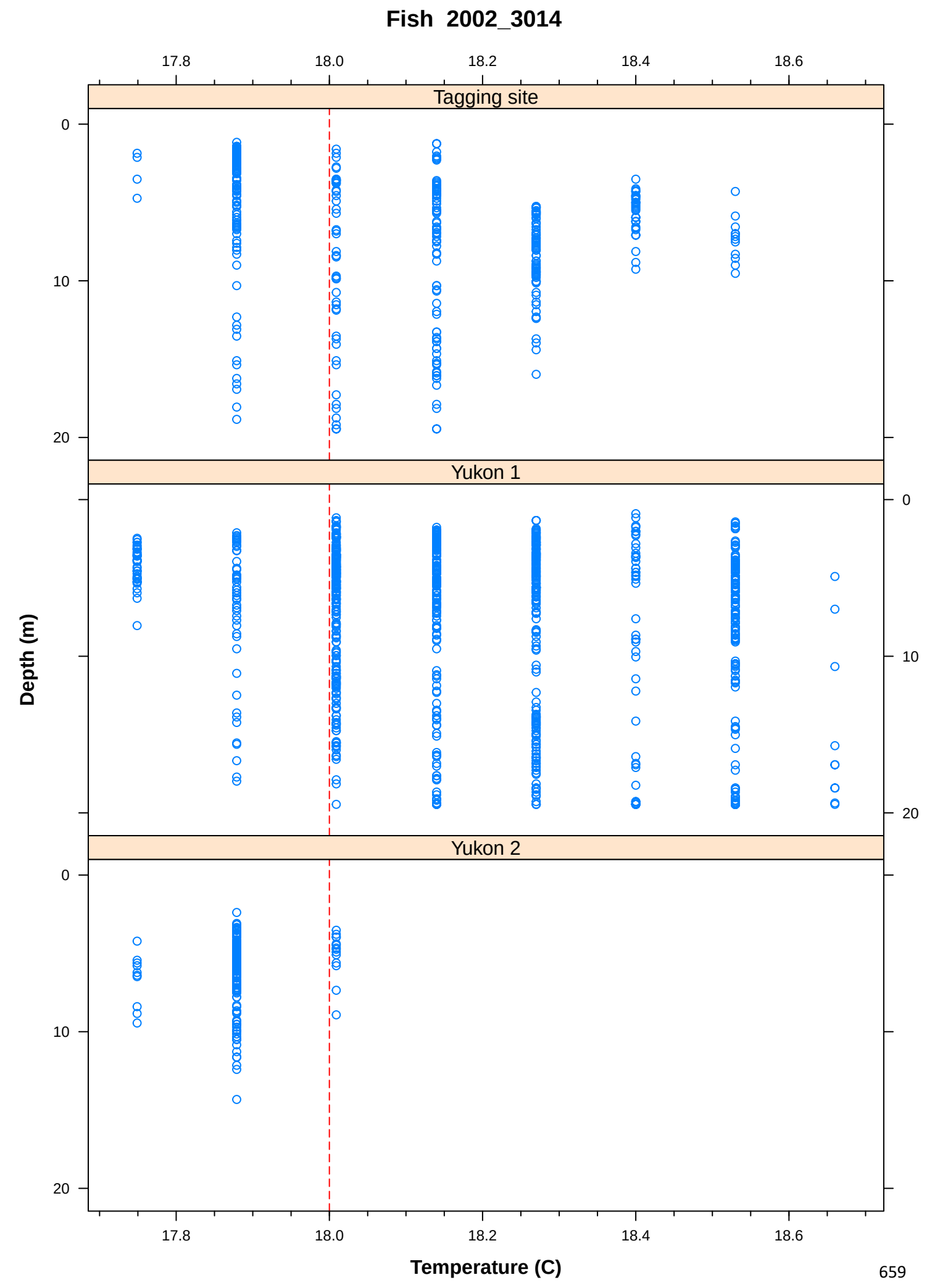

Fish 2002_3014
Tagging site
Yukon 1
Yukon 2
Density
0.2
0.0
0
5
10
15
20
Depth (m)

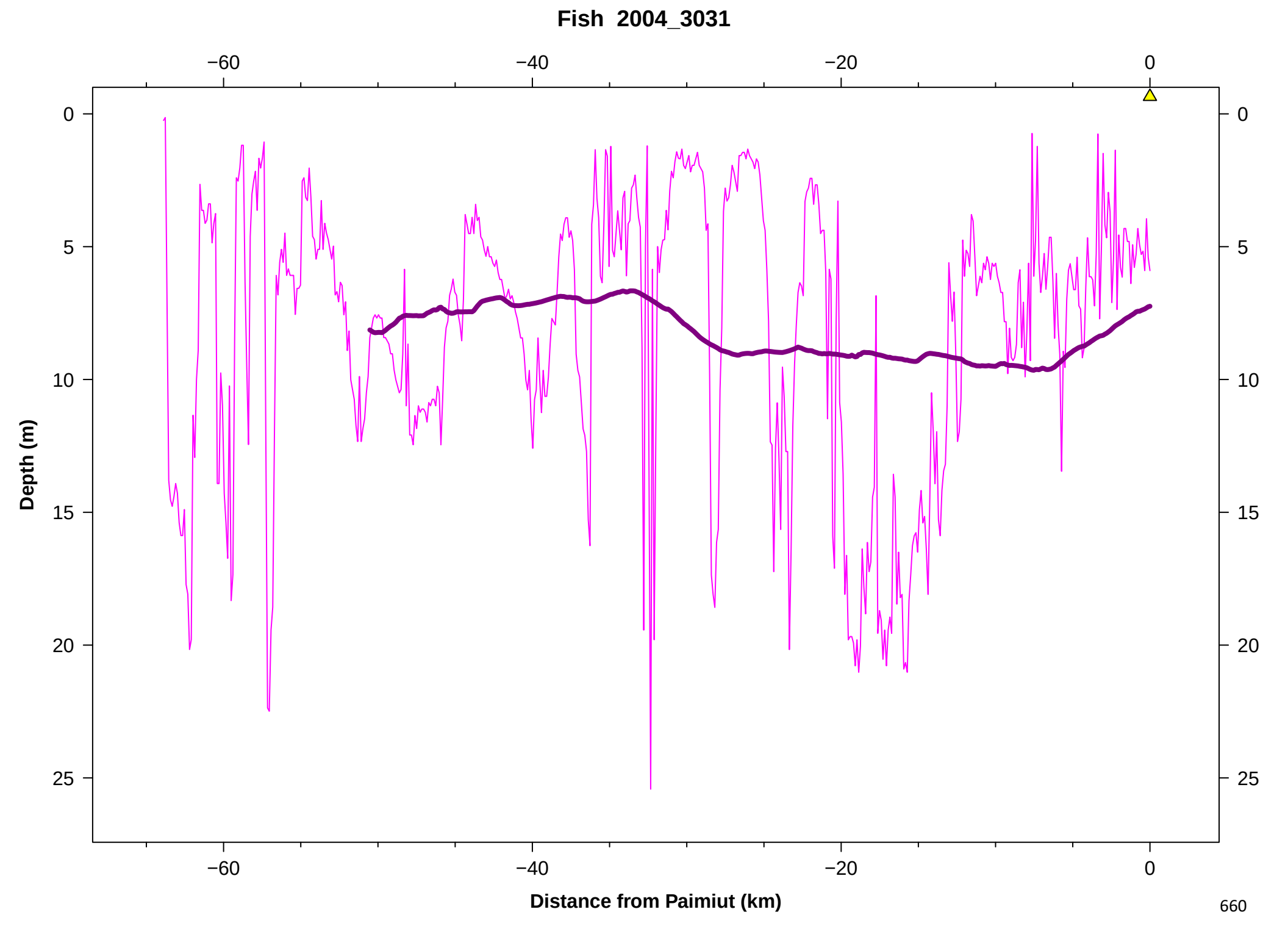

Fish 2002_3014
−50
0
50
100
19.5
19.0
18.5
18.0
17.5
17.0
Temperature (C)
Distance from Paimiut (km)

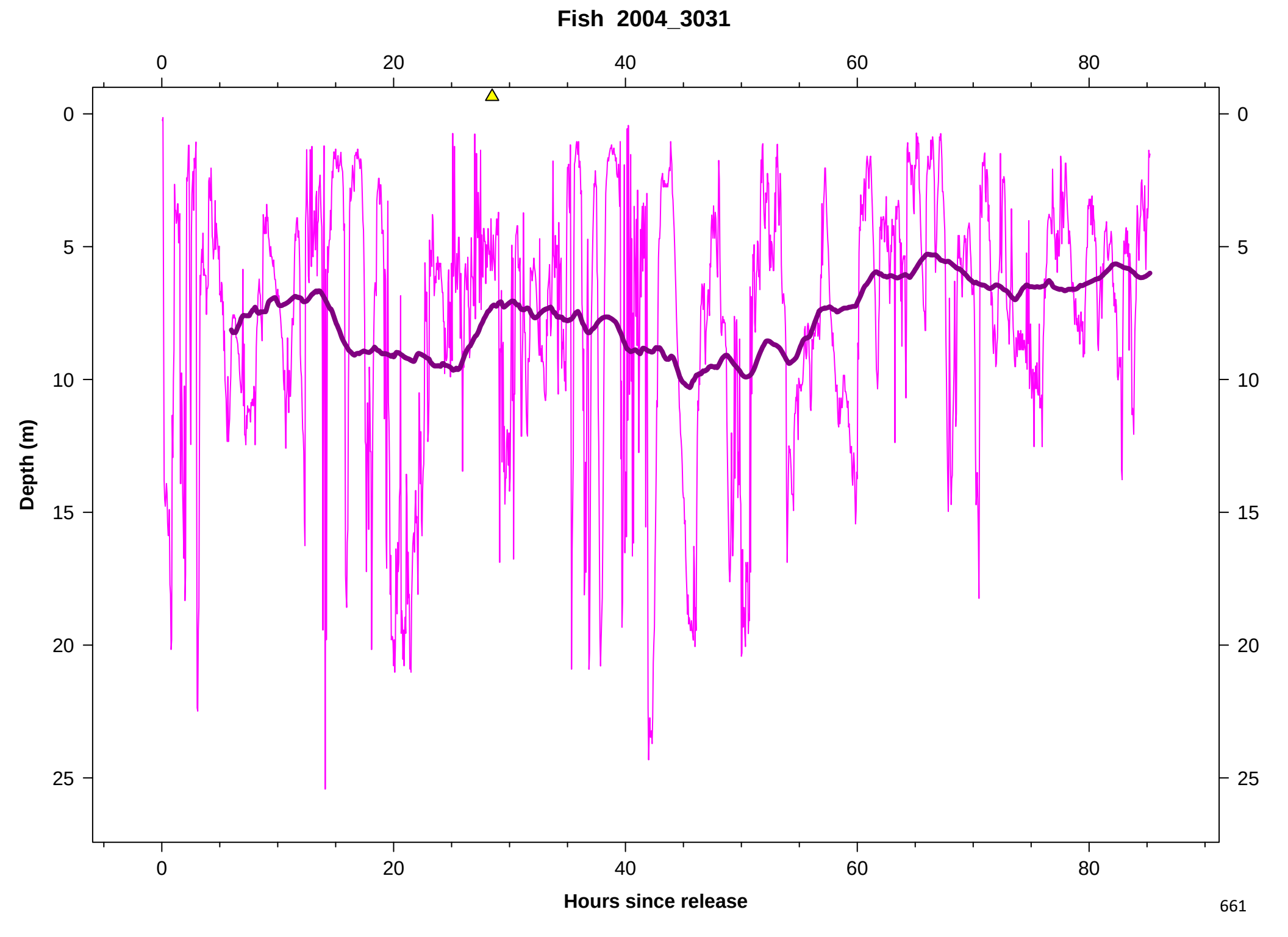

Fish 2002_3014
0
20
40
60
19.5
19.0
18.5
18.0
17.5
17.0
Temperature (C)
Hours since release

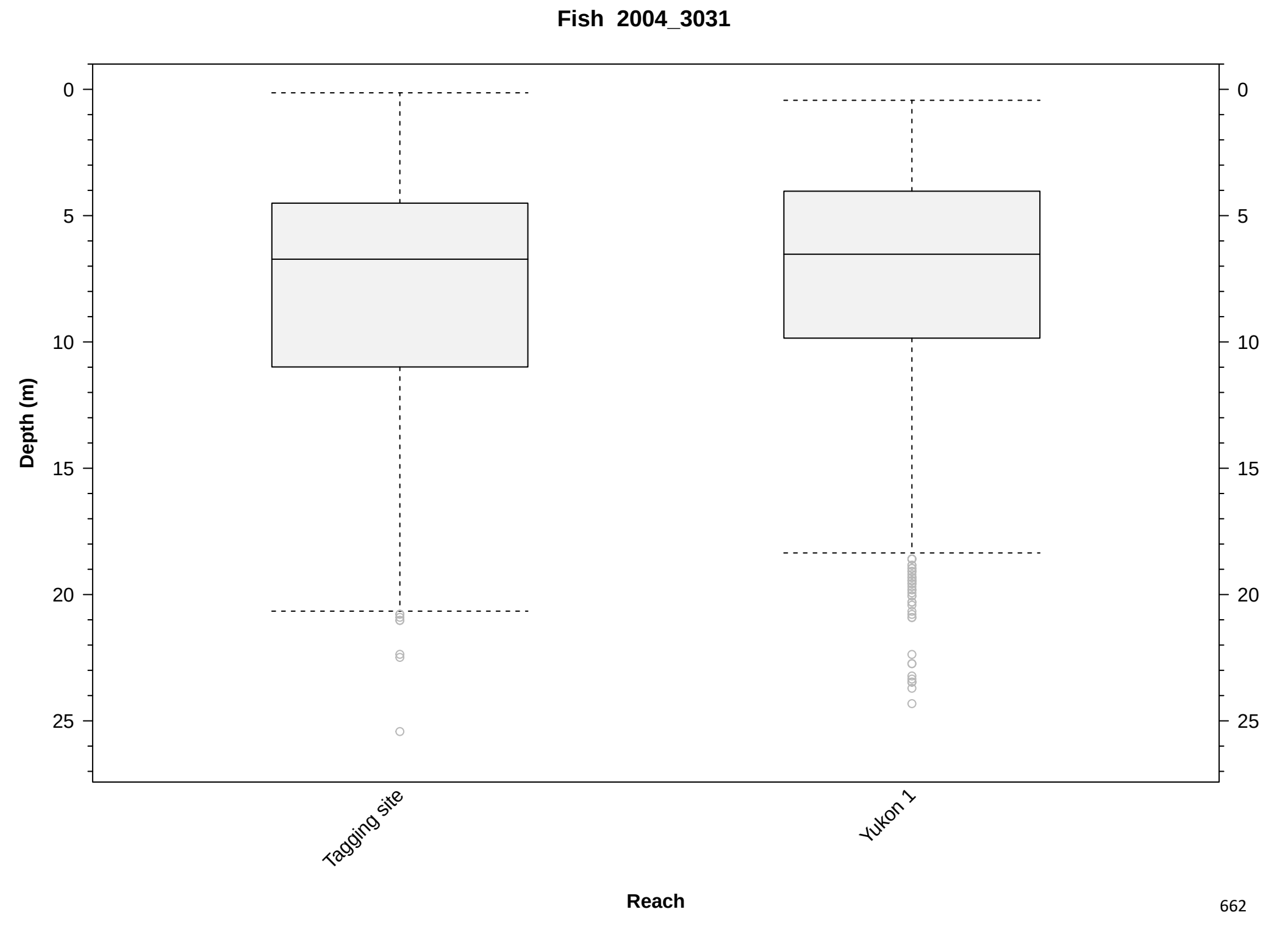

Fish 2002_3014
Temperature (C)
18.6
18.4
18.2
18.0
17.8
Tagging site
Yukon 1
Yukon 2
Reach

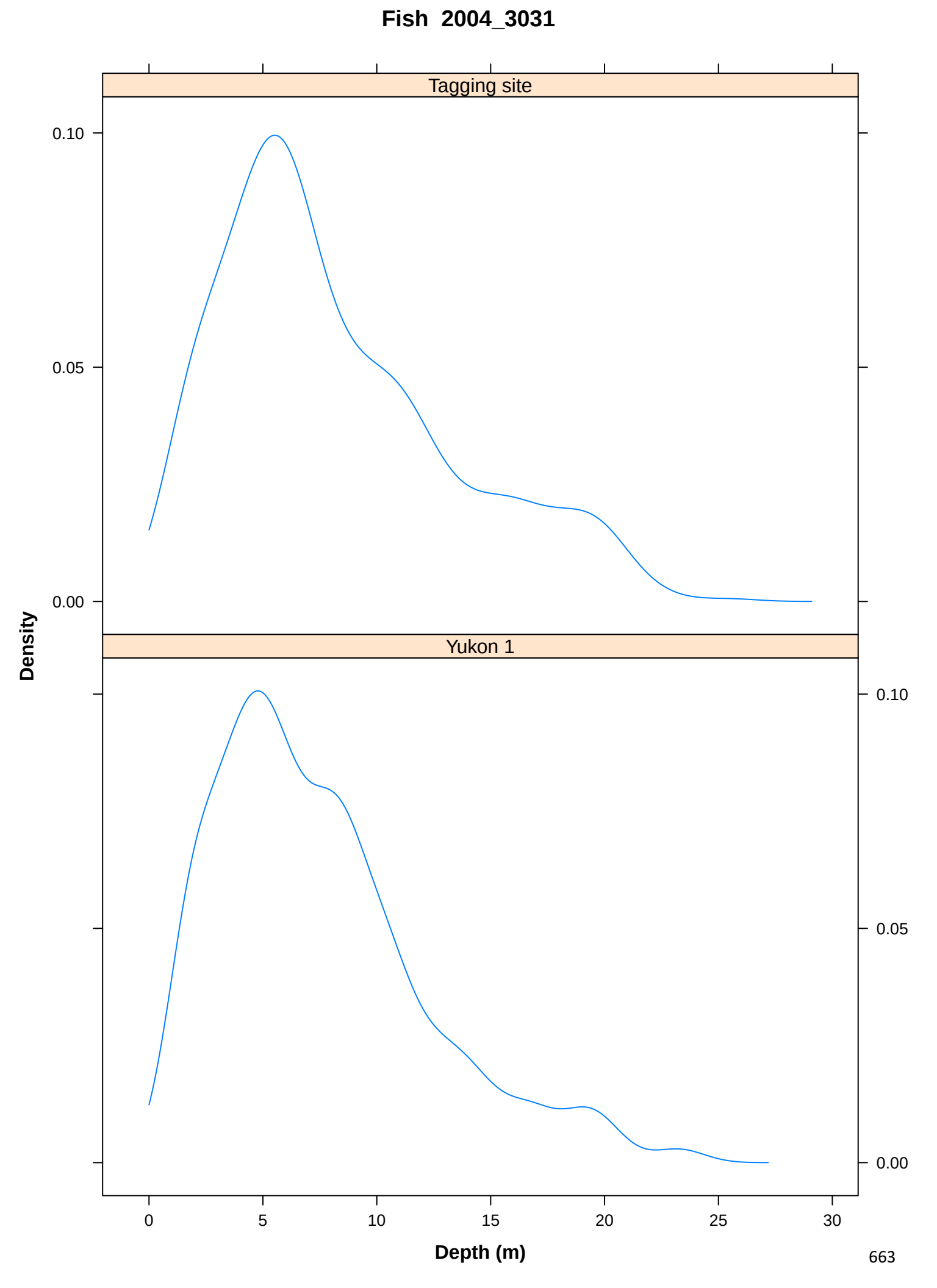

Fish 2002_3014
17.6
17.8
18.0
18.2
18.4
18.6
18.8
Tagging site
Yukon 1
Yukon 2
20
0
Density
Temperature (C)

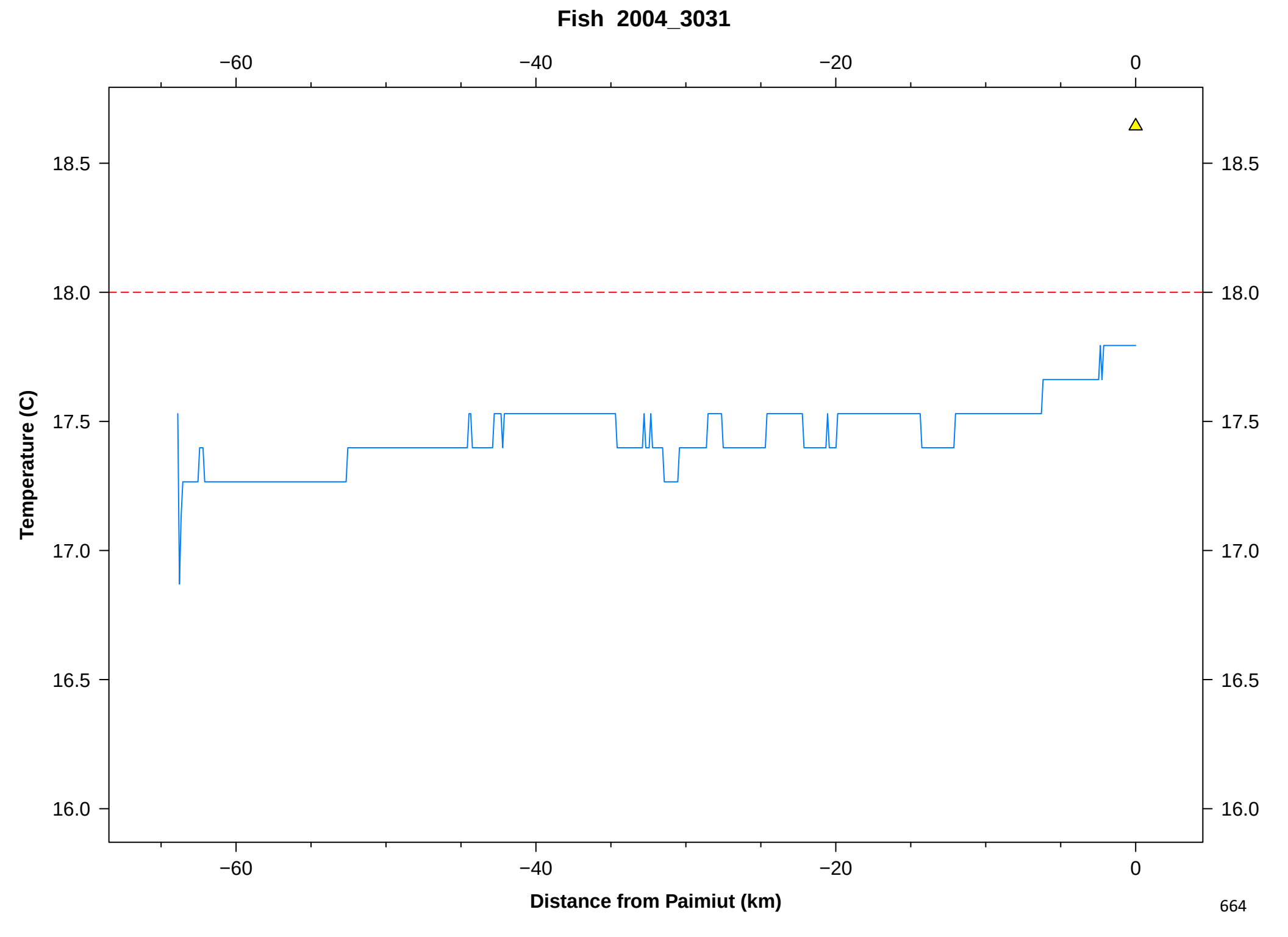

Fish 2002_3014
17.8
18.0
18.2
18.4
18.6
Tagging site
Yukon 1
Yukon 2
0
10
20
Depth (m)
Temperature (C)

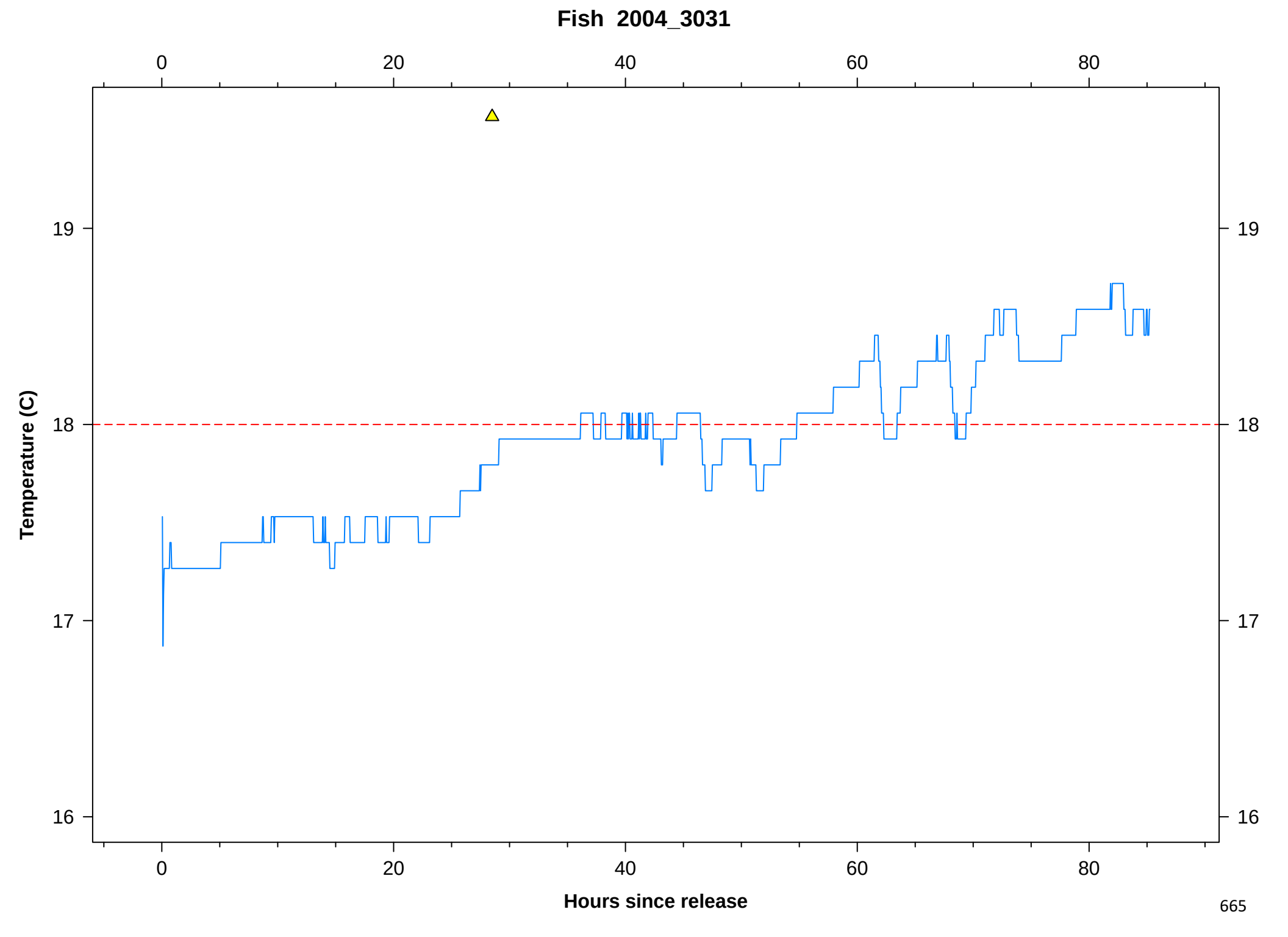

Fish 2004_3031
−60
−40
−20
0
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

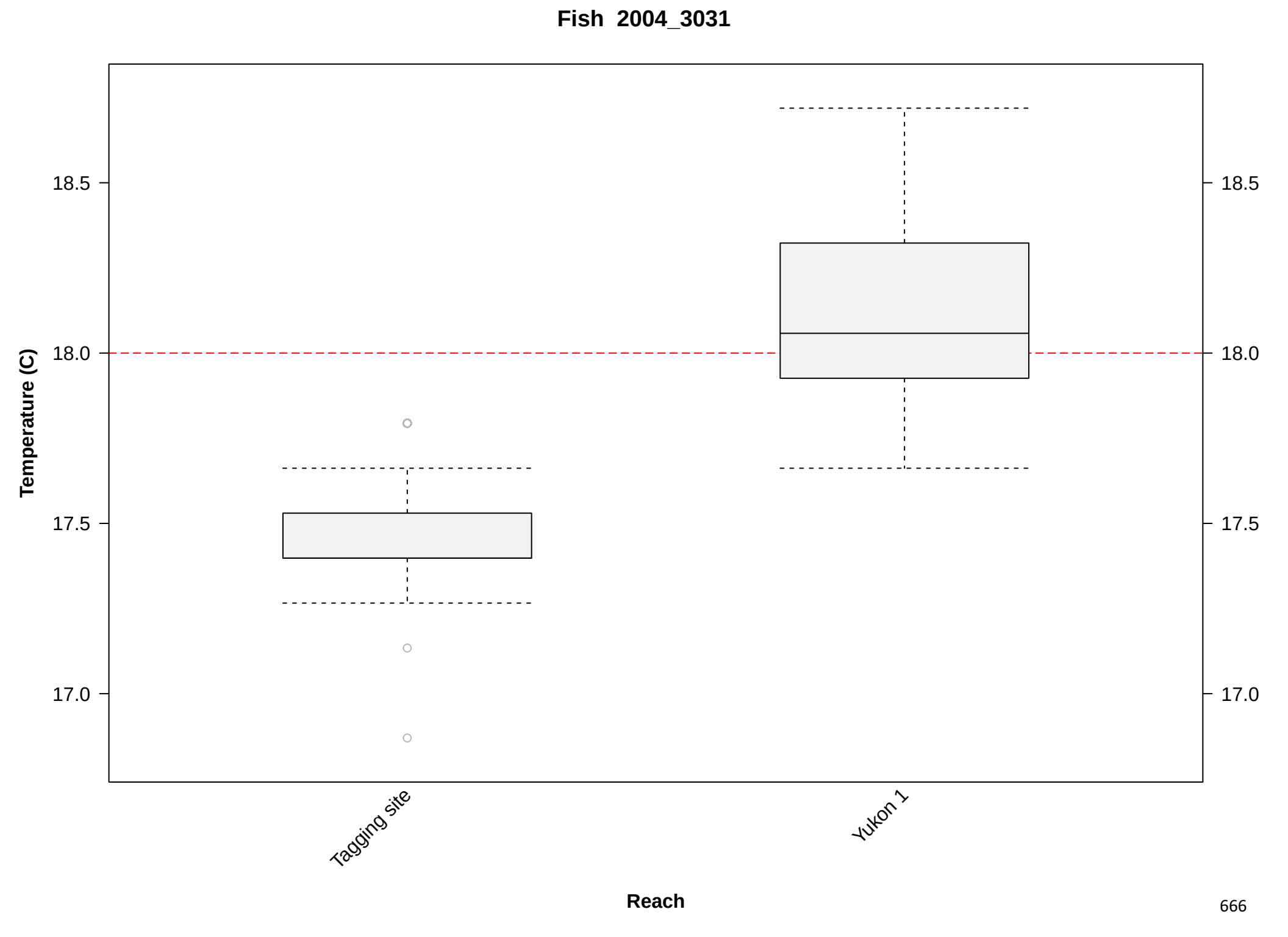

Fish 2004_3031
0
20
40
60
80
0
5
10
15
20
25
Depth (m)
Hours since release

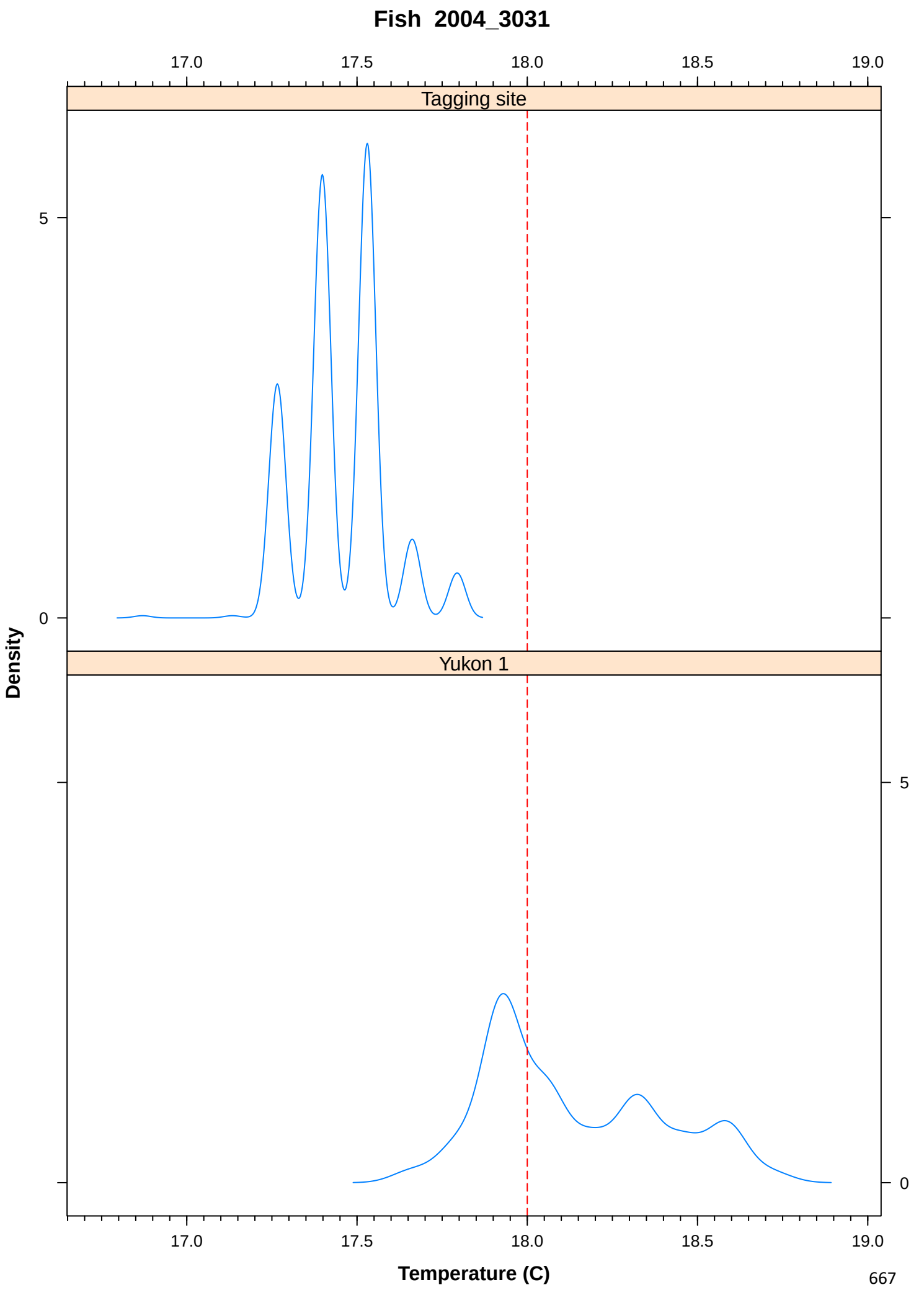

Fish 2004_3031
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Reach

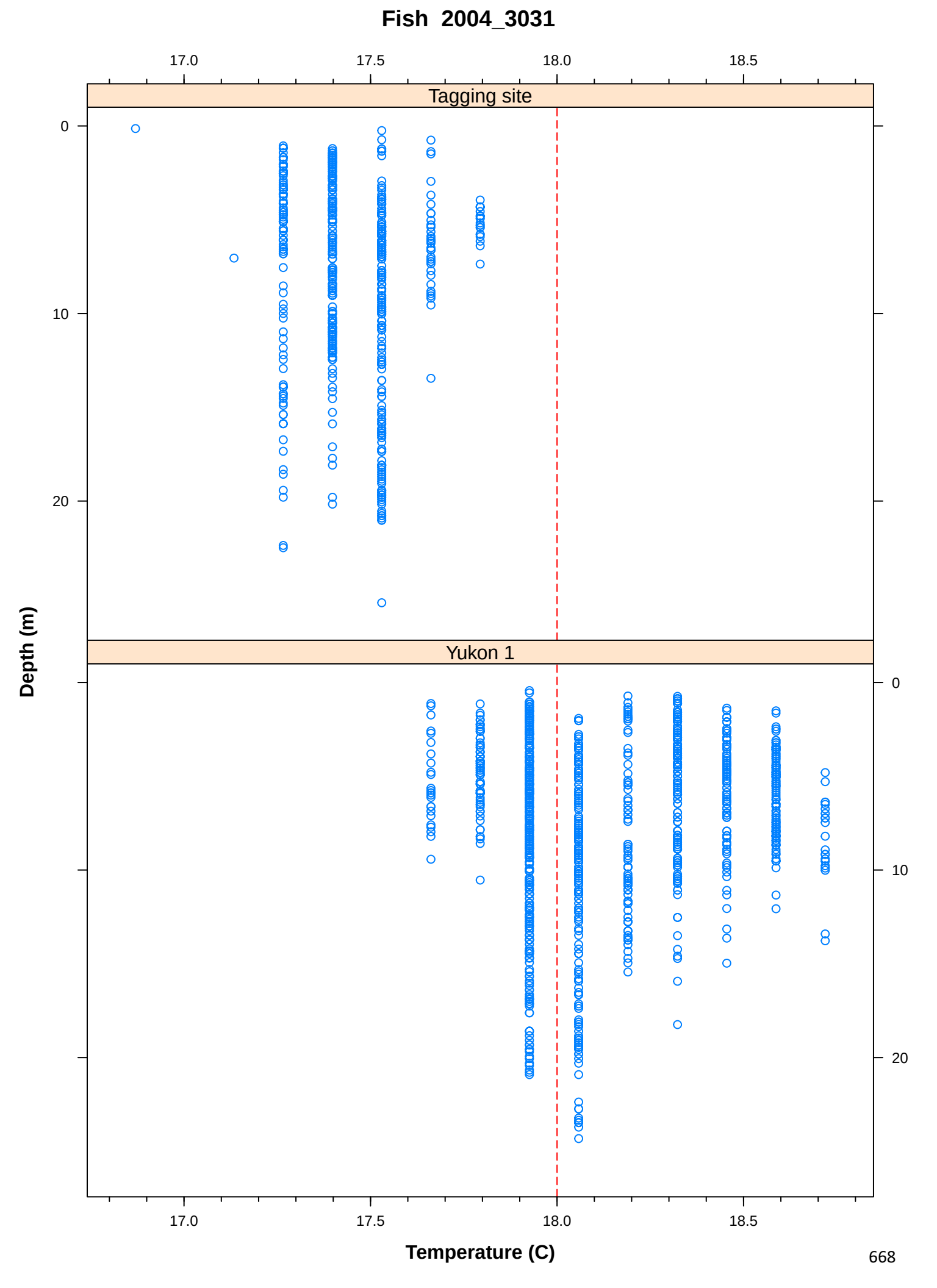

Fish 2004_3031
Tagging site
Yukon 1
Density
0.10
0.05
0.00
0
5
10
15
20
25
30
Depth (m)


Fish 2004_3031
−60
−40
−20
0
18.5
18.0
17.5
17.0
16.5
16.0
Temperature (C)
Distance from Paimiut (km)

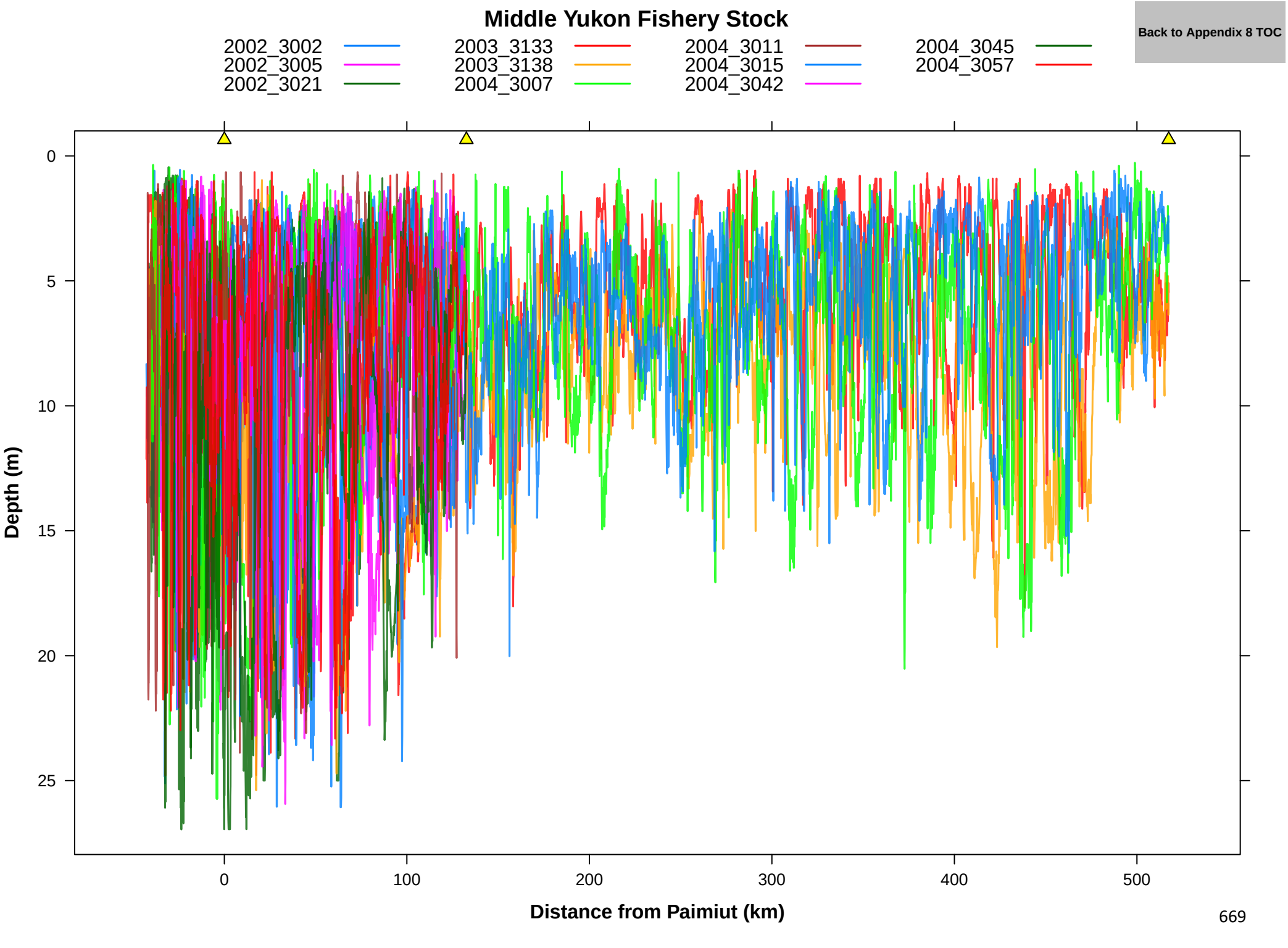

Fish 2004_3031
0
20
40
60
80
19
18
17
16
Temperature (C)
Hours since release

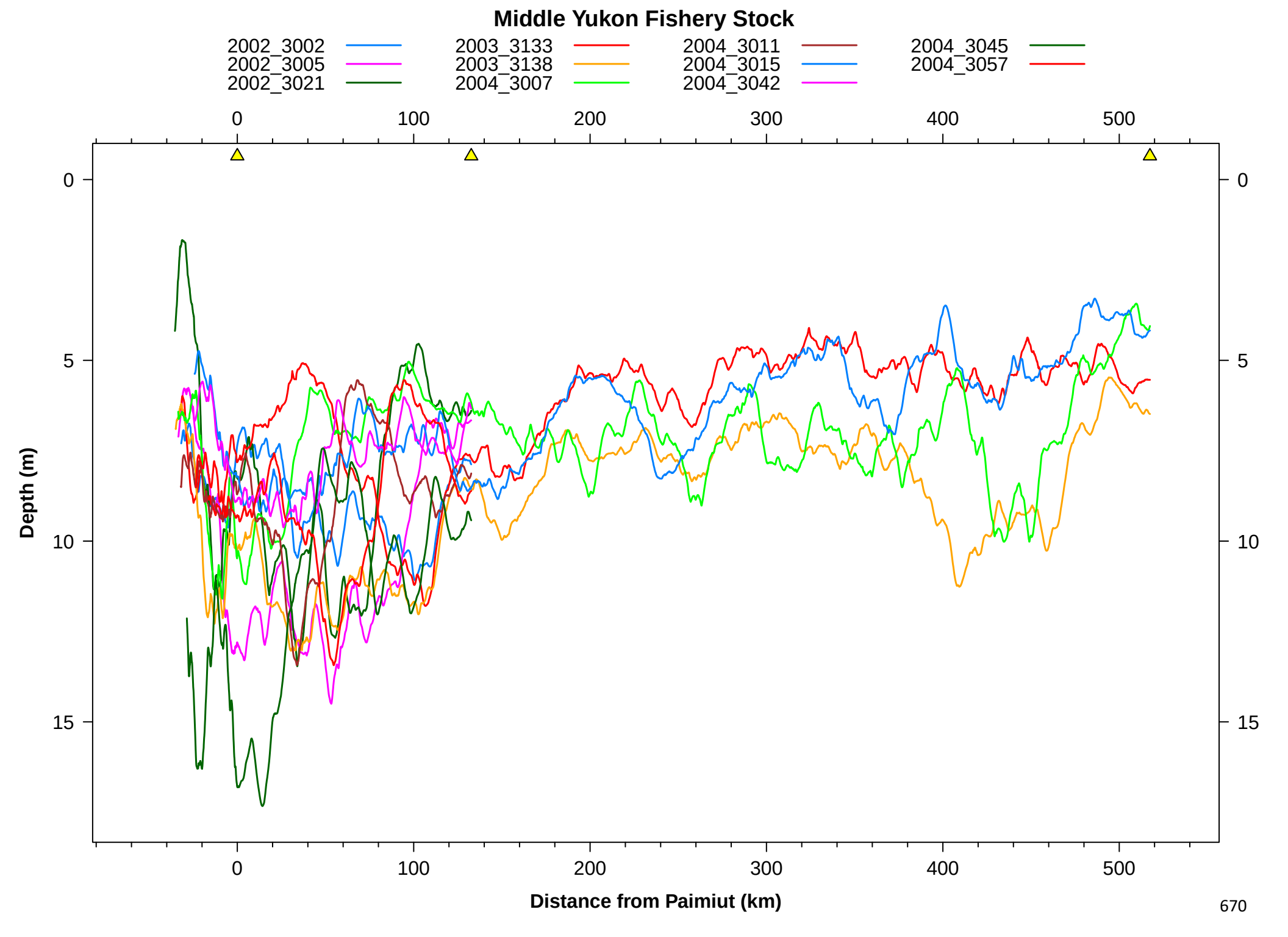

Fish 2004_3031
Temperature (C)
18.5
18.0
17.5
17.0
Tagging site
Yukon 1
Reach

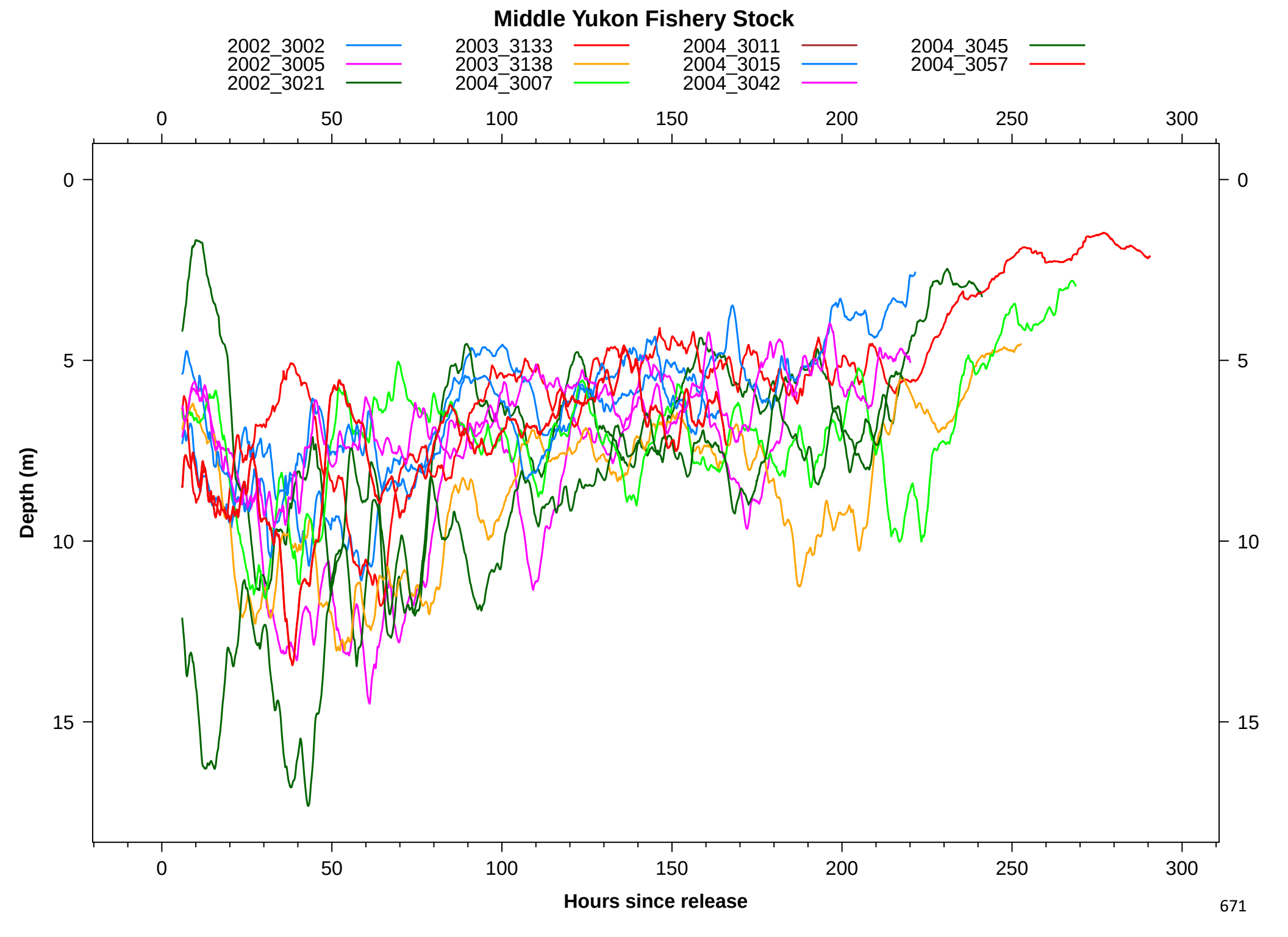

Fish 2004_3031
17.0
17.5
18.0
18.5
19.0
Tagging site
5
0
Yukon 1
5
0
Density
17.0
17.5
18.0
18.5
19.0
Temperature (C)

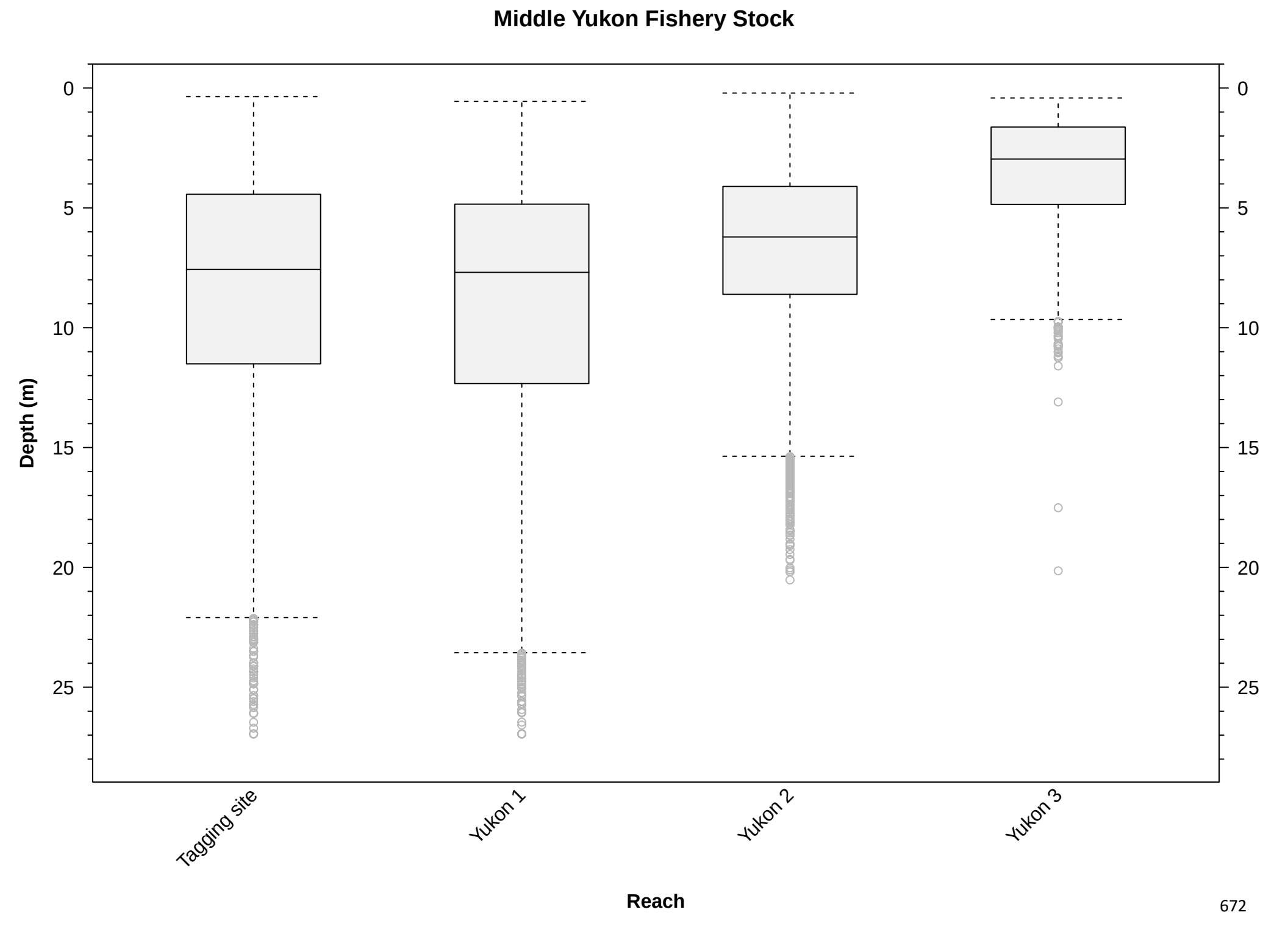

Fish 2004_3031
Tagging site
Yukon 1
Depth (m)
Temperature (C)
17.0
17.5
18.0
18.5
0
10
20

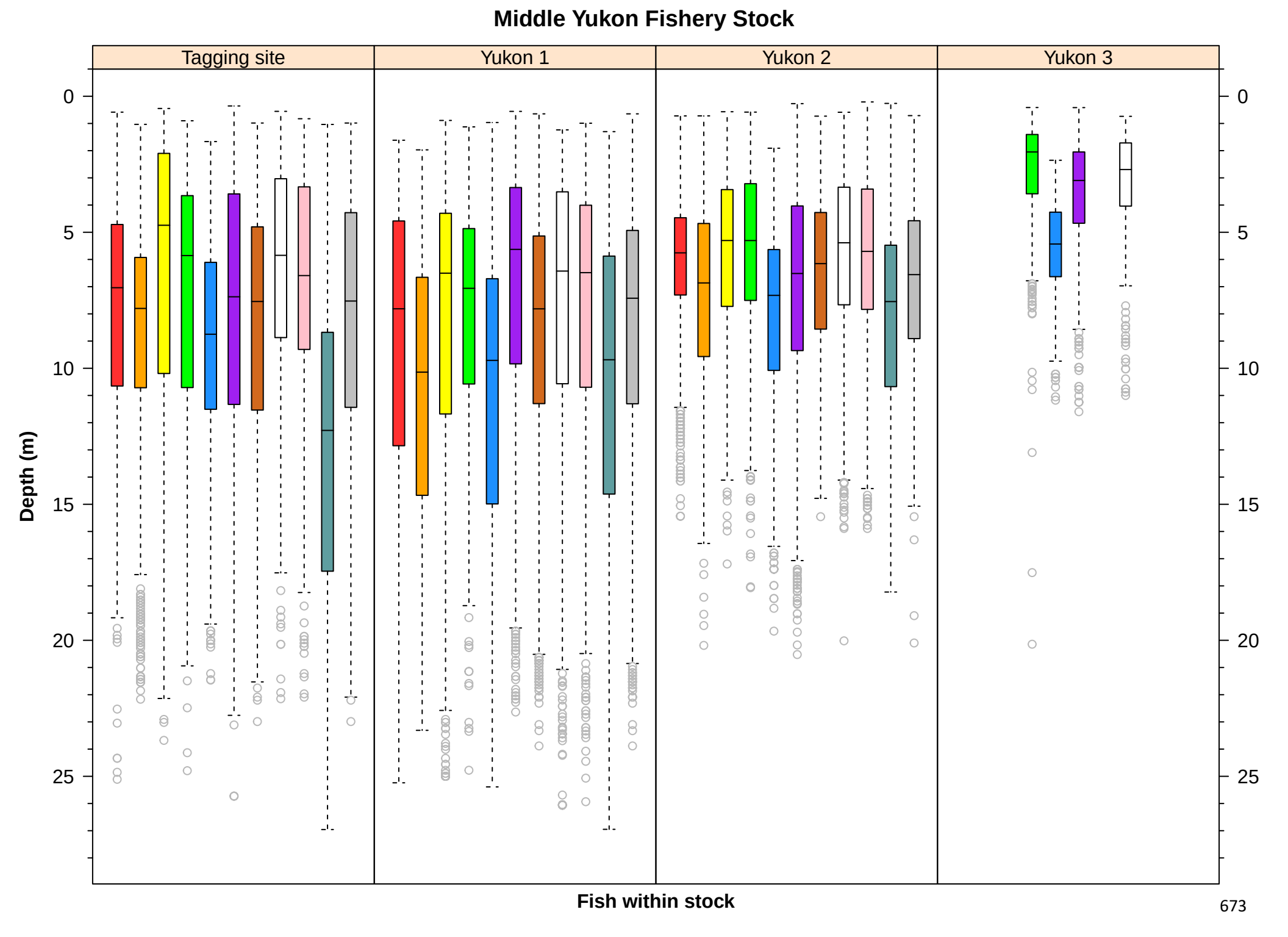
Back to Appendix 8 TOC

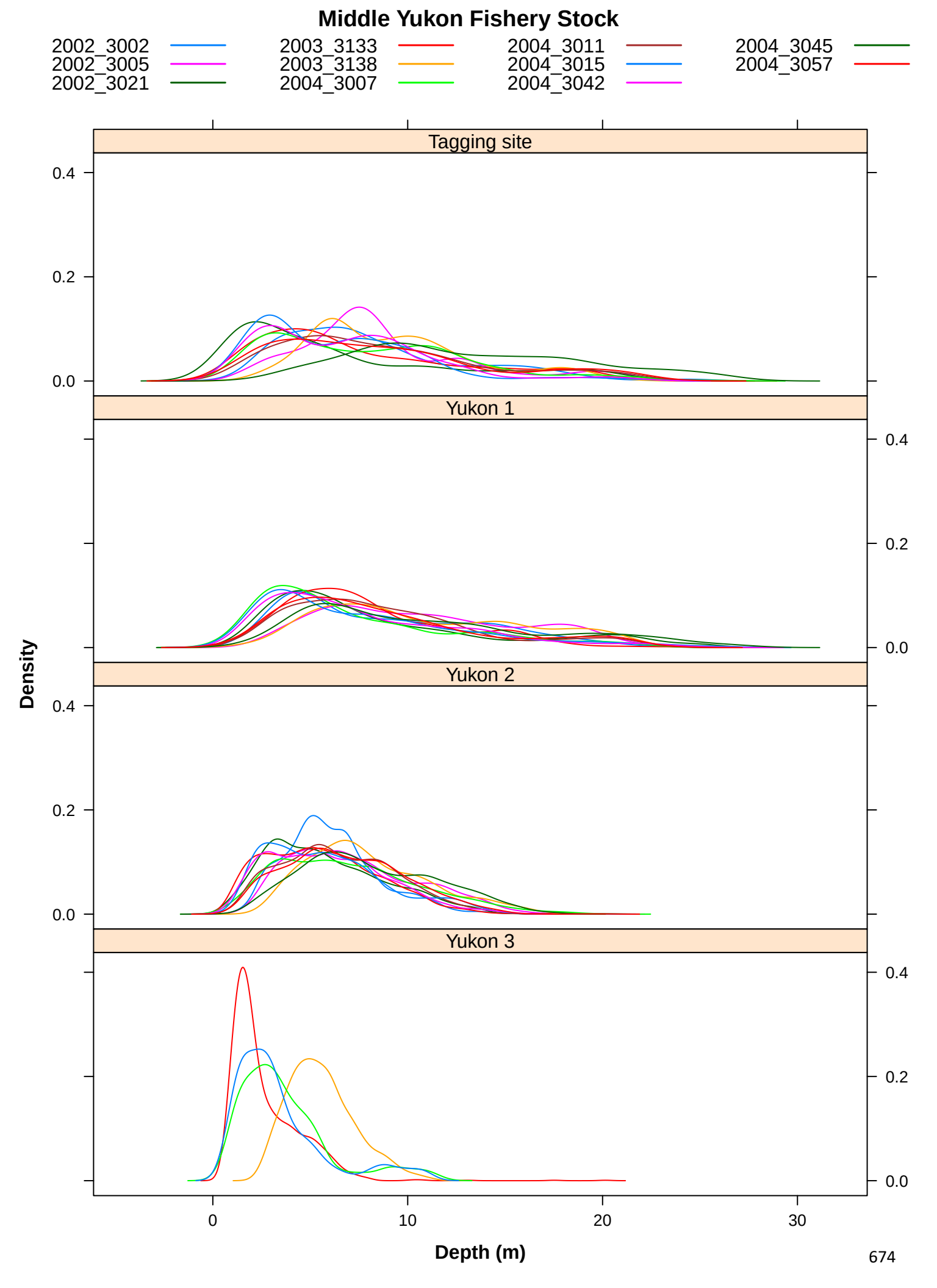


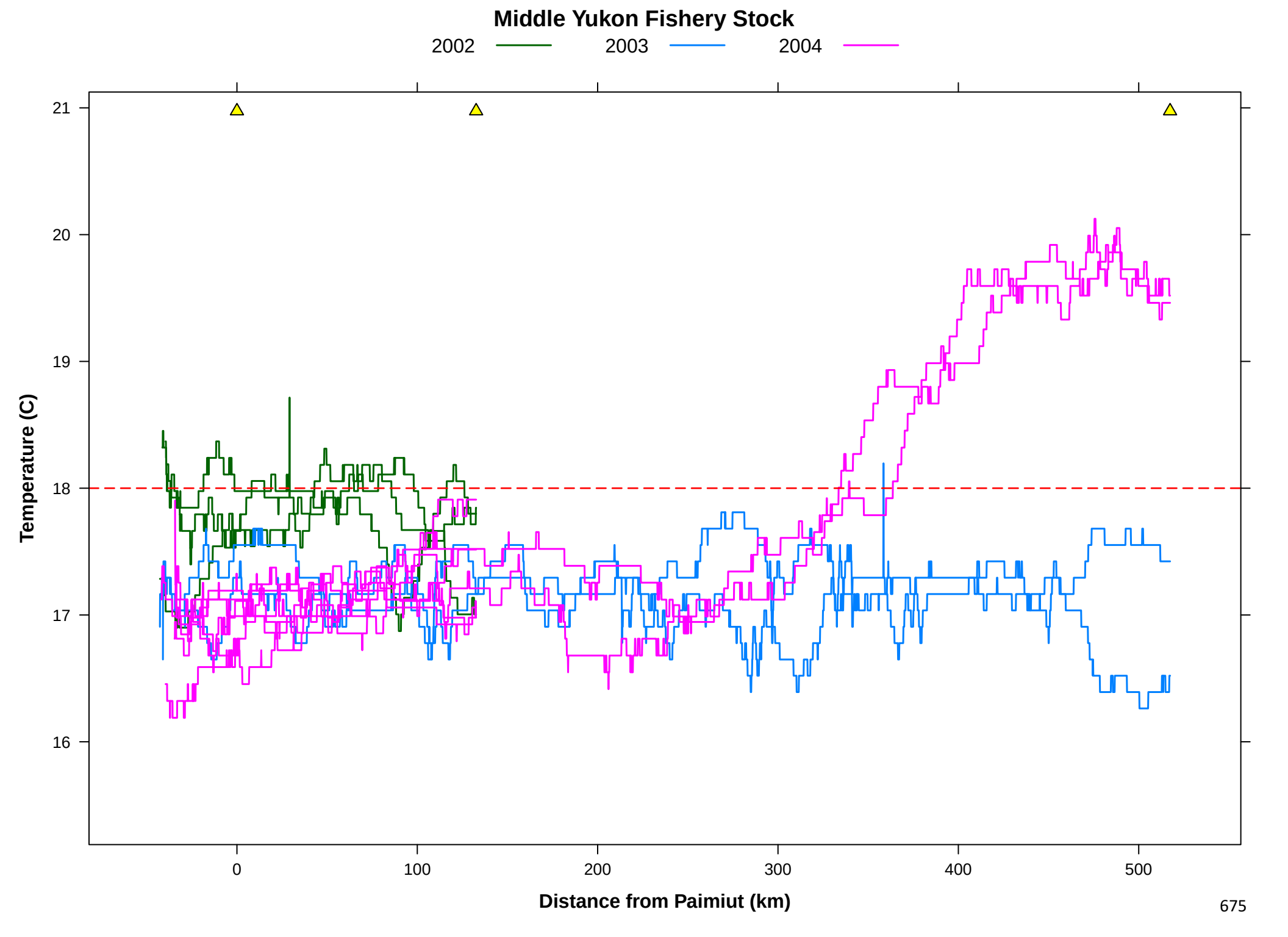

Middle Yukon Fishery Stock
2002_3002
2002_3005
2002_3021
2003_3133
2003_3138
2004_3007
2004_3011
2004_3015
2004_3042
2004_3045
2004_3057
0
100
200
300
400
500
0
5
10
15
Depth (m)
Distance from Paimiut (km)

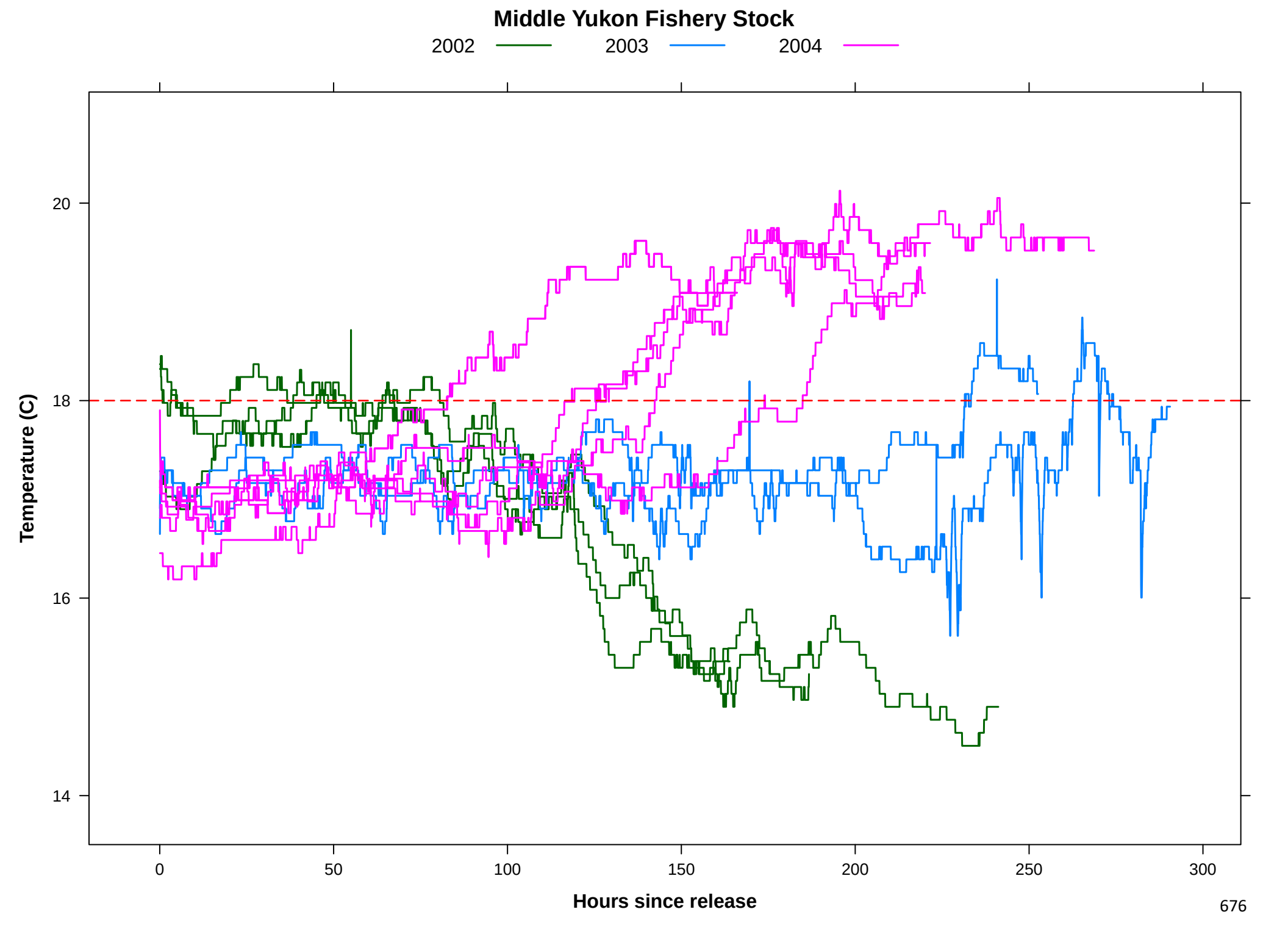

Middle Yukon Fishery Stock
2002_3002
2002_3005
2002_3021
2003_3133
2003_3138
2004_3007
2004_3011
2004_3015
2004_3042
2004_3045
2004_3057
0
50
100
150
200
250
300
0
5
10
15
Depth (m)
Hours since release

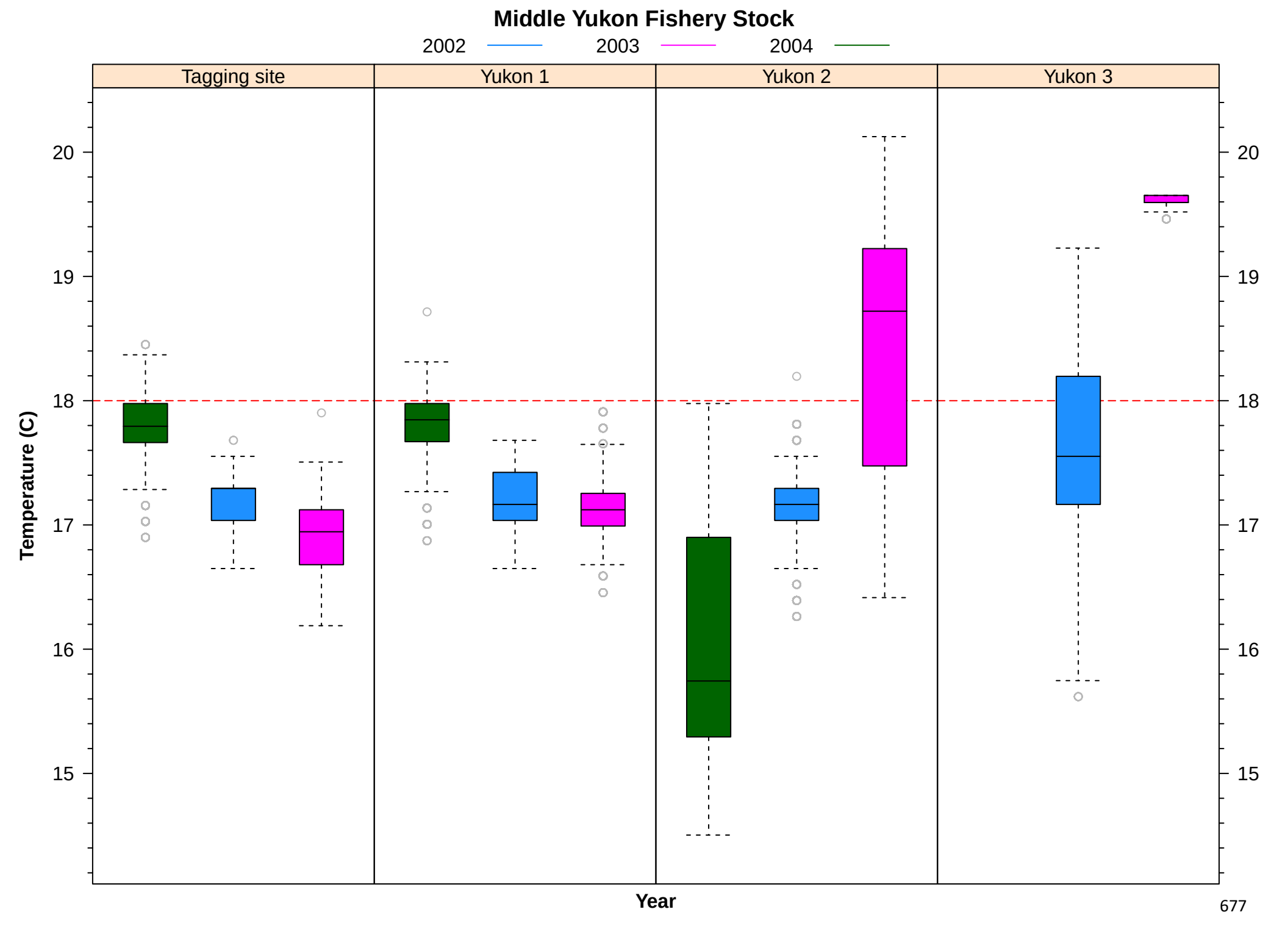

Middle Yukon Fishery Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach

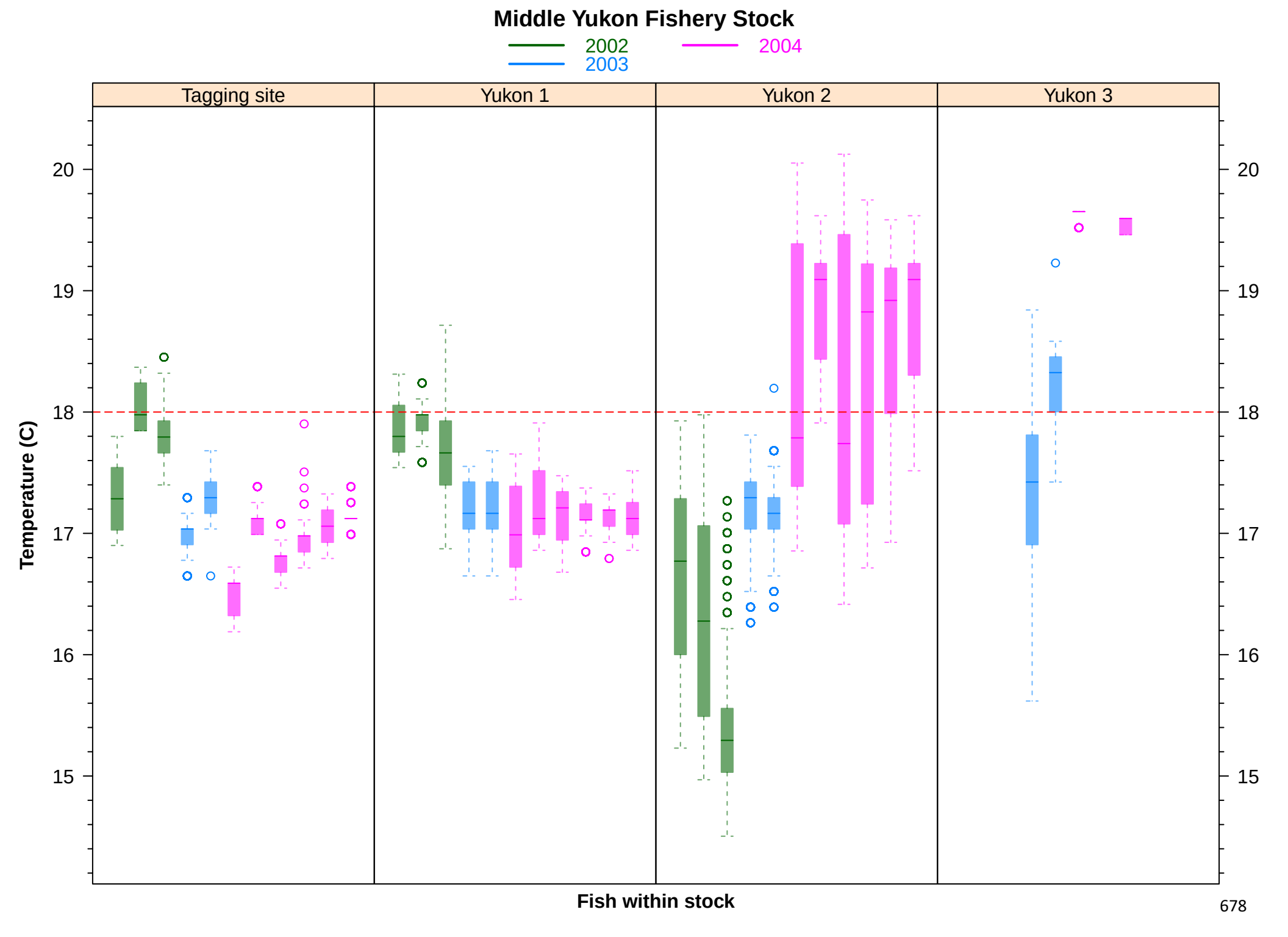

Middle Yukon Fishery Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Depth (m)
0
5
10
15
20
25
Fish within stock
673

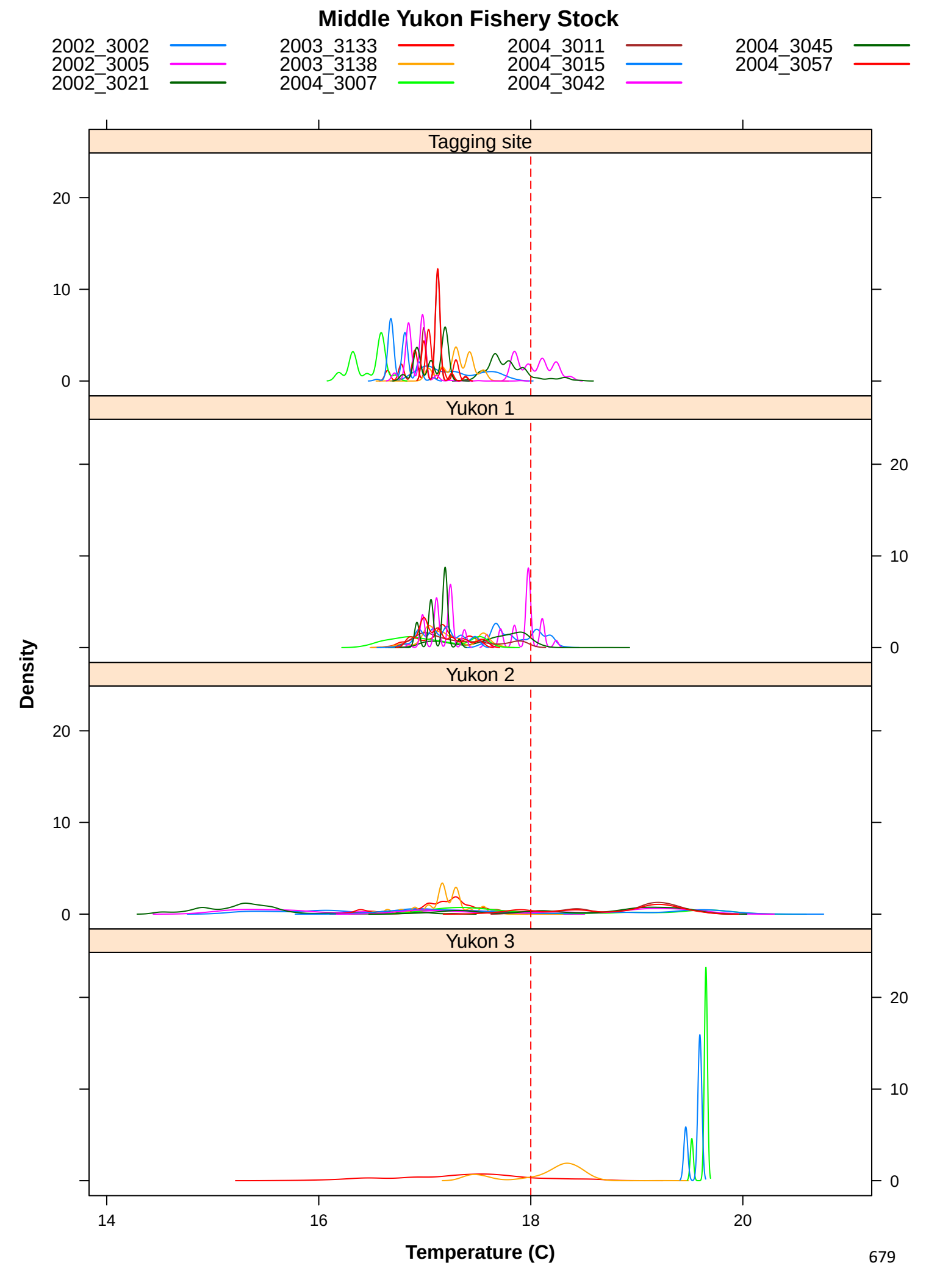

Middle Yukon Fishery Stock
2002_3002
2002_3005
2002_3021
2003_3133
2003_3138
2004_3007
2004_3011
2004_3015
2004_3042
2004_3045
2004_3057
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
0.4
0.2
0.0
0
10
20
30
Depth (m)
674

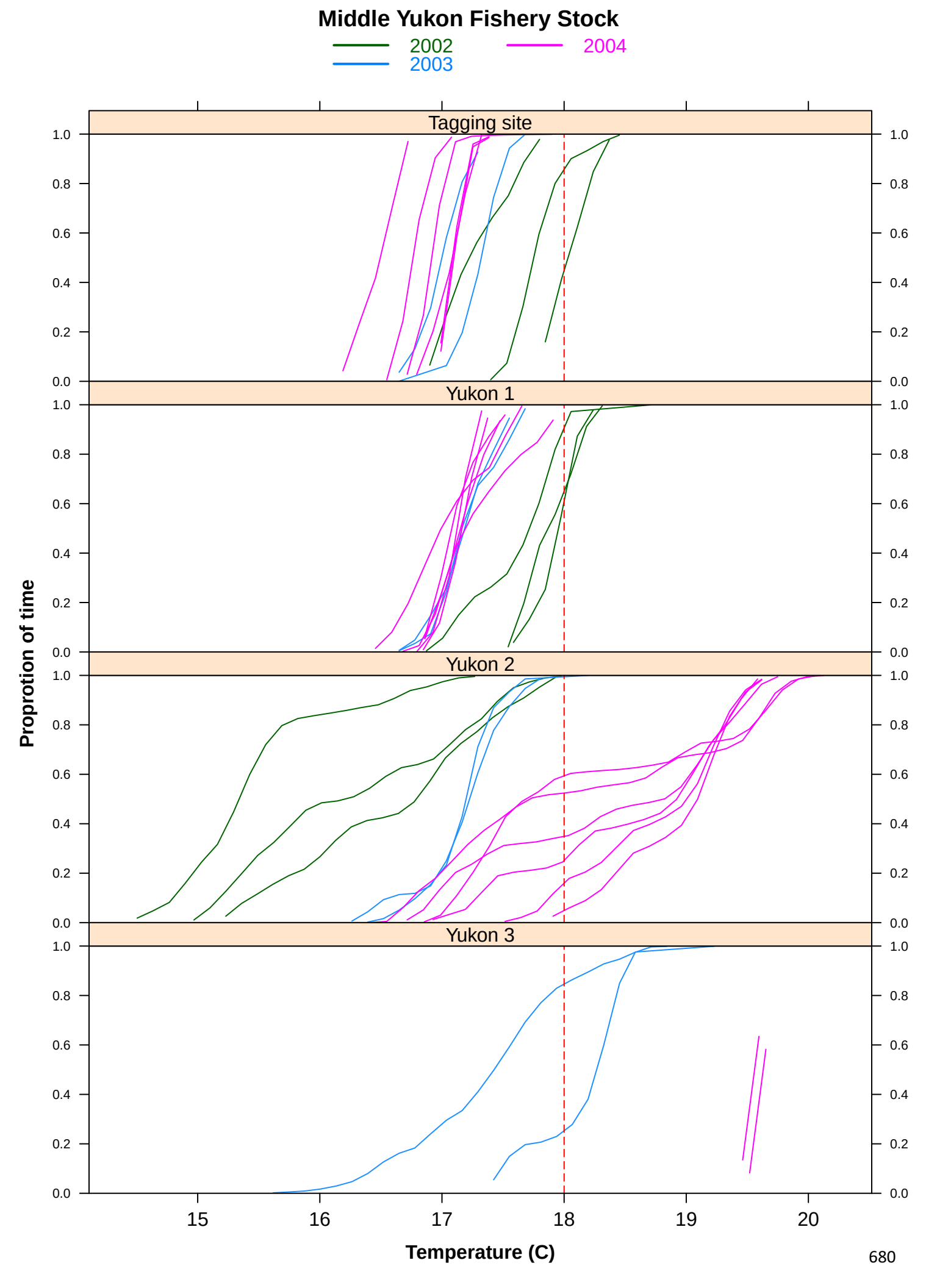

Middle Yukon Fishery Stock
2002
2003
2004
21
20
19
18
17
16
Temperature (C)
0
100
200
300
400
500
Distance from Paimiut (km)

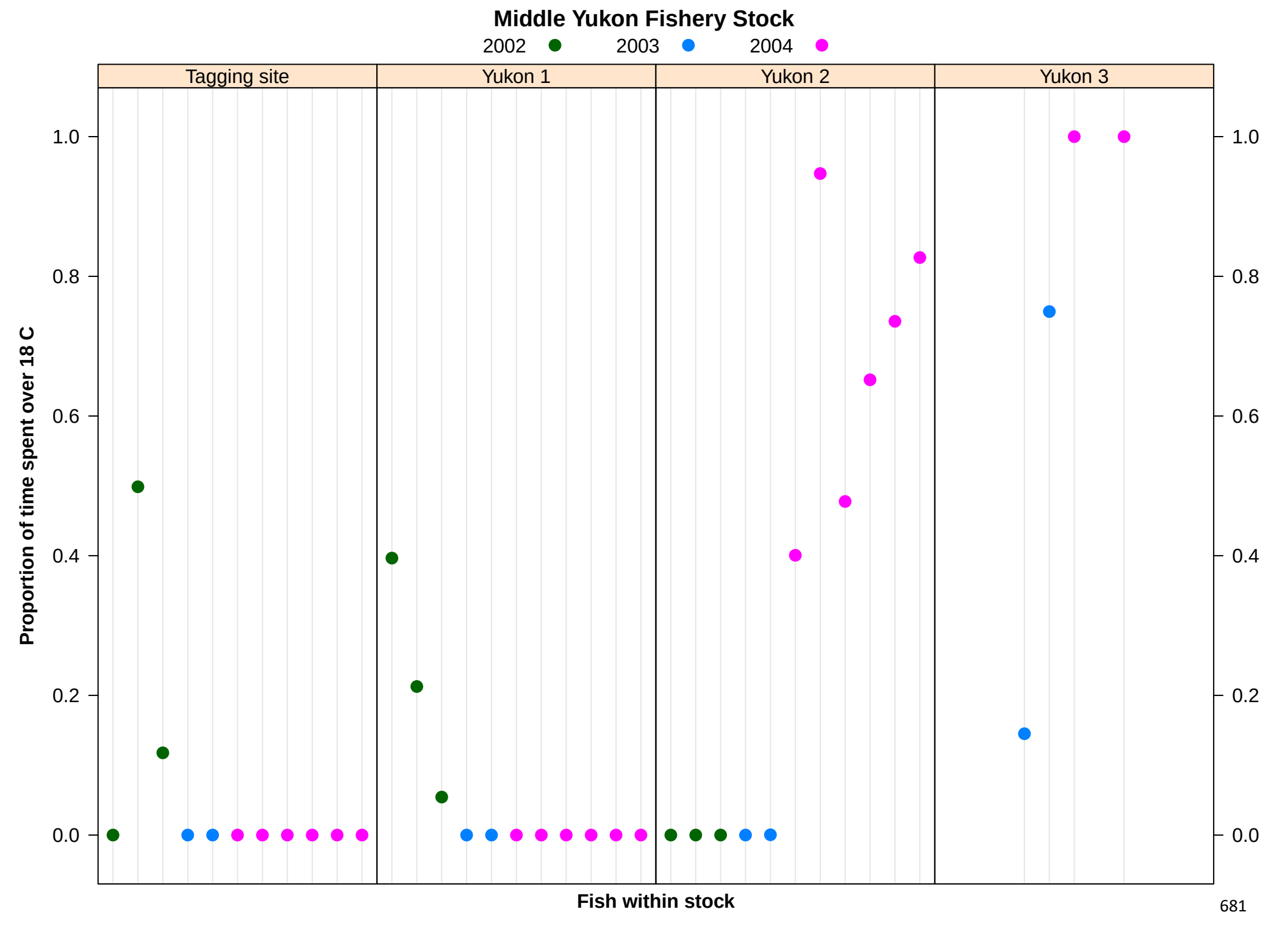

Middle Yukon Fishery Stock
2002
2003
2004
Temperature (C)
20
18
16
14
0
50
100
150
200
250
300
Hours since release

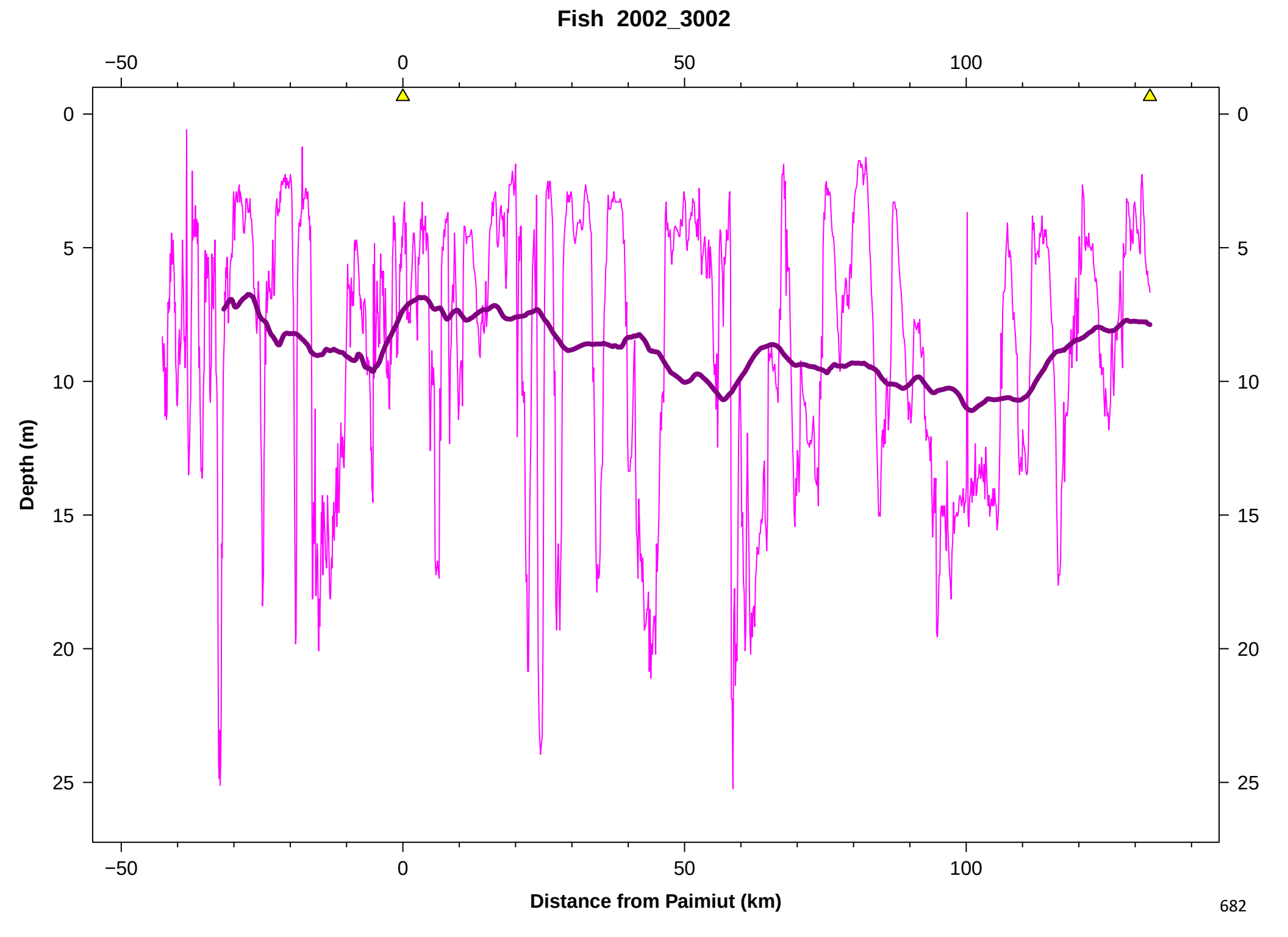

Middle Yukon Fishery Stock
2002
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Temperature (C)
20
19
18
17
16
15
Year
677

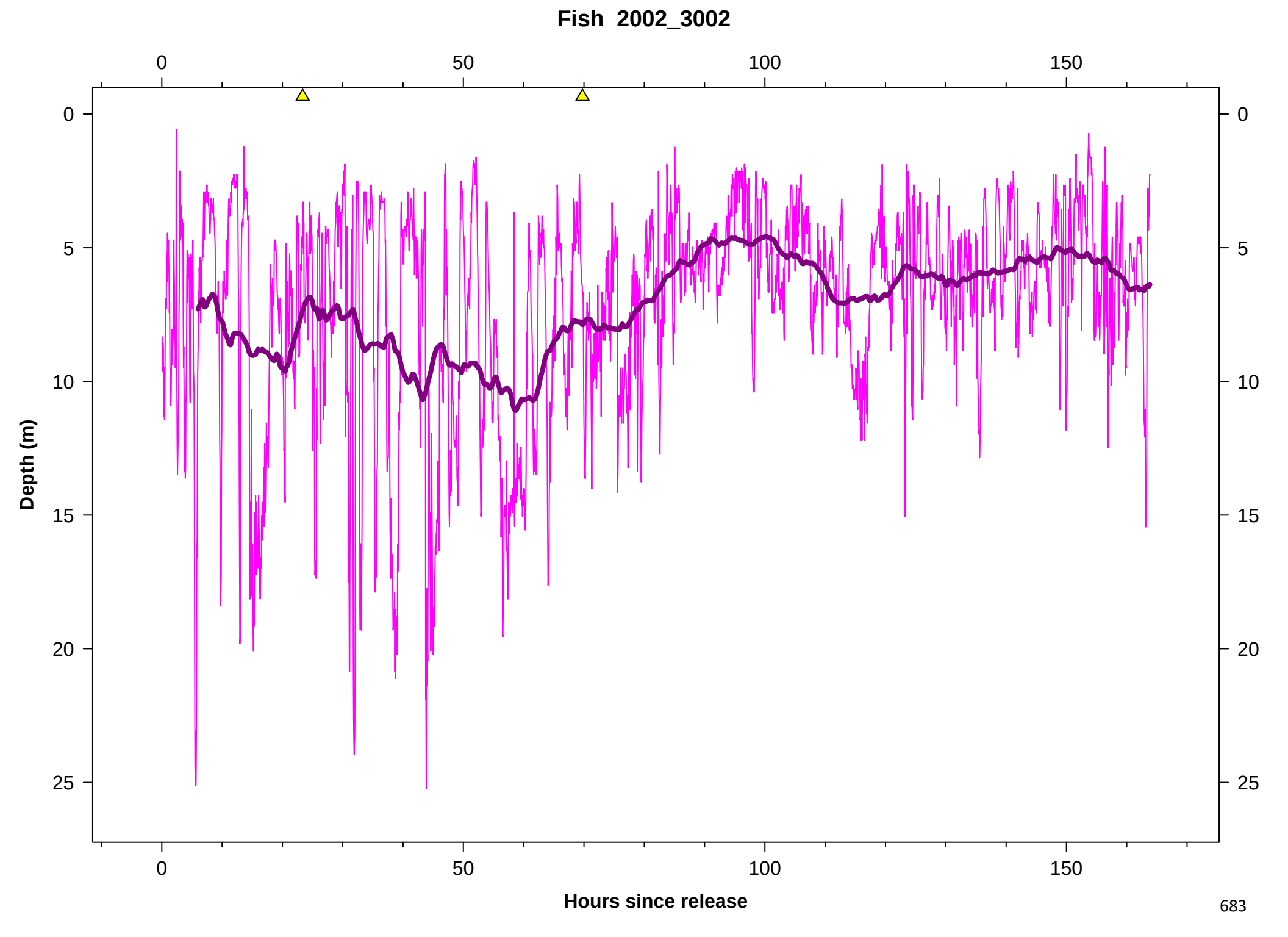

Middle Yukon Fishery Stock
2002
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Temperature (C)
20
19
18
17
16
15
Fish within stock
678

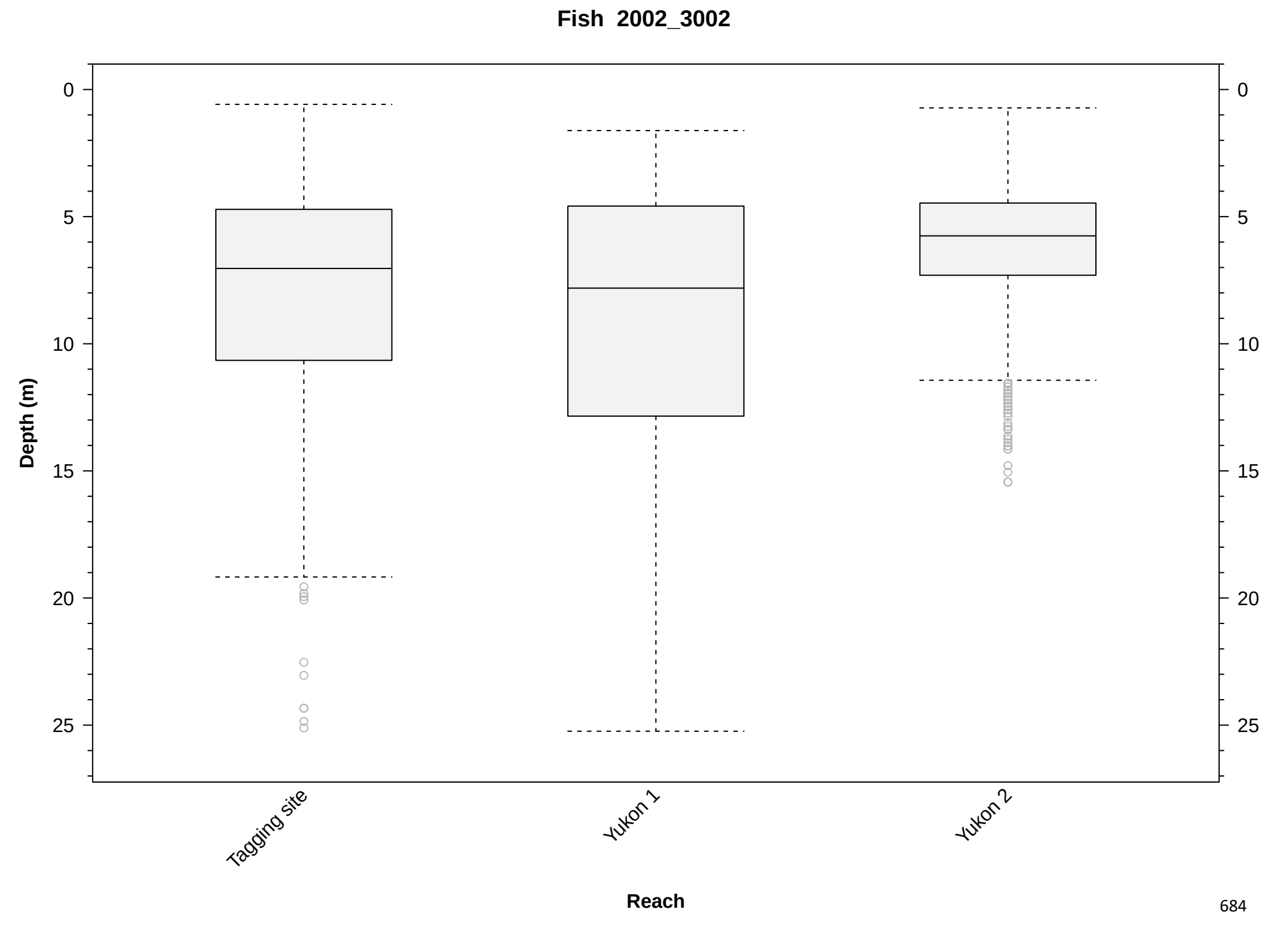

Middle Yukon Fishery Stock
2002_3002
2002_3005
2002_3021
2003_3133
2003_3138
2004_3007
2004_3011
2004_3015
2004_3042
2004_3045
2004_3057
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
Temperature (C)
0
10
20
14
16
18
20
679

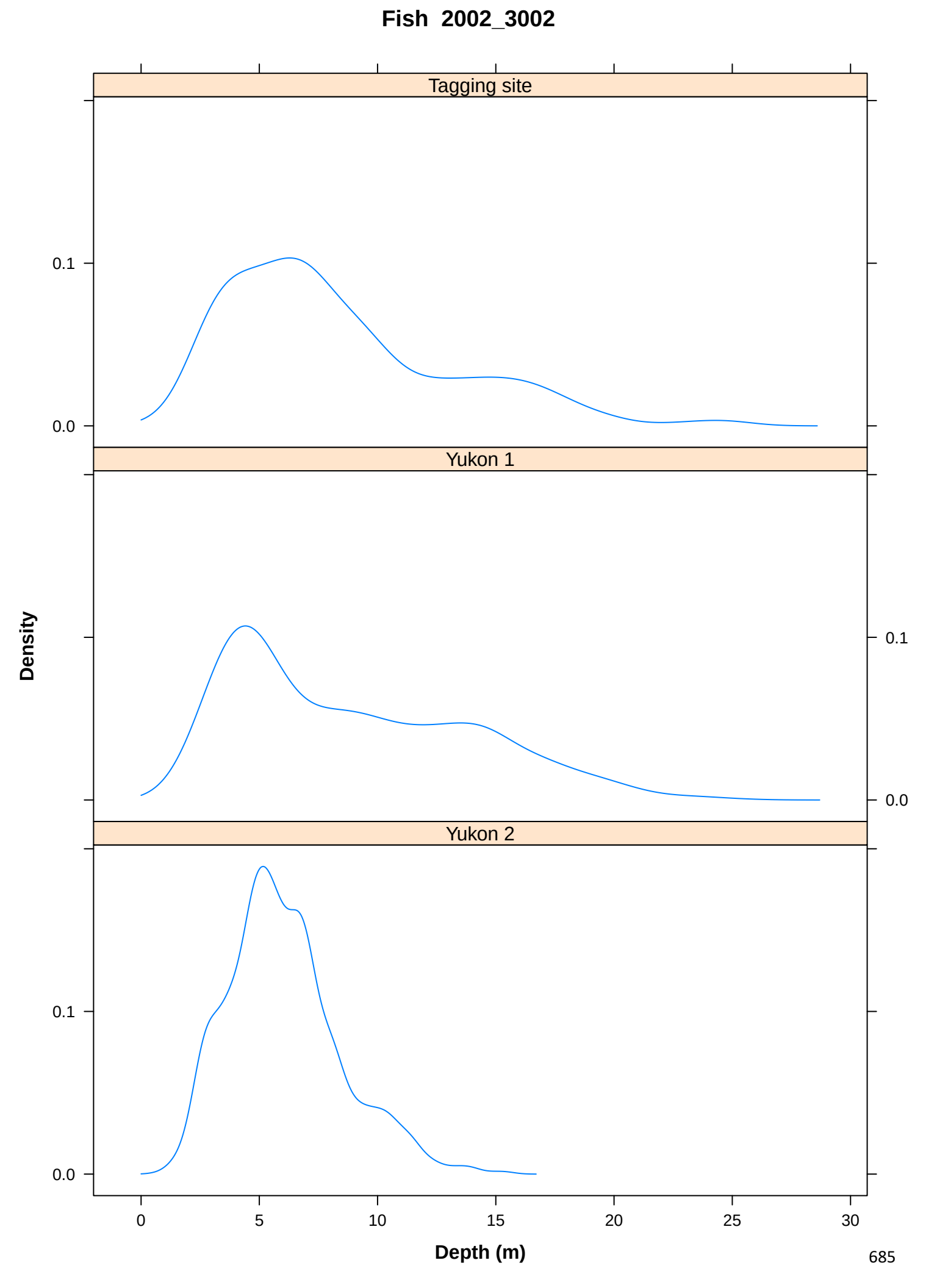

Middle Yukon Fishery Stock
2002
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
15
16
17
18
19
20

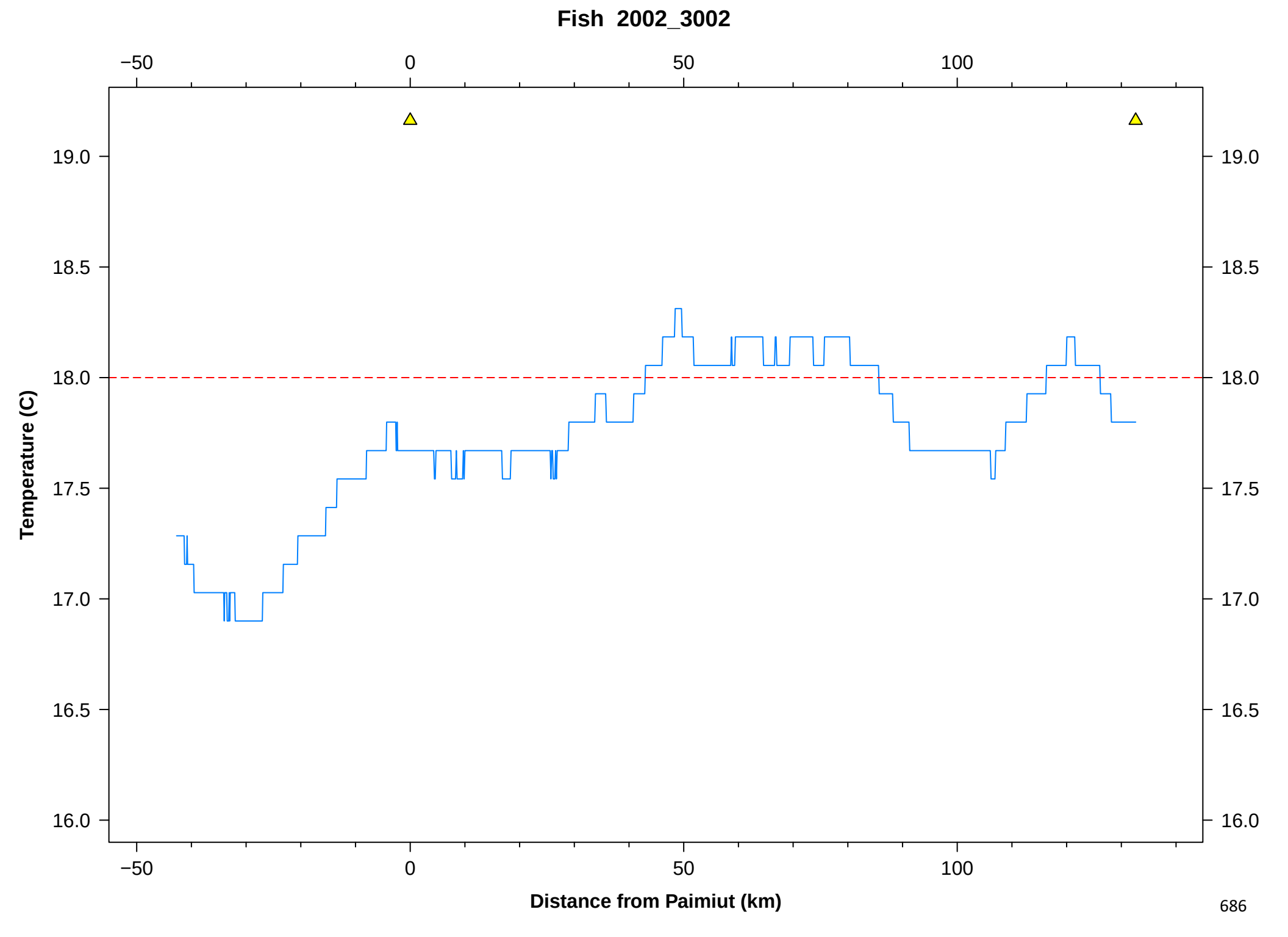

Middle Yukon Fishery Stock
2002
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock
681

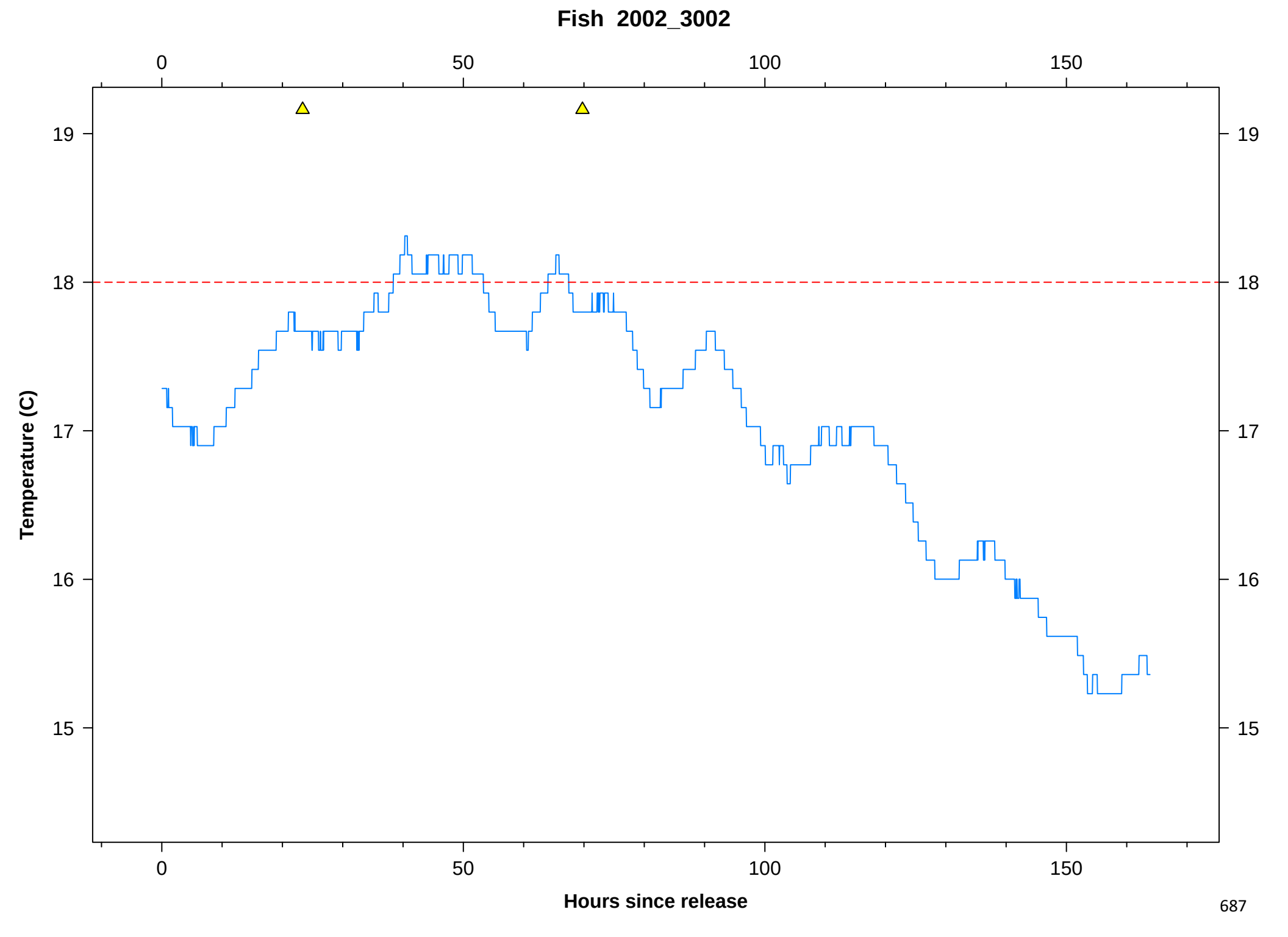

Fish 2002_3002
−50
0
50
100
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

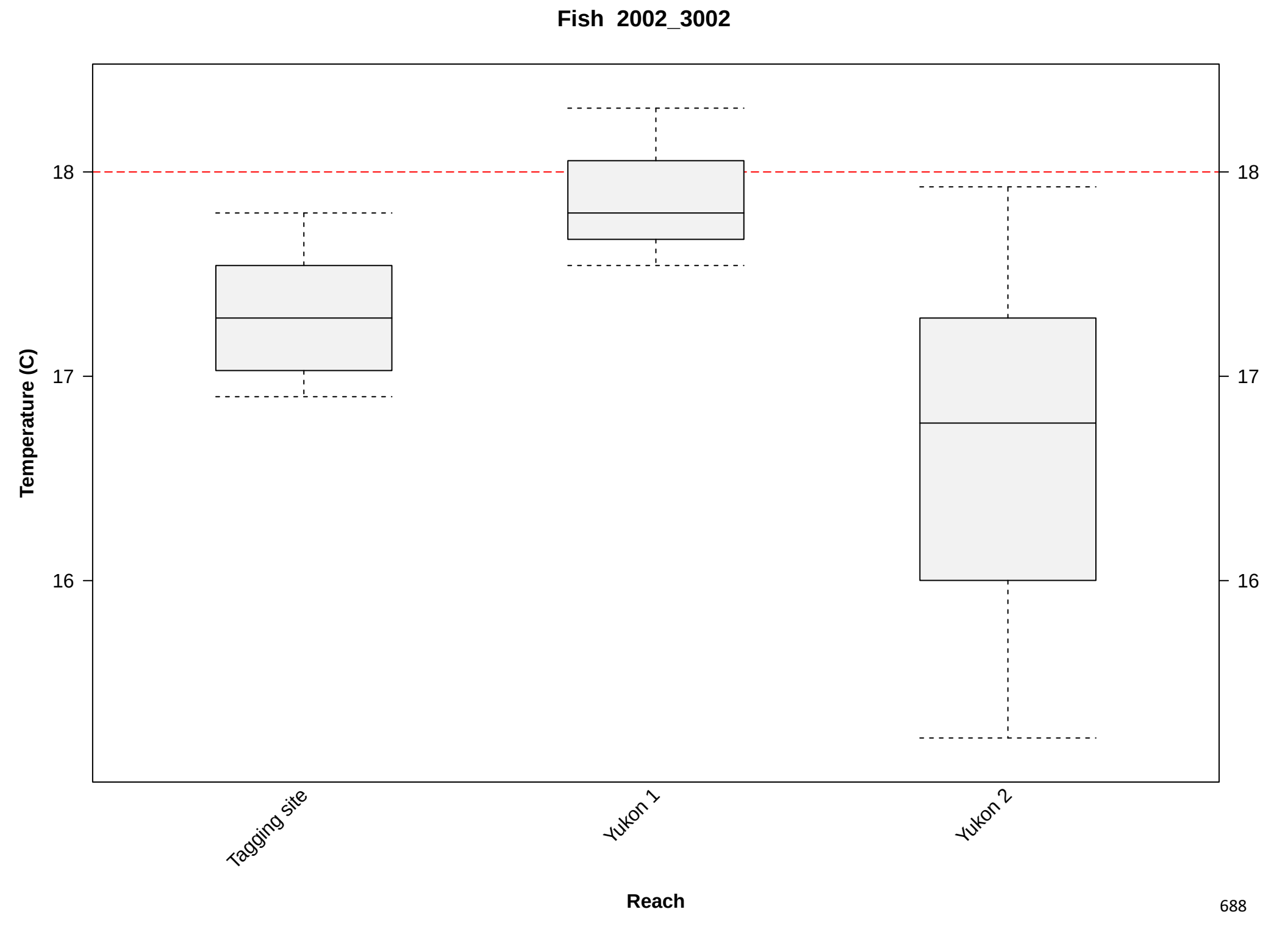

Fish 2002_3002
0
50
100
150
0
5
10
15
20
25
Depth (m)
Hours since release

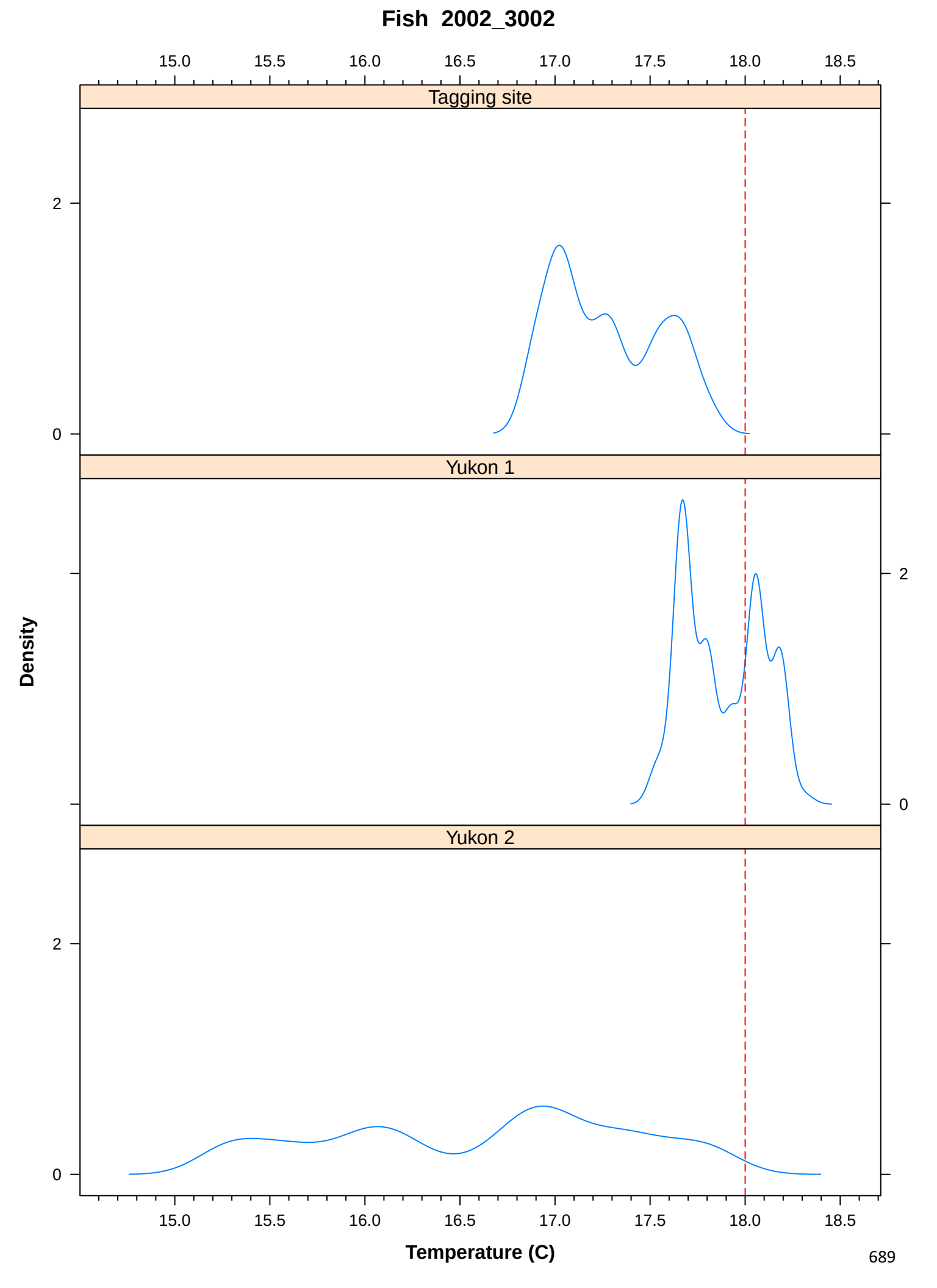

Fish 2002_3002
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Reach
684

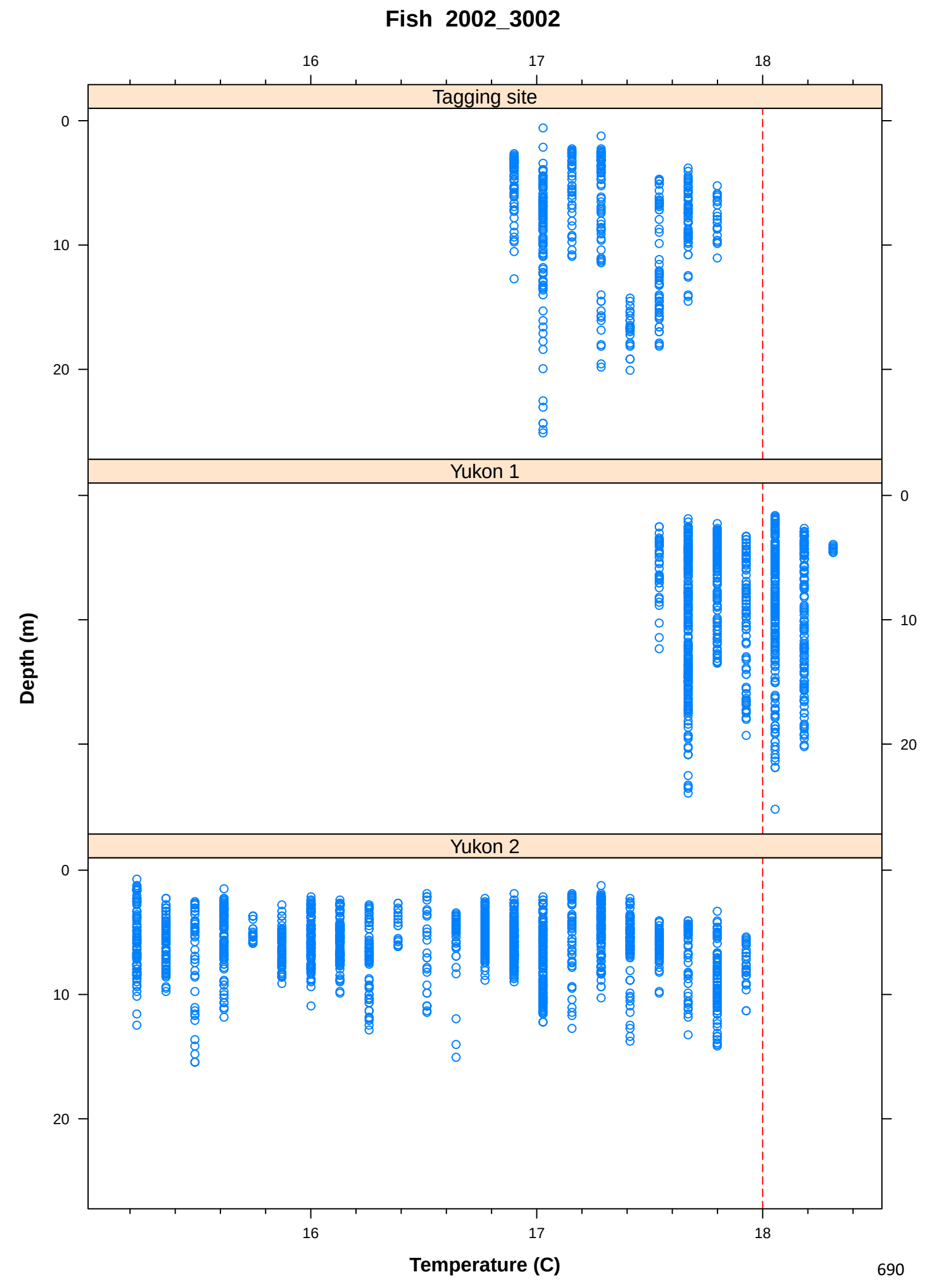

Fish 2002_3002
Tagging site
Yukon 1
Yukon 2
Density
0.1
0.0
0.1
0.0
0.1
0.0
0
5
10
15
20
25
30
Depth (m)

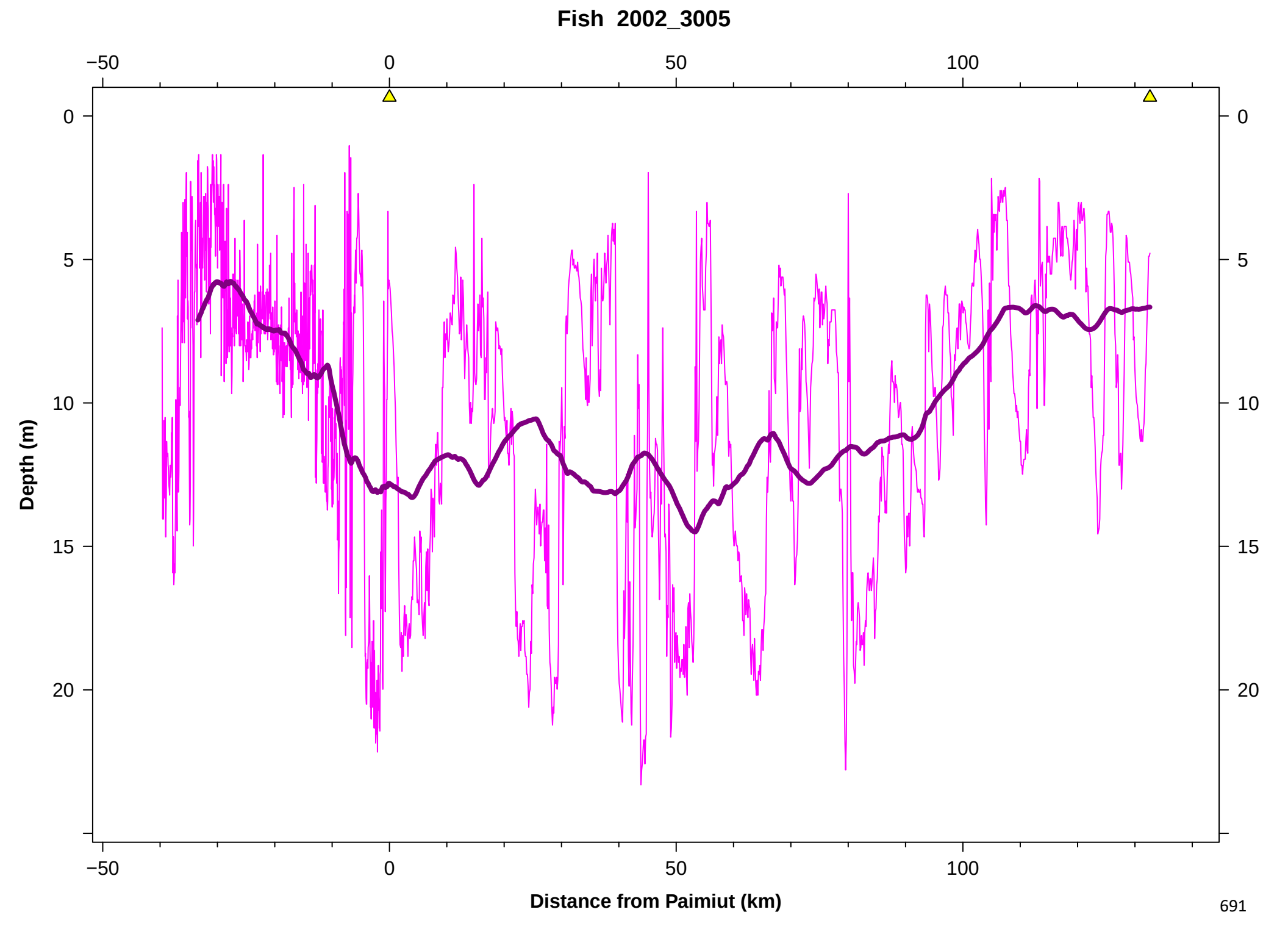

Fish 2002_3002
−50
0
50
100
19.0
18.5
18.0
17.5
17.0
16.5
16.0
Temperature (C)
Distance from Paimiut (km)

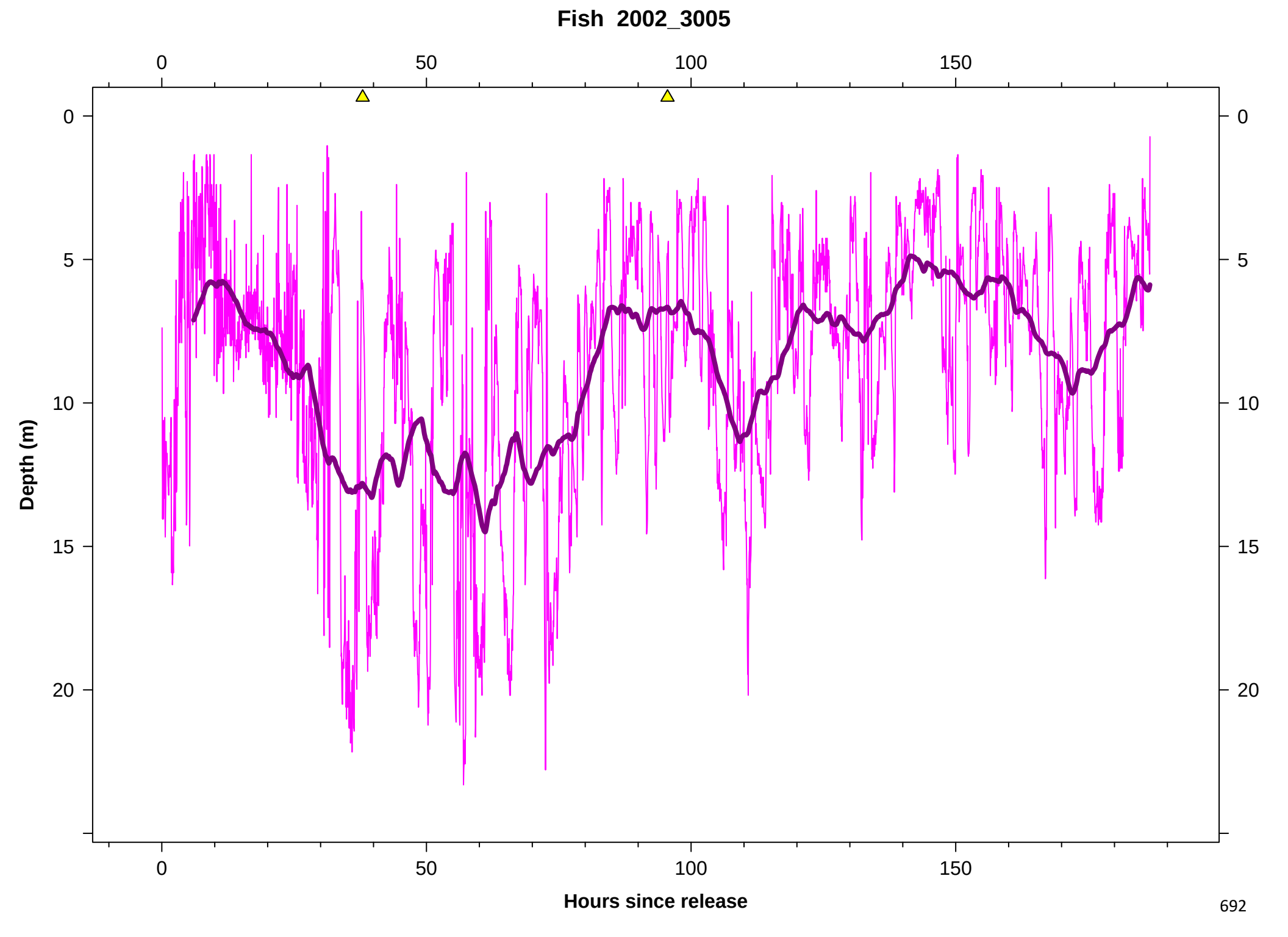

Fish 2002_3002
0
50
100
150
19
18
17
16
15
Temperature (C)
Hours since release

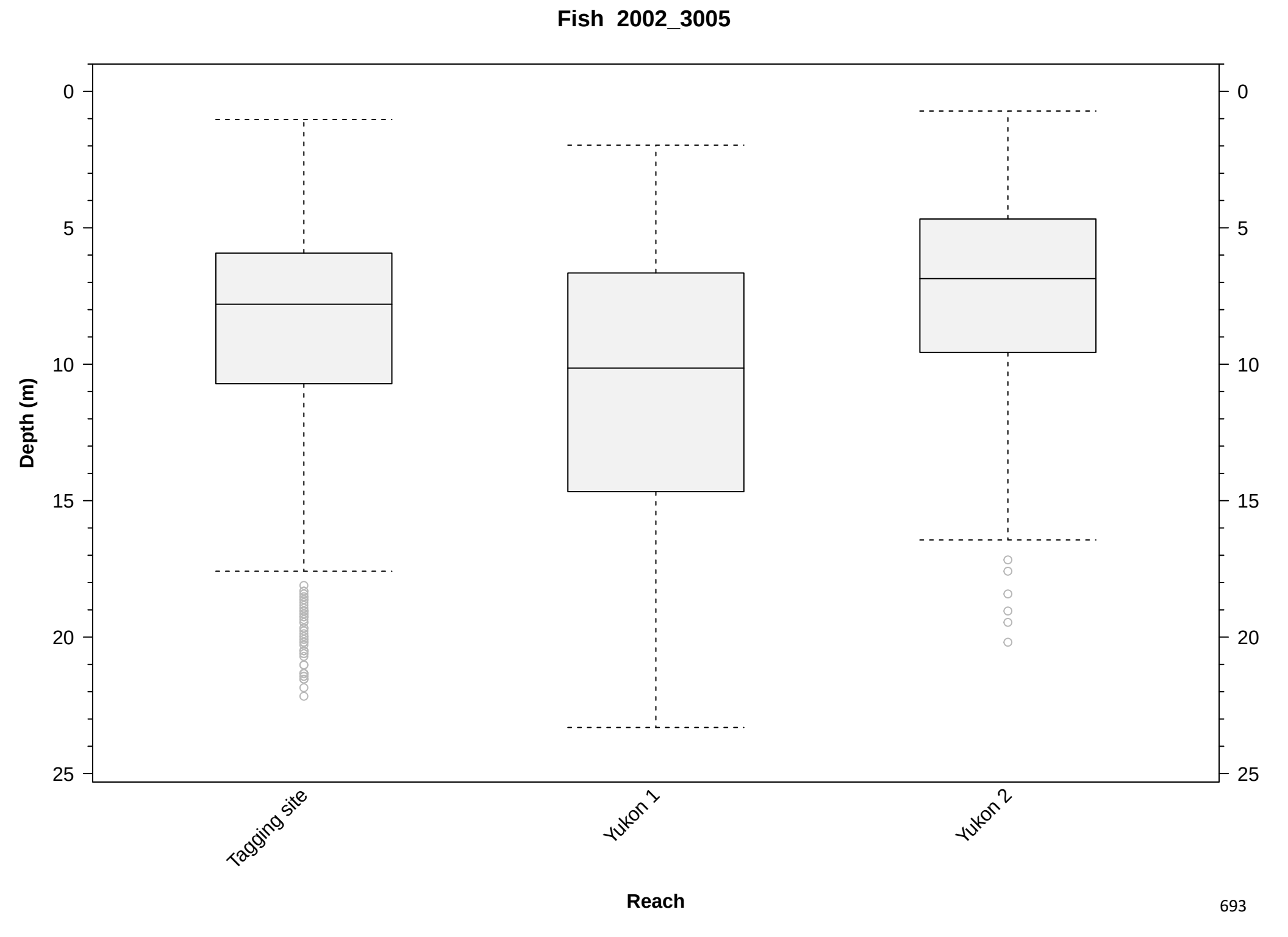

Fish 2002_3002
Temperature (C)
18
17
16
Tagging site
Yukon 1
Yukon 2
Reach

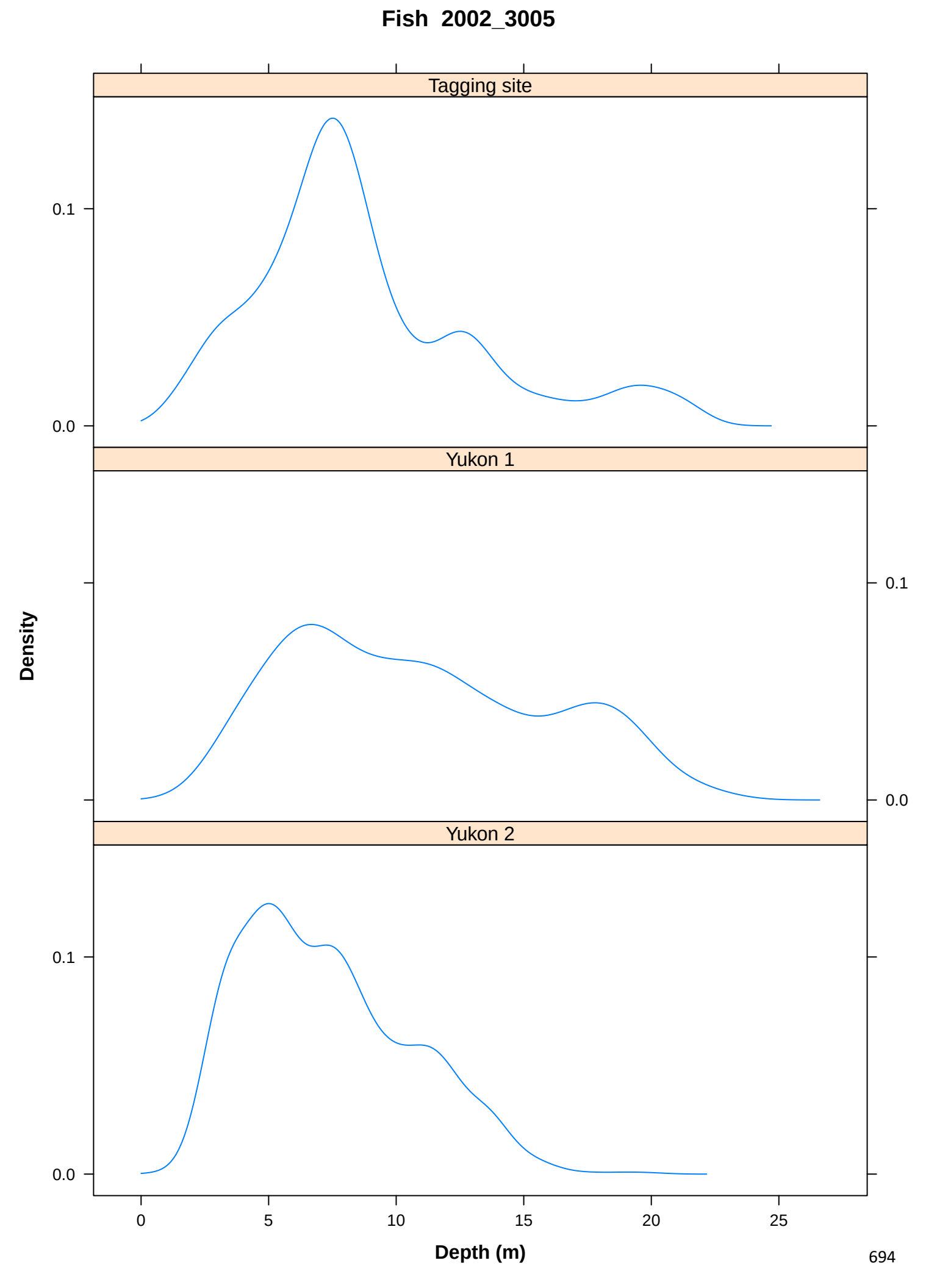

Fish 2002_3002
15.0
15.5
16.0
16.5
17.0
17.5
18.0
18.5
Tagging site
Yukon 1
Yukon 2
2
0
Density
Temperature (C)

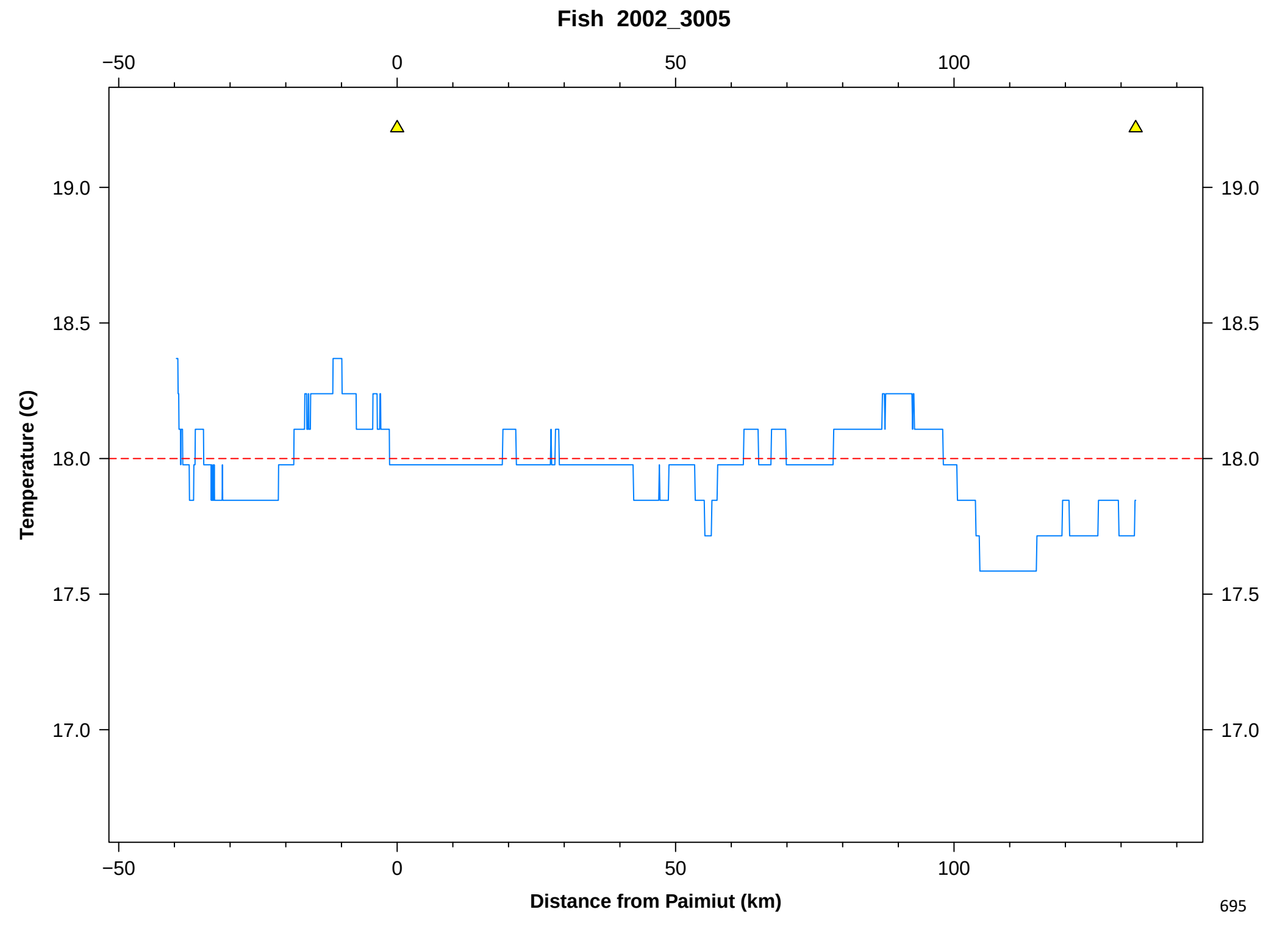

Fish 2002_3002
Tagging site
Yukon 1
Yukon 2
Depth (m)
Temperature (C)
16
17
18
0
10
20

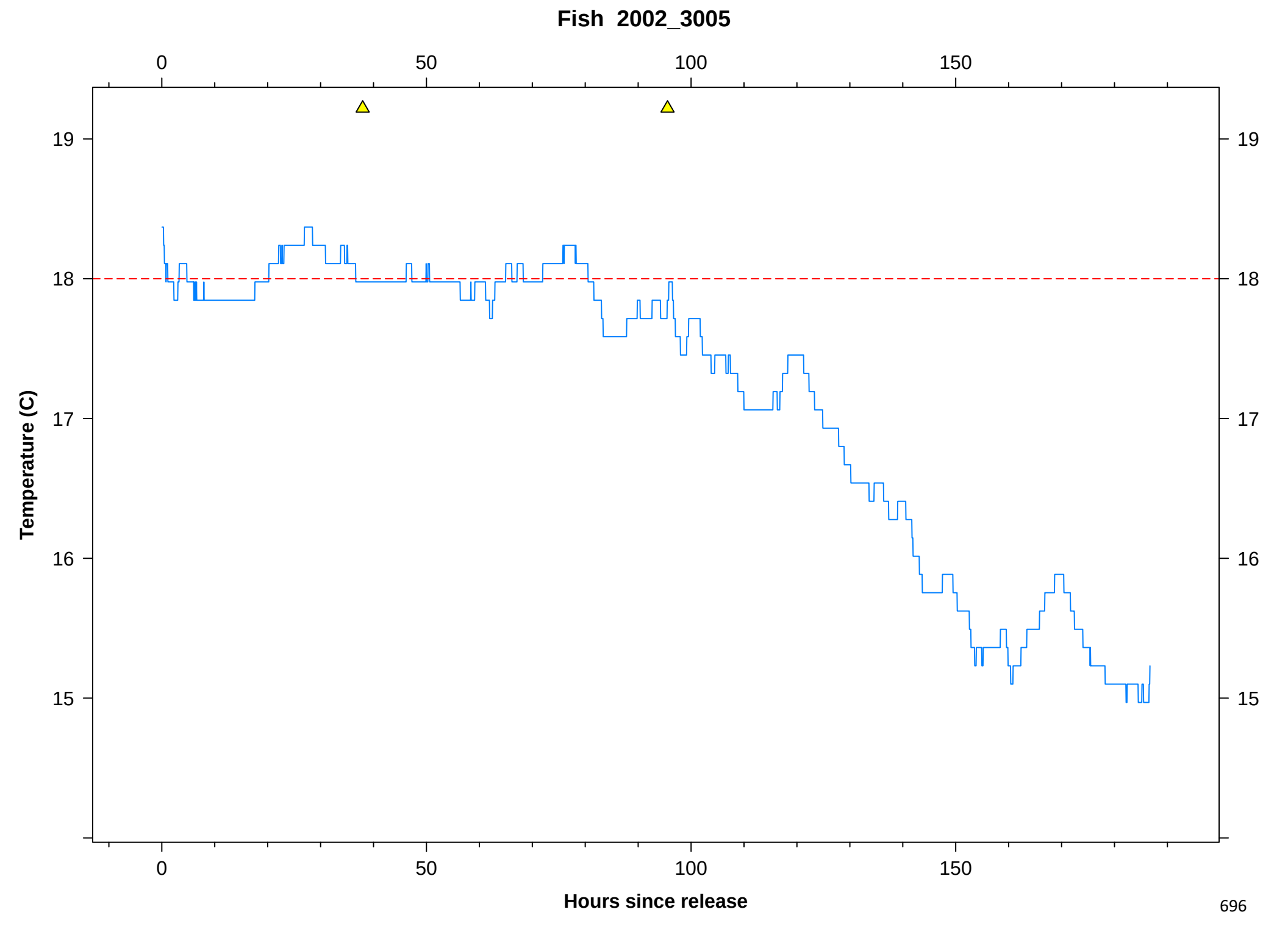

Fish 2002_3005
−50
0
50
100
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

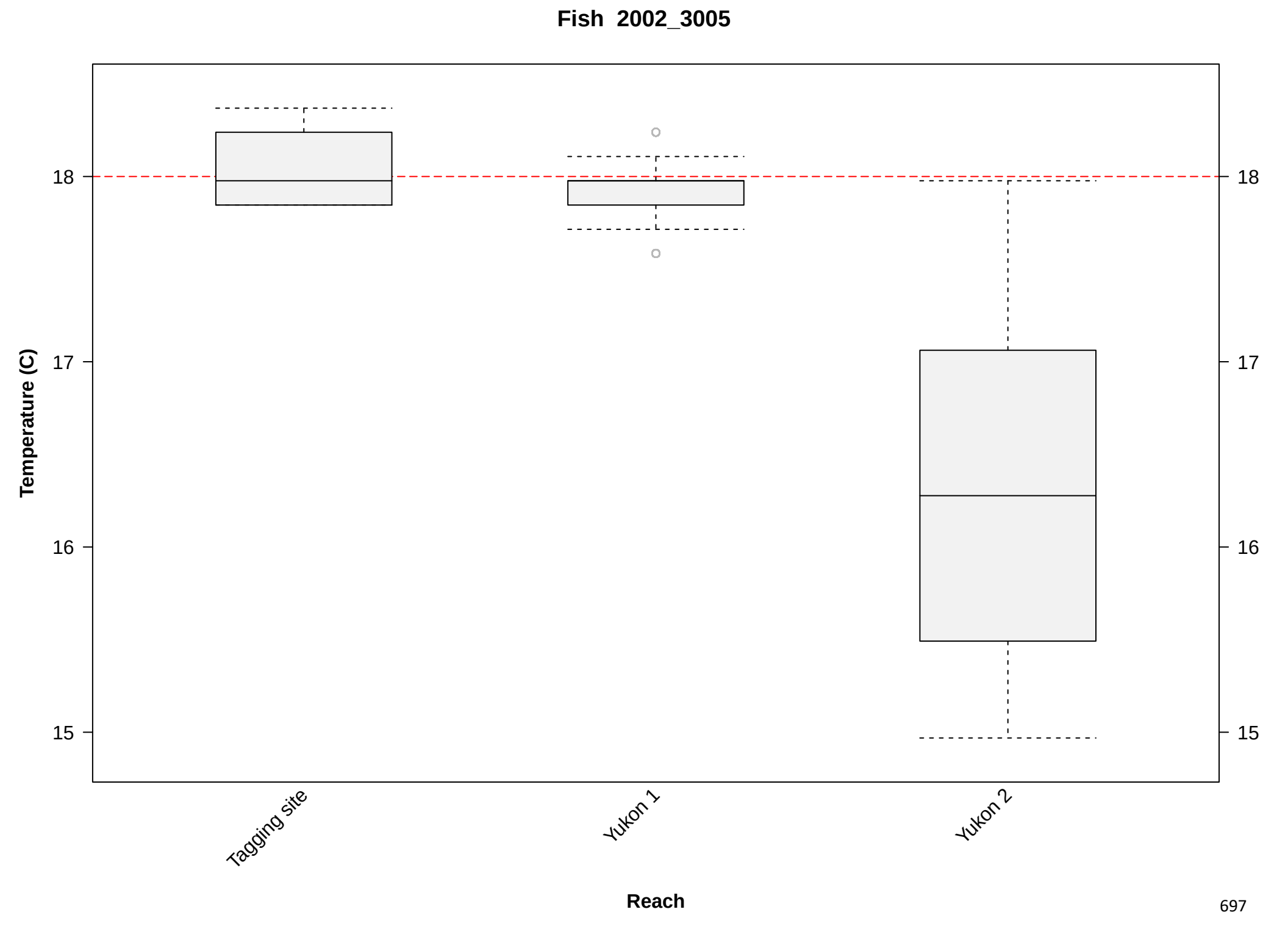

Fish 2002_3005
0
50
100
150
0
5
10
15
20
Depth (m)
Hours since release

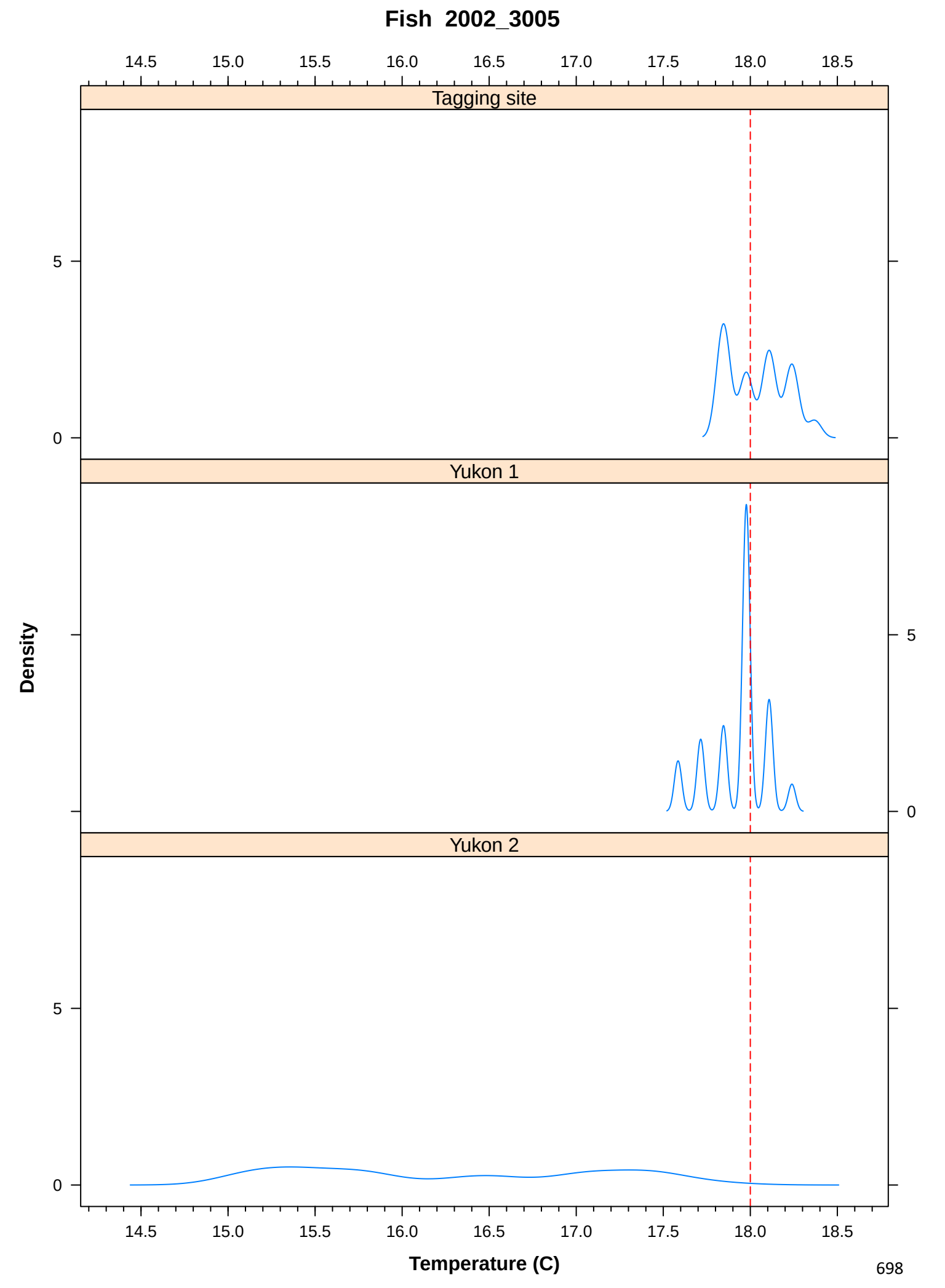

Fish 2002_3005
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Reach

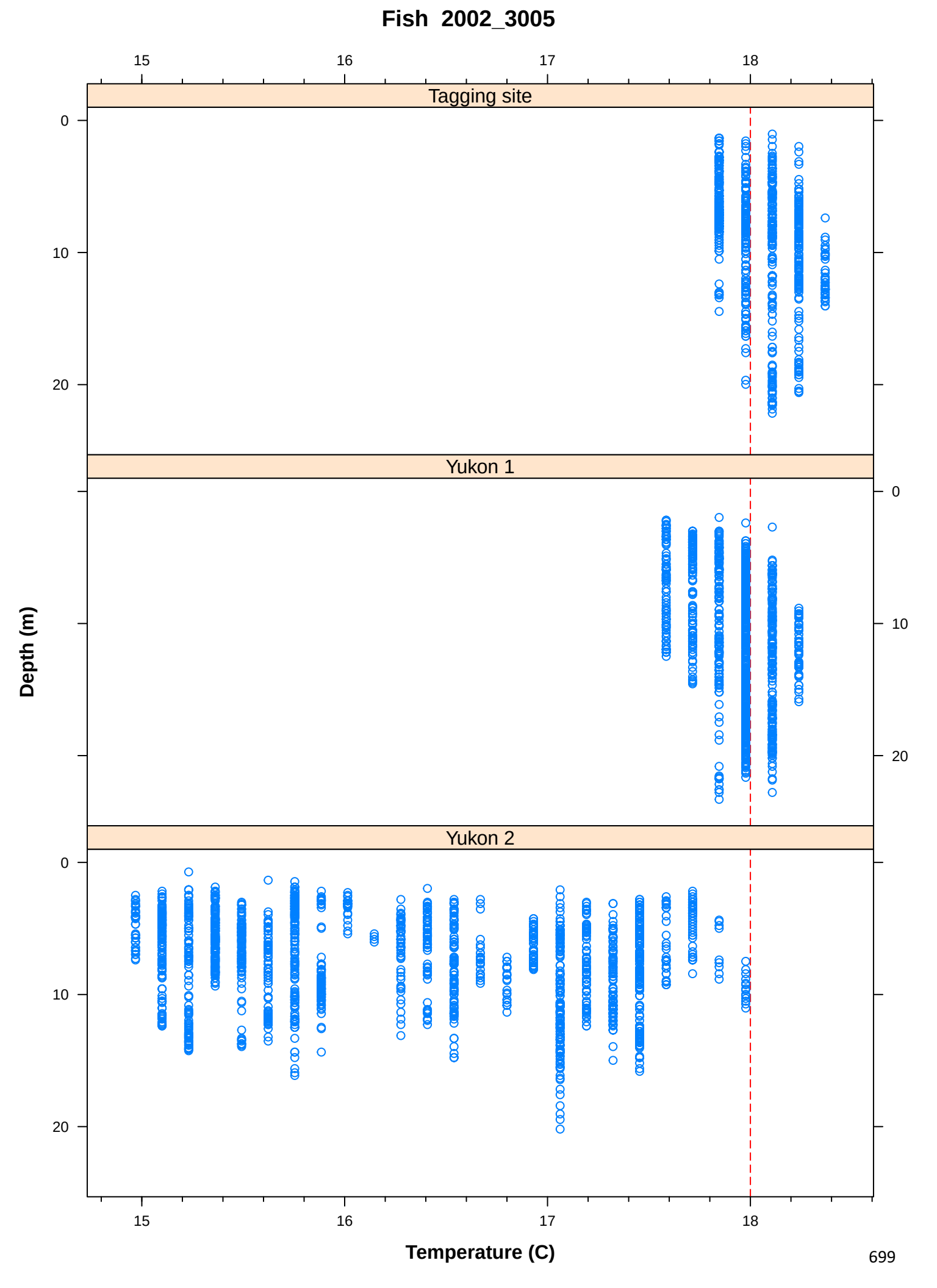

Fish 2002_3005
Tagging site
Yukon 1
Yukon 2
Density
0.1
0.0
0
5
10
15
20
25
Depth (m)
694

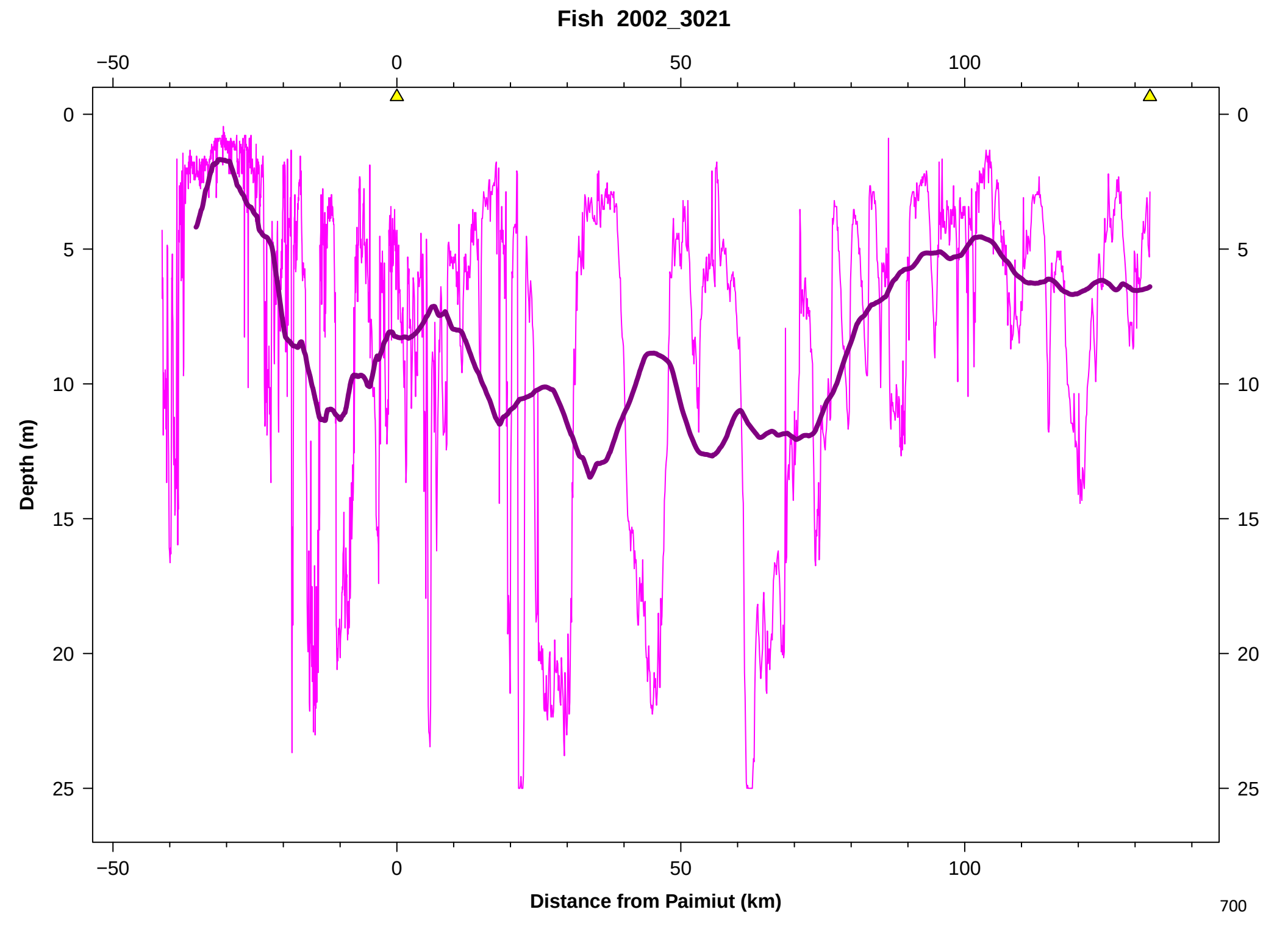

Fish 2002_3005
−50
0
50
100
19.0
18.5
18.0
17.5
17.0
Temperature (C)
Distance from Paimiut (km)

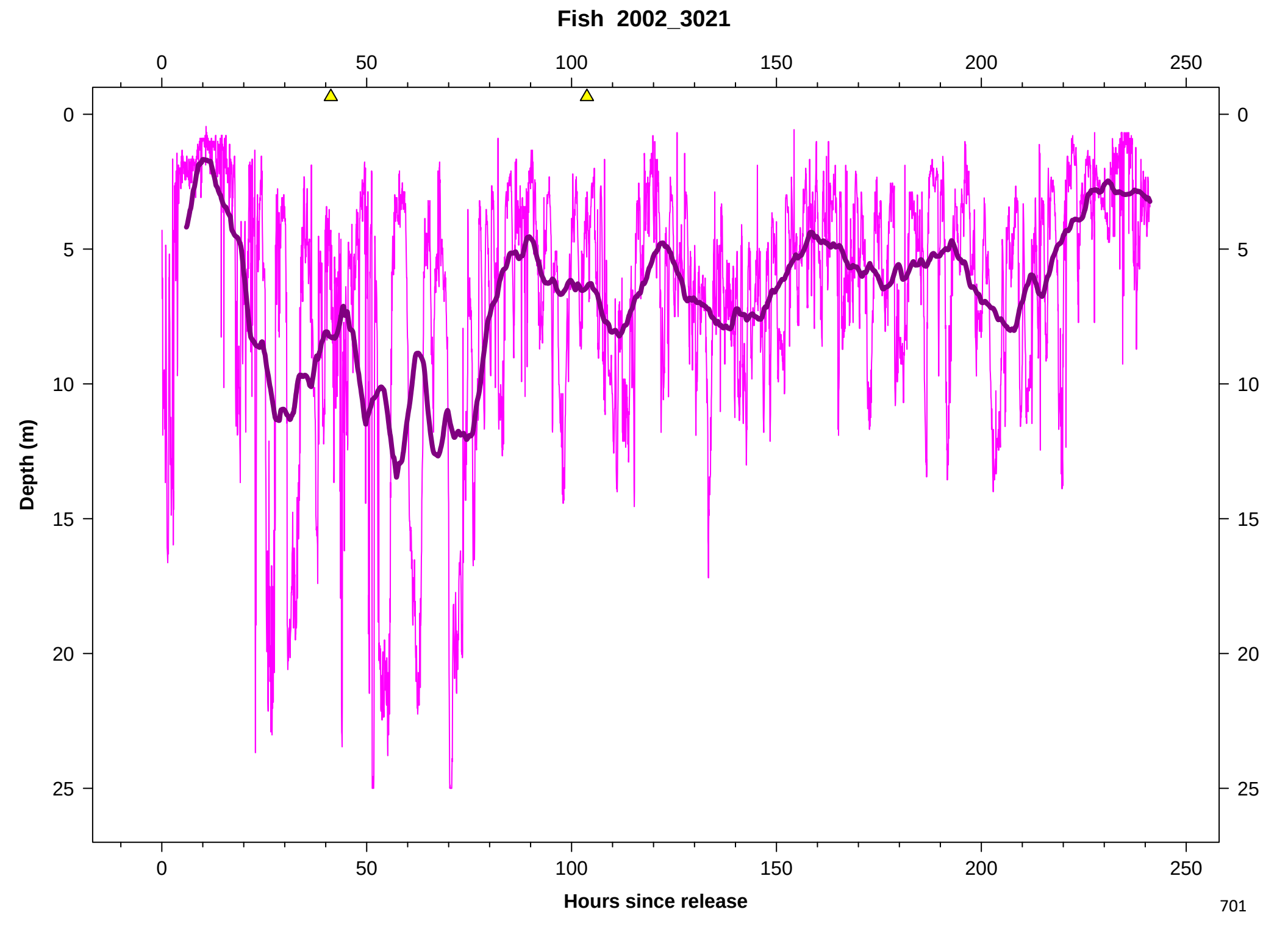

Fish 2002_3005
0
50
100
150
19
18
17
16
15
Temperature (C)
Hours since release

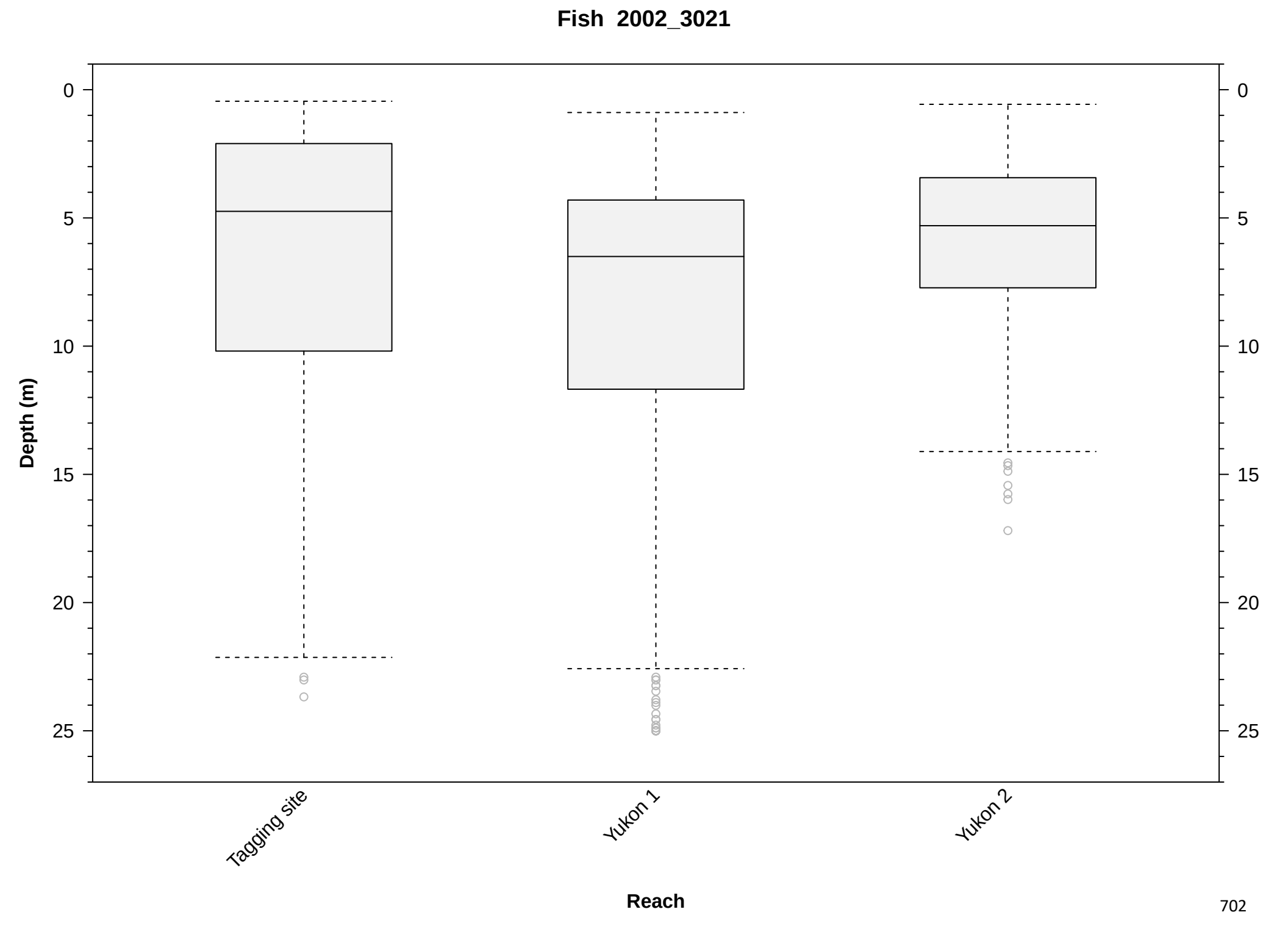

Fish 2002_3005
Temperature (C)
18
17
16
15
Tagging site
Yukon 1
Yukon 2
Reach

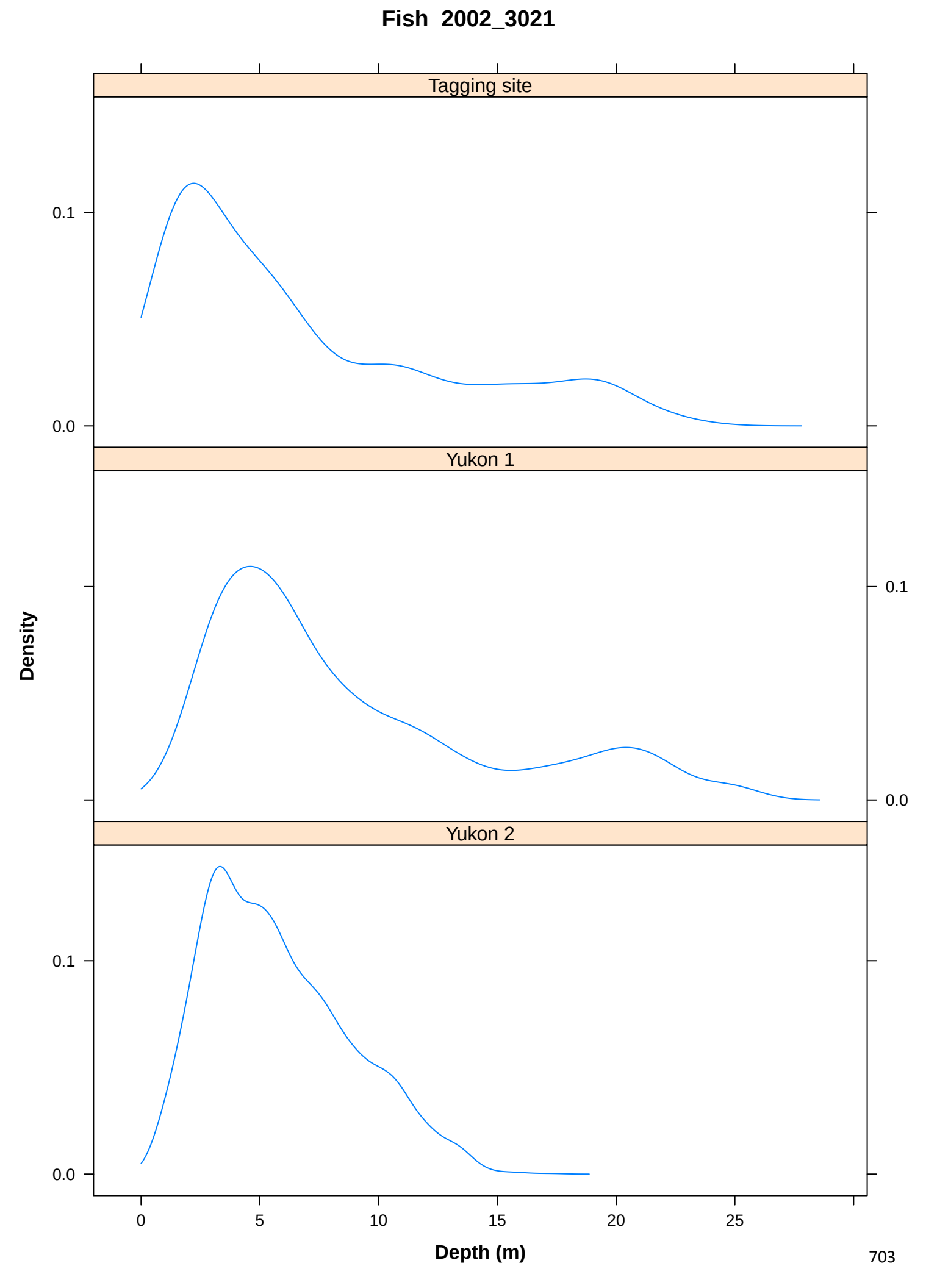

Fish 2002_3005
14.5
15.0
15.5
16.0
16.5
17.0
17.5
18.0
18.5
Tagging site
Yukon 1
Yukon 2
5
0
Density
Temperature (C)

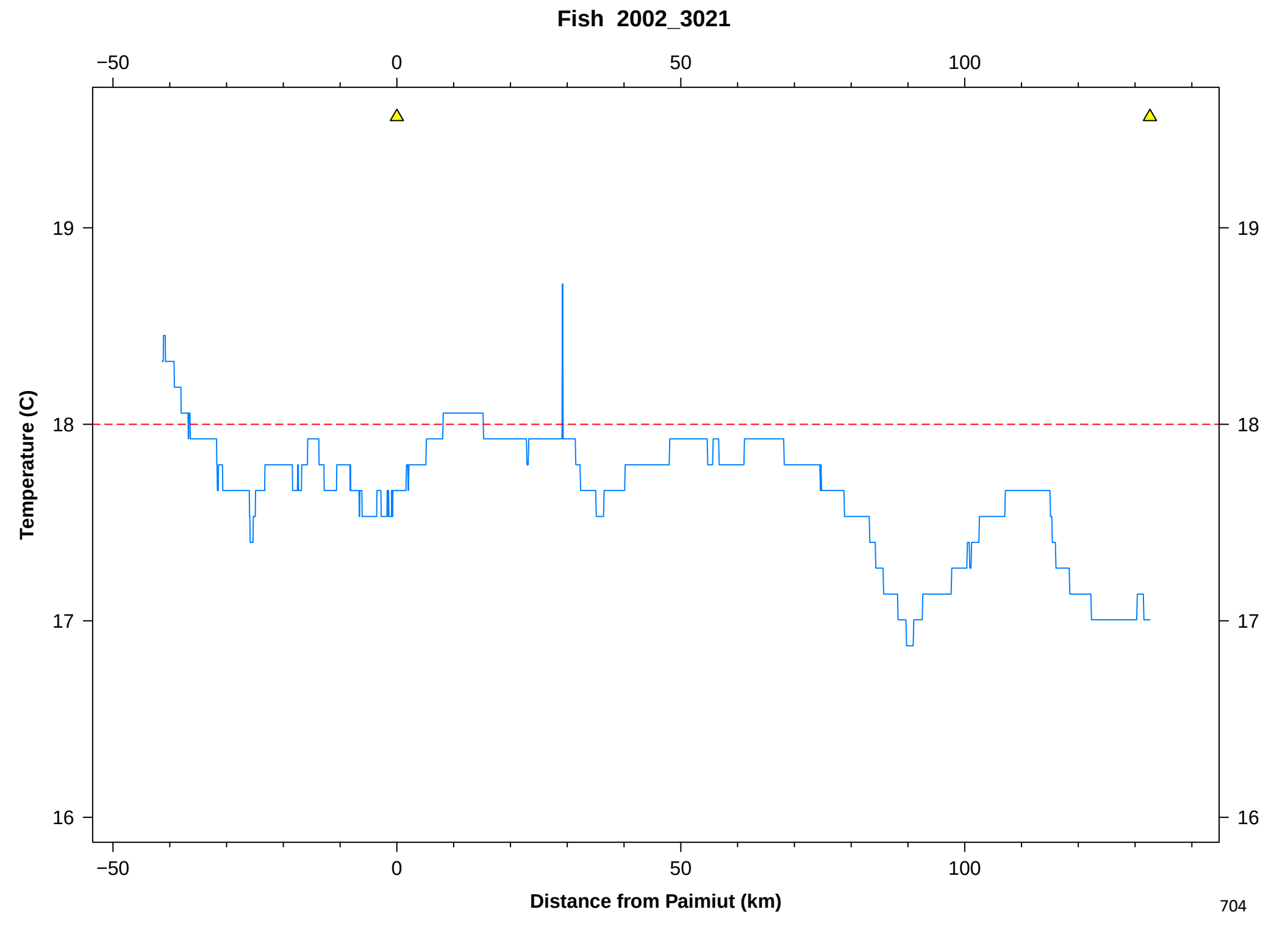

Fish 2002_3005
Tagging site
Yukon 1
Yukon 2
Depth (m)
Temperature (C)
15
16
17
18
0
10
20

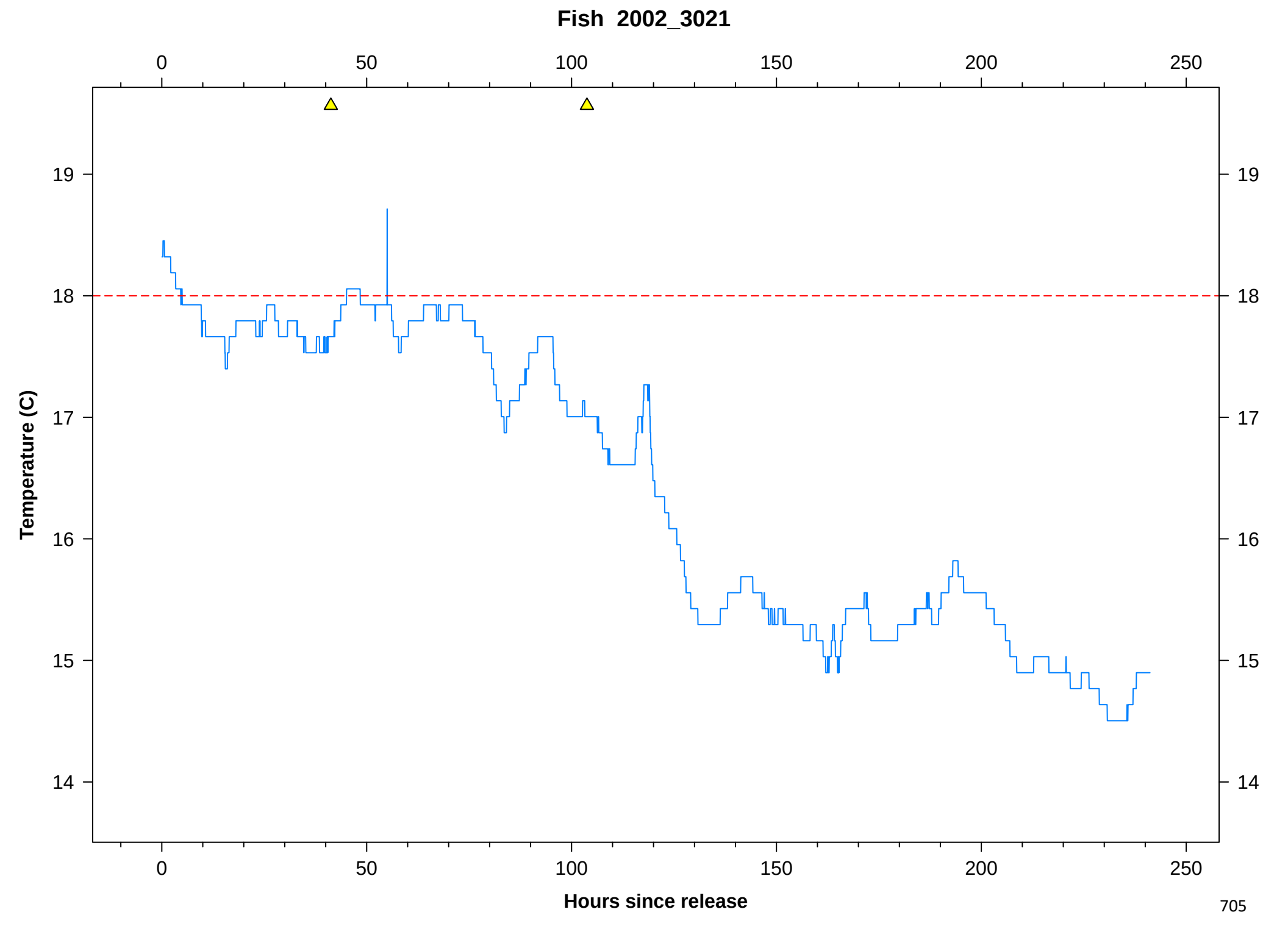

Fish 2002_3021
−50
0
50
100
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
700

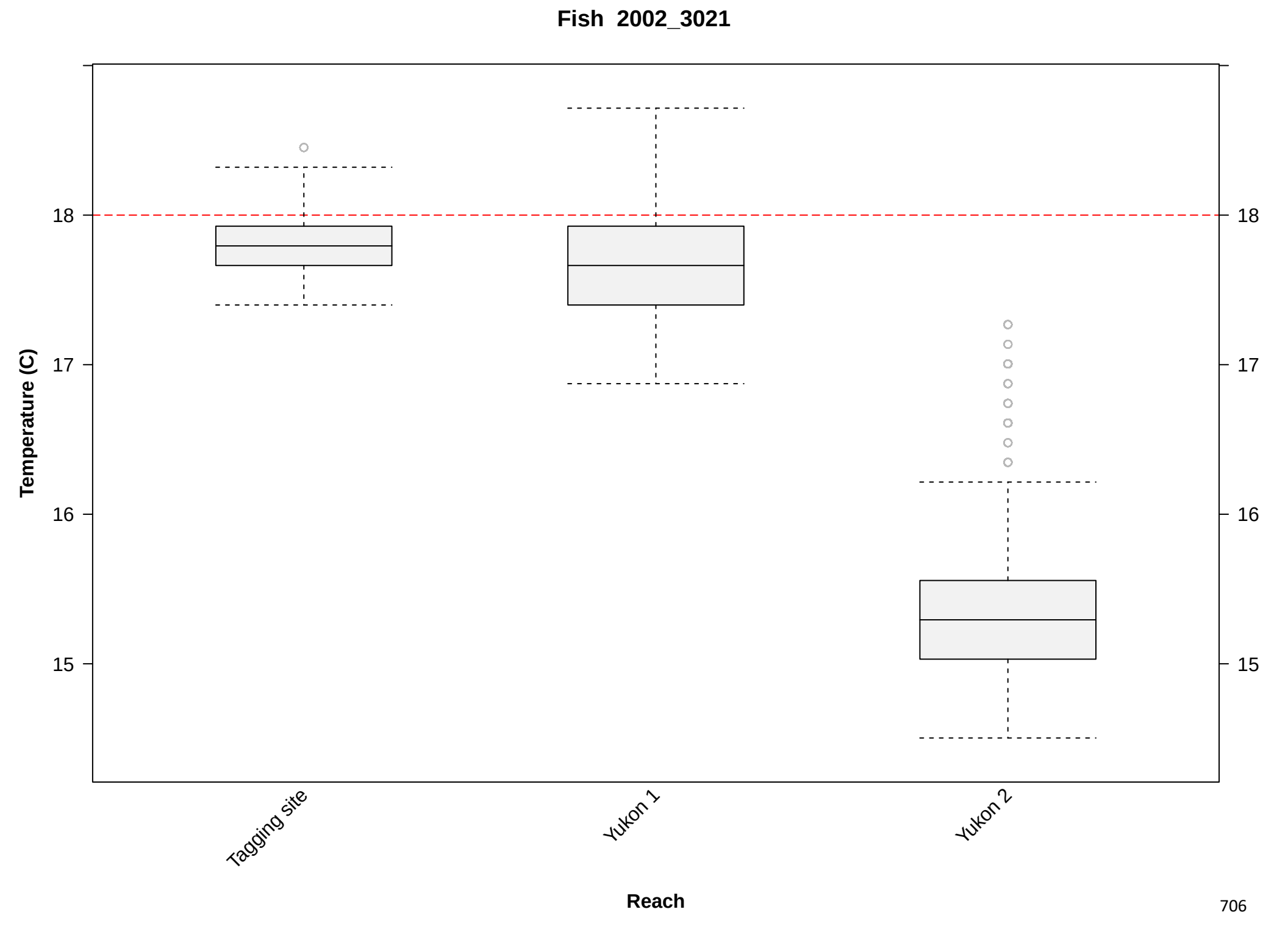

Fish 2002_3021
0
50
100
150
200
250
0
5
10
15
20
25
Depth (m)
Hours since release
701

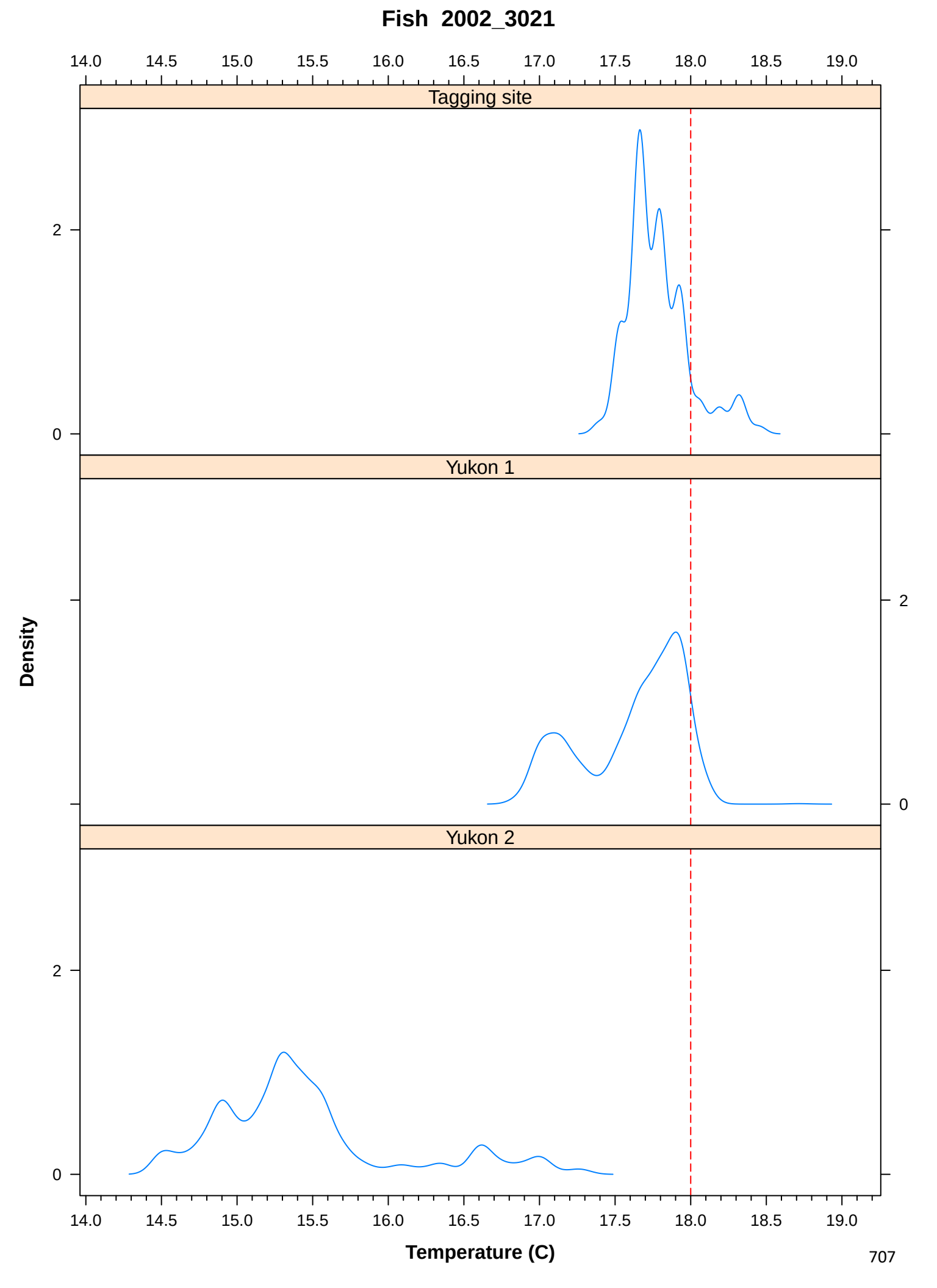

Fish 2002_3021
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Reach

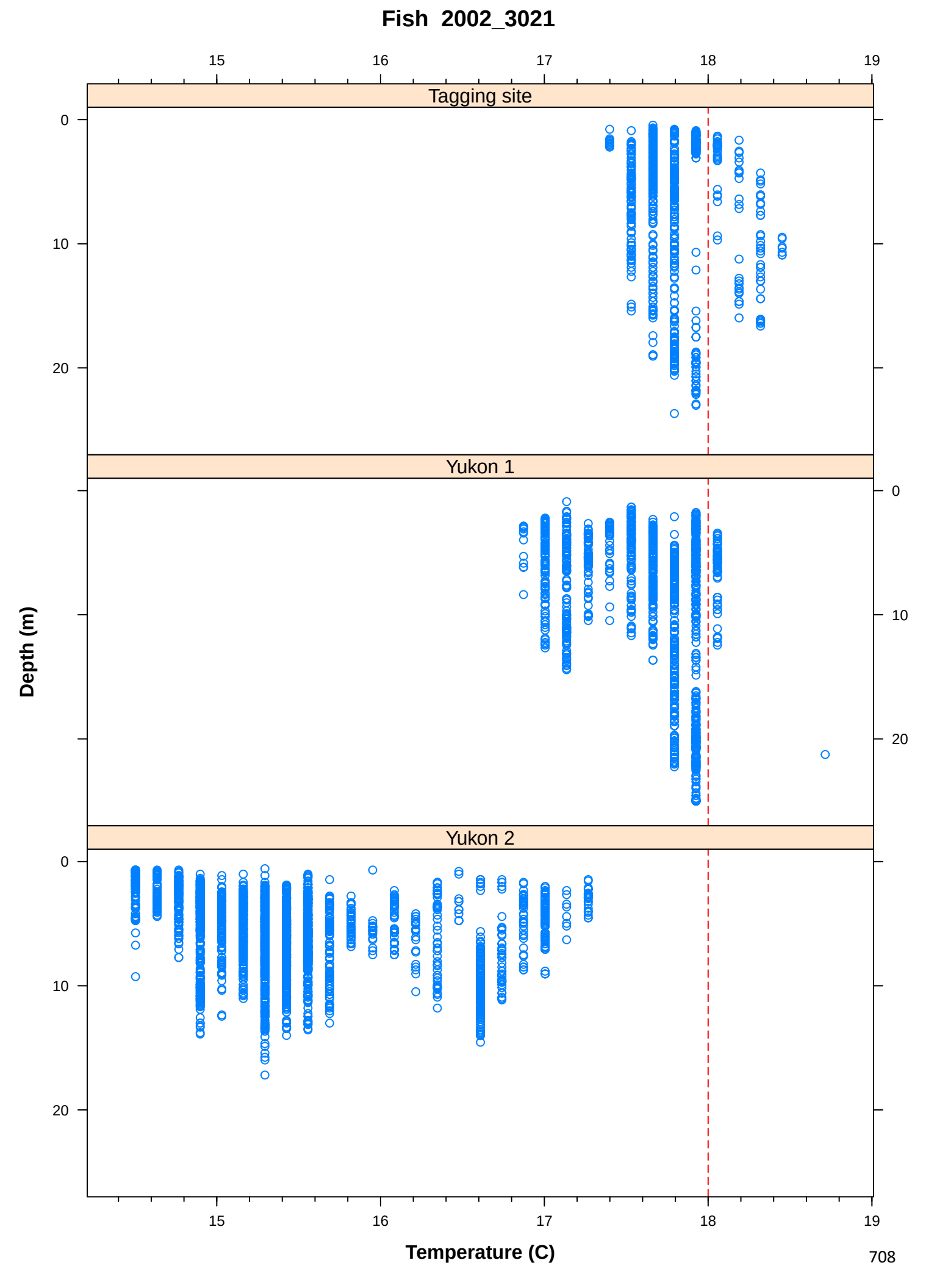

Fish 2002_3021
Tagging site
Yukon 1
Yukon 2
Density
0.1
0.0
0
5
10
15
20
25
Depth (m)
703

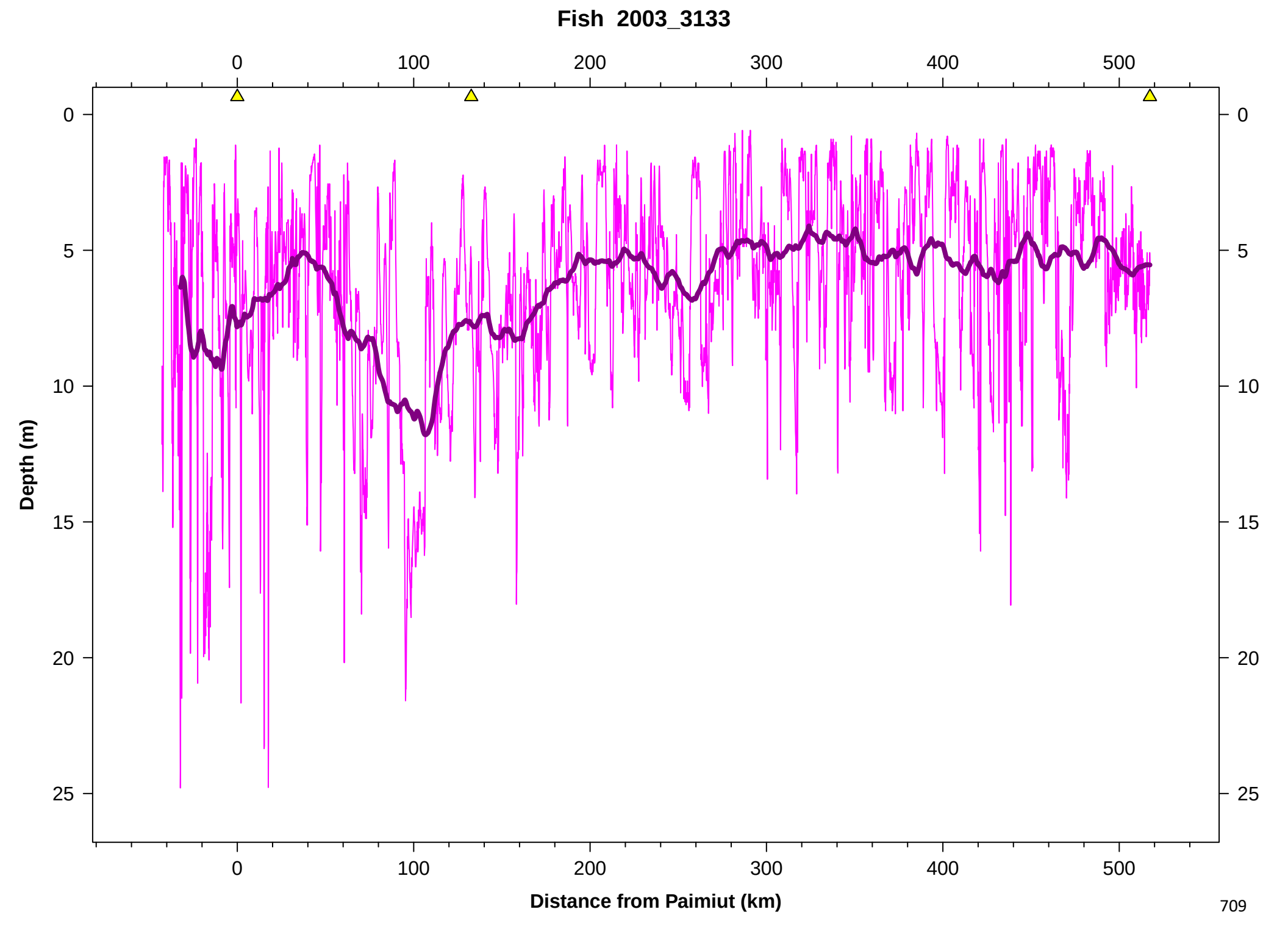

Fish 2002_3021
−50
0
50
100
19
18
17
16
Temperature (C)
Distance from Paimiut (km)
704

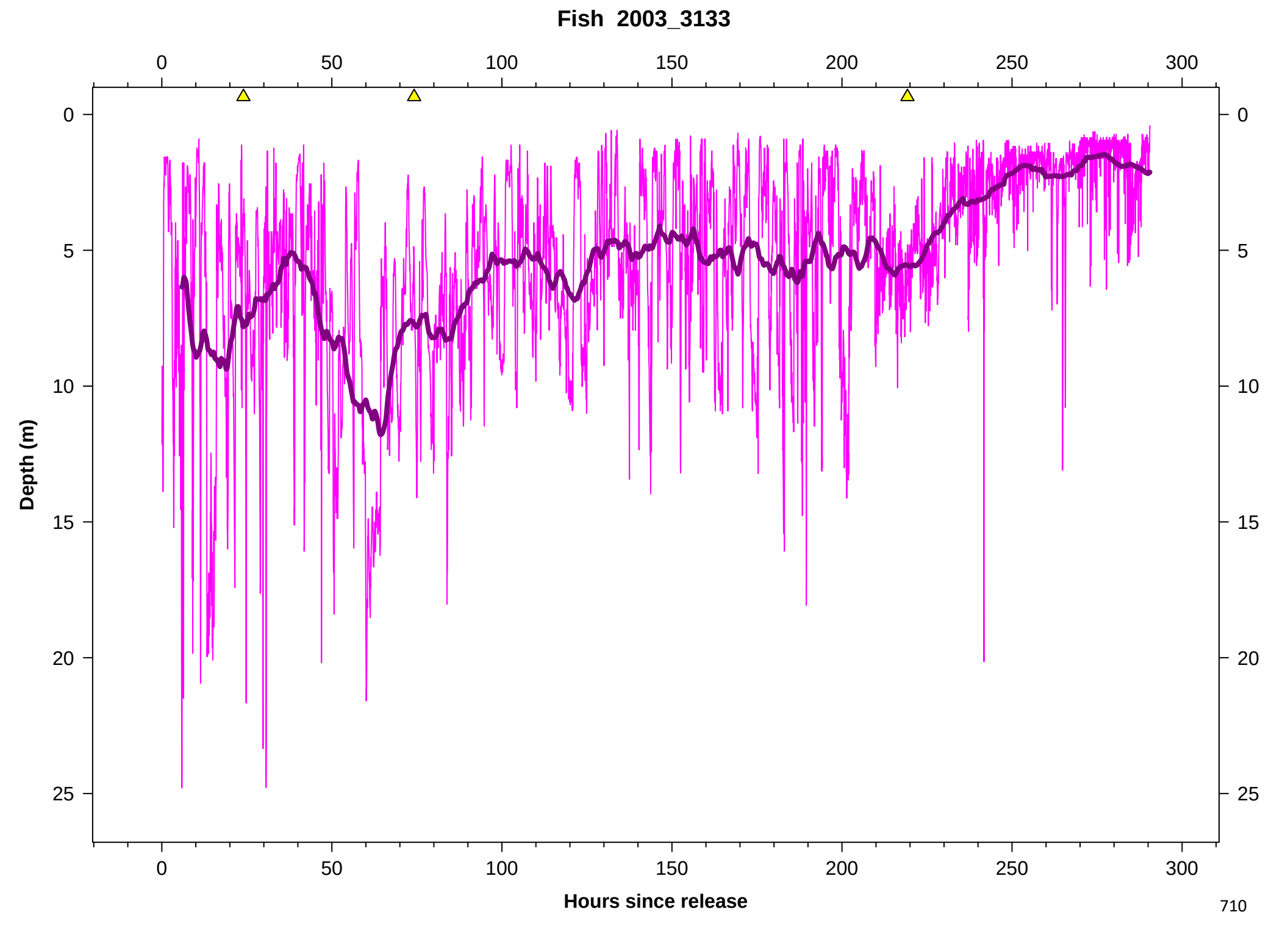

Fish 2002_3021
0
50
100
150
200
250
19
18
17
16
15
14
Temperature (C)
Hours since release
705

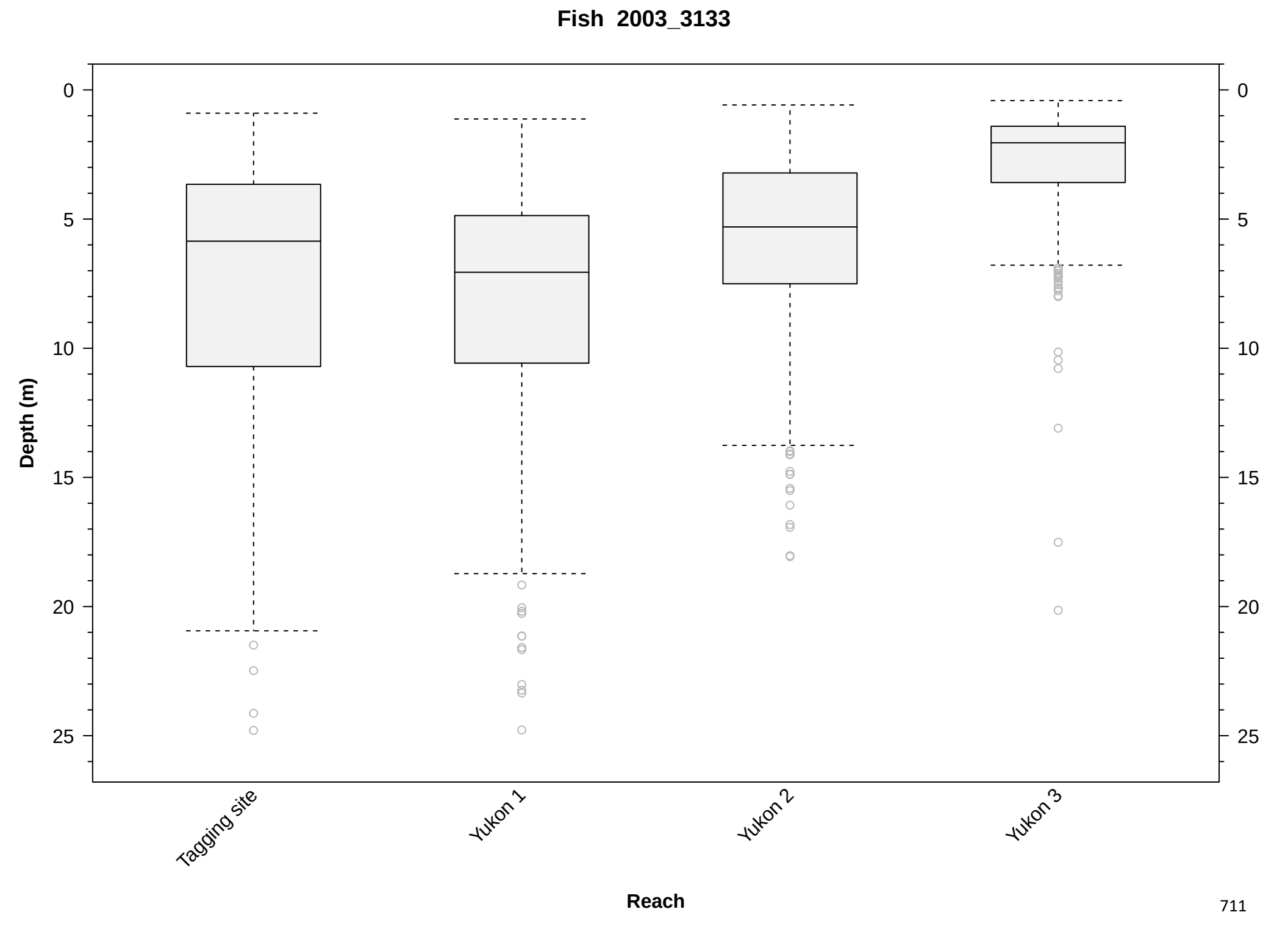

Fish 2002_3021
Temperature (C)
18
17
16
15
Tagging site
Yukon 1
Yukon 2
Reach
706

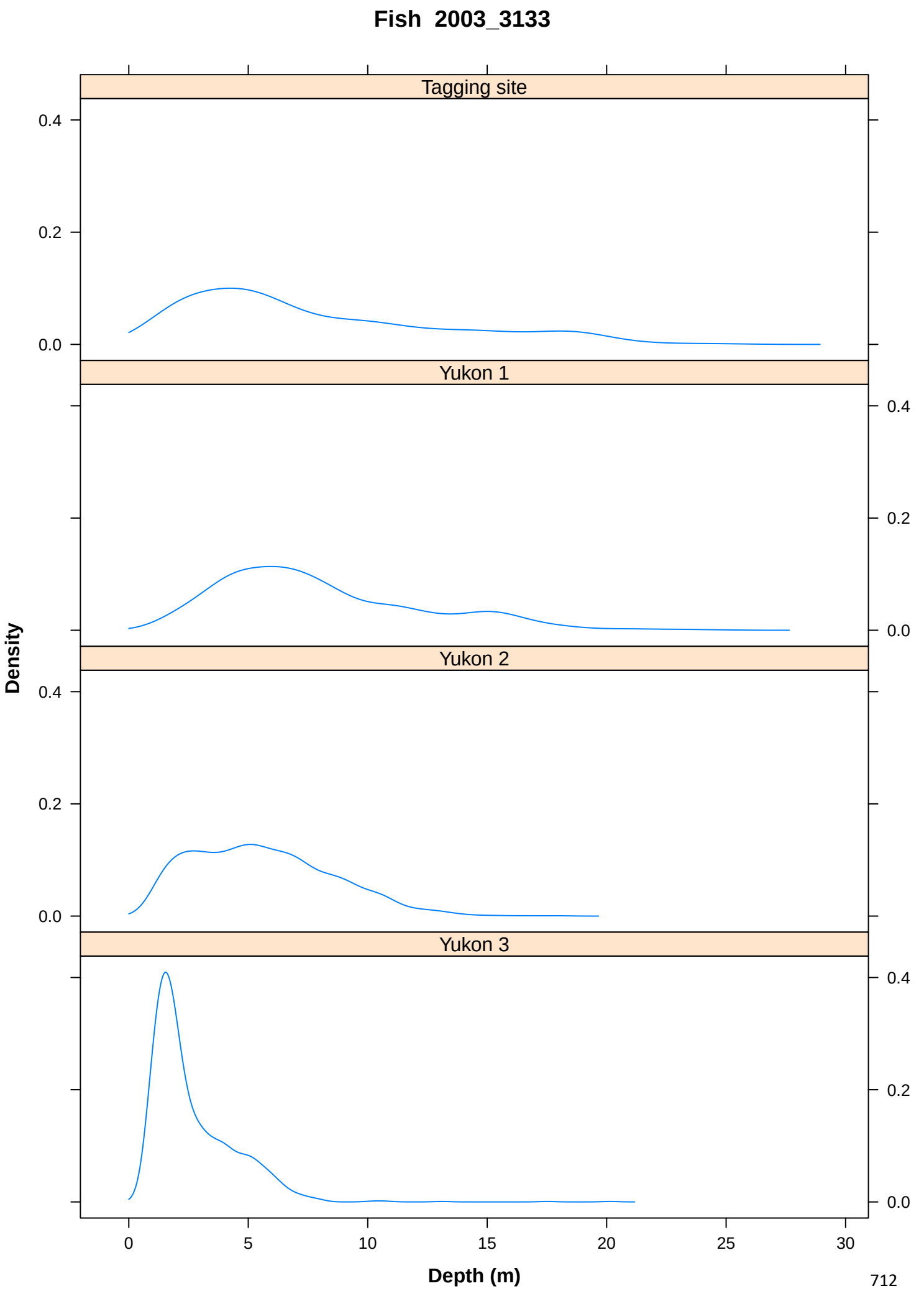

Fish 2002_3021
14.0
14.5
15.0
15.5
16.0
16.5
17.0
17.5
18.0
18.5
19.0
Tagging site
Yukon 1
Yukon 2
Density
0
2
Temperature (C)
707

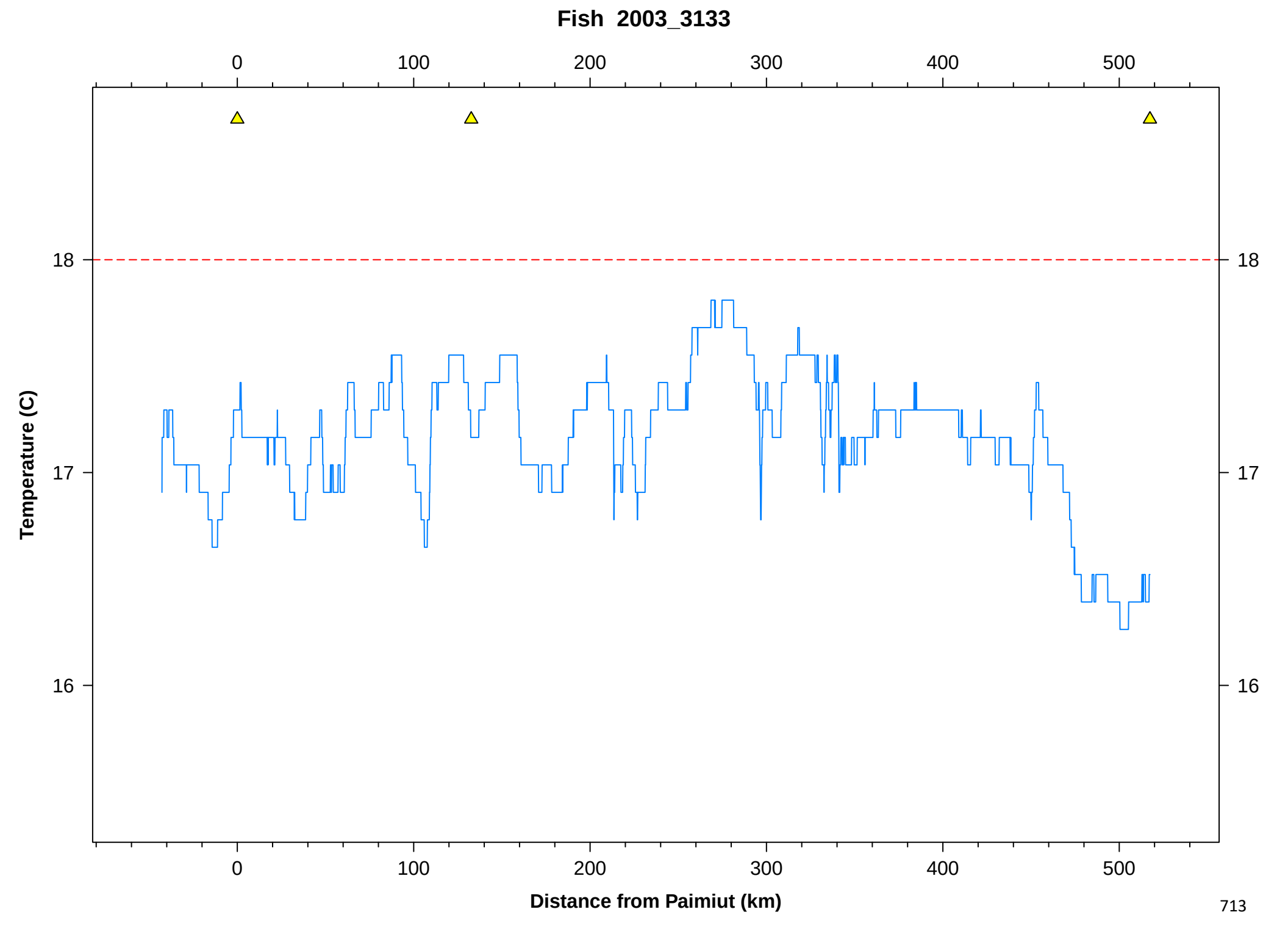

Fish 2002_3021
Tagging site
Yukon 1
Yukon 2
Depth (m)
Temperature (C)
15
16
17
18
19
0
10
20

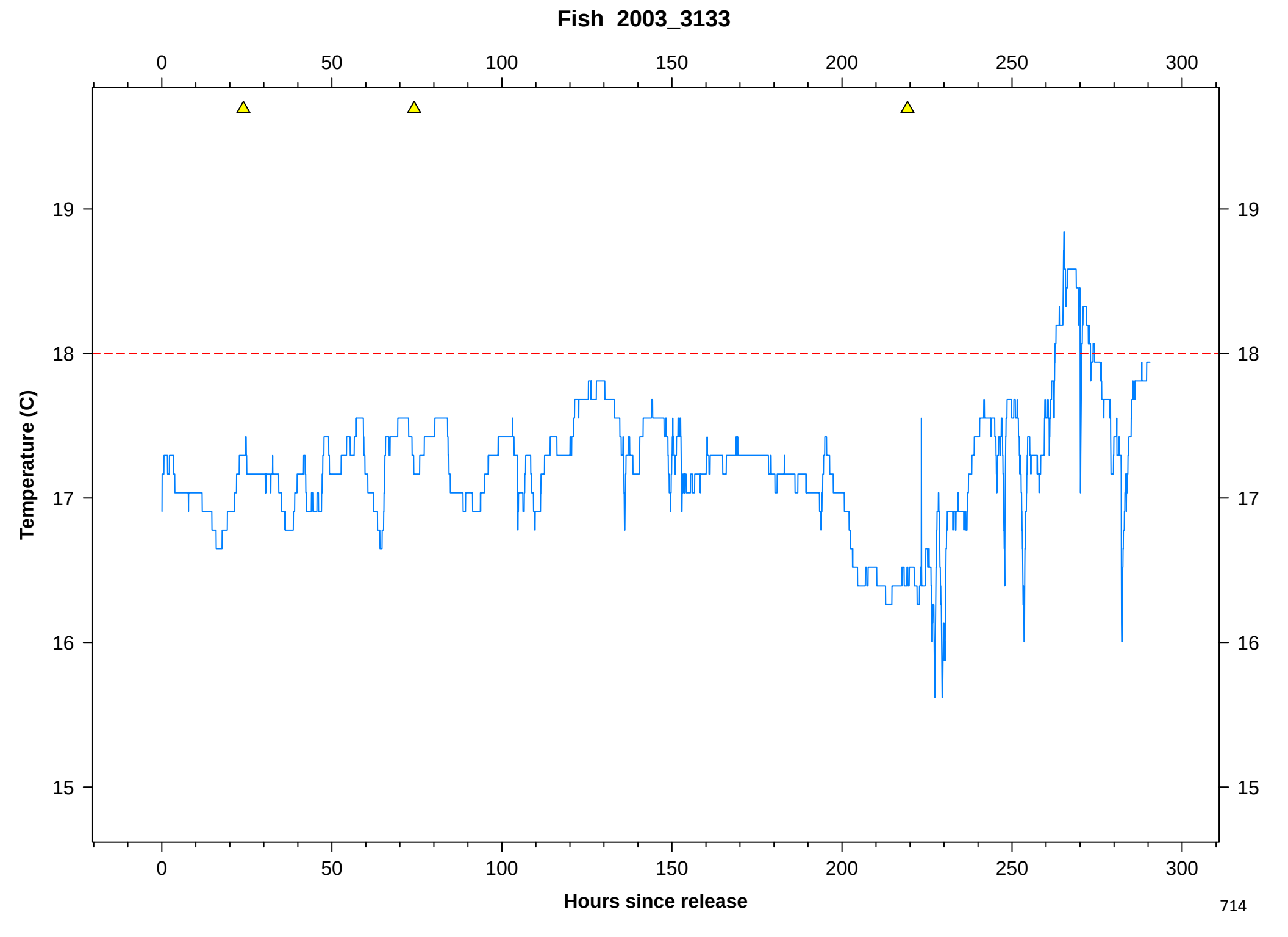

Fish 2003_3133
0
100
200
300
400
500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

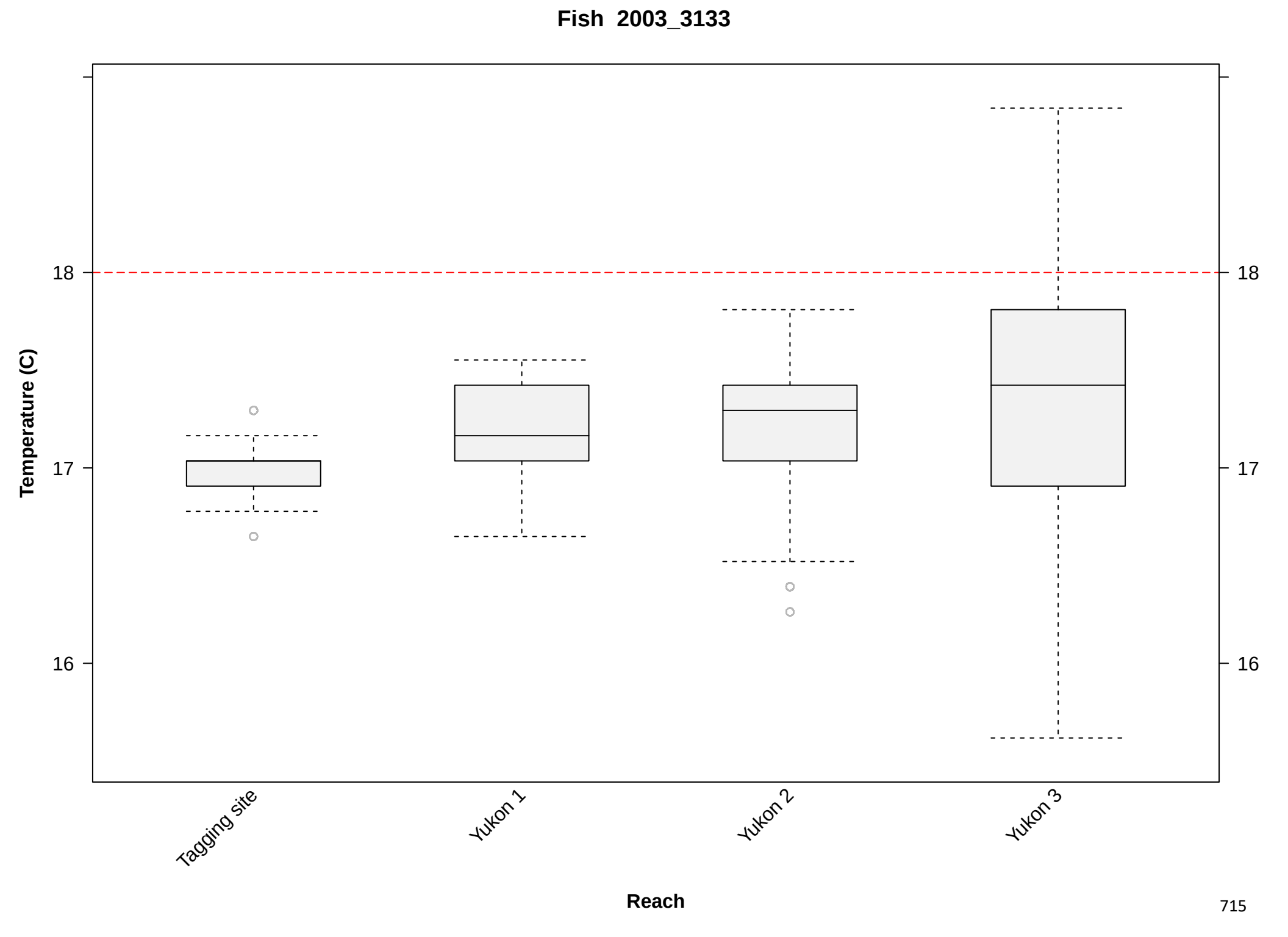

Fish 2003_3133
0
50
100
150
200
250
300
0
5
10
15
20
25
Depth (m)
Hours since release
710

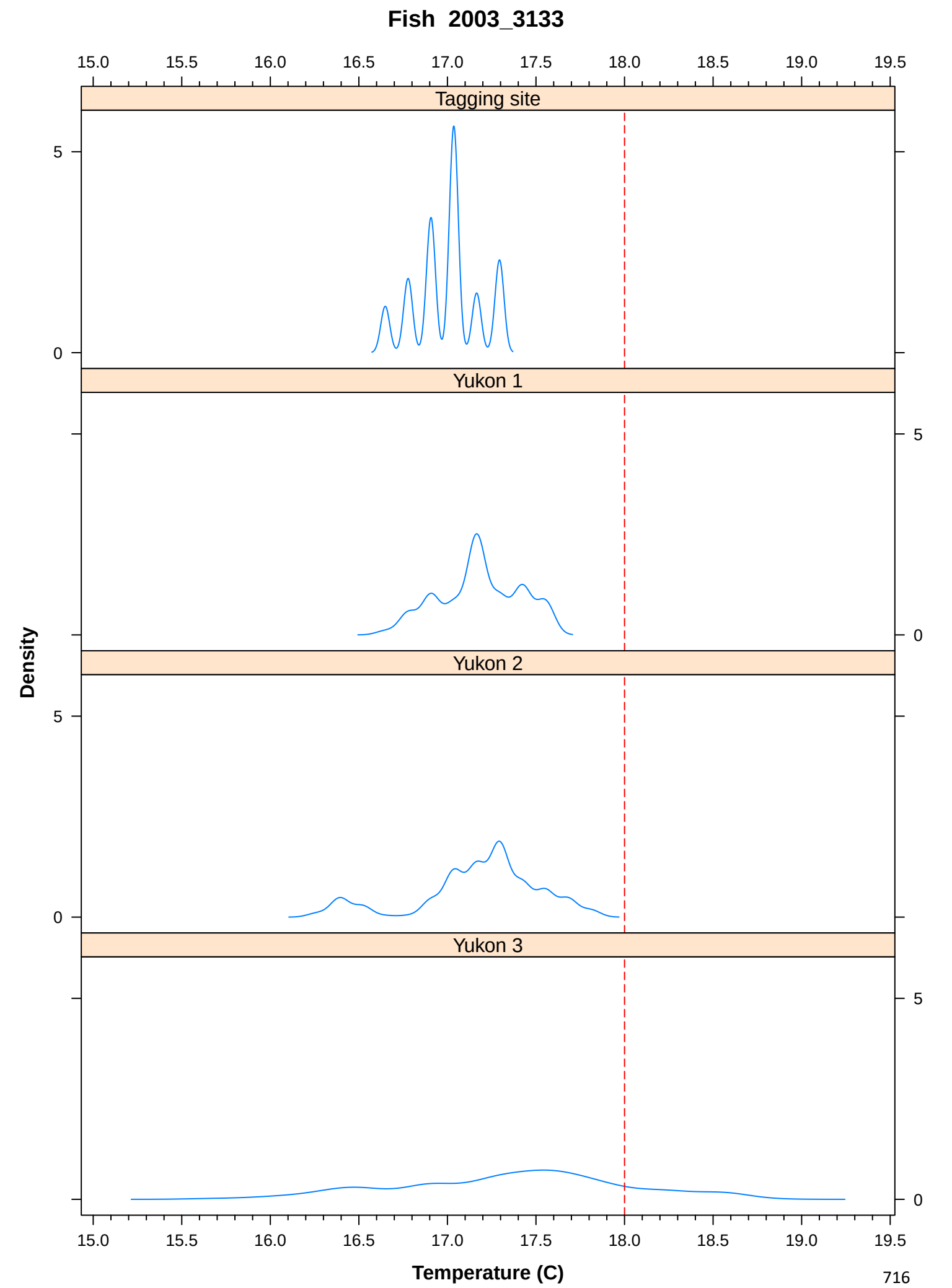

Fish 2003_3133
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach
711

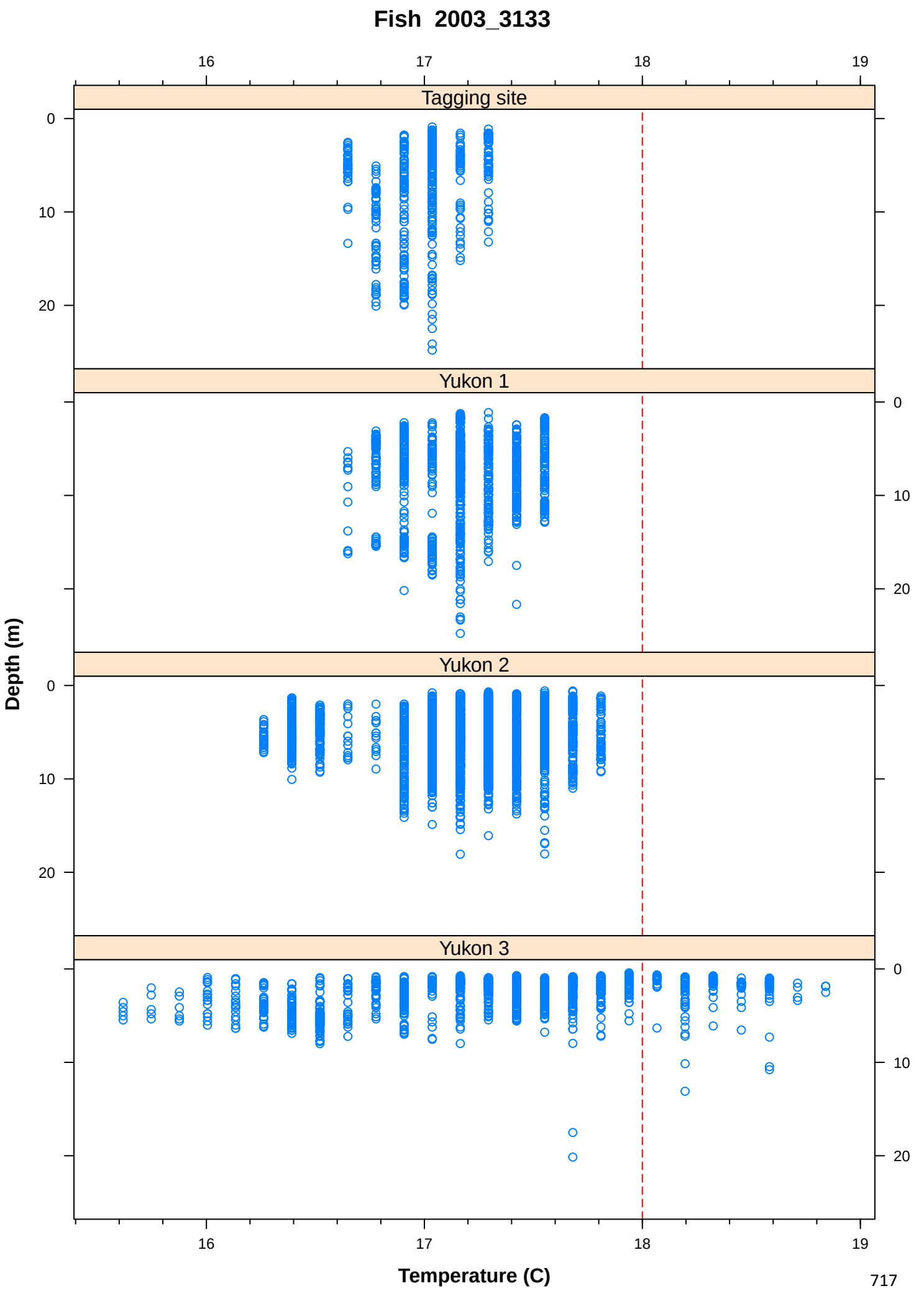

Fish 2003_3133
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
0.0
0.2
0.4
0
5
10
15
20
25
30
Depth (m)

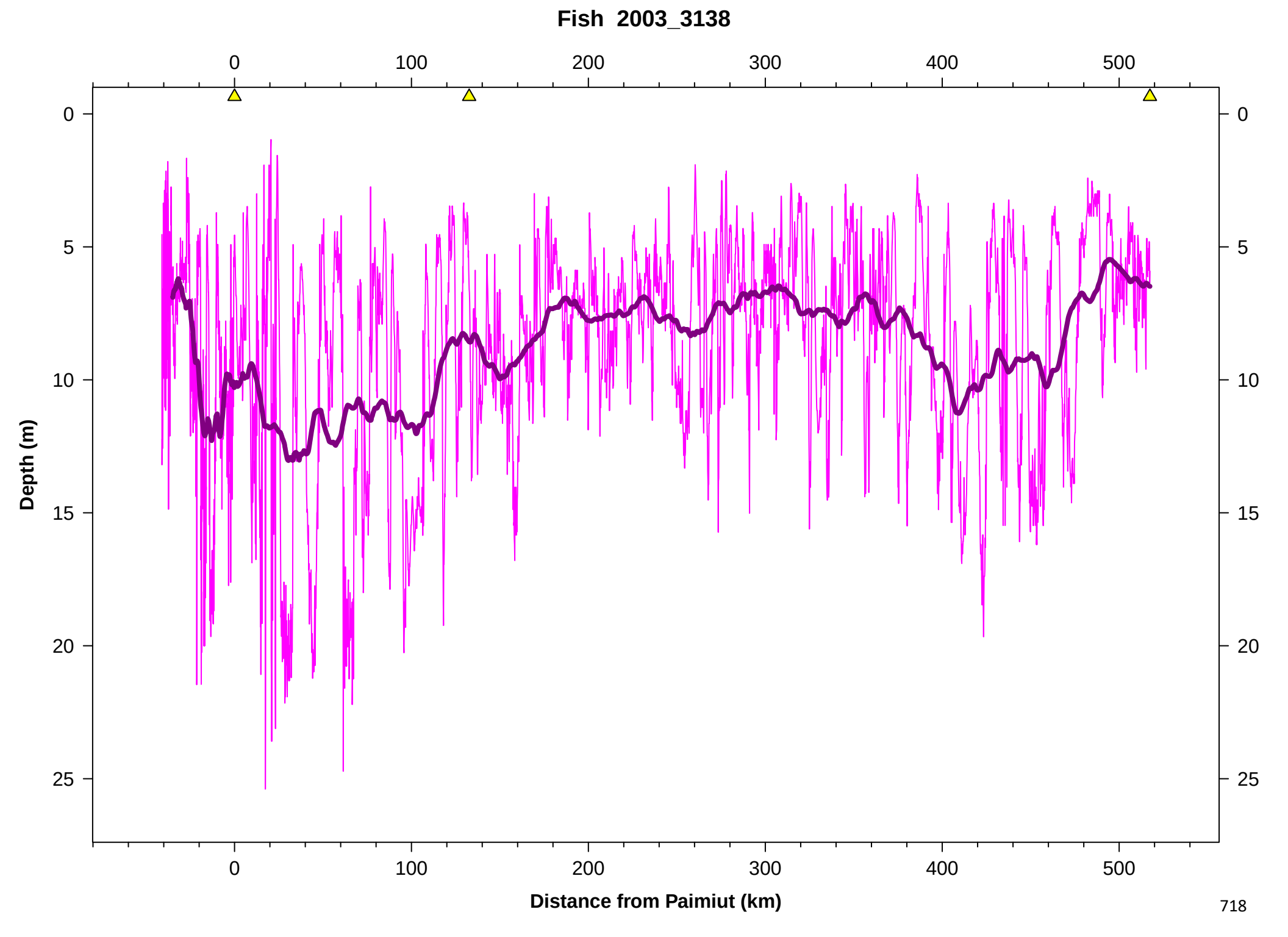

Fish 2003_3133
0
100
200
300
400
500
18
17
16
Temperature (C)
Distance from Paimiut (km)

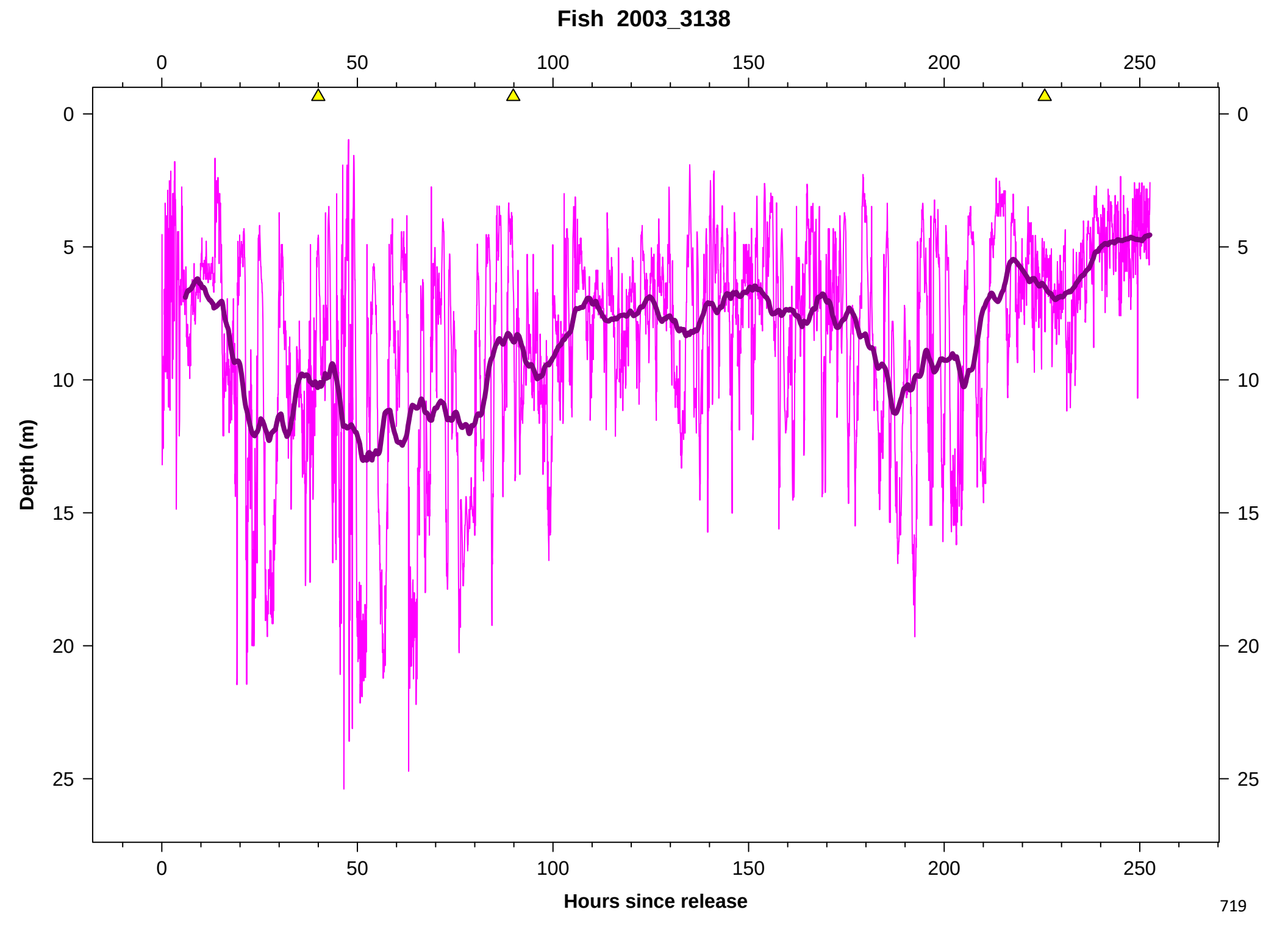

Fish 2003_3133
0
50
100
150
200
250
300
19
18
17
16
15
Temperature (C)
Hours since release
714

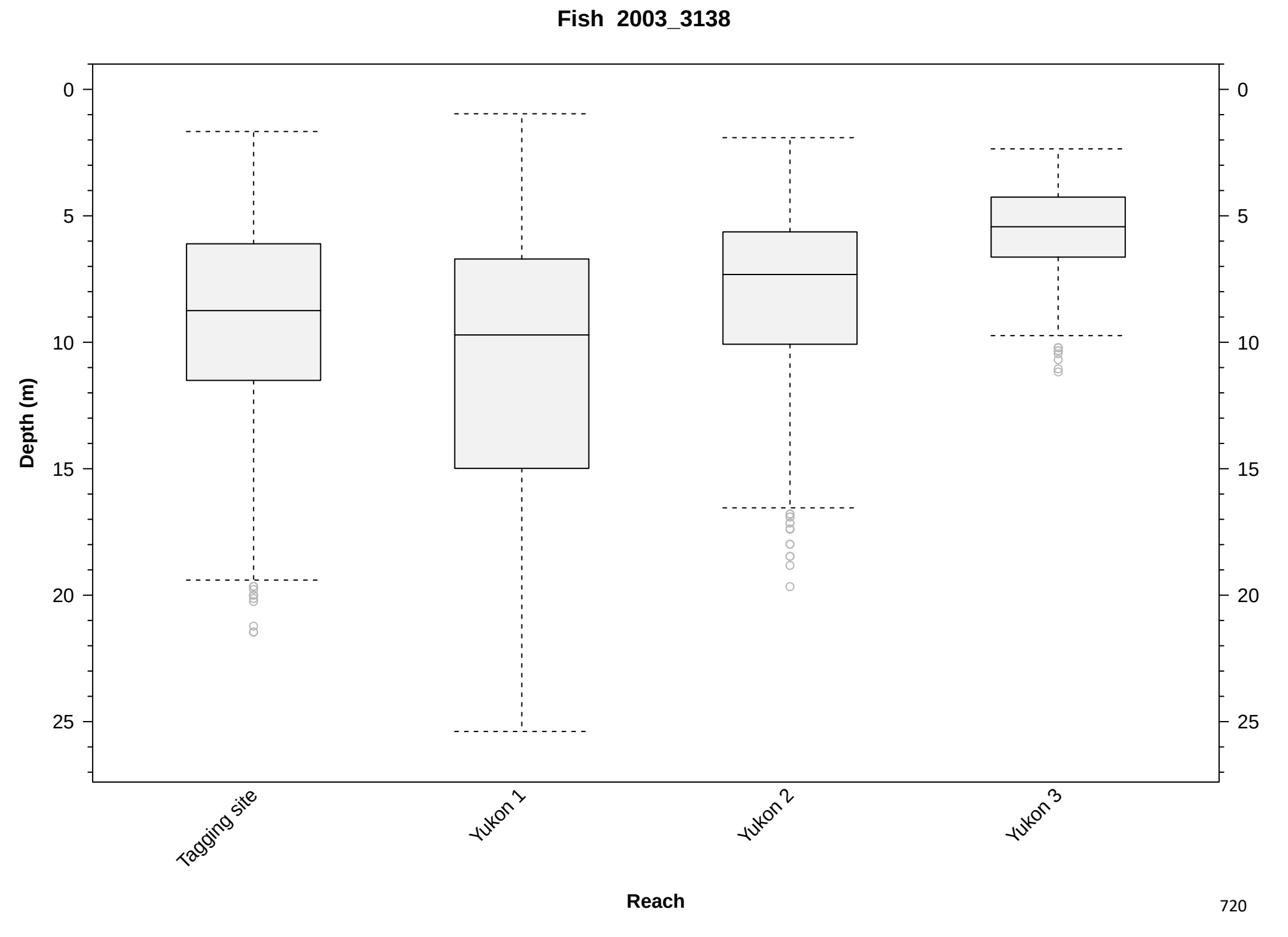

Fish 2003_3133
Temperature (C)
18
17
16
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach

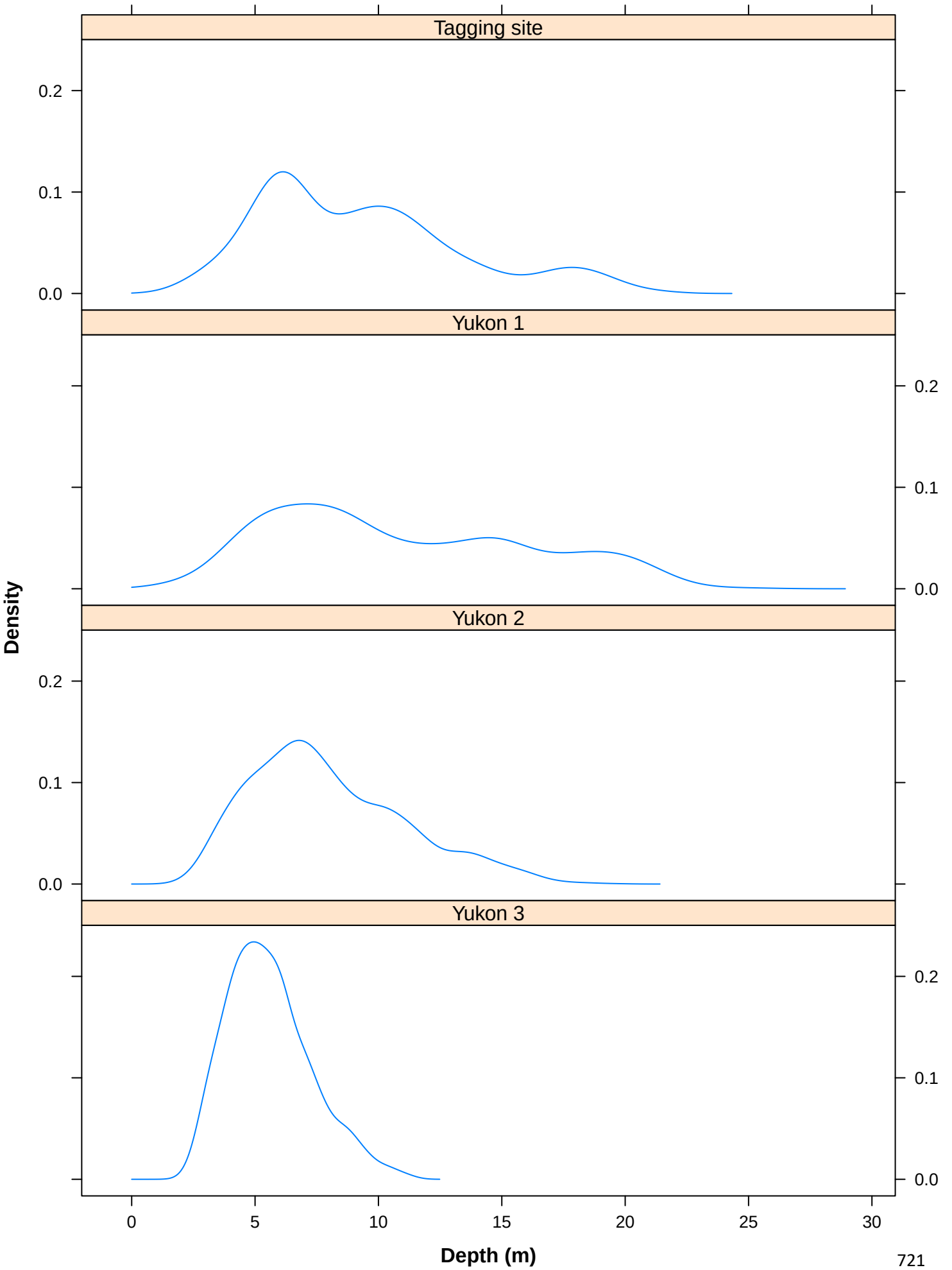

Fish 2003_3133
15.0
15.5
16.0
16.5
17.0
17.5
18.0
18.5
19.0
19.5
Tagging site
Yukon 1
Yukon 2
Yukon 3
5
0
Density
Temperature (C)

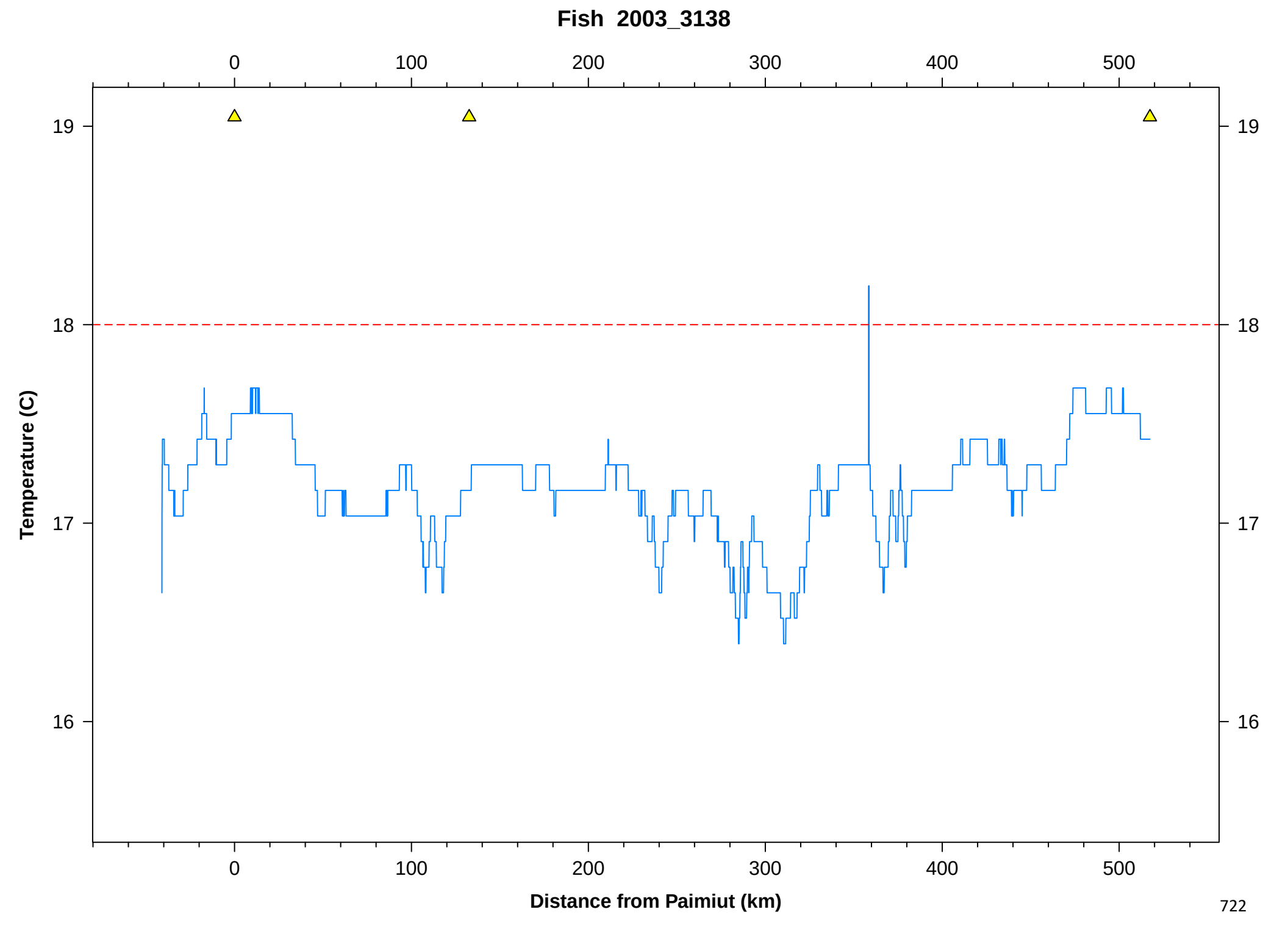

Fish 2003_3133
Tagging site
Yukon 1
Yukon 2
Yukon 3
Depth (m)
Temperature (C)
16
17
18
19
0
10
20

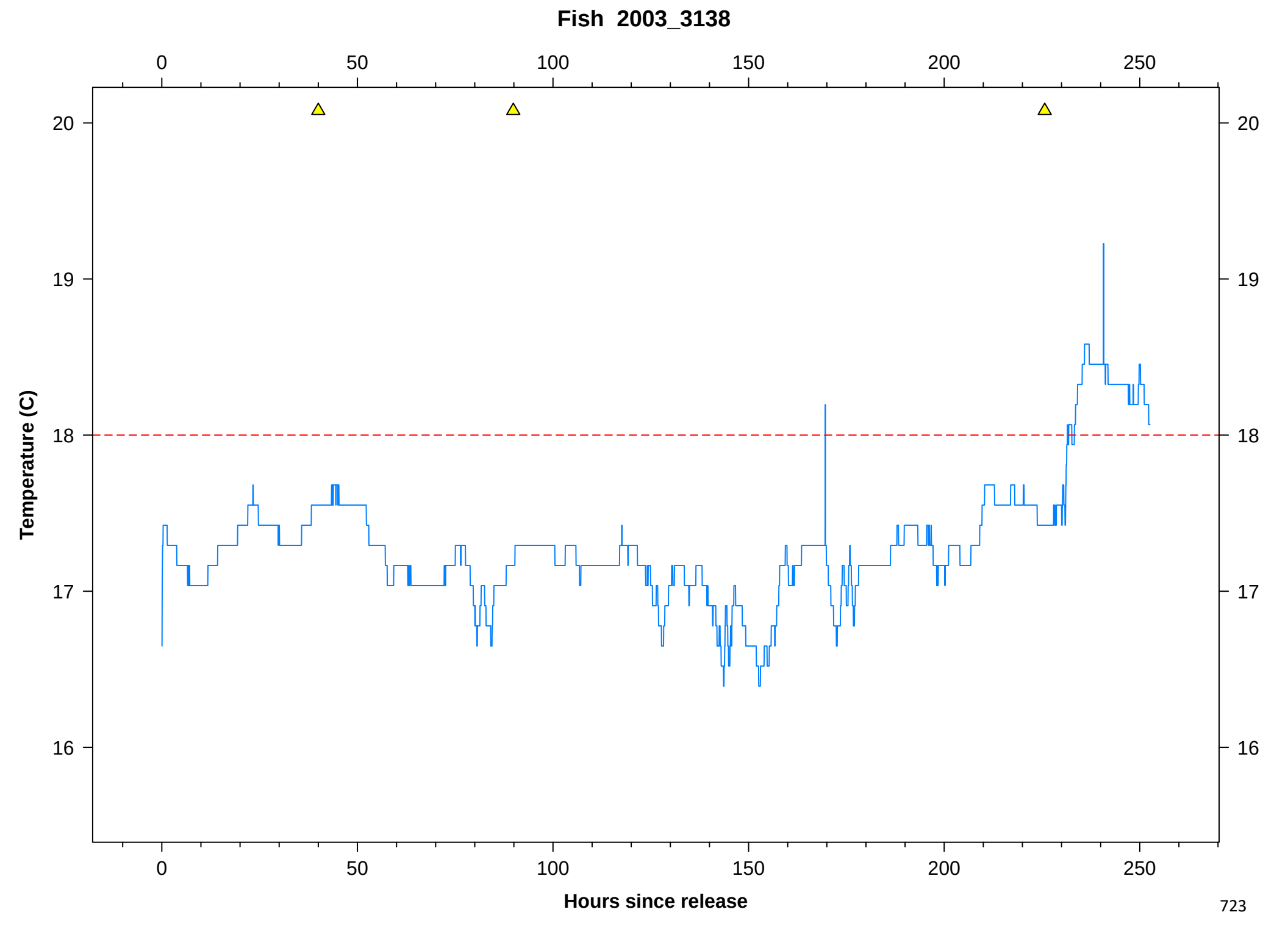

Fish 2003_3138
0
100
200
300
400
500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

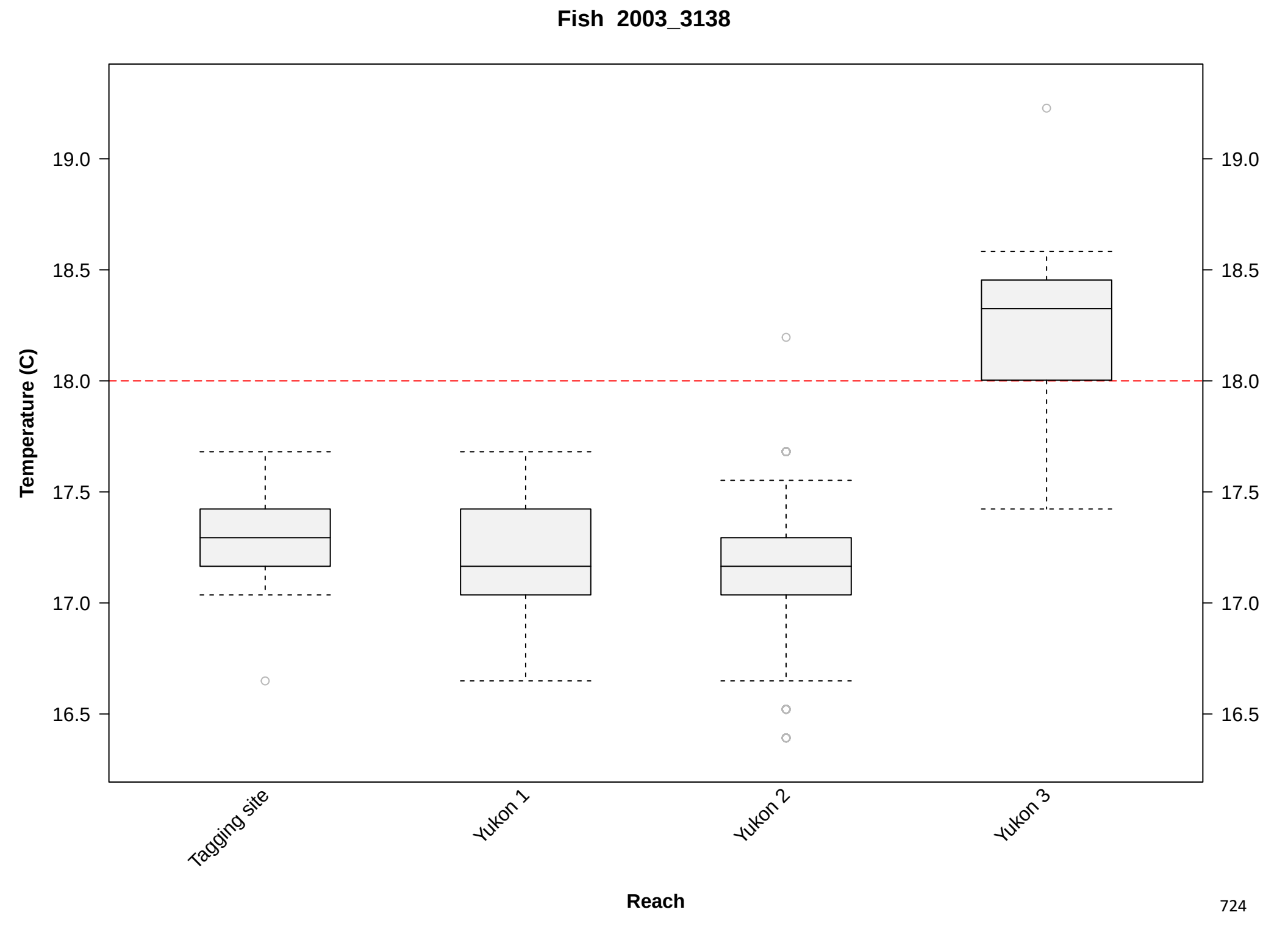

Fish 2003_3138
0
50
100
150
200
250
0
5
10
15
20
25
Depth (m)
Hours since release
719

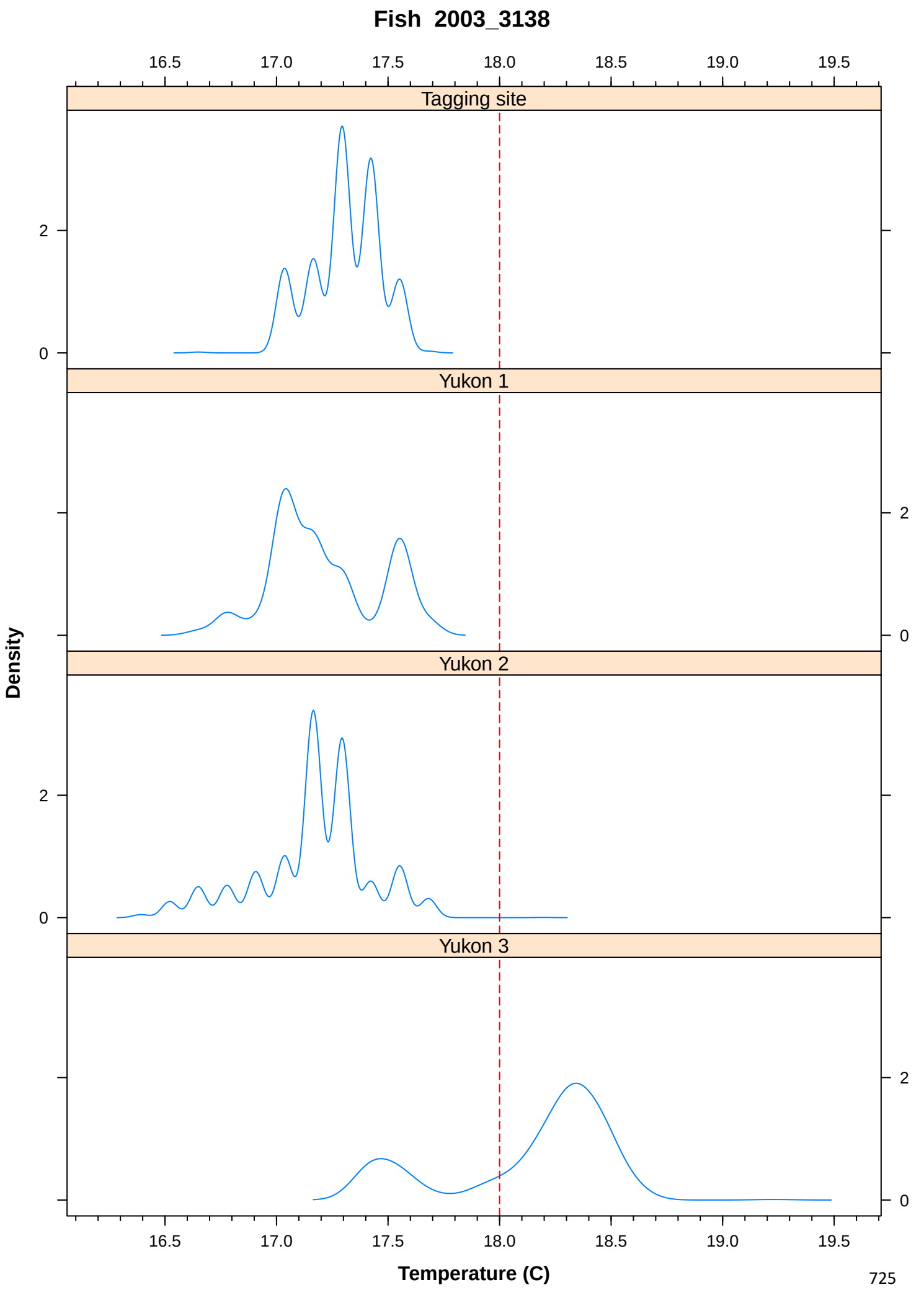

Fish 2003_3138
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach

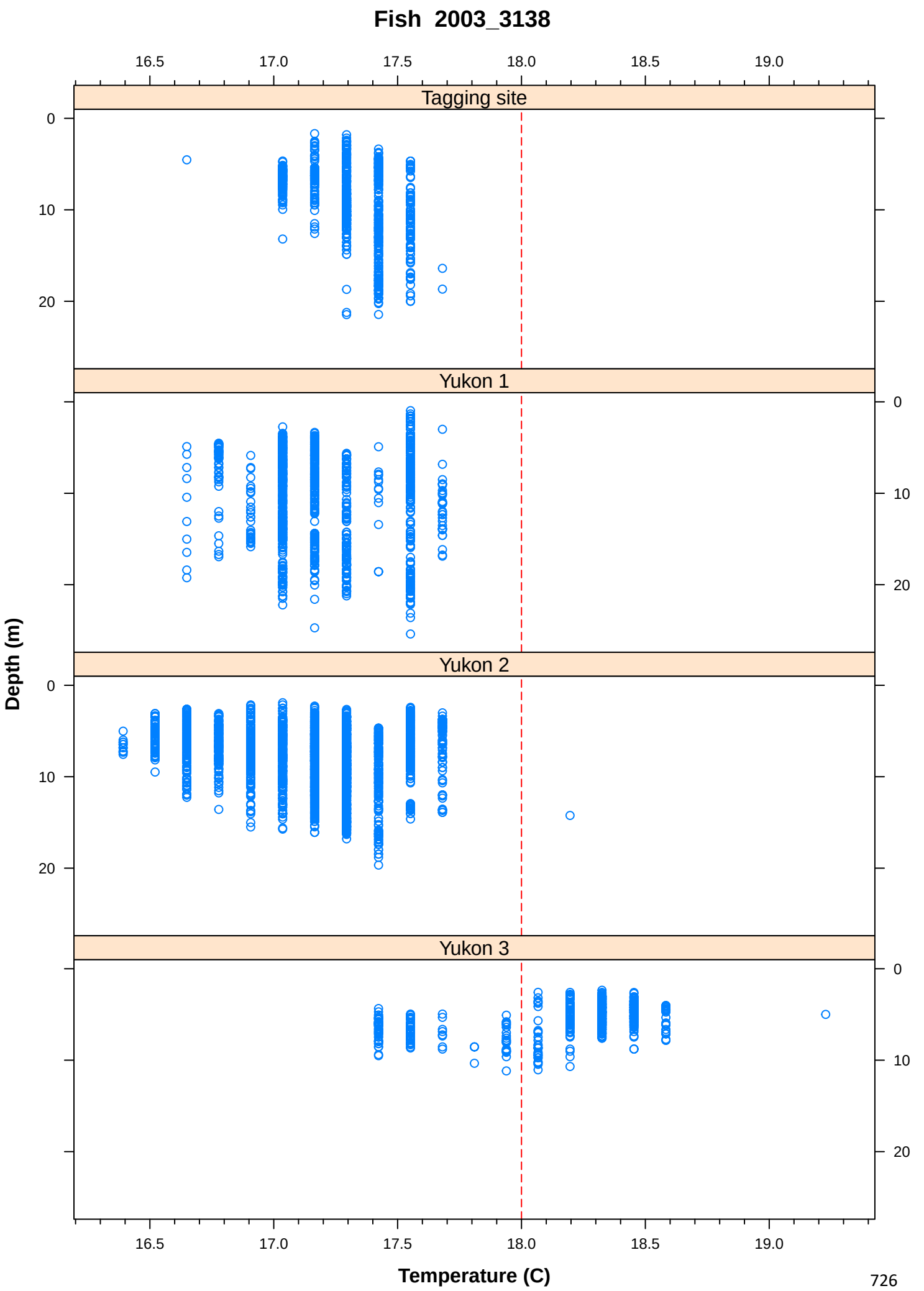

Fish 2003_3138
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
0.0
0.1
0.2
0
5
10
15
20
25
30
Depth (m)

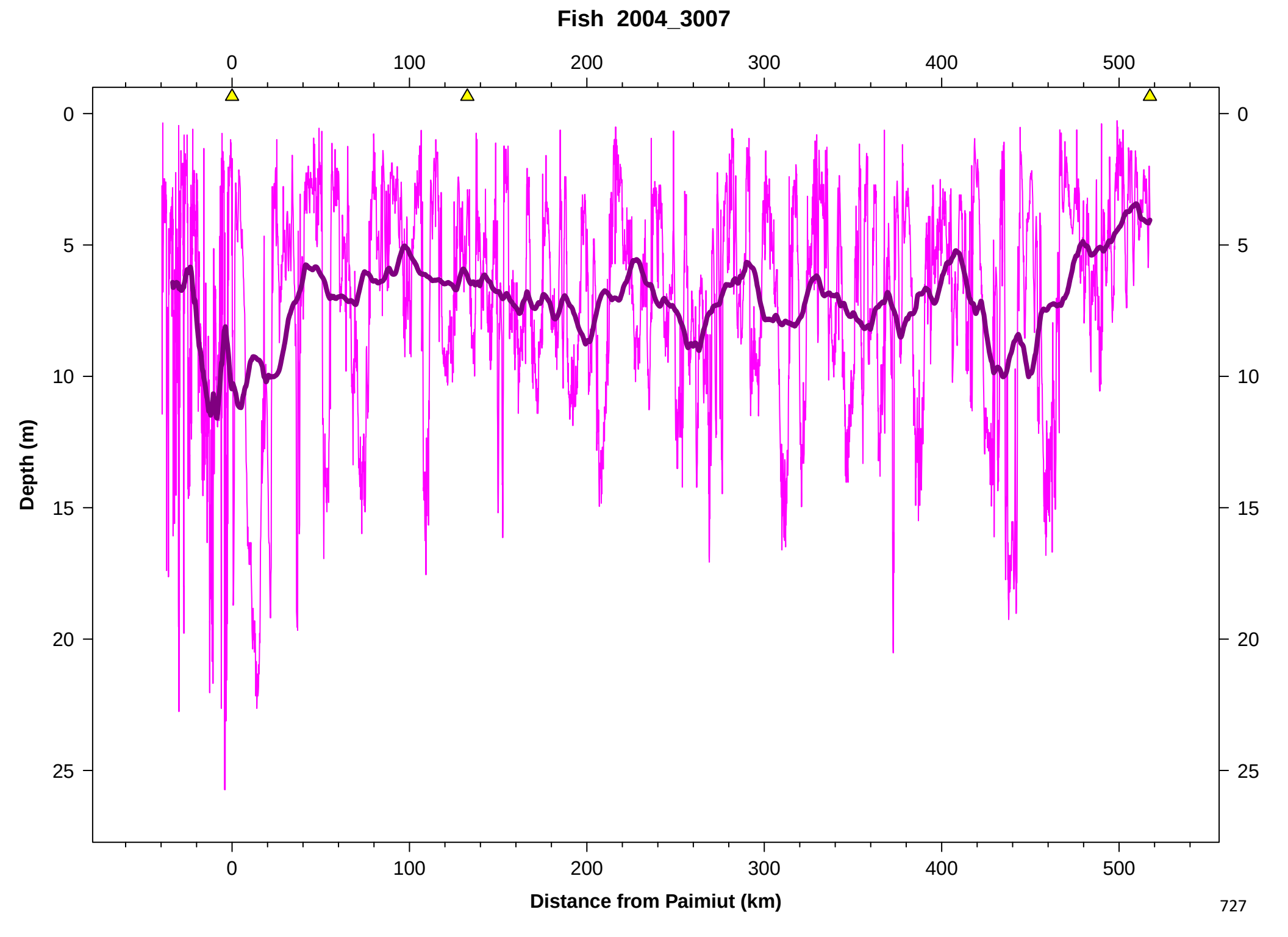

Fish 2003_3138
0
100
200
300
400
500
19
18
17
16
Temperature (C)
Distance from Paimiut (km)

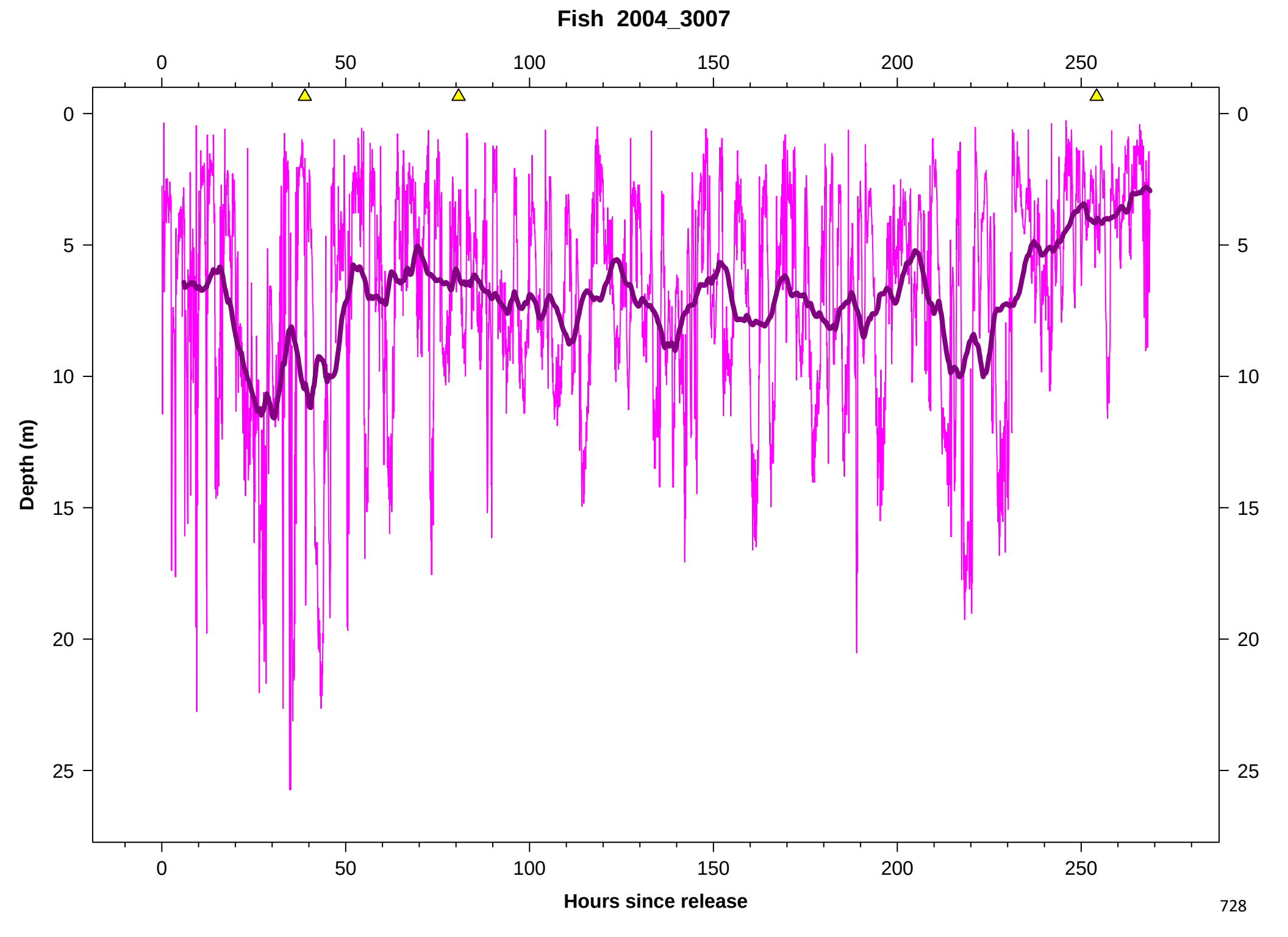

Fish 2003_3138
0
50
100
150
200
250
20
19
18
17
16
Temperature (C)
Hours since release

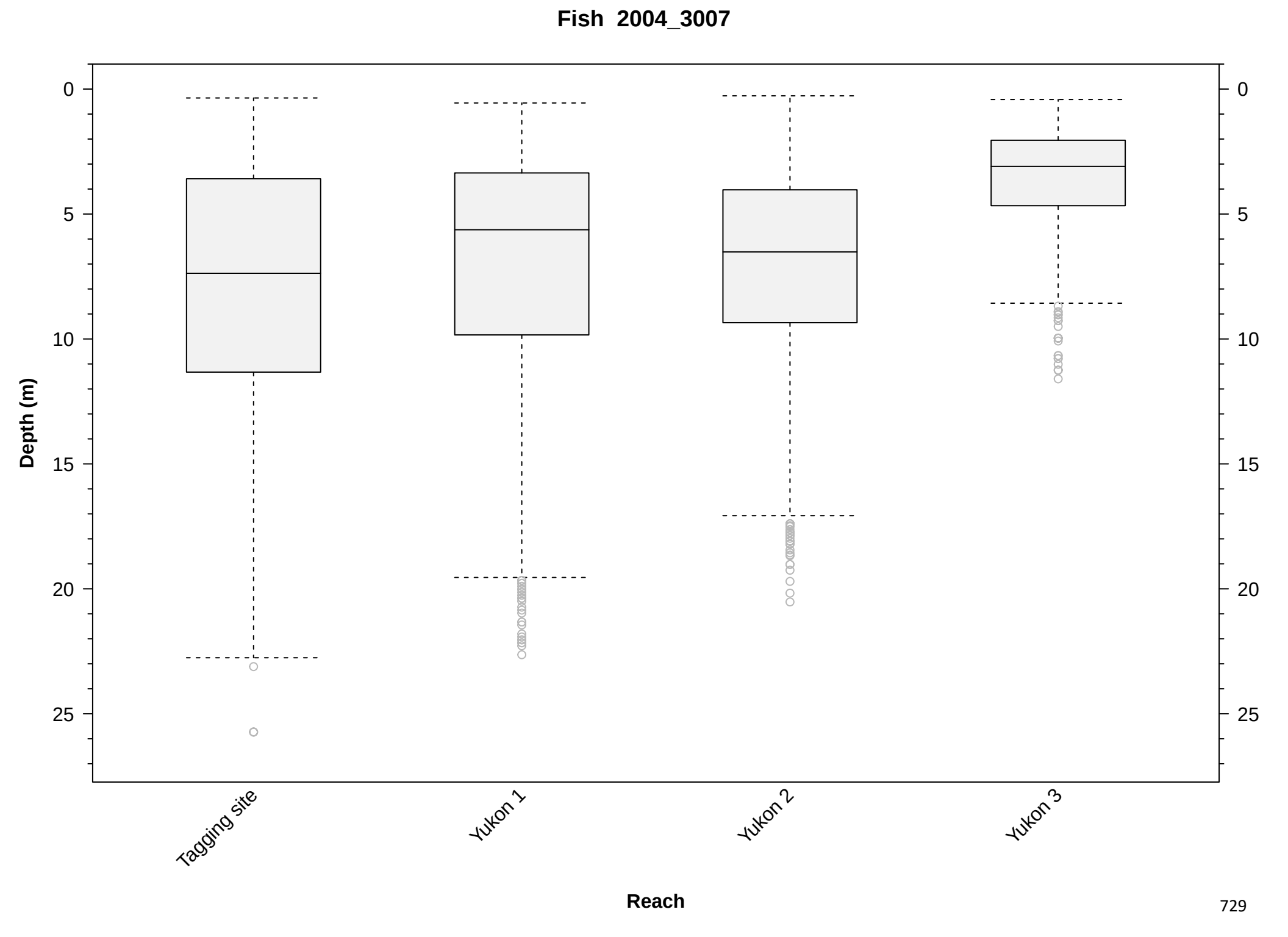

Fish 2003_3138
Temperature (C)
19.0
18.5
18.0
17.5
17.0
16.5
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach

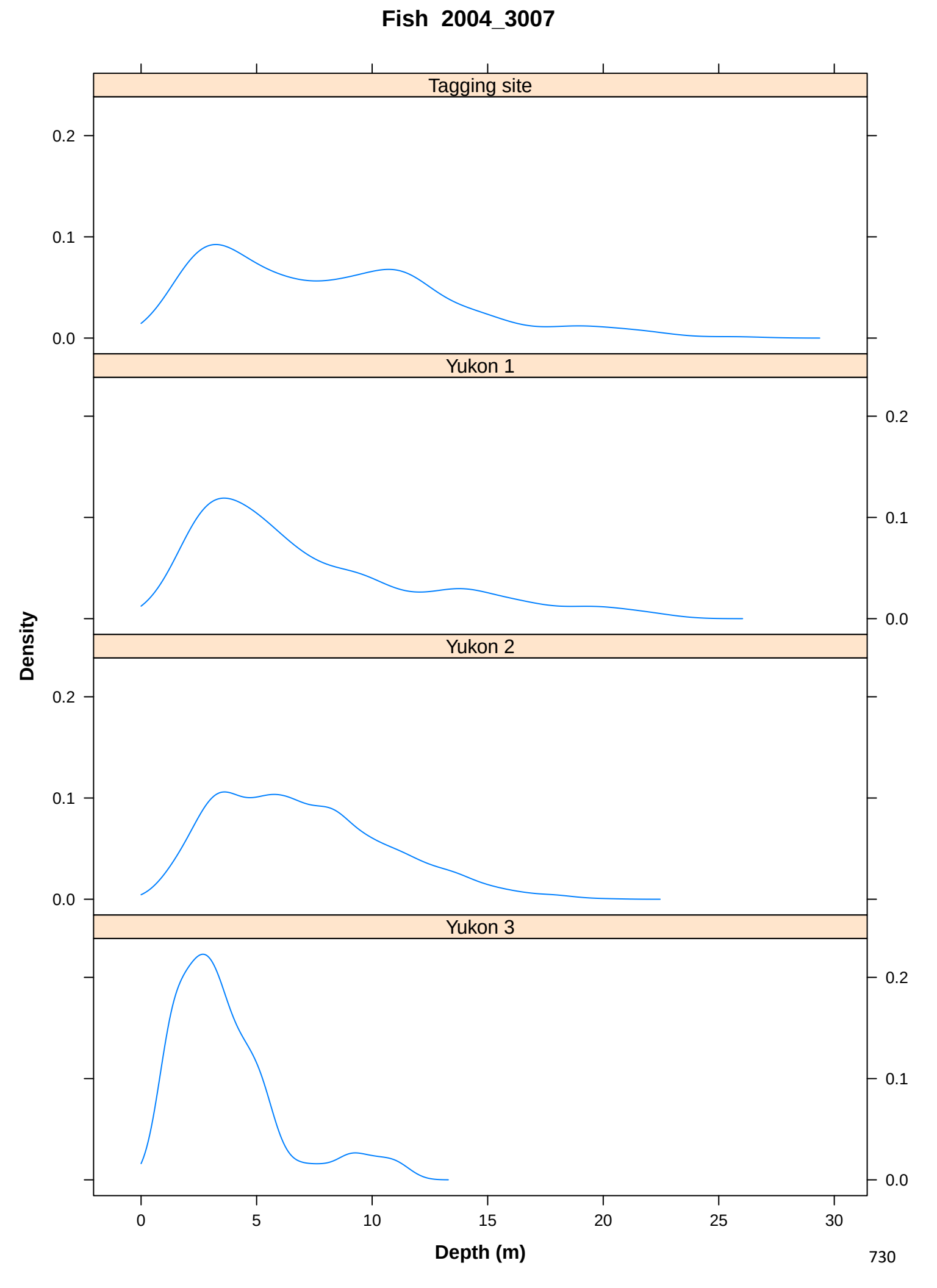

Fish 2003_3138
16.5
17.0
17.5
18.0
18.5
19.0
19.5
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
0
2
Temperature (C)

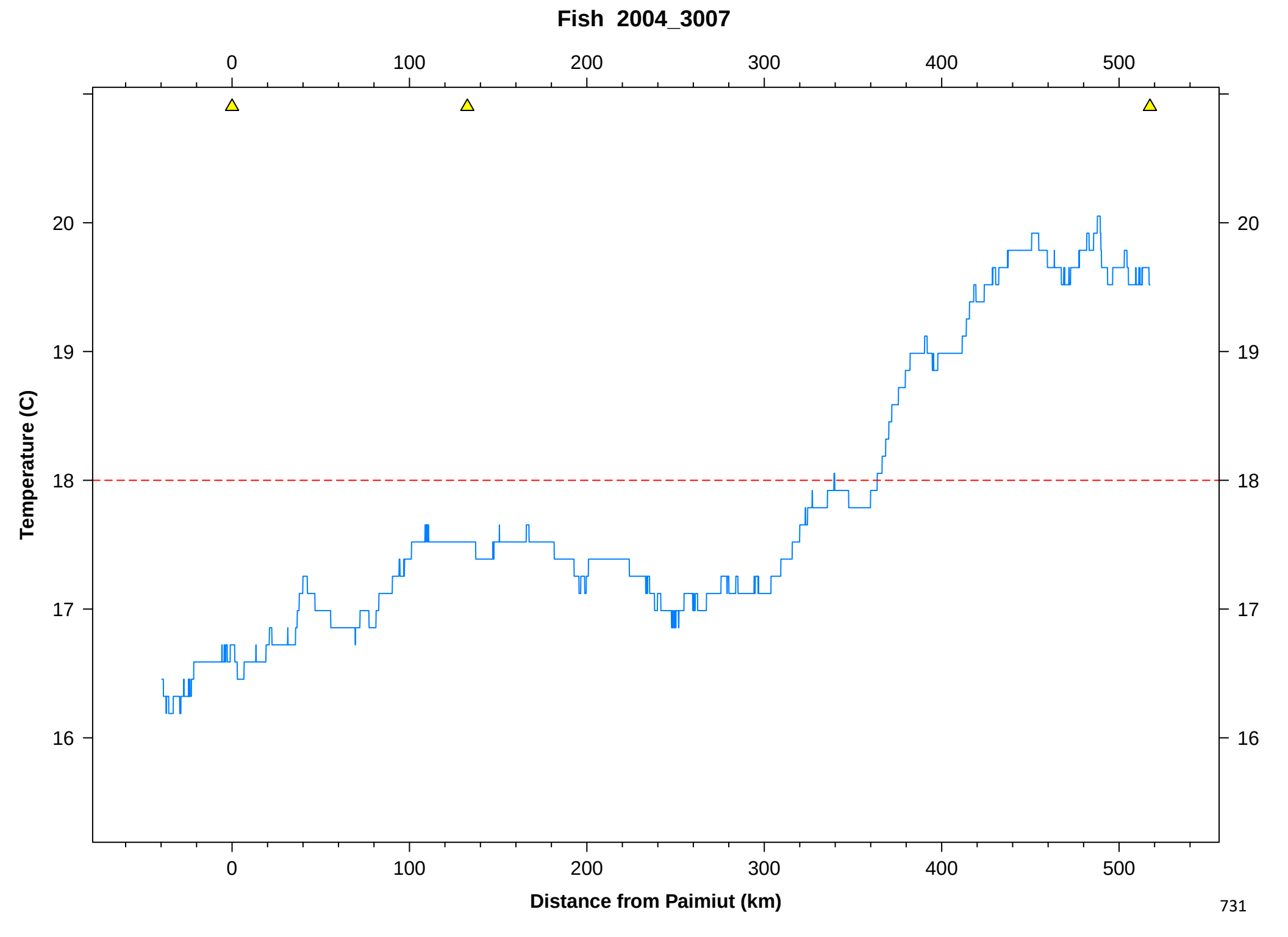

Fish 2003_3138
Tagging site
Yukon 1
Yukon 2
Yukon 3
Depth (m)
Temperature (C)
16.5
17.0
17.5
18.0
18.5
19.0
0
10
20

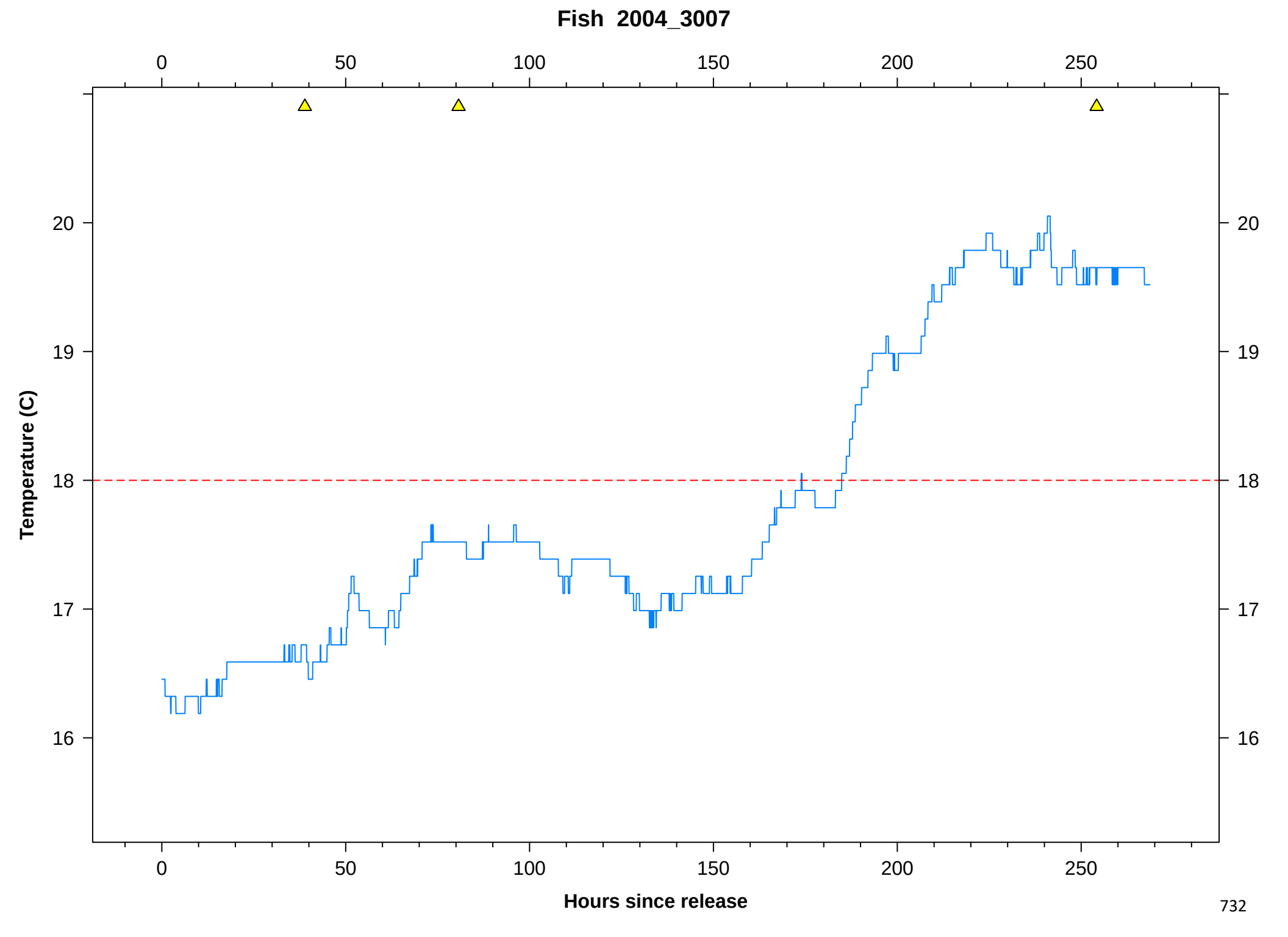

Fish 2004_3007
0
100
200
300
400
500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

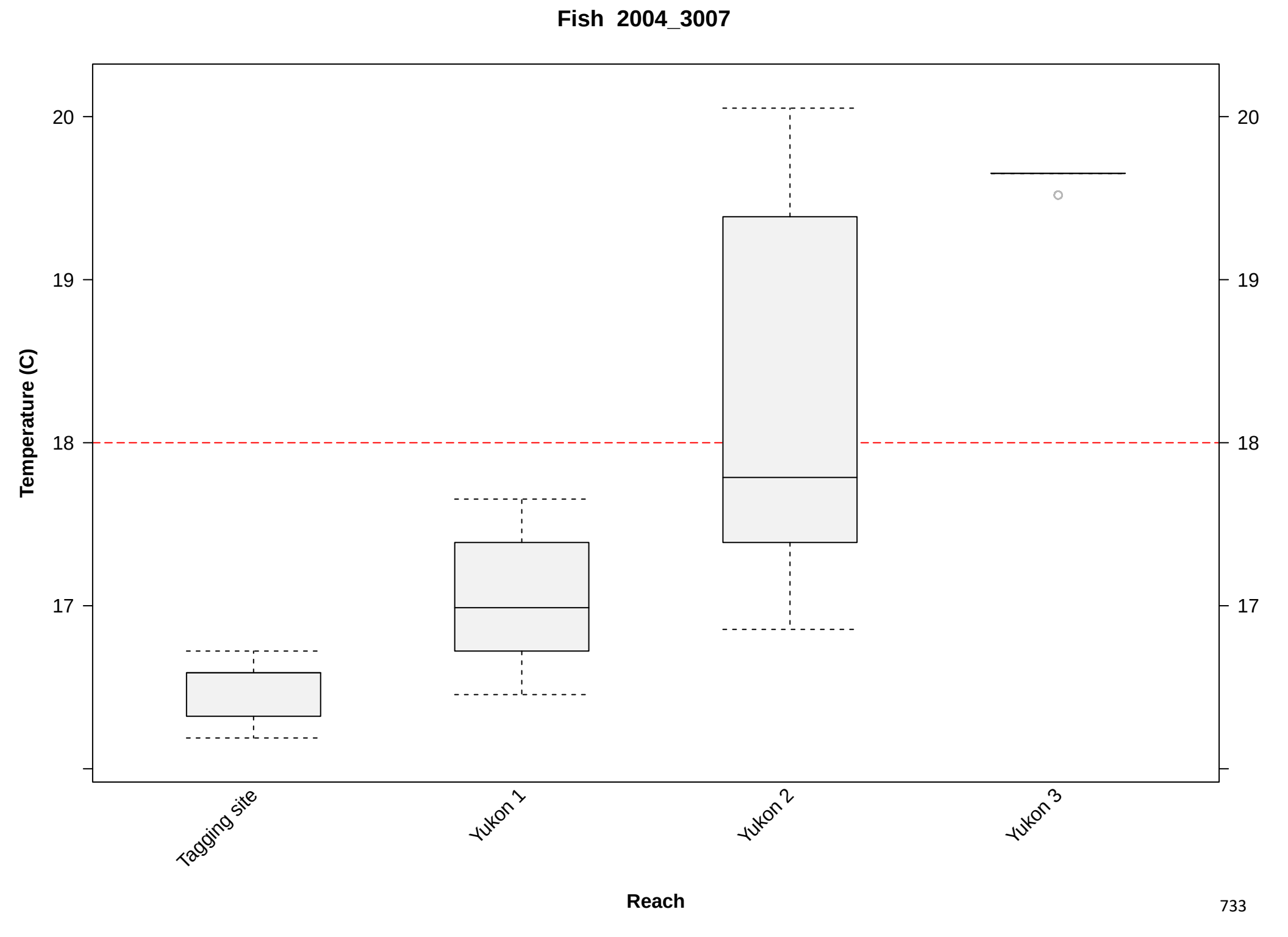

Fish 2004_3007
0
50
100
150
200
250
0
5
10
15
20
25
Depth (m)
Hours since release

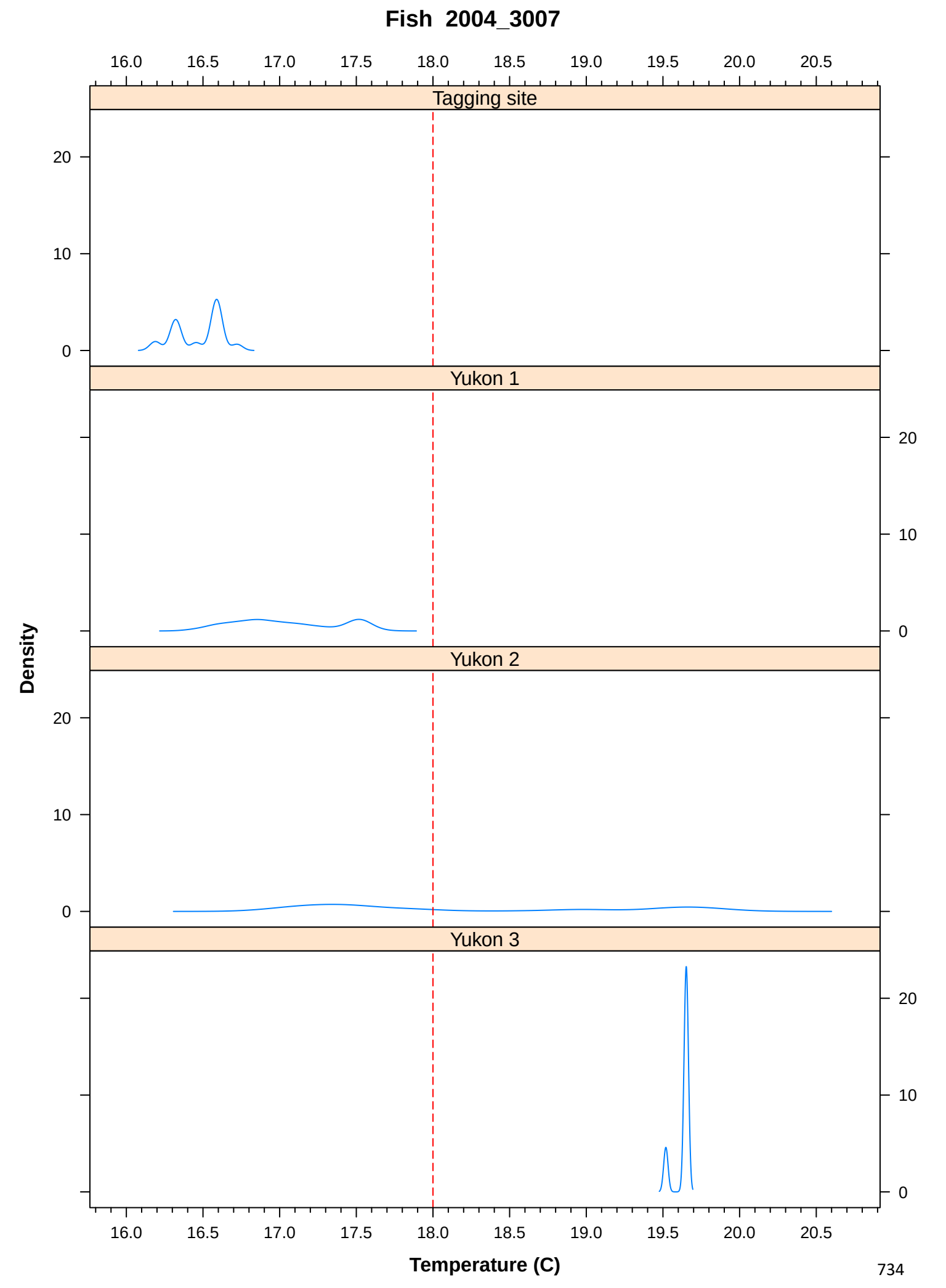

Fish 2004_3007
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach

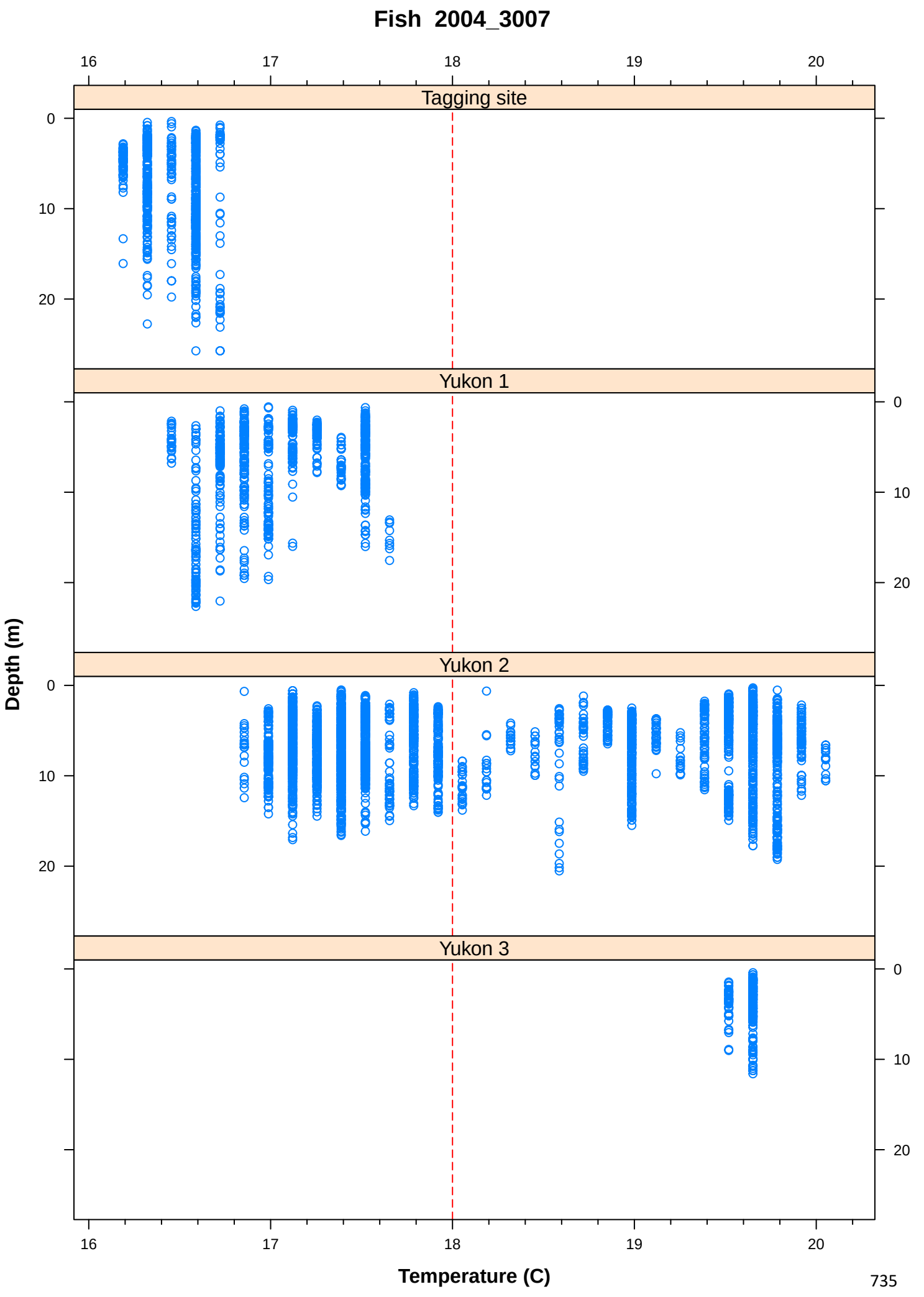

Fish 2004_3007
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
0.0
0.1
0.2
0
5
10
15
20
25
30
Depth (m)
730

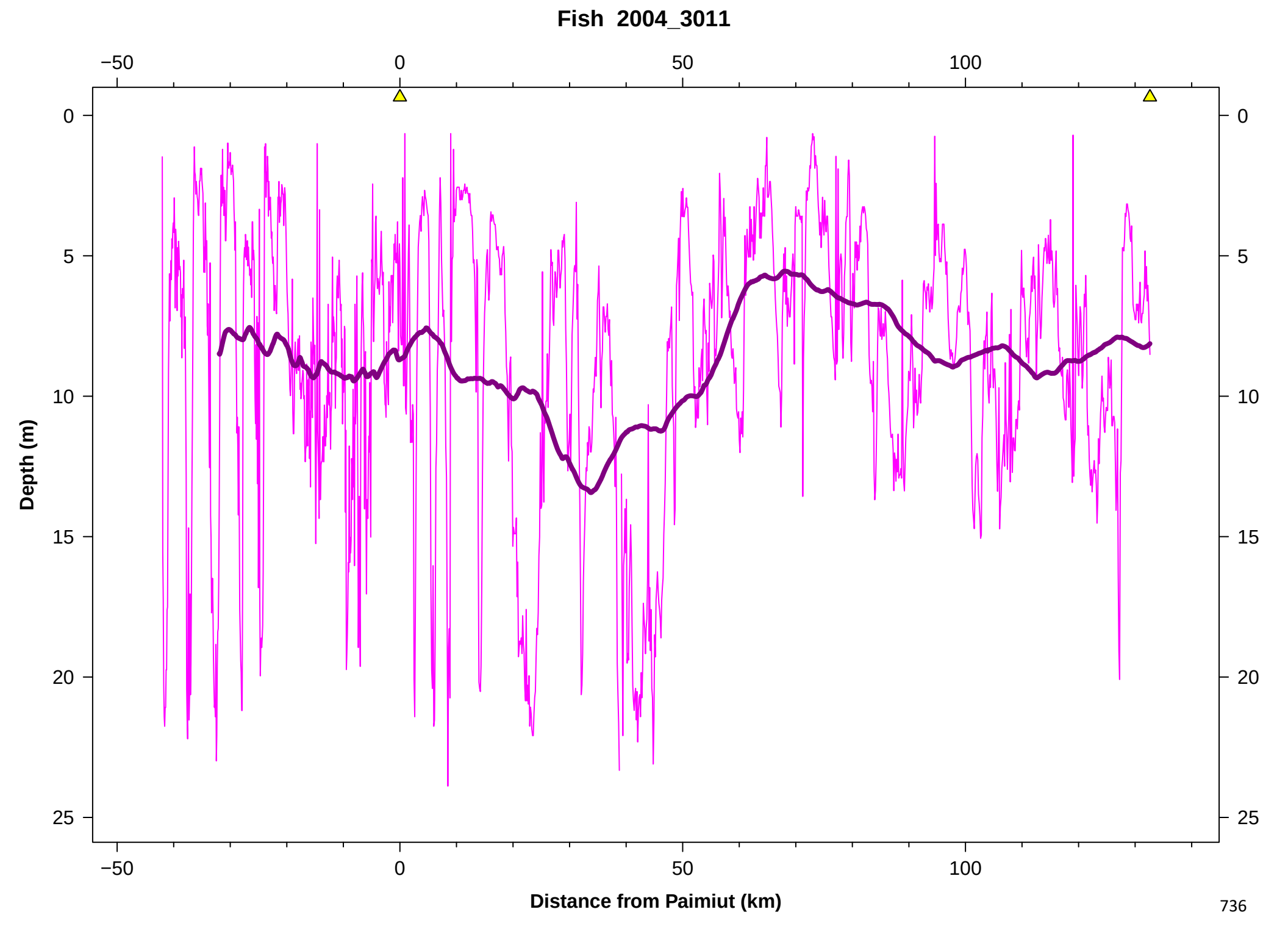

Fish 2004_3007
0
100
200
300
400
500
20
19
18
17
16
Temperature (C)
Distance from Paimiut (km)

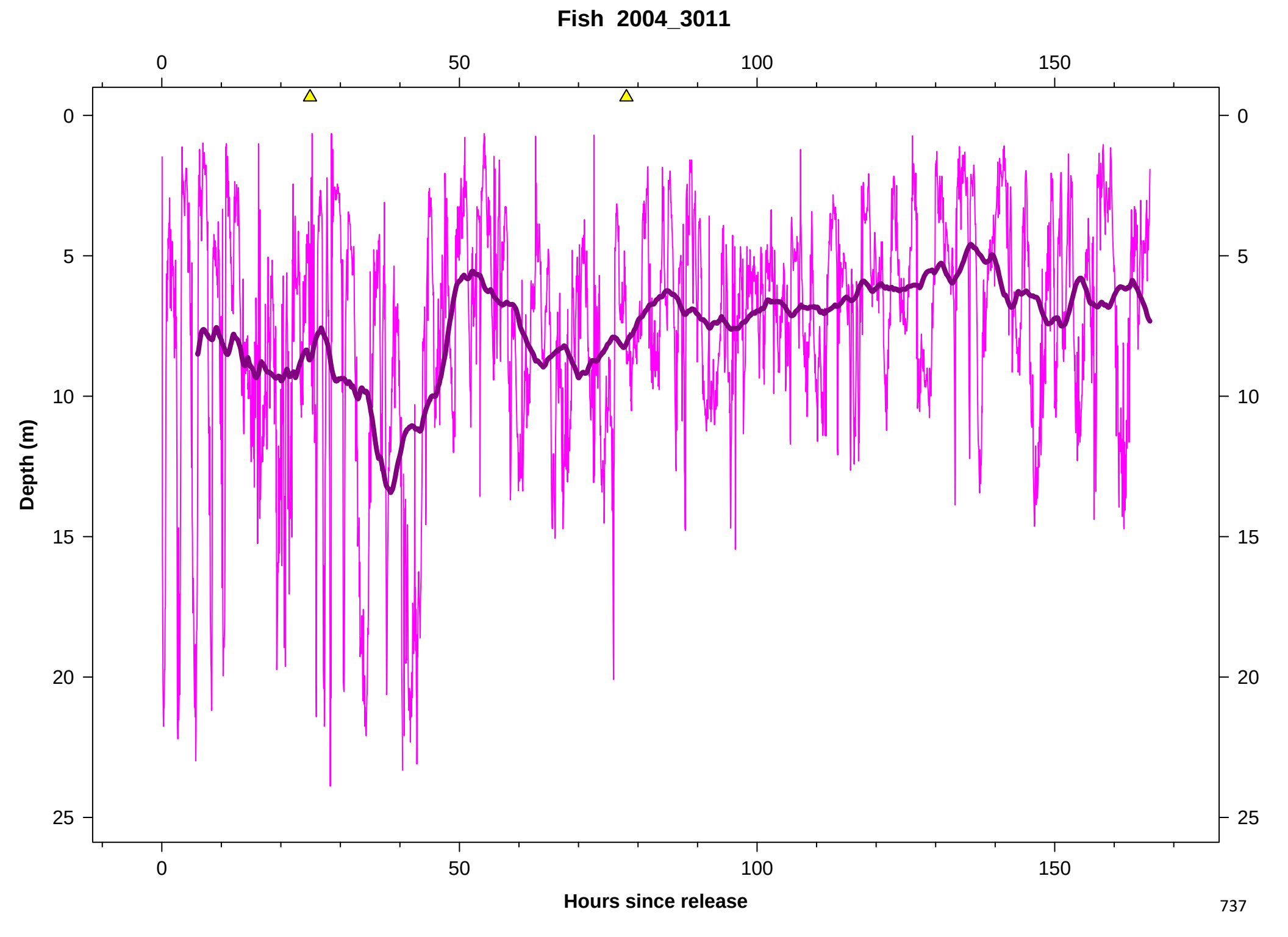

Fish 2004_3007
0
50
100
150
200
250
20
19
18
17
16
Temperature (C)
Hours since release

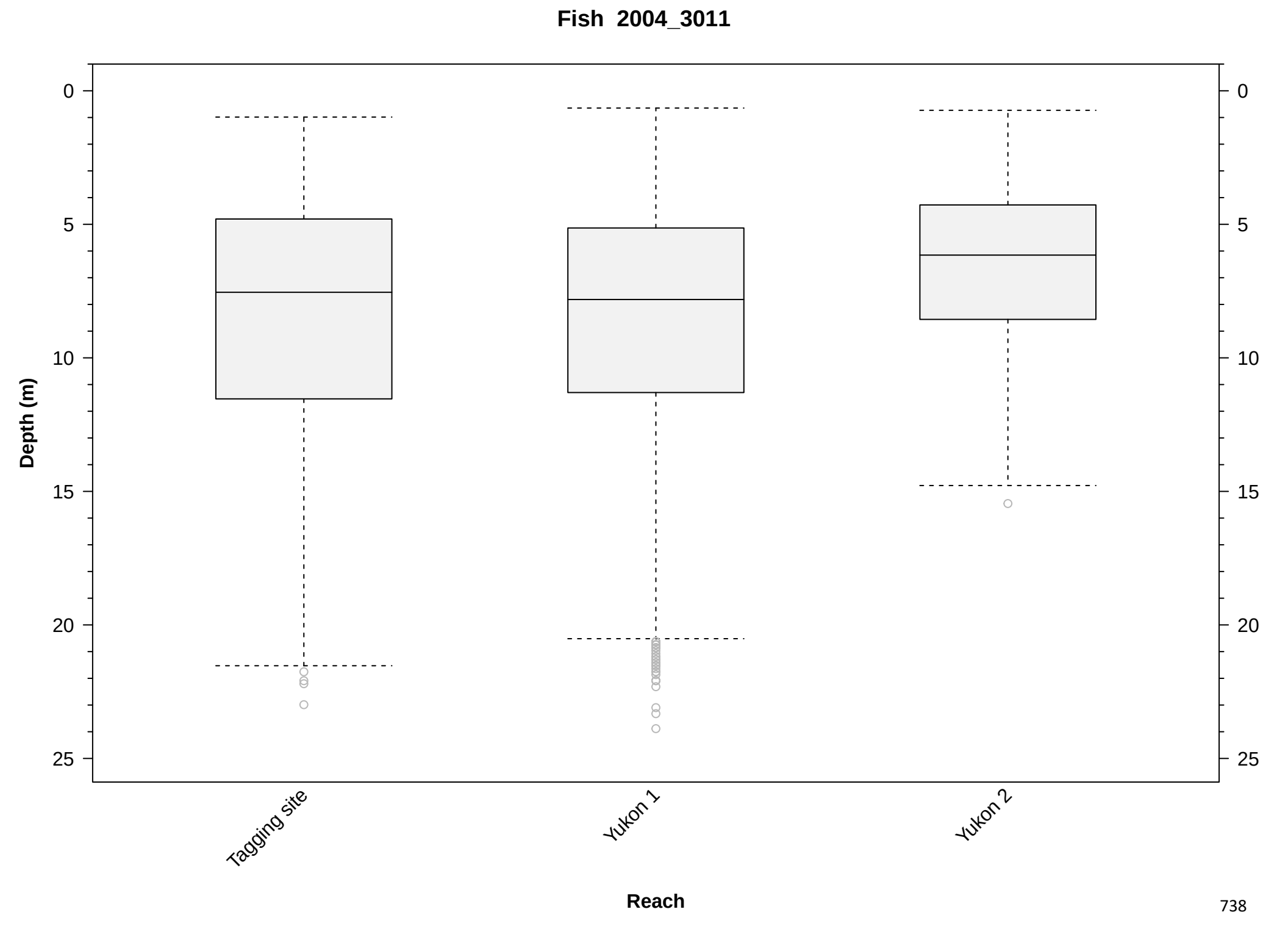

Fish 2004_3007
Temperature (C)
20
19
18
17
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach

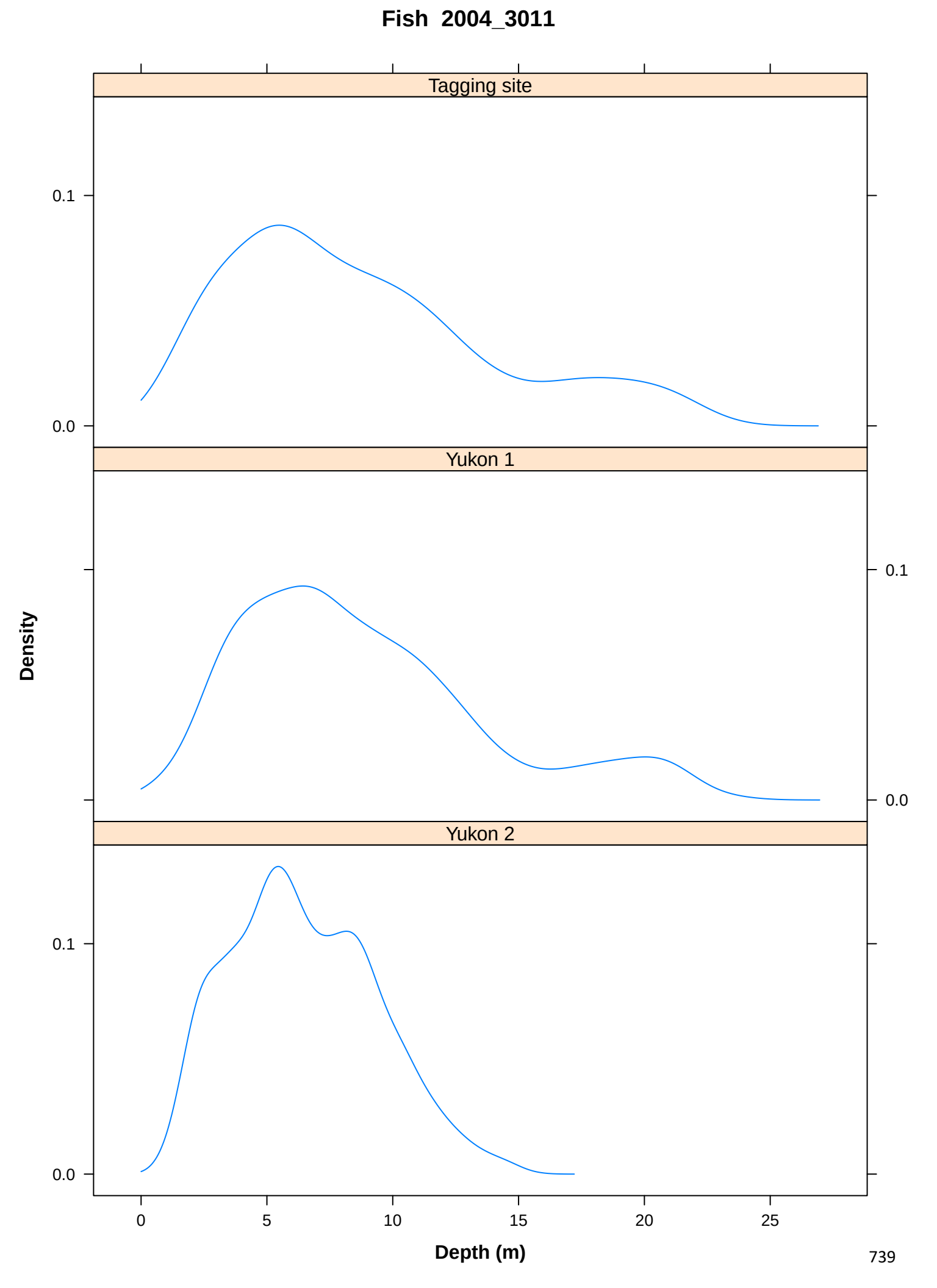

Fish 2004_3007
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
Temperature (C)
16.0
16.5
17.0
17.5
18.0
18.5
19.0
19.5
20.0
20.5
0
10
20

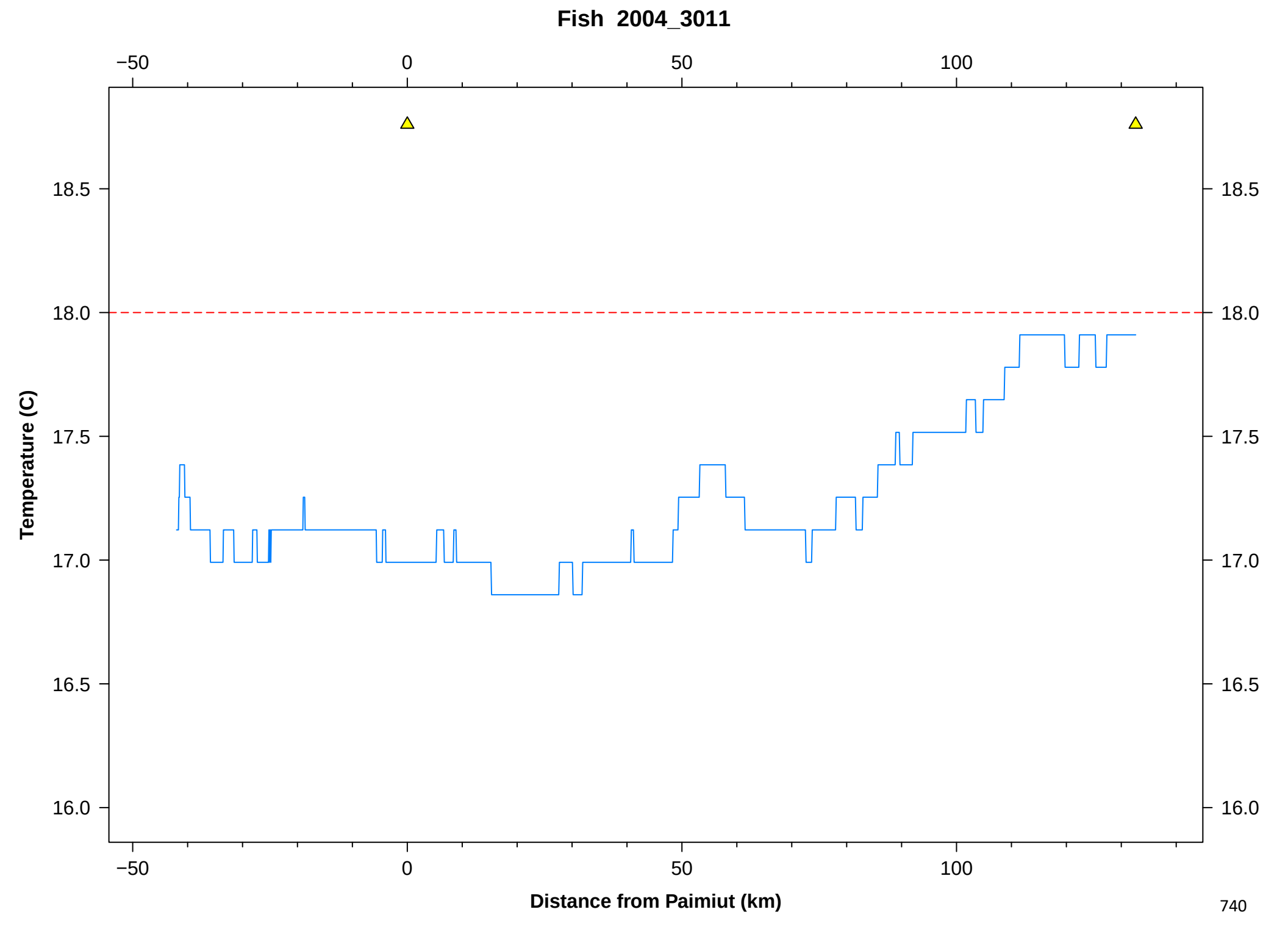

Fish 2004_3007
Tagging site
Yukon 1
Yukon 2
Yukon 3
Depth (m)
Temperature (C)
16
17
18
19
20
0
10
20

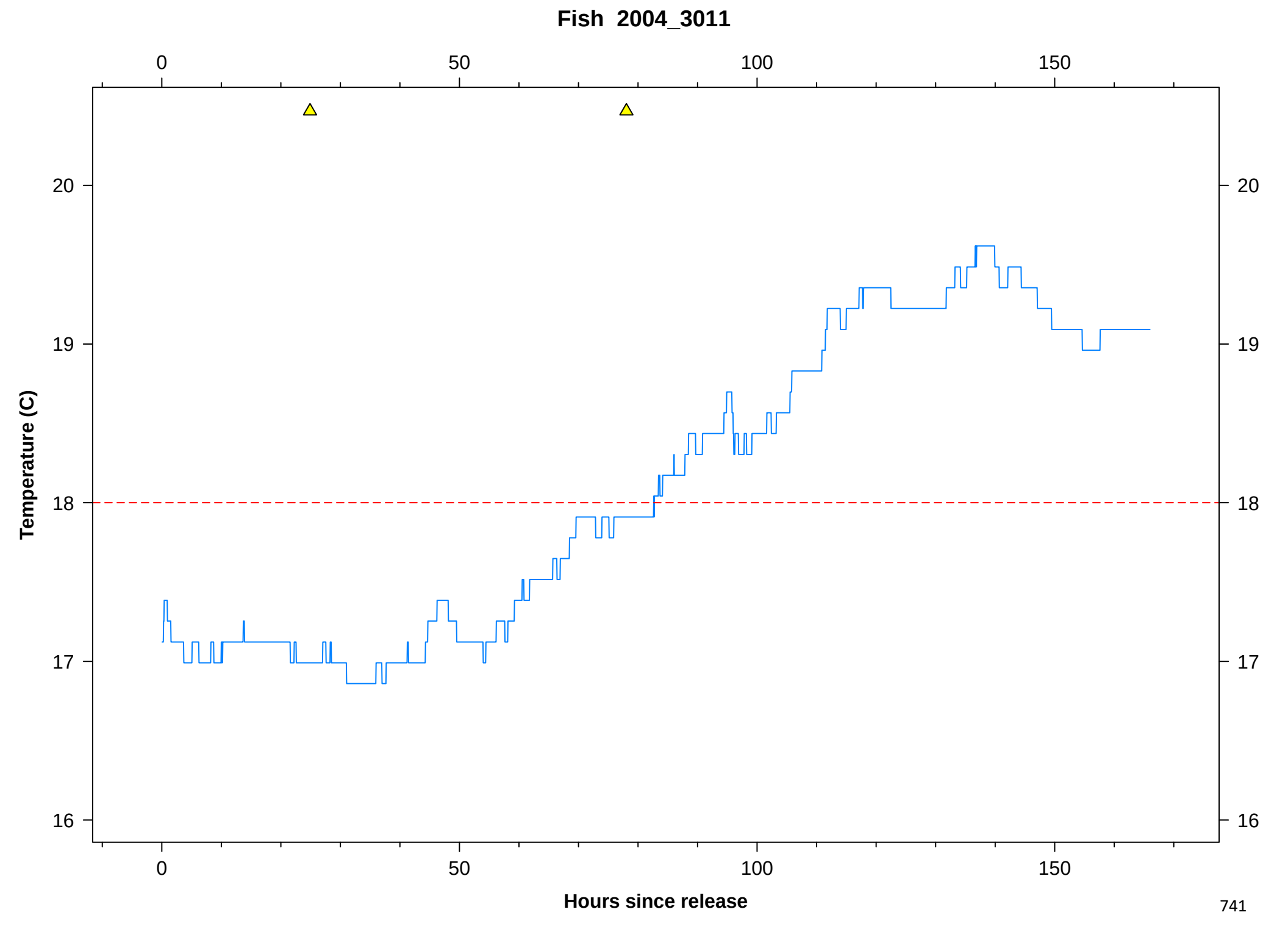

Fish 2004_3011
−50
0
50
100
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

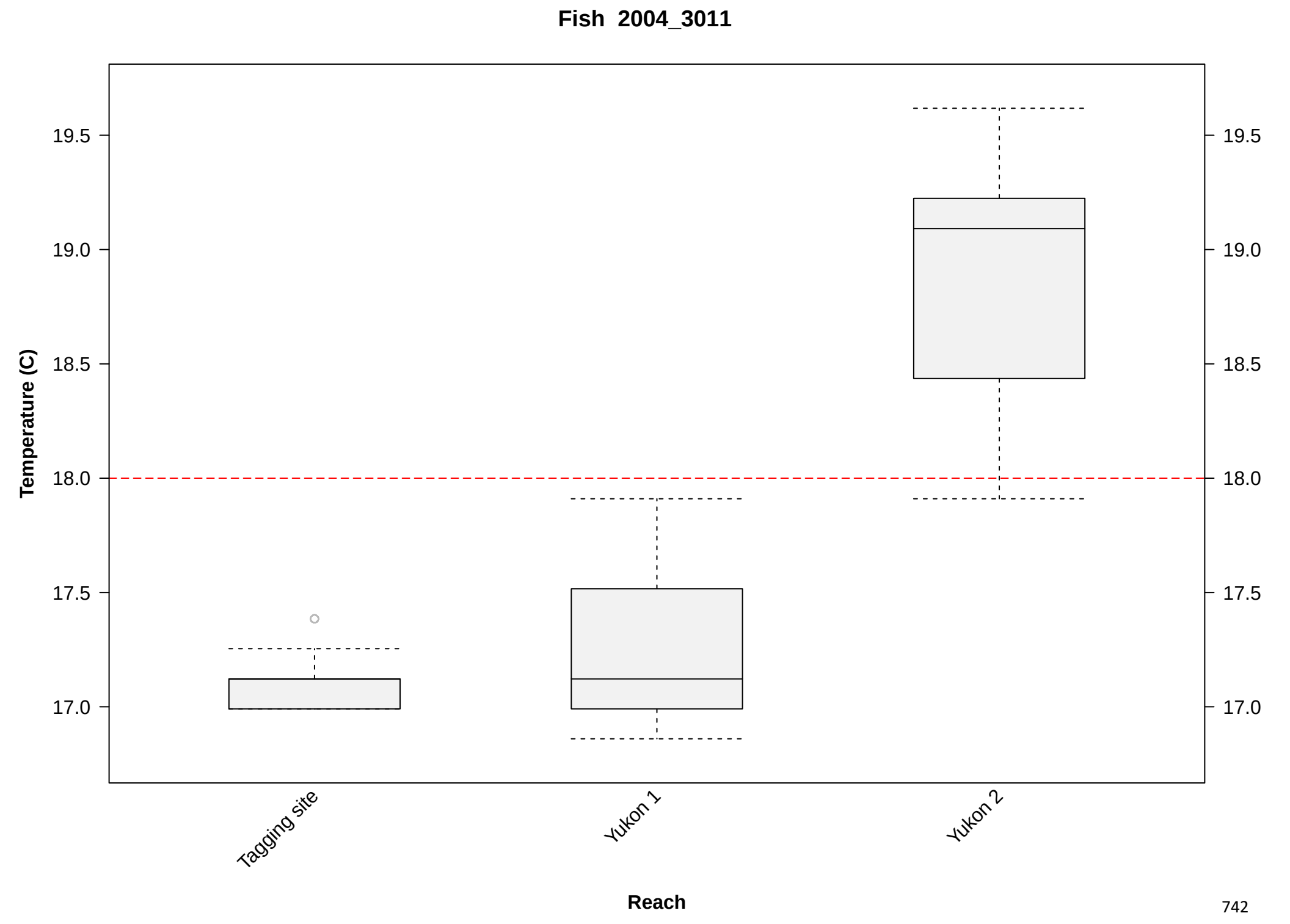

Fish 2004_3011
0
50
100
150
0
5
10
15
20
25
Depth (m)
Hours since release

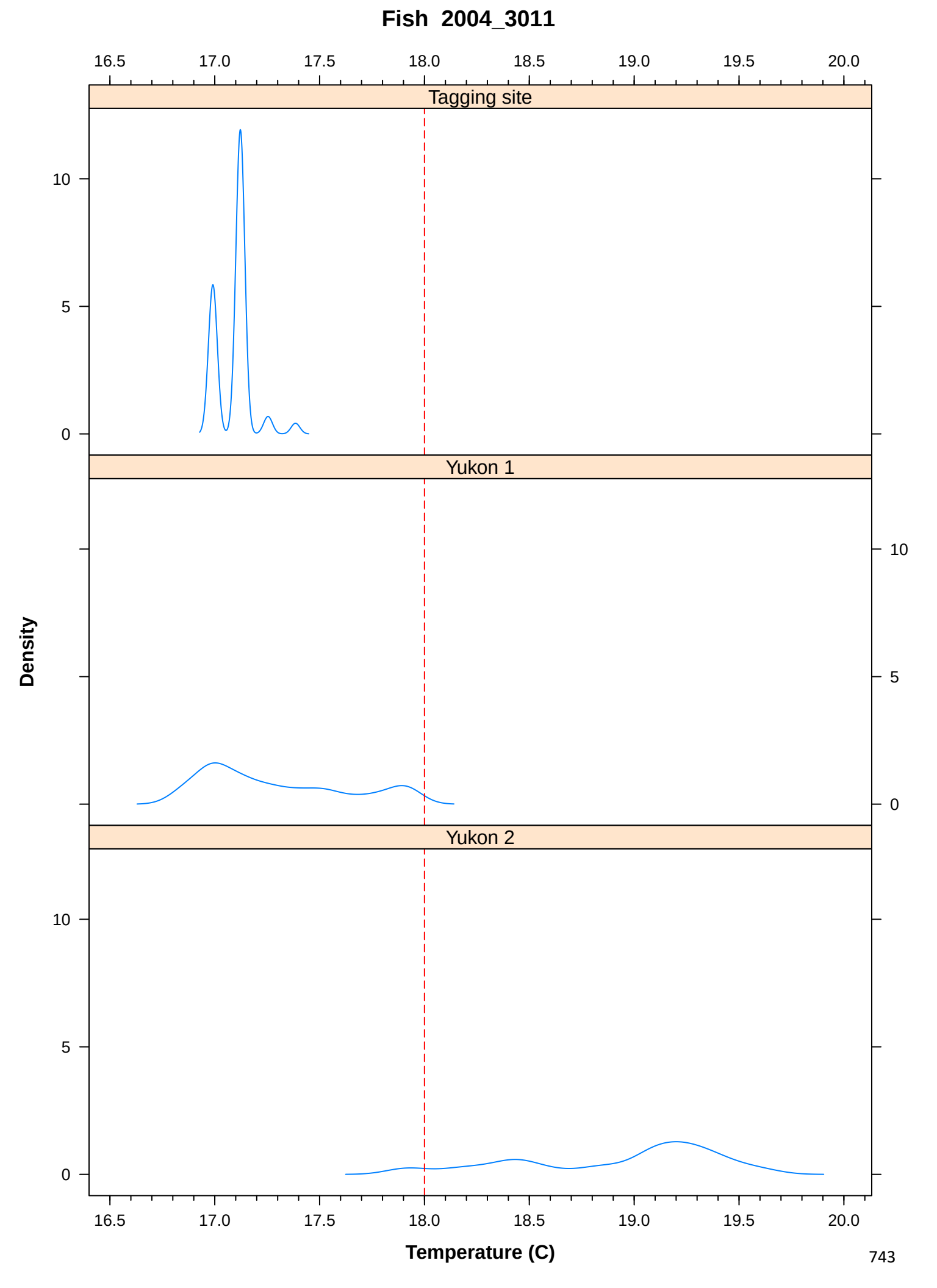

Fish 2004_3011
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Reach

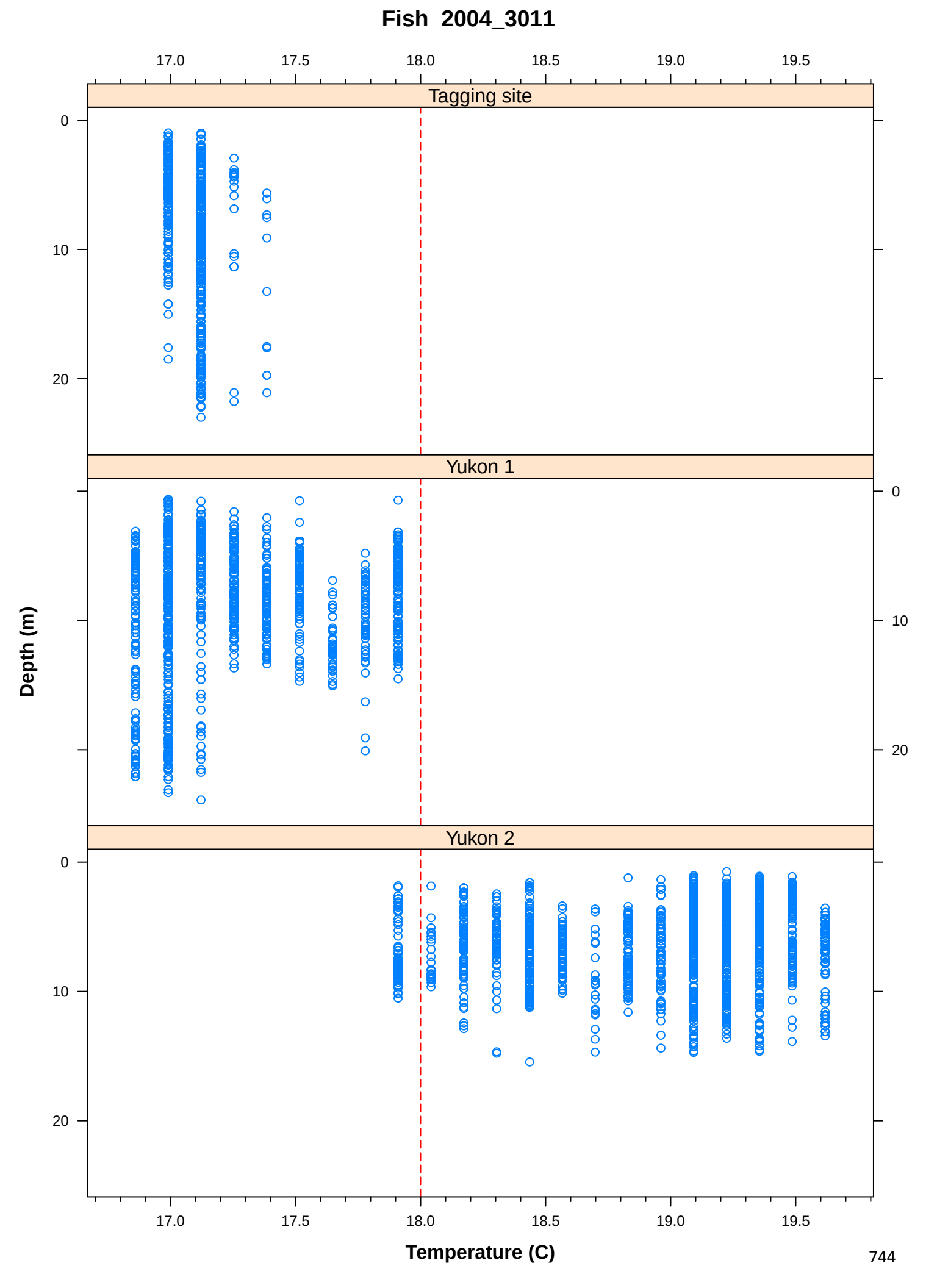

Fish 2004_3011
Tagging site
Yukon 1
Yukon 2
Density
0.1
0.0
0
5
10
15
20
25
Depth (m)

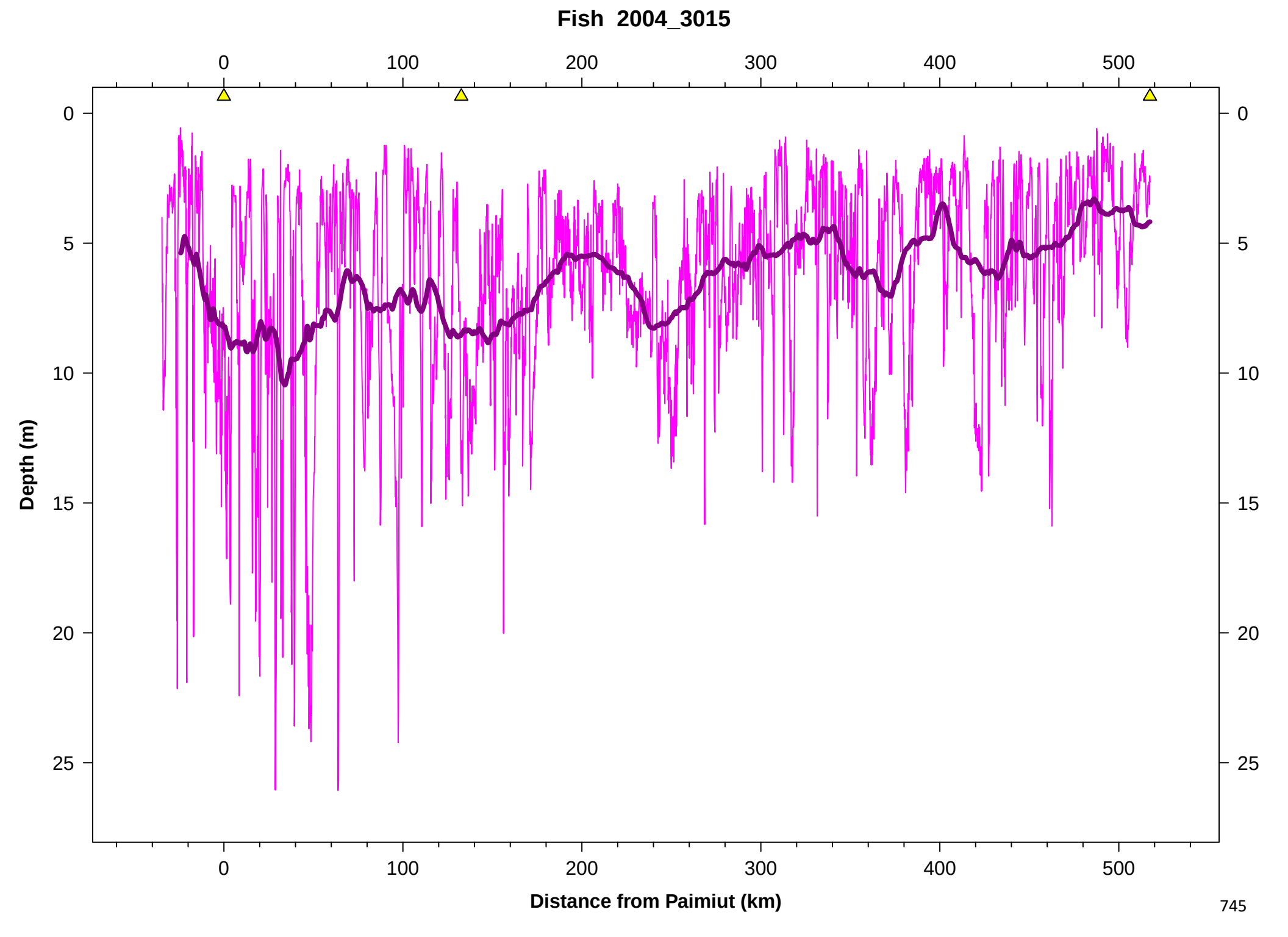

Fish 2004_3011
−50
0
50
100
18.5
18.0
17.5
17.0
16.5
16.0
Temperature (C)
Distance from Paimiut (km)

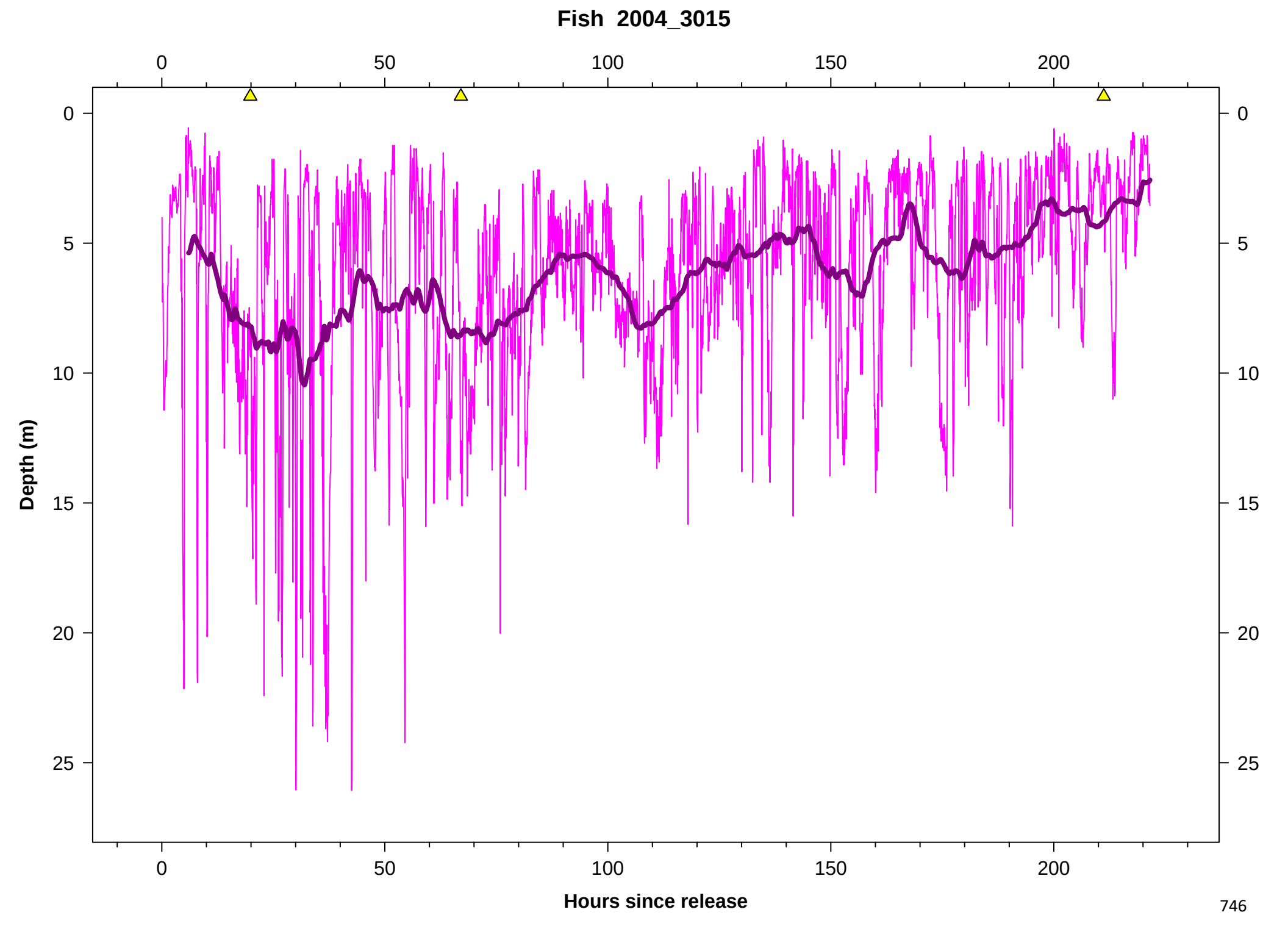

Fish 2004_3011
0
50
100
150
20
19
18
17
16
Temperature (C)
Hours since release
741

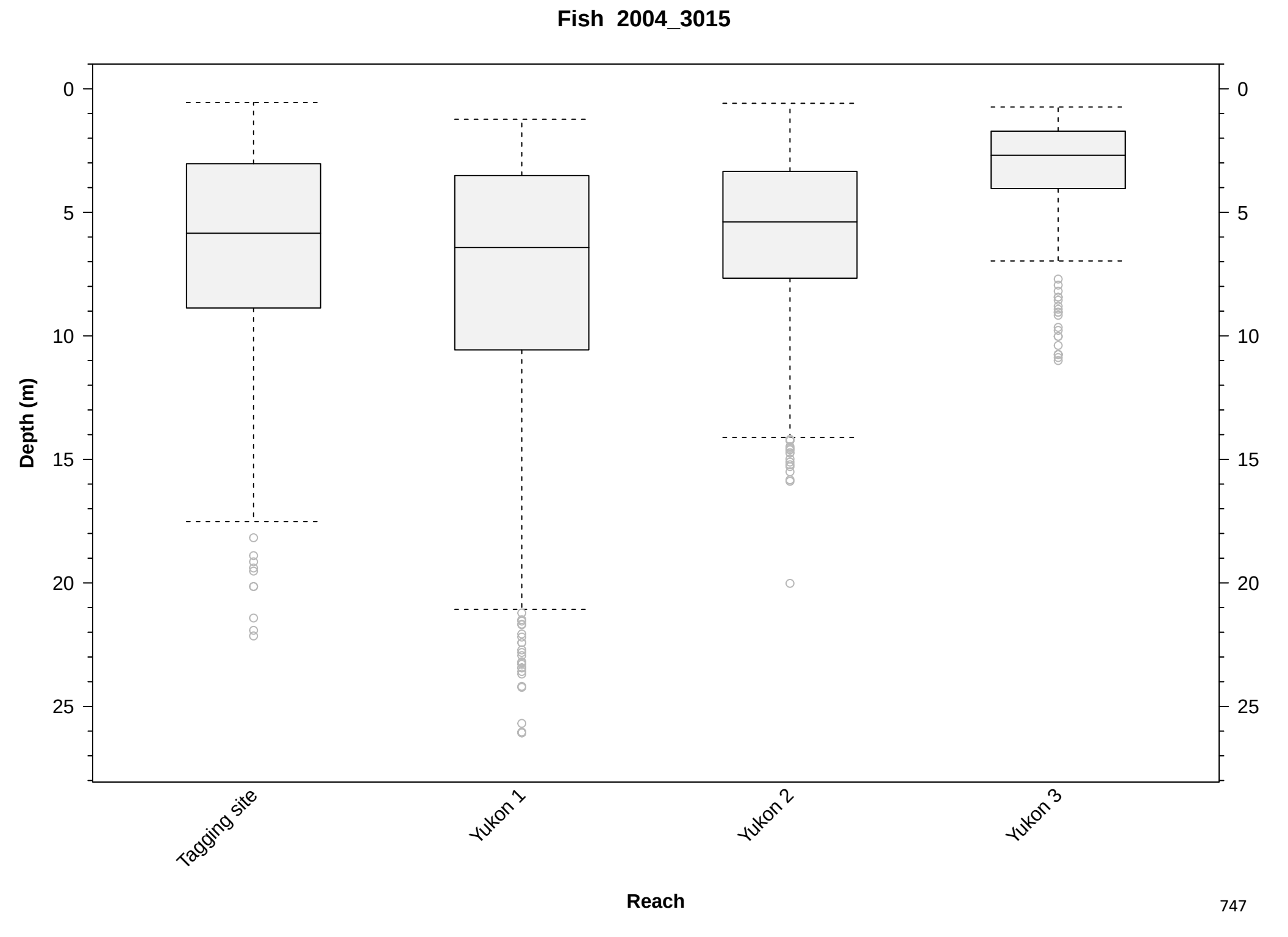

Fish 2004_3011
Temperature (C)
19.5
19.0
18.5
18.0
17.5
17.0
Tagging site
Yukon 1
Yukon 2
Reach

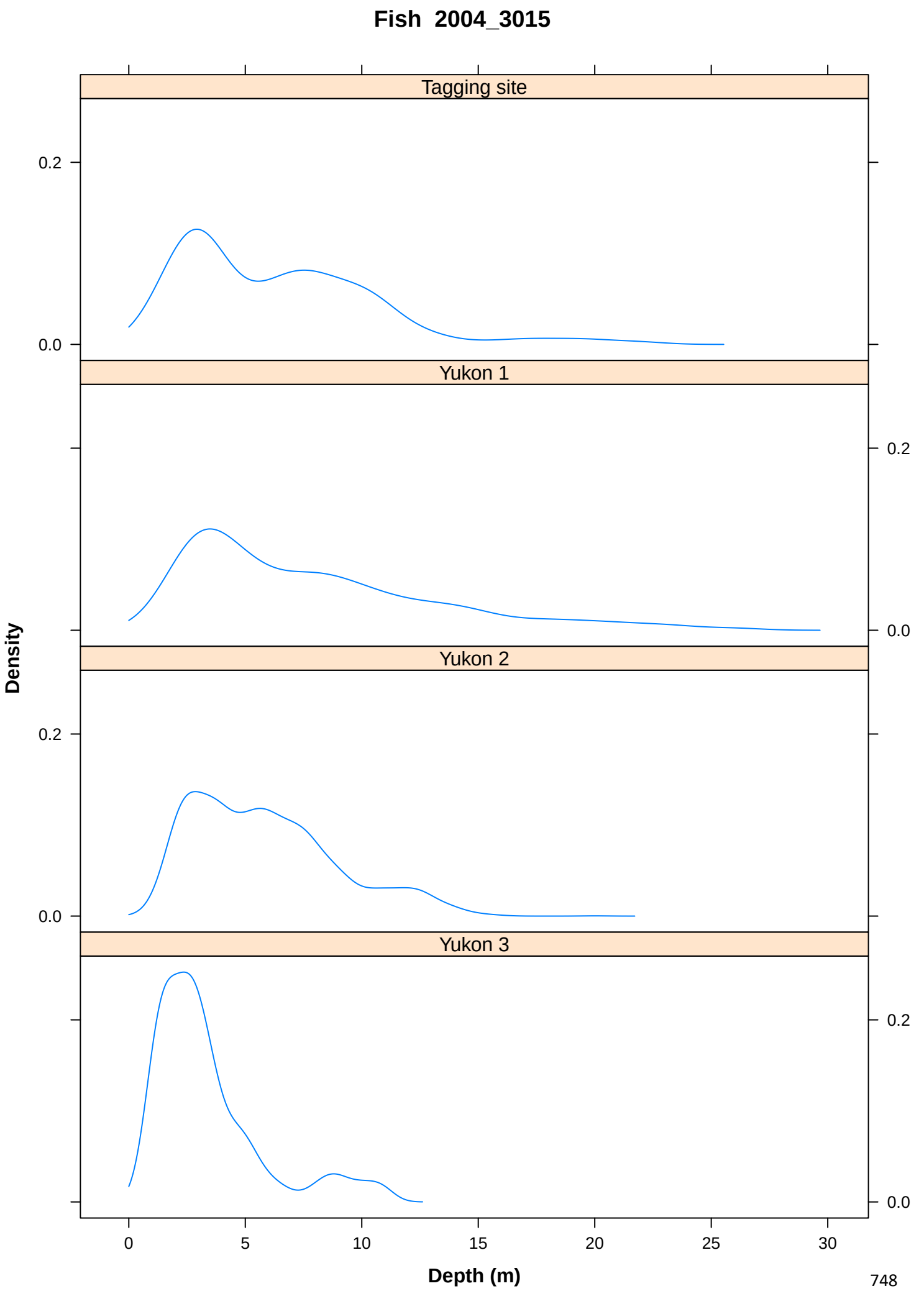

Fish 2004_3011
16.5
17.0
17.5
18.0
18.5
19.0
19.5
20.0
Tagging site
Yukon 1
Yukon 2
10
5
0
Density
Temperature (C)

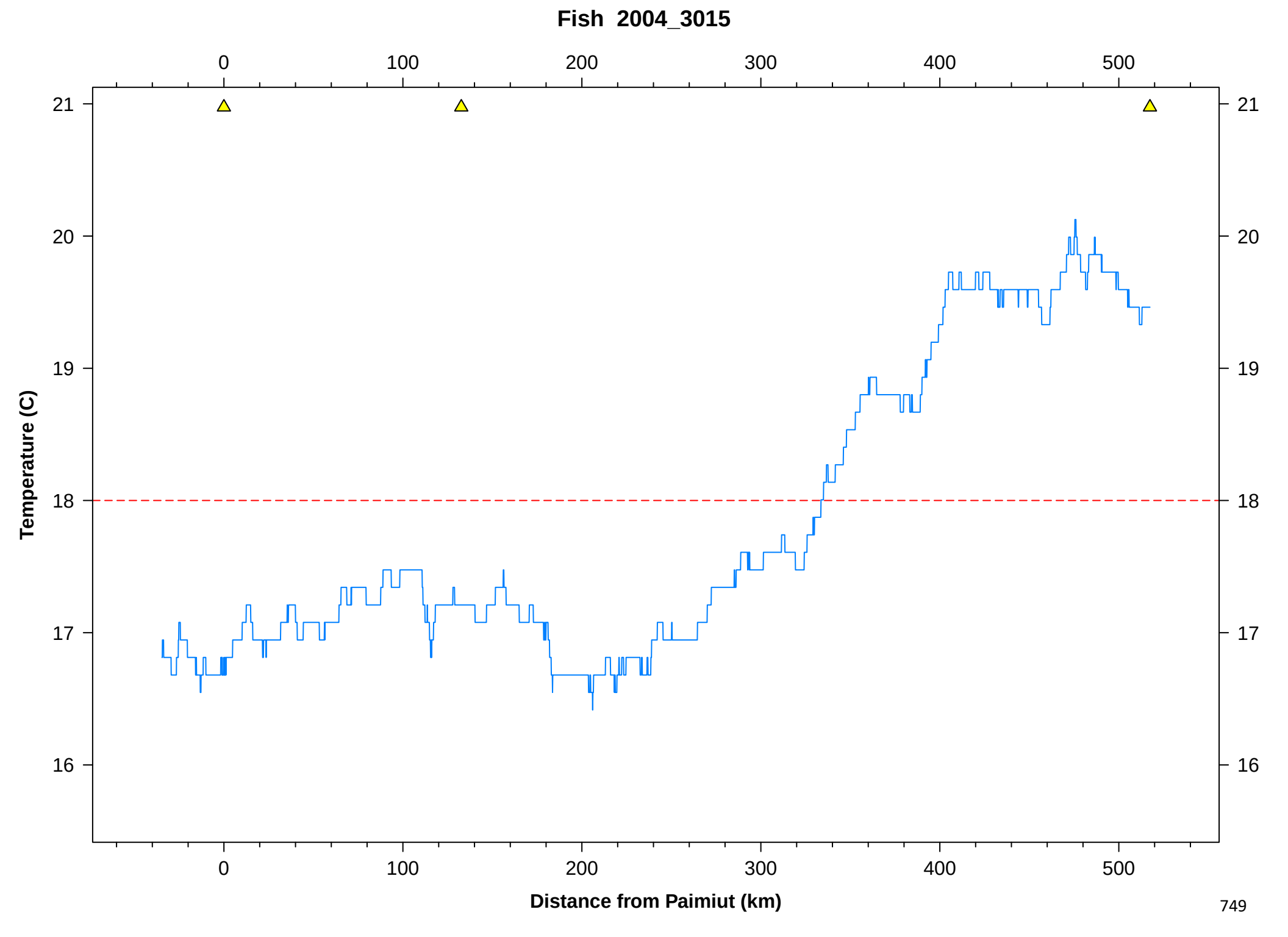

Fish 2004_3011
Tagging site
Yukon 1
Yukon 2
Depth (m)
Temperature (C)
17.0
17.5
18.0
18.5
19.0
19.5
0
10
20

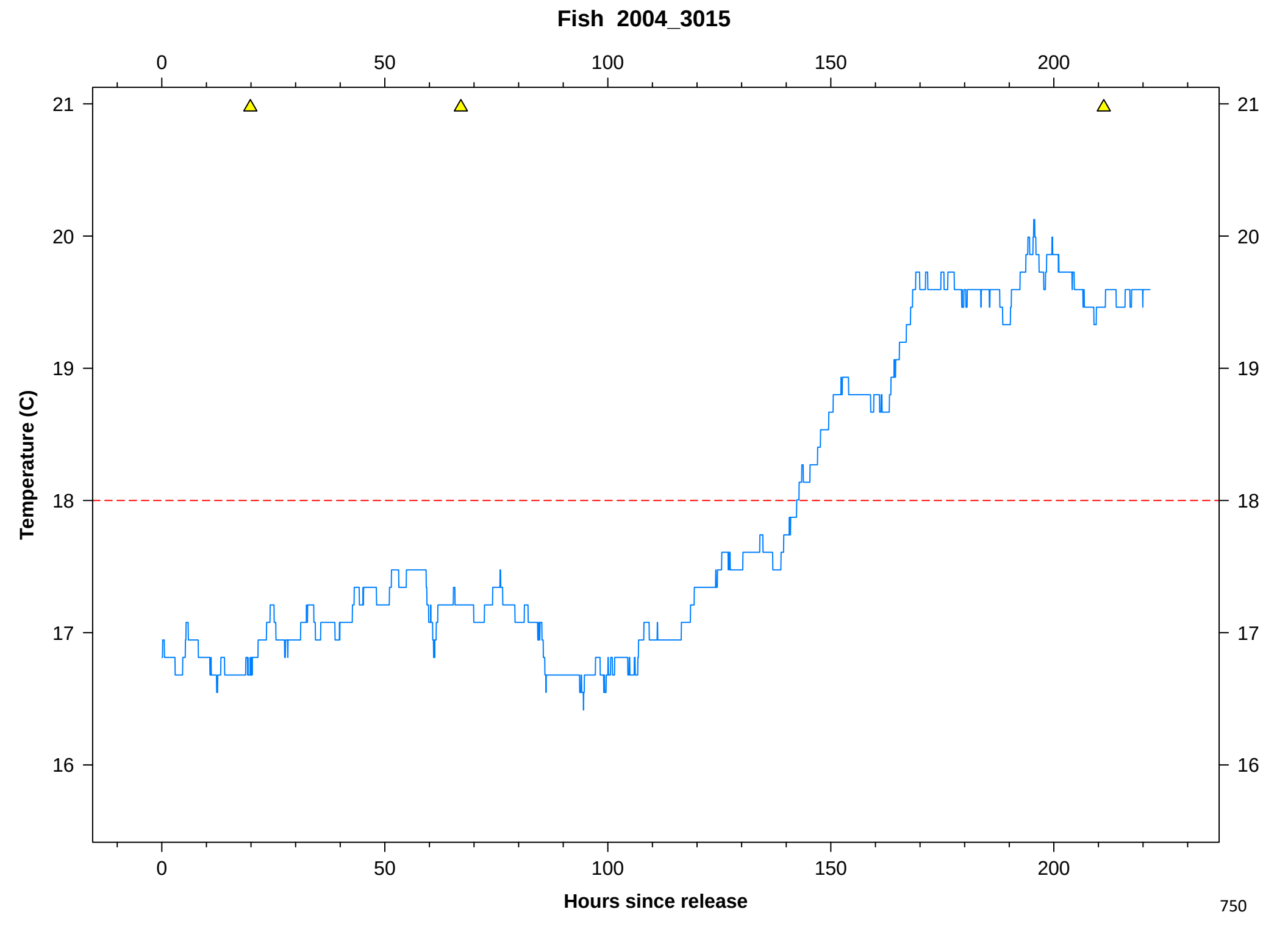

Fish 2004_3015
0
100
200
300
400
500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

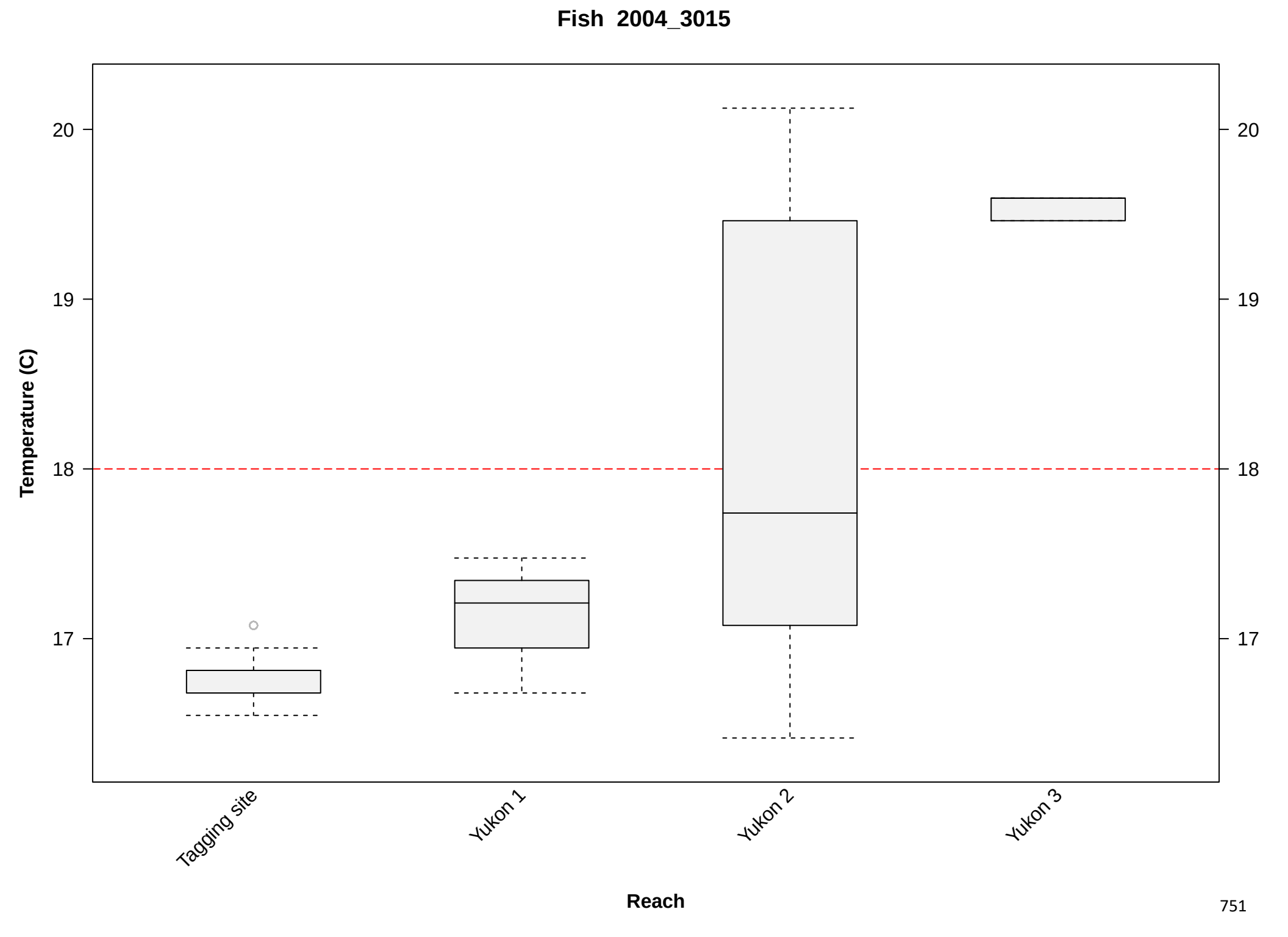

Fish 2004_3015
0
50
100
150
200
0
5
10
15
20
25
Depth (m)
Hours since release

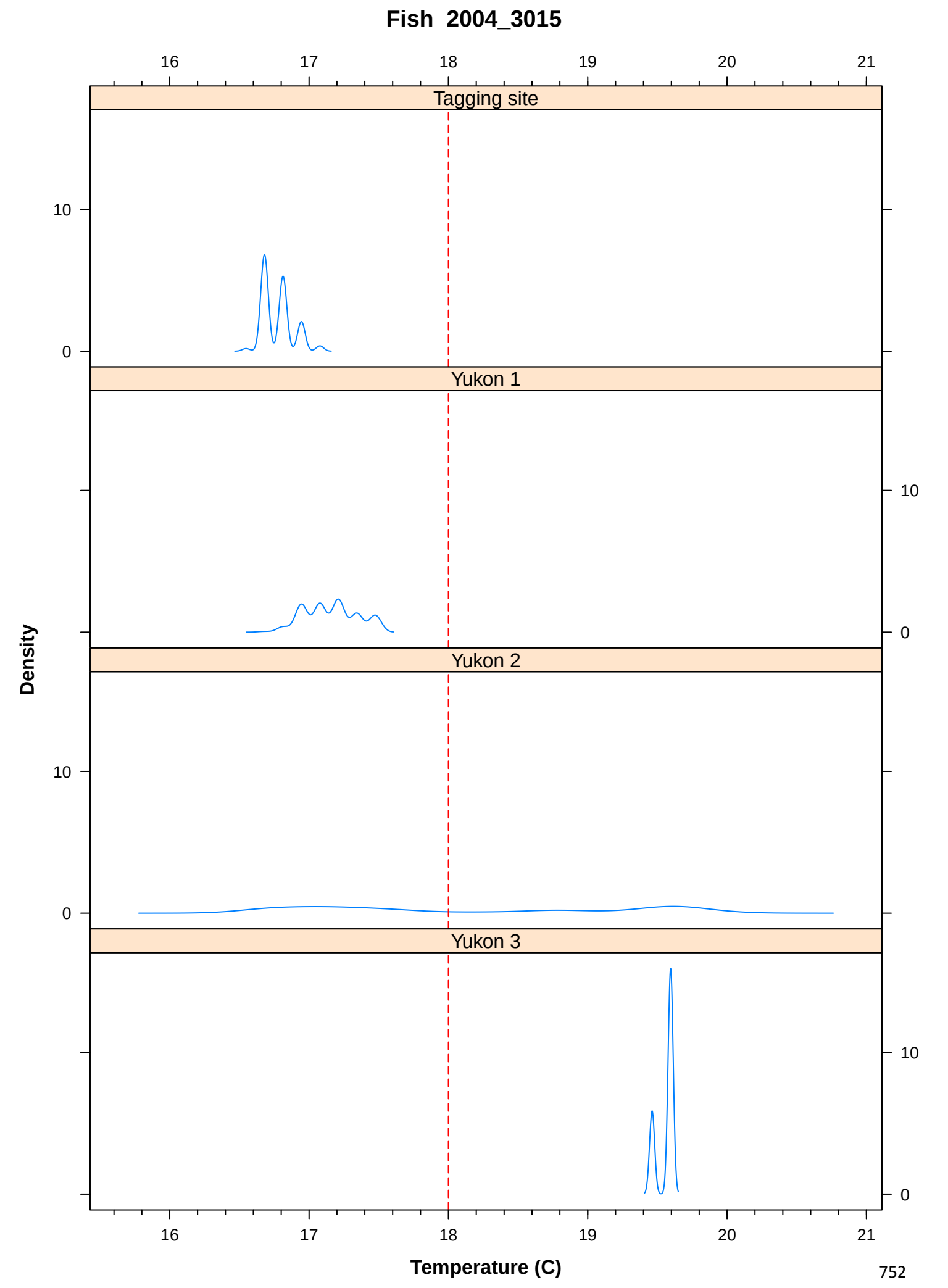

Fish 2004_3015
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach
747

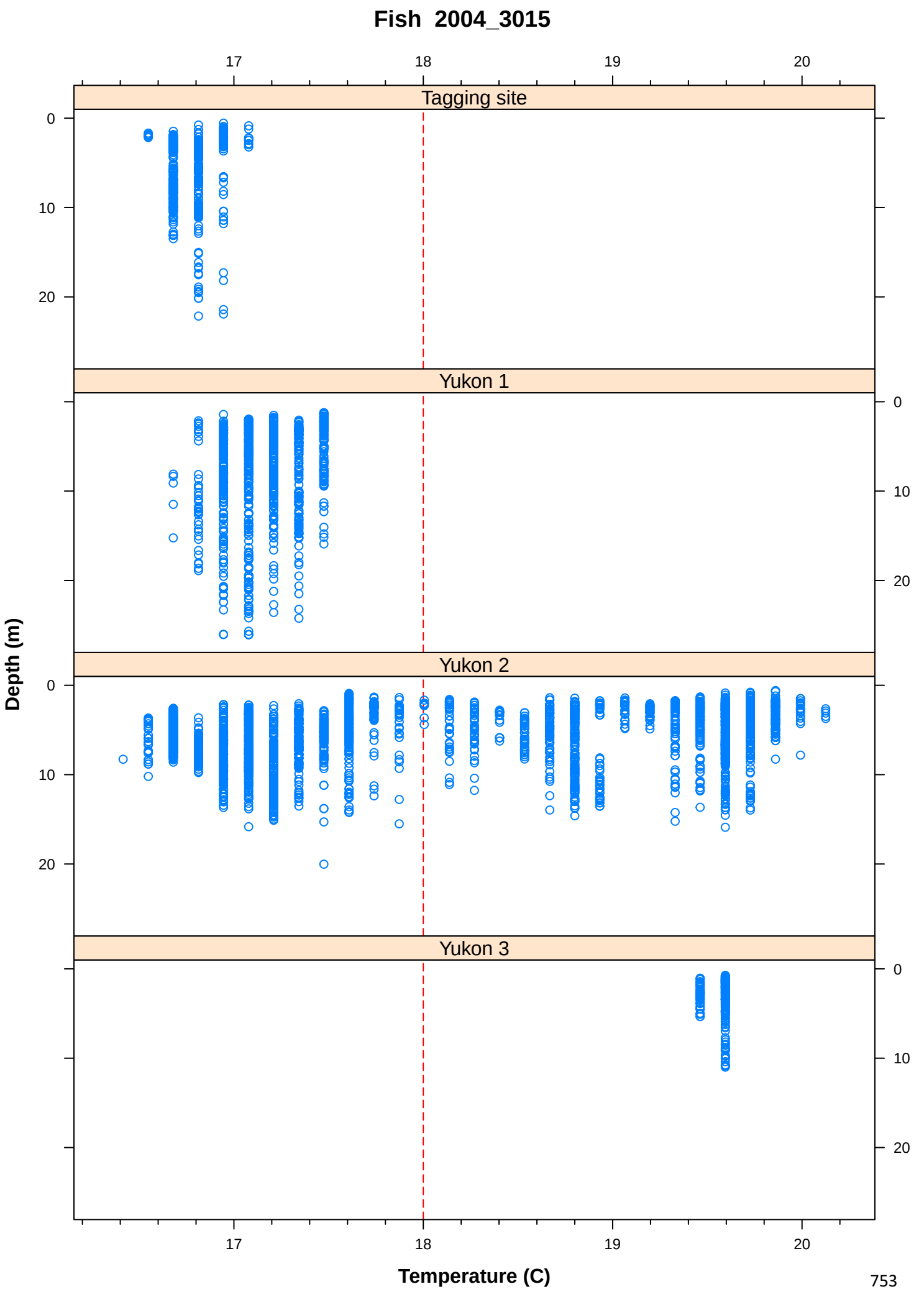

Fish 2004_3015
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
0.2
0.0
0
5
10
15
20
25
30
Depth (m)

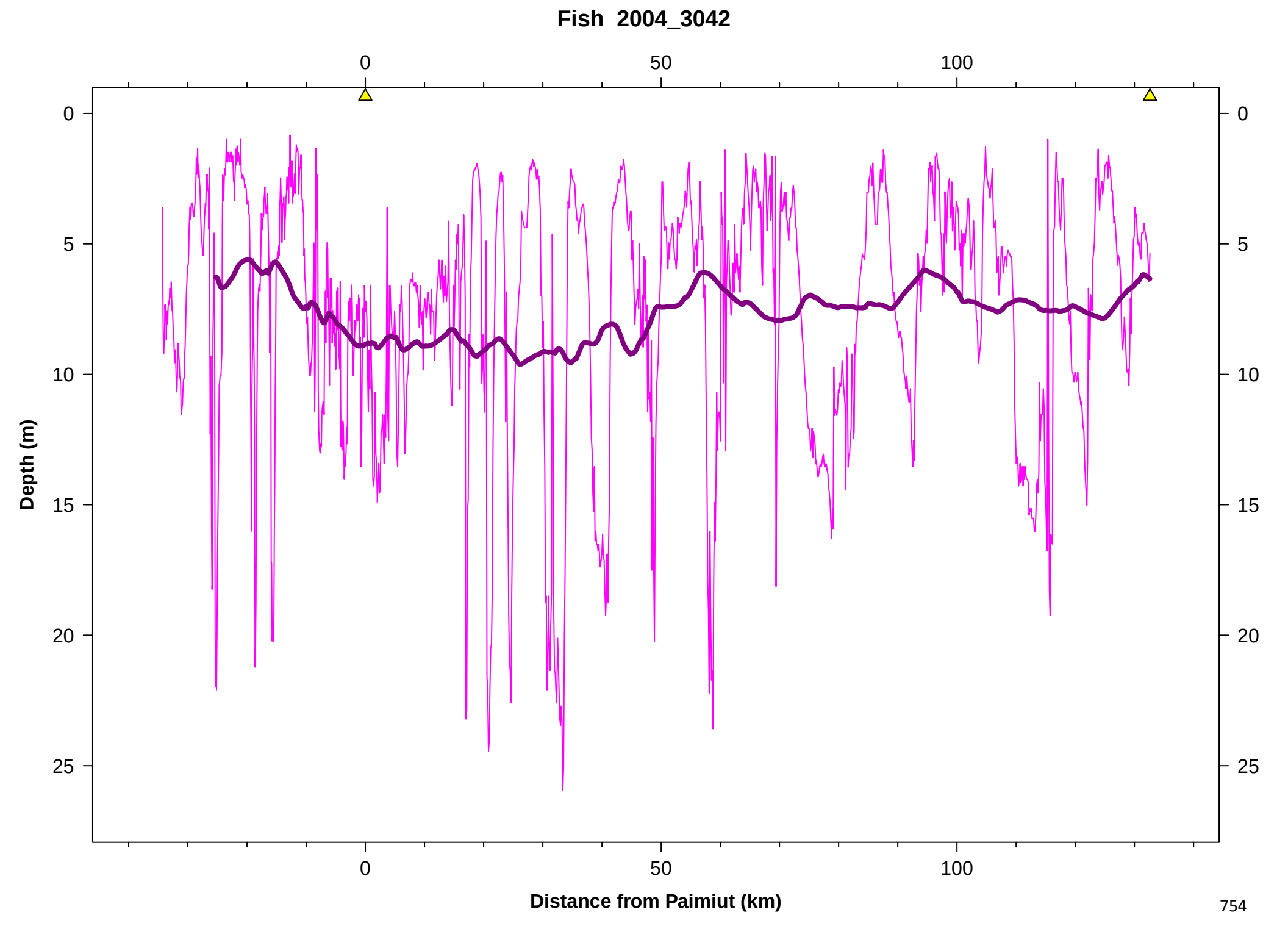

Fish 2004_3015
0
100
200
300
400
500
21
20
19
18
17
16
Temperature (C)
Distance from Paimiut (km)

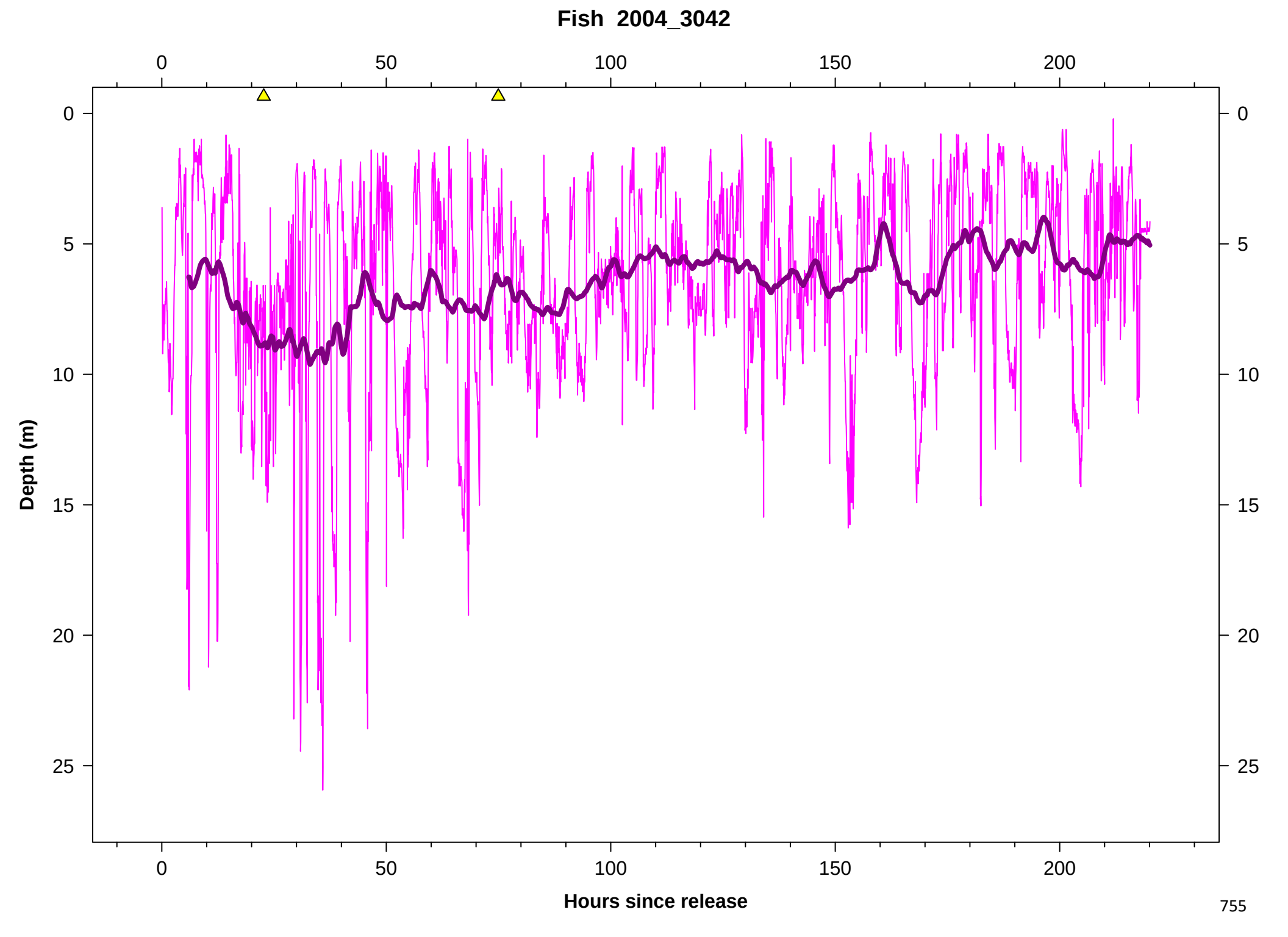

Fish 2004_3015
0
50
100
150
200
21
20
19
18
17
16
Temperature (C)
Hours since release

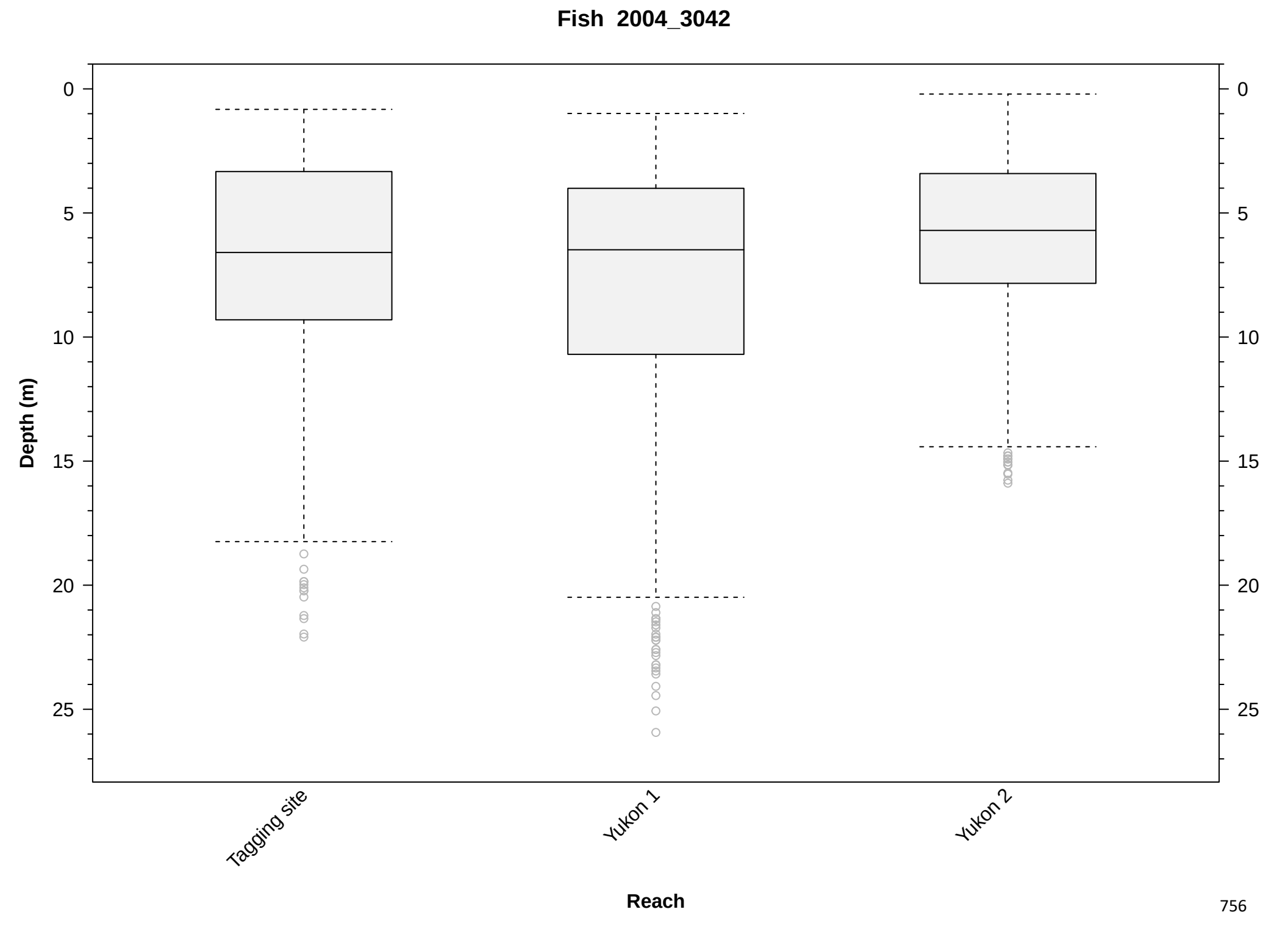

Fish 2004_3015
Temperature (C)
20
19
18
17
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach

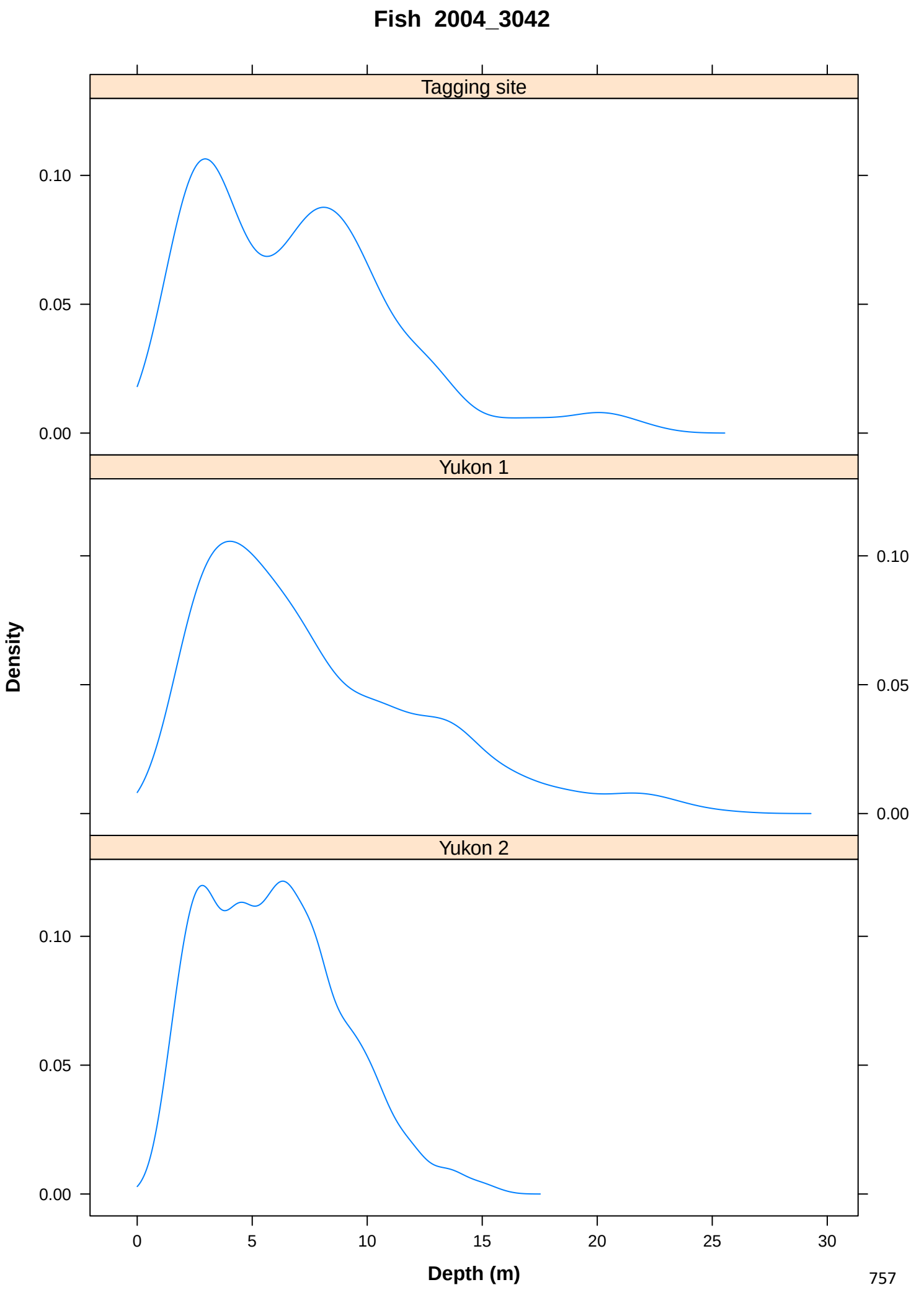

Fish 2004_3015
16
17
18
19
20
21
Tagging site
Yukon 1
Yukon 2
Yukon 3
10
0
Density
Temperature (C)

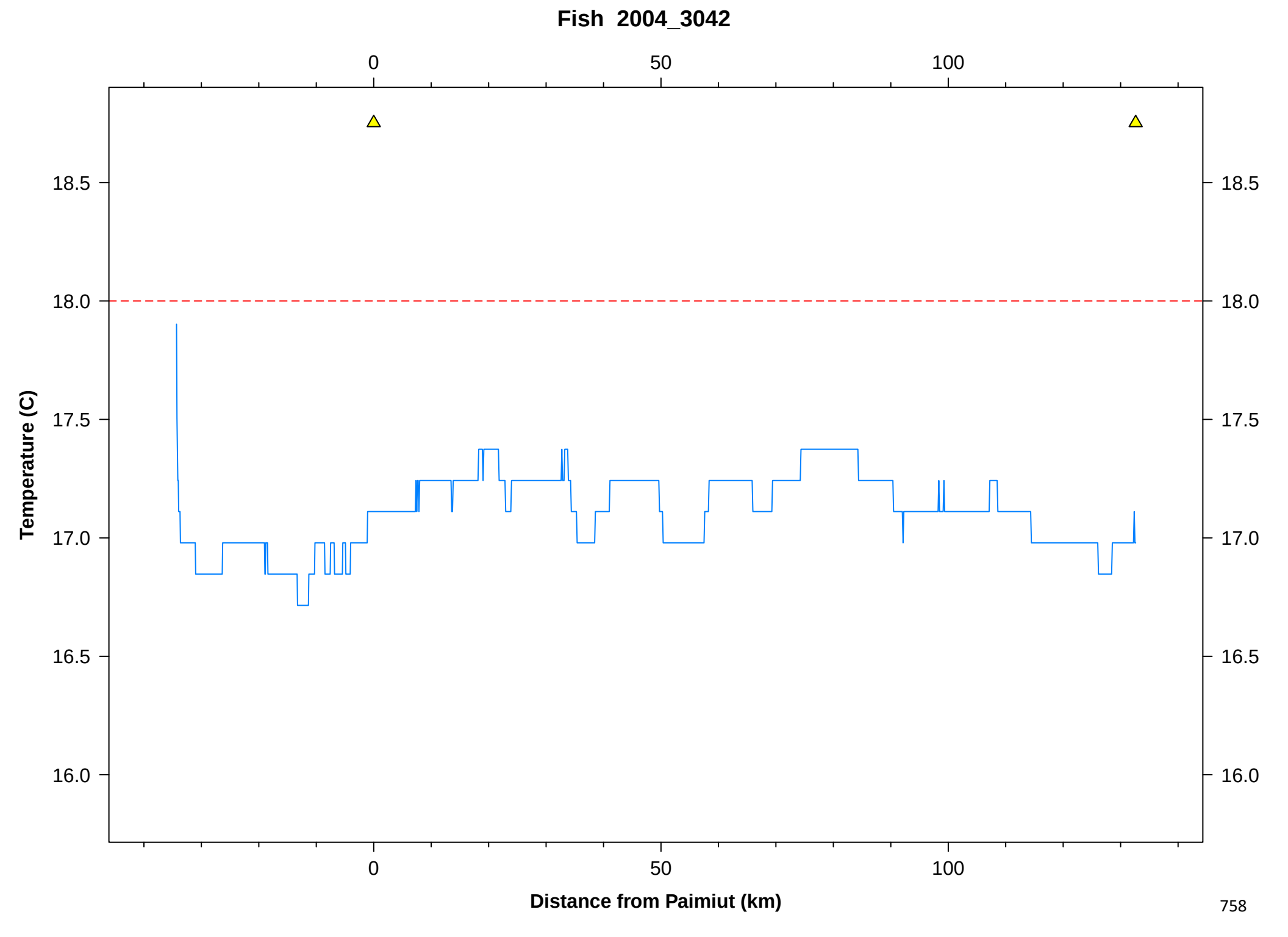

Fish 2004_3015
Tagging site
Yukon 1
Yukon 2
Yukon 3
Depth (m)
Temperature (C)
17
18
19
20
0
10
20

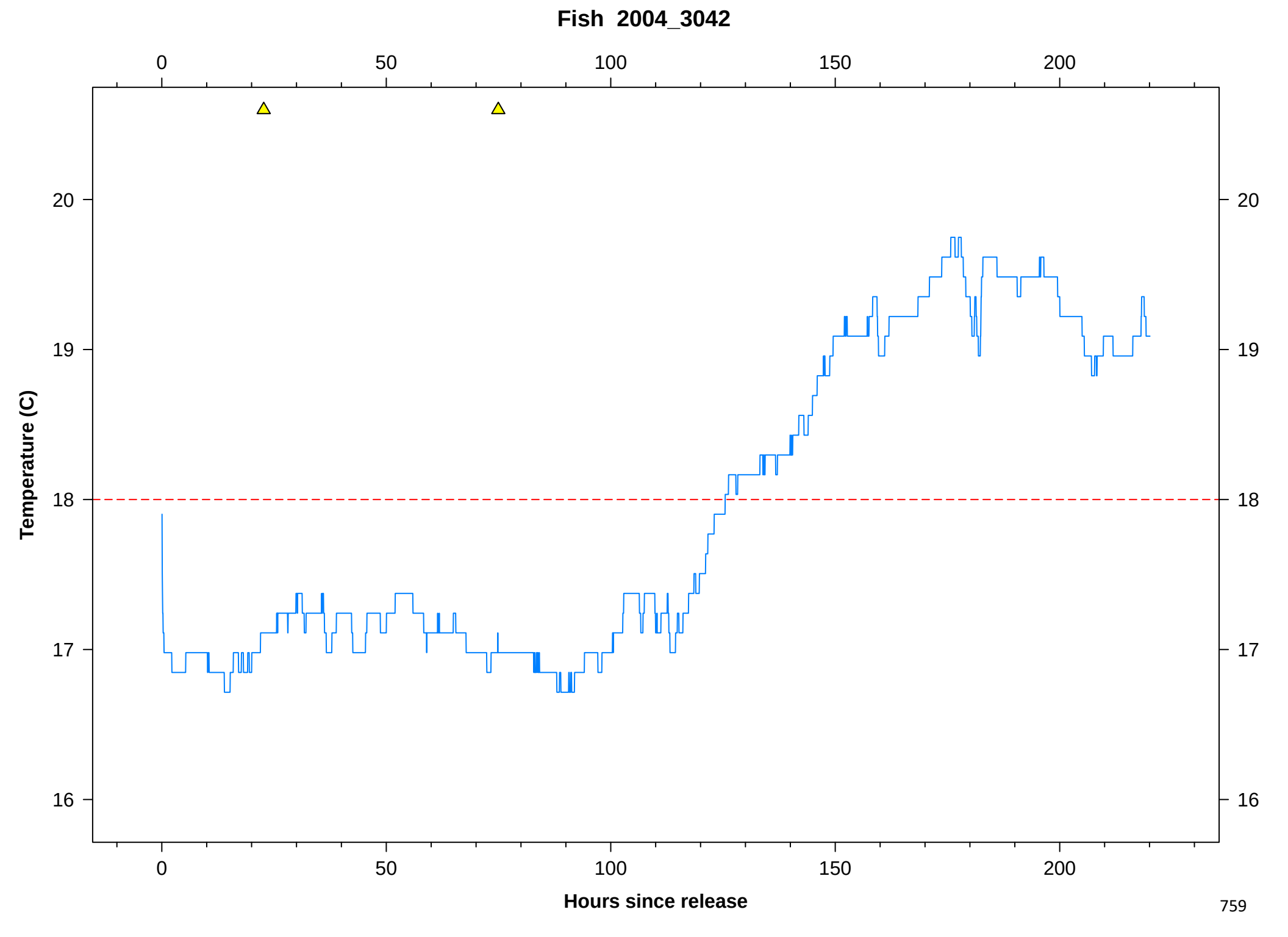

Fish 2004_3042
0
50
100
0
5
10
15
20
25
Depth (m)
0
50
100
Distance from Paimiut (km)

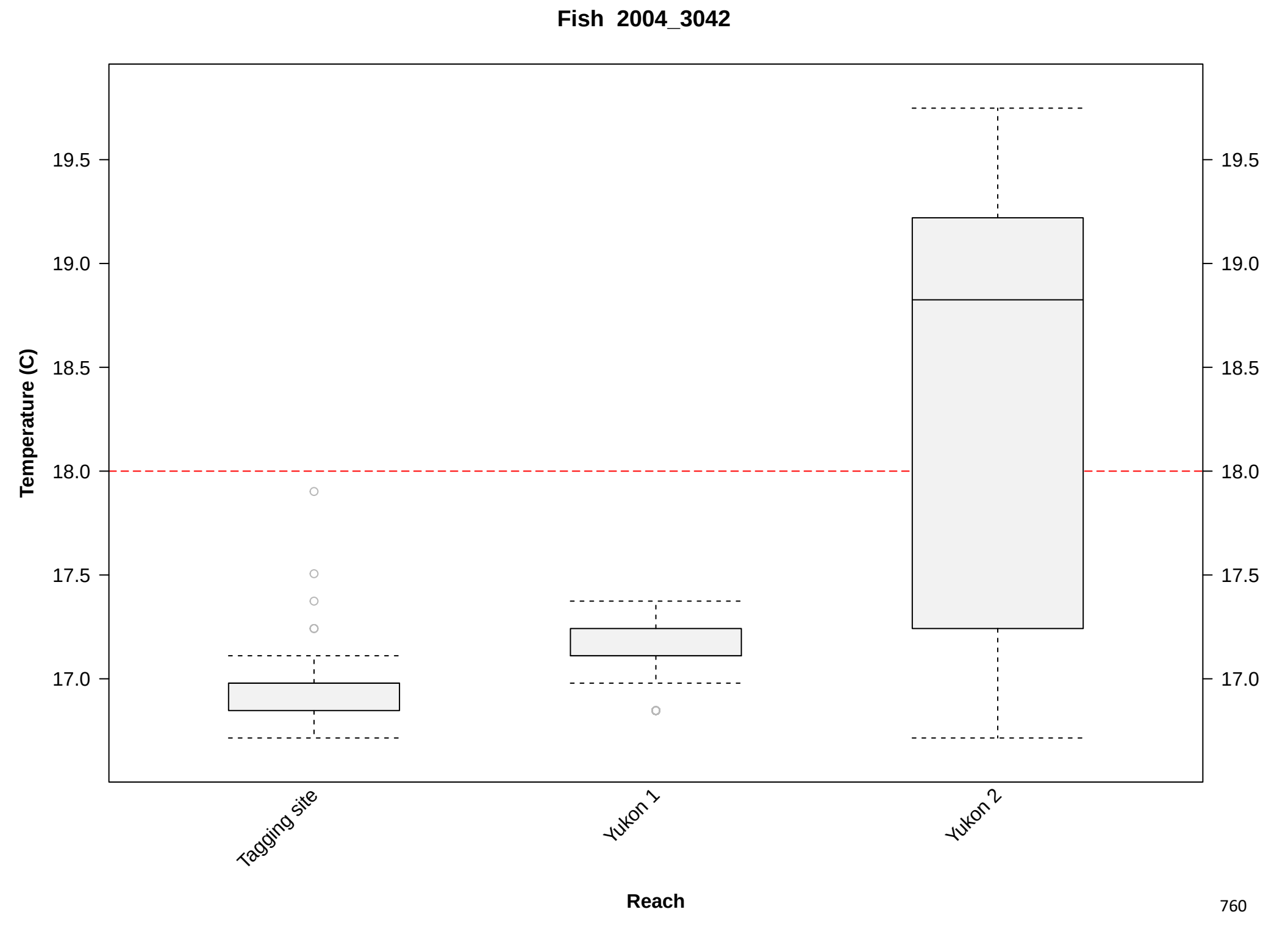

Fish 2004_3042
0
50
100
150
200
0
5
10
15
20
25
Depth (m)
Hours since release

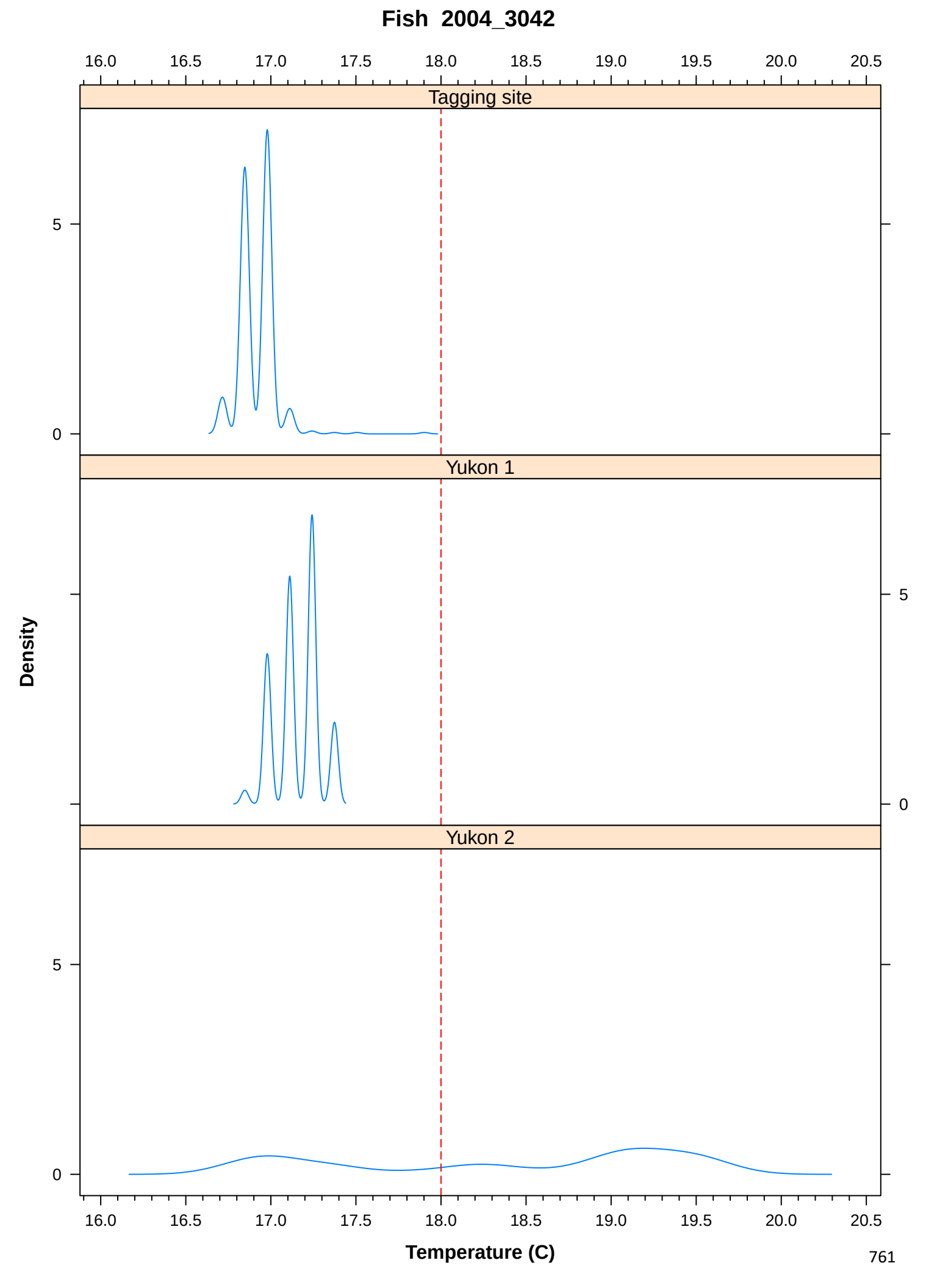

Fish 2004_3042
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Reach

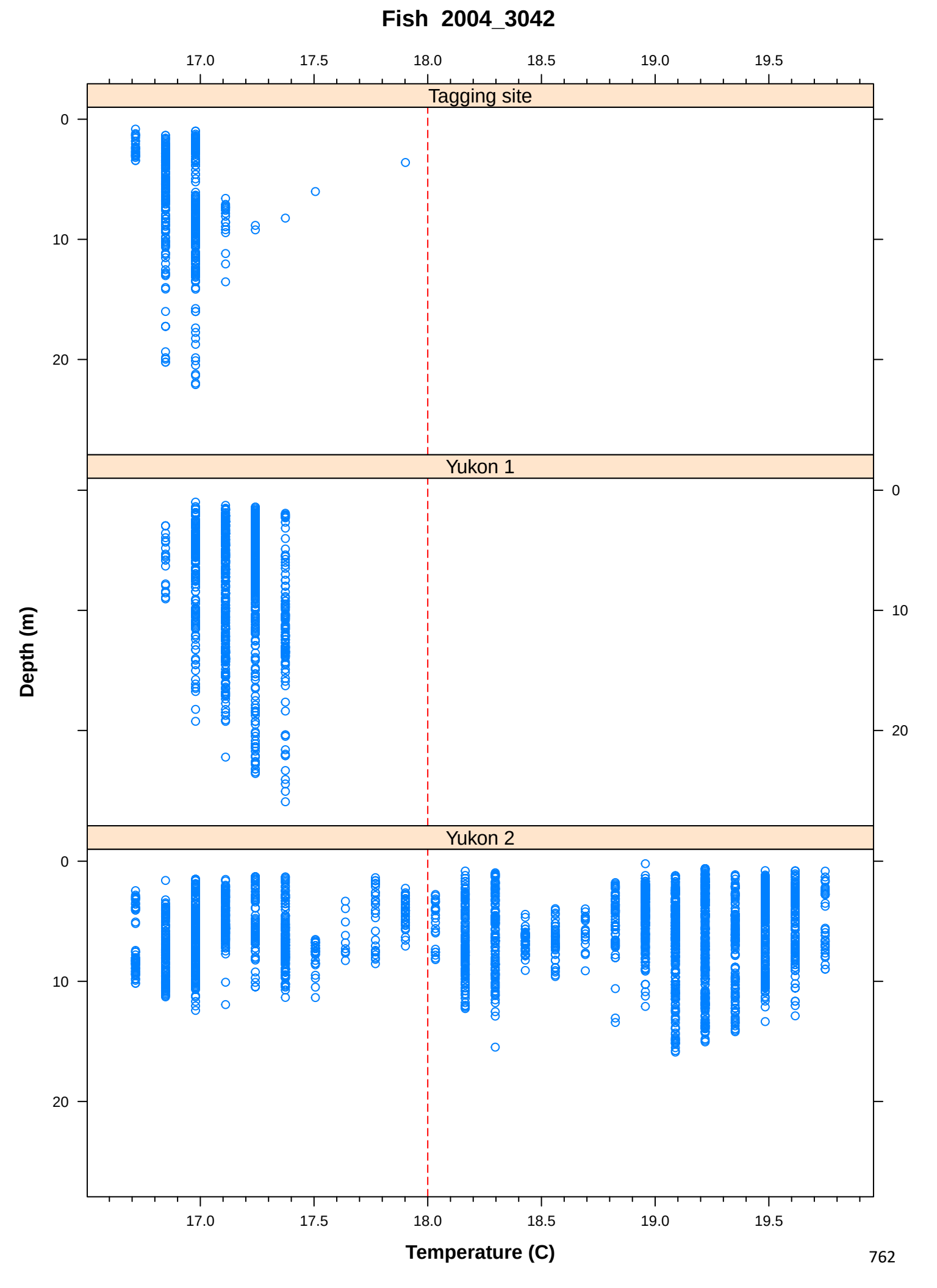

Fish 2004_3042
Tagging site
Yukon 1
Yukon 2
Density
0.10
0.05
0.00
0
5
10
15
20
25
30
Depth (m)

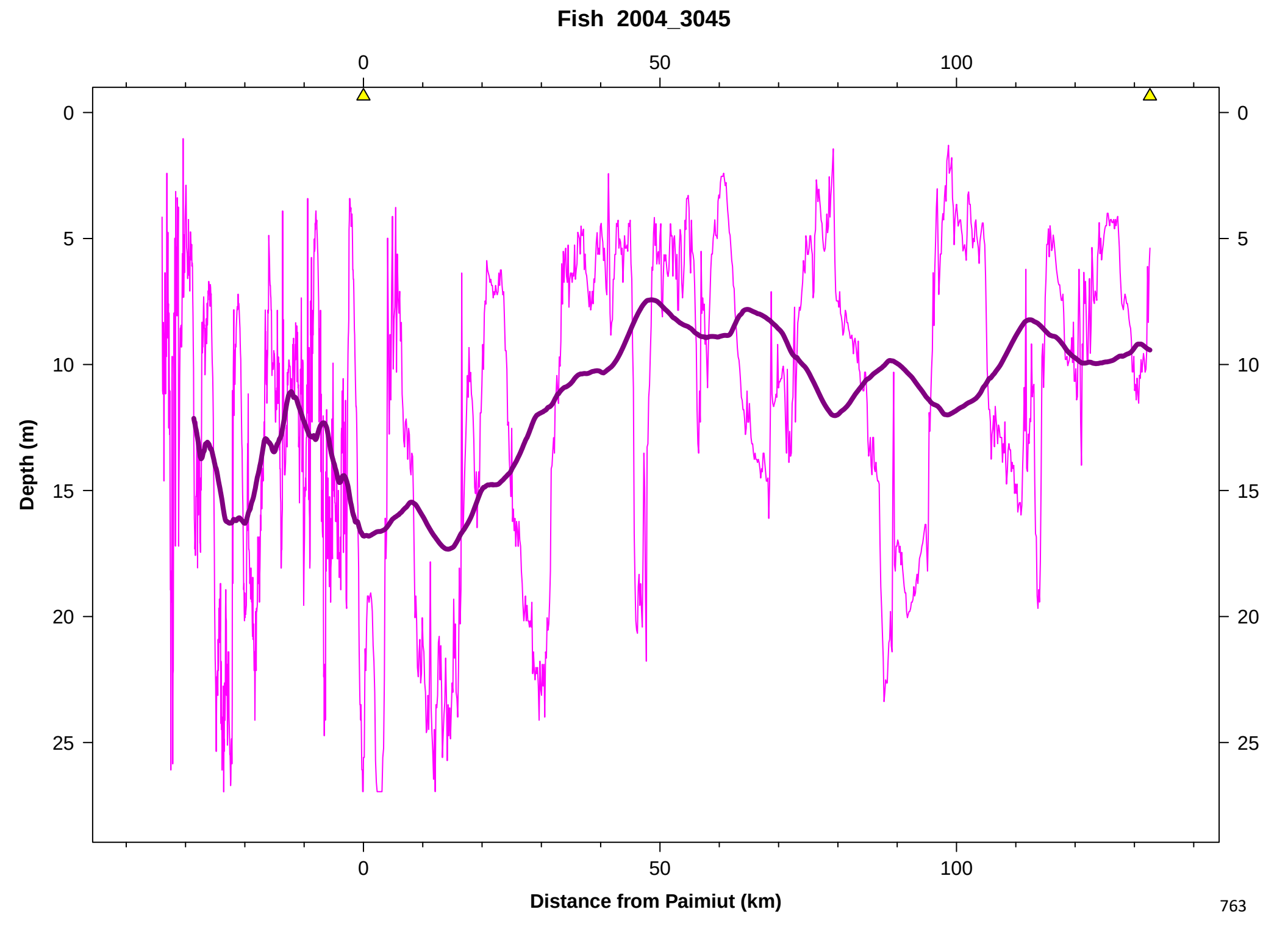

Fish 2004_3042
0
50
100
18.5
18.0
17.5
17.0
16.5
16.0
Temperature (C)
Distance from Paimiut (km)

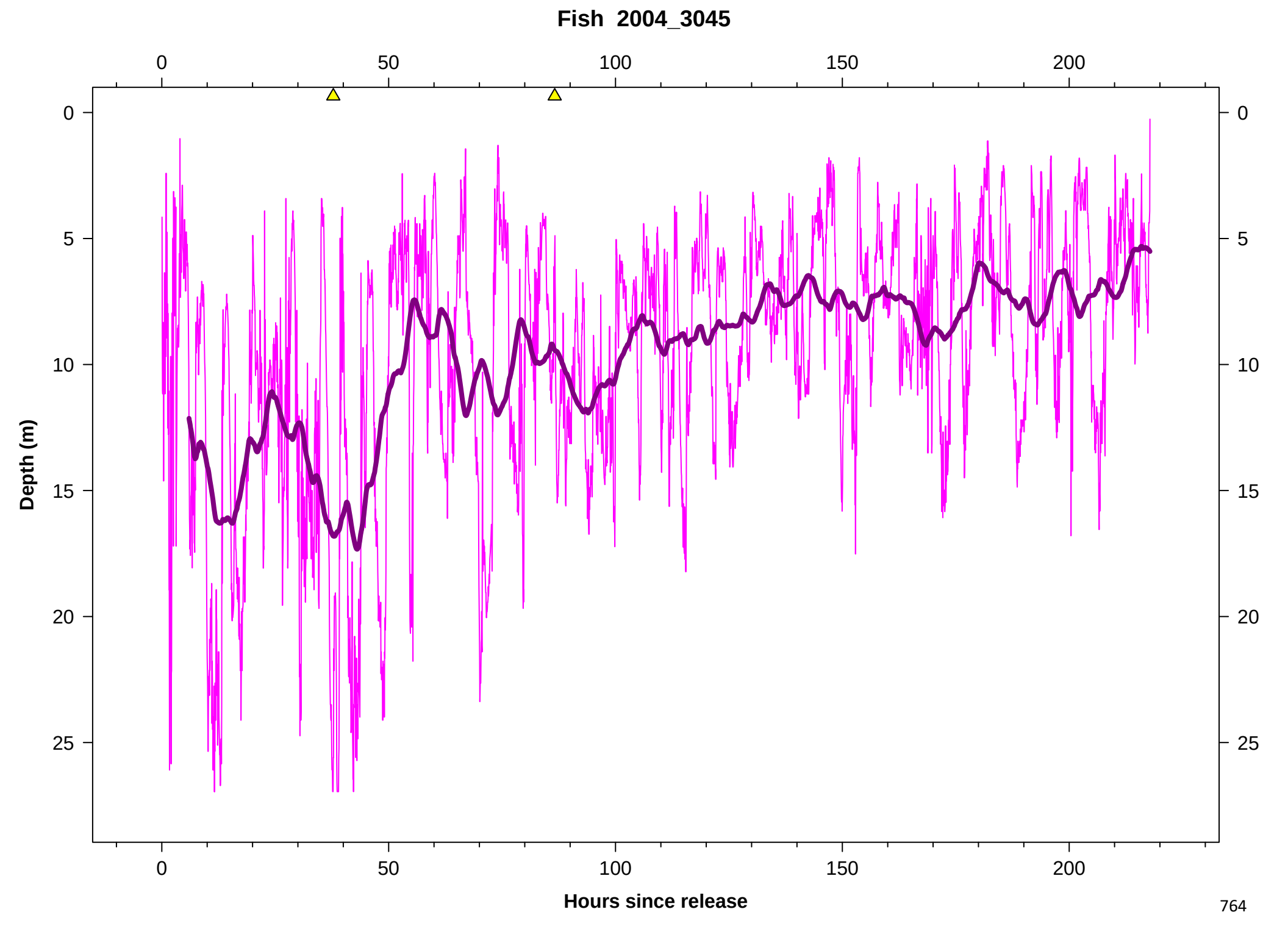

Fish 2004_3042
0
50
100
150
200
20
19
18
17
16
Temperature (C)
Hours since release

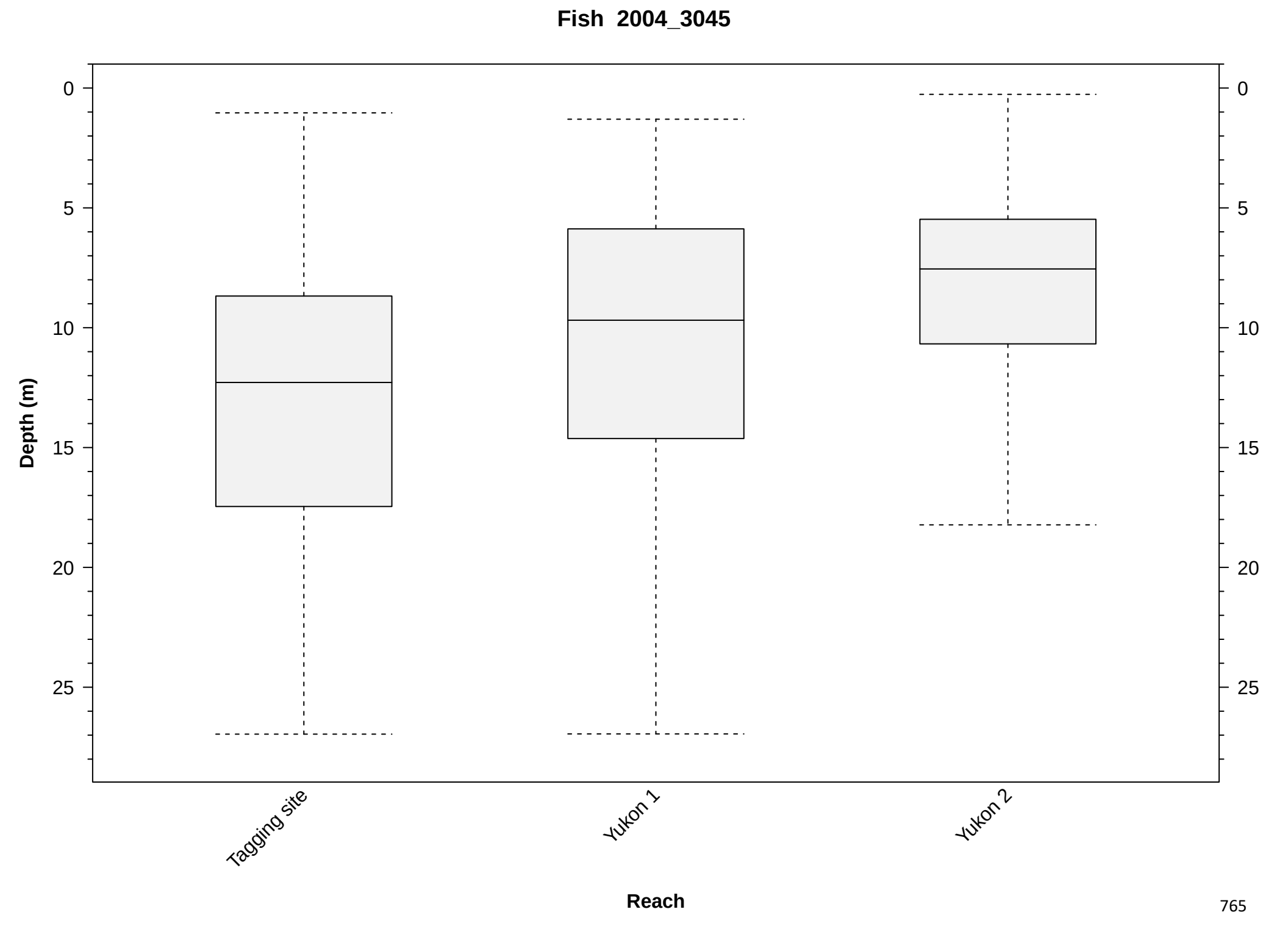

Fish 2004_3042
Temperature (C)
19.5
19.0
18.5
18.0
17.5
17.0
Tagging site
Yukon 1
Yukon 2
Reach

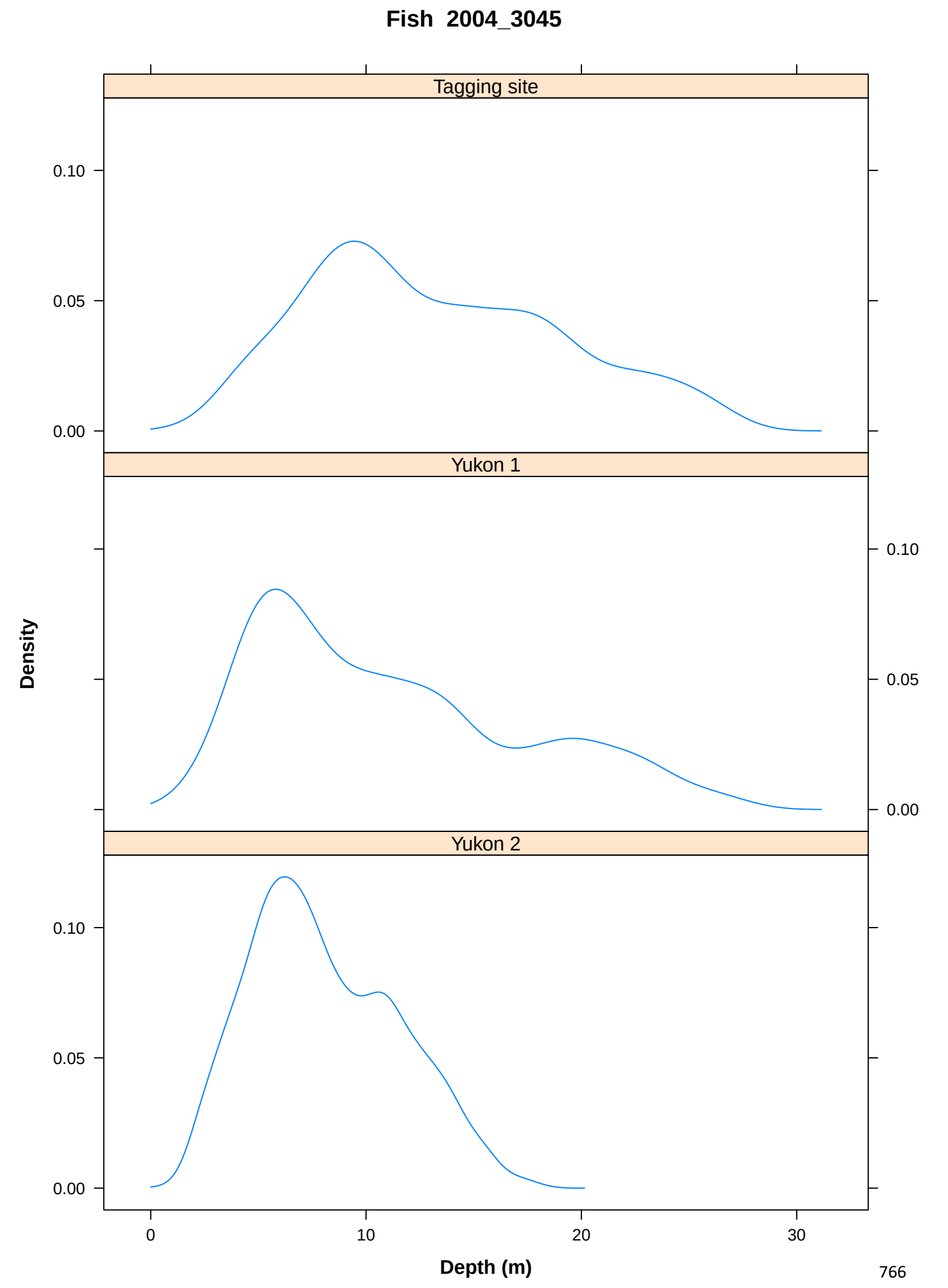

Fish 2004_3042
16.0
16.5
17.0
17.5
18.0
18.5
19.0
19.5
20.0
20.5
Tagging site
Yukon 1
Yukon 2
Density
5
0
Temperature (C)

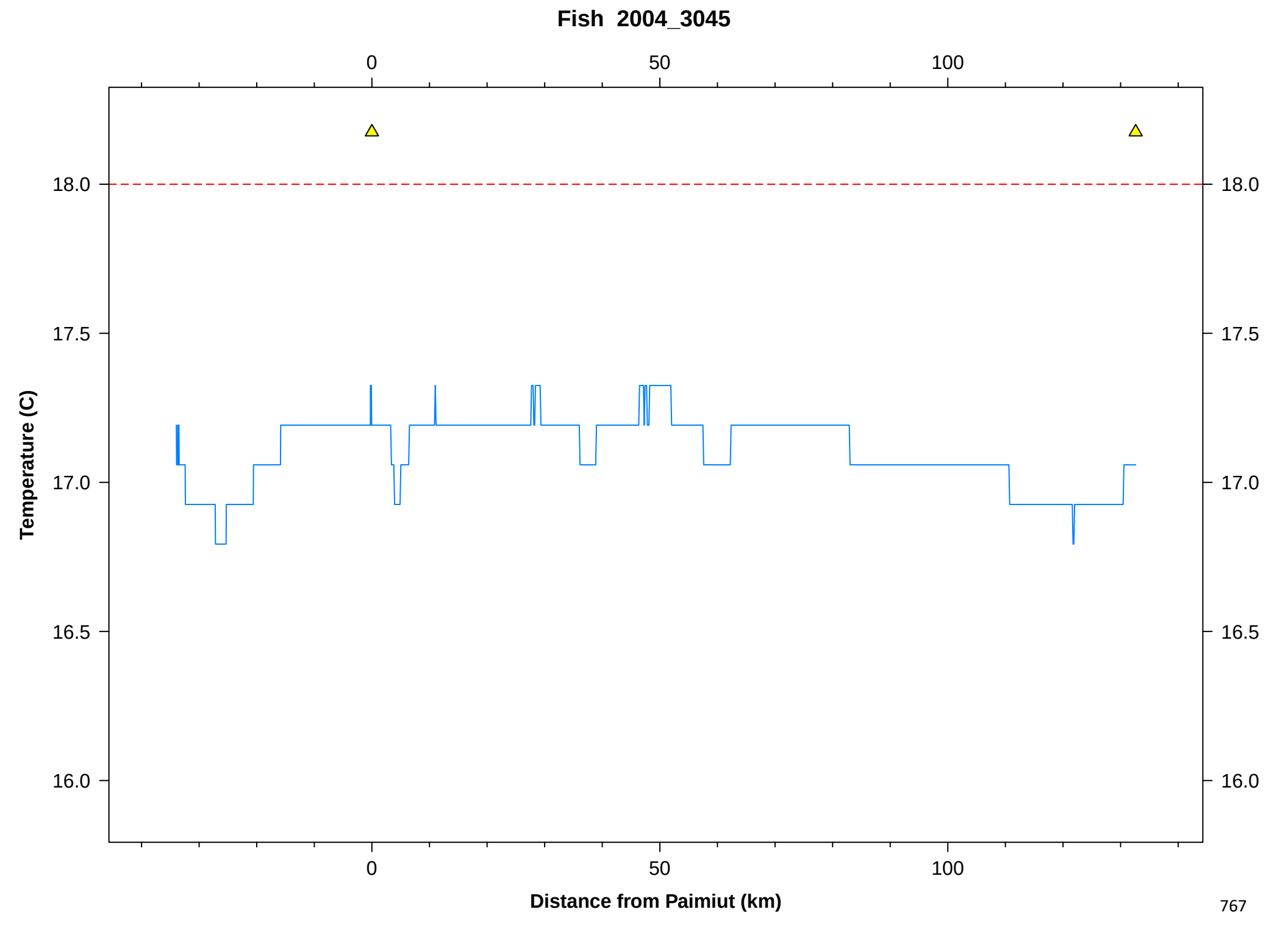

Fish 2004_3042
Tagging site
Yukon 1
Yukon 2
Depth (m)
Temperature (C)
17.0
17.5
18.0
18.5
19.0
19.5
0
10
20

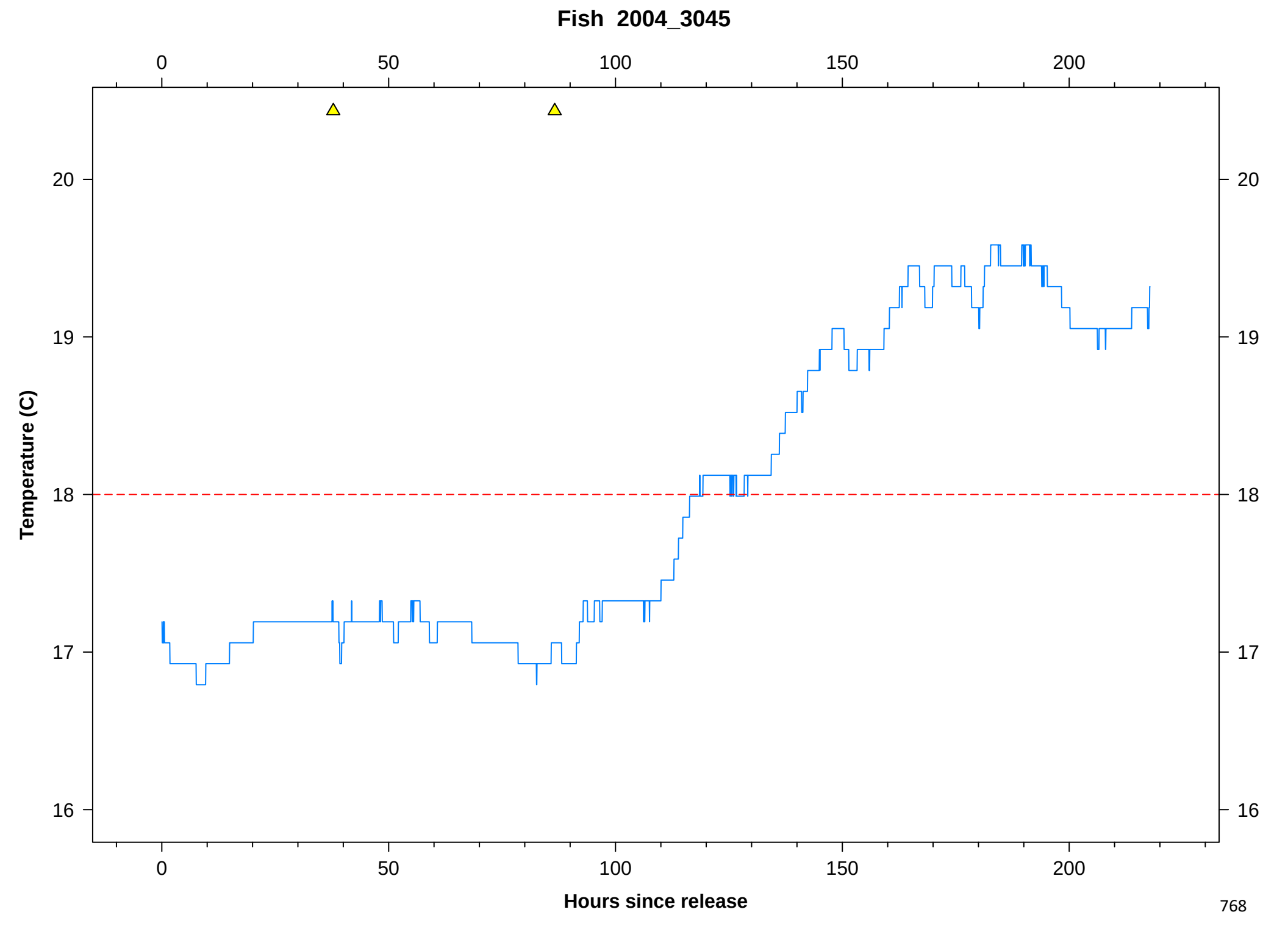

Fish 2004_3045
0
50
100
0
5
10
15
20
25
Depth (m)
0
50
100
Distance from Paimiut (km)

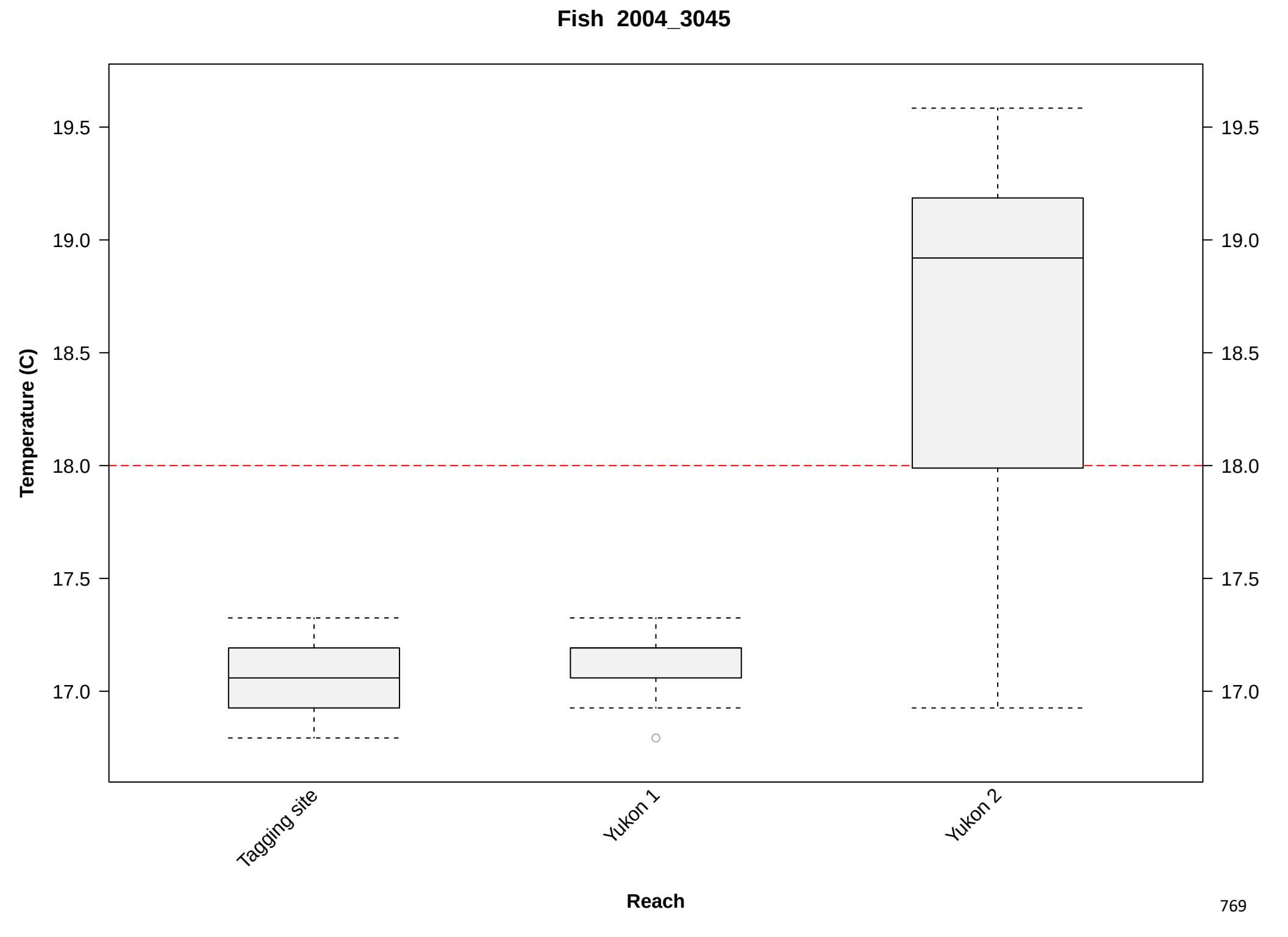

Fish 2004_3045
0
50
100
150
200
0
5
10
15
20
25
Depth (m)
Hours since release

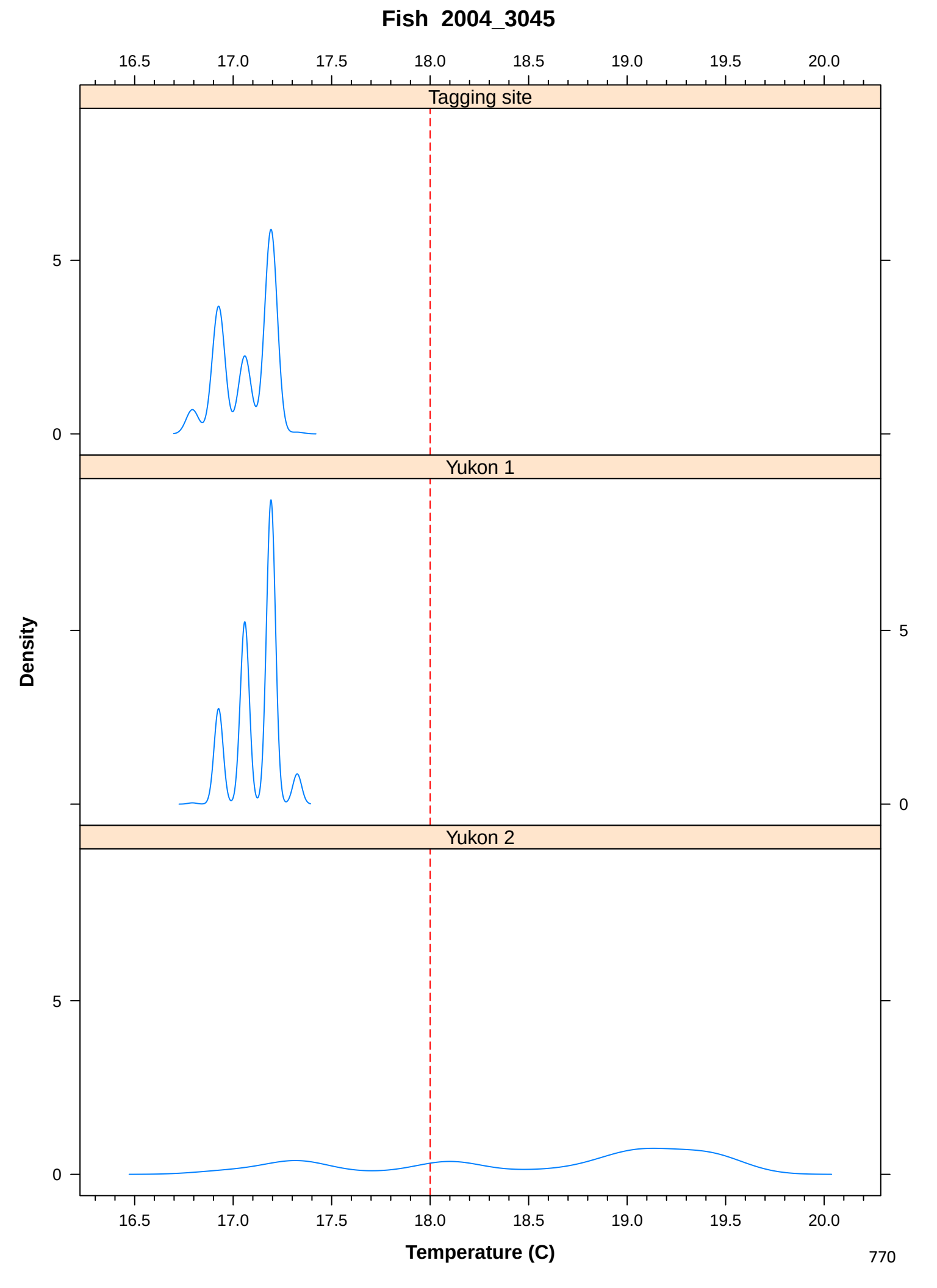

Fish 2004_3045
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Reach

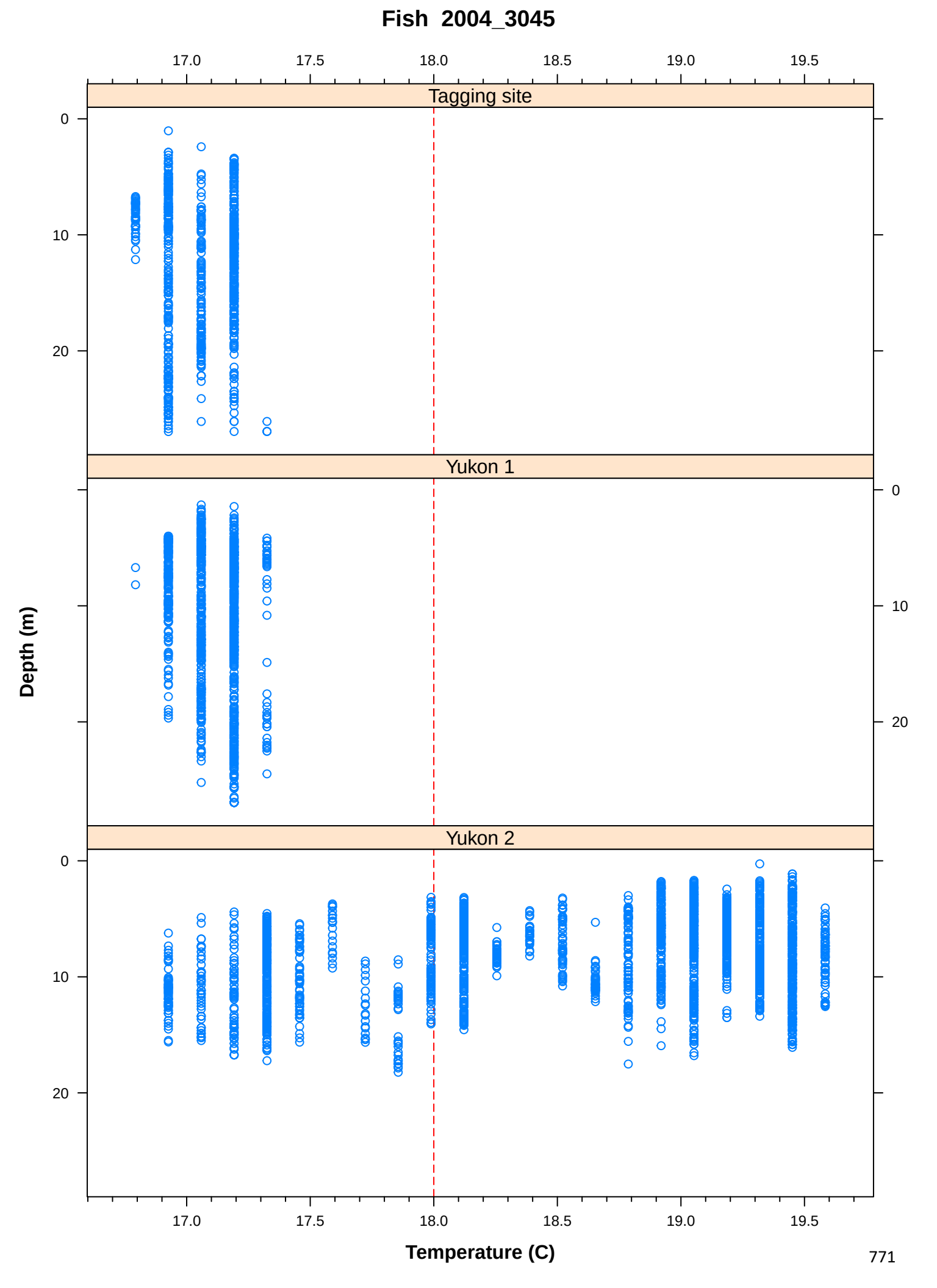

Fish 2004_3045
Tagging site
Yukon 1
Yukon 2
Density
0.10
0.05
0.00
0
10
20
30
Depth (m)

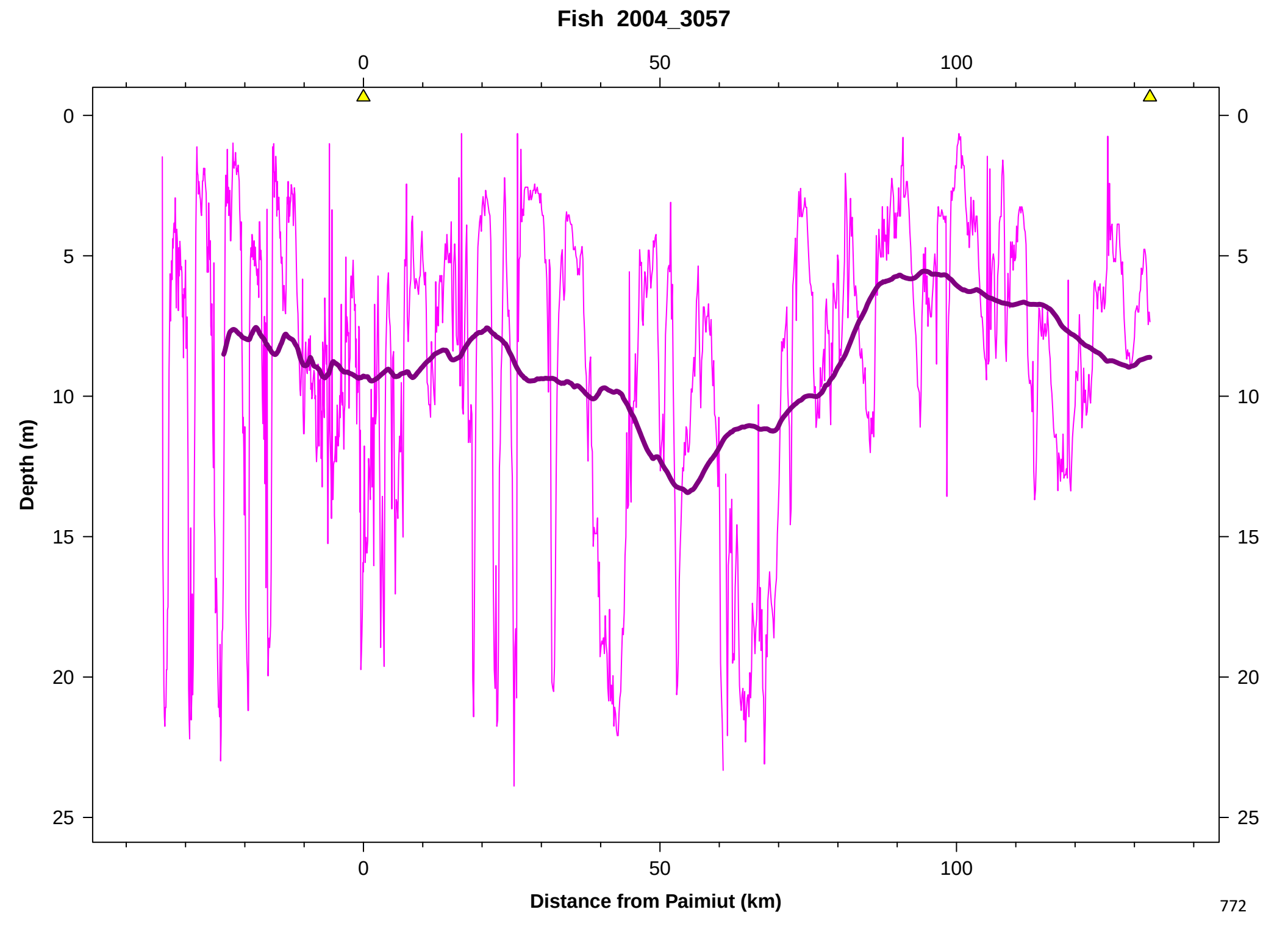

Fish 2004_3045
0
50
100
18.0
17.5
17.0
16.5
16.0
Temperature (C)
Distance from Paimiut (km)

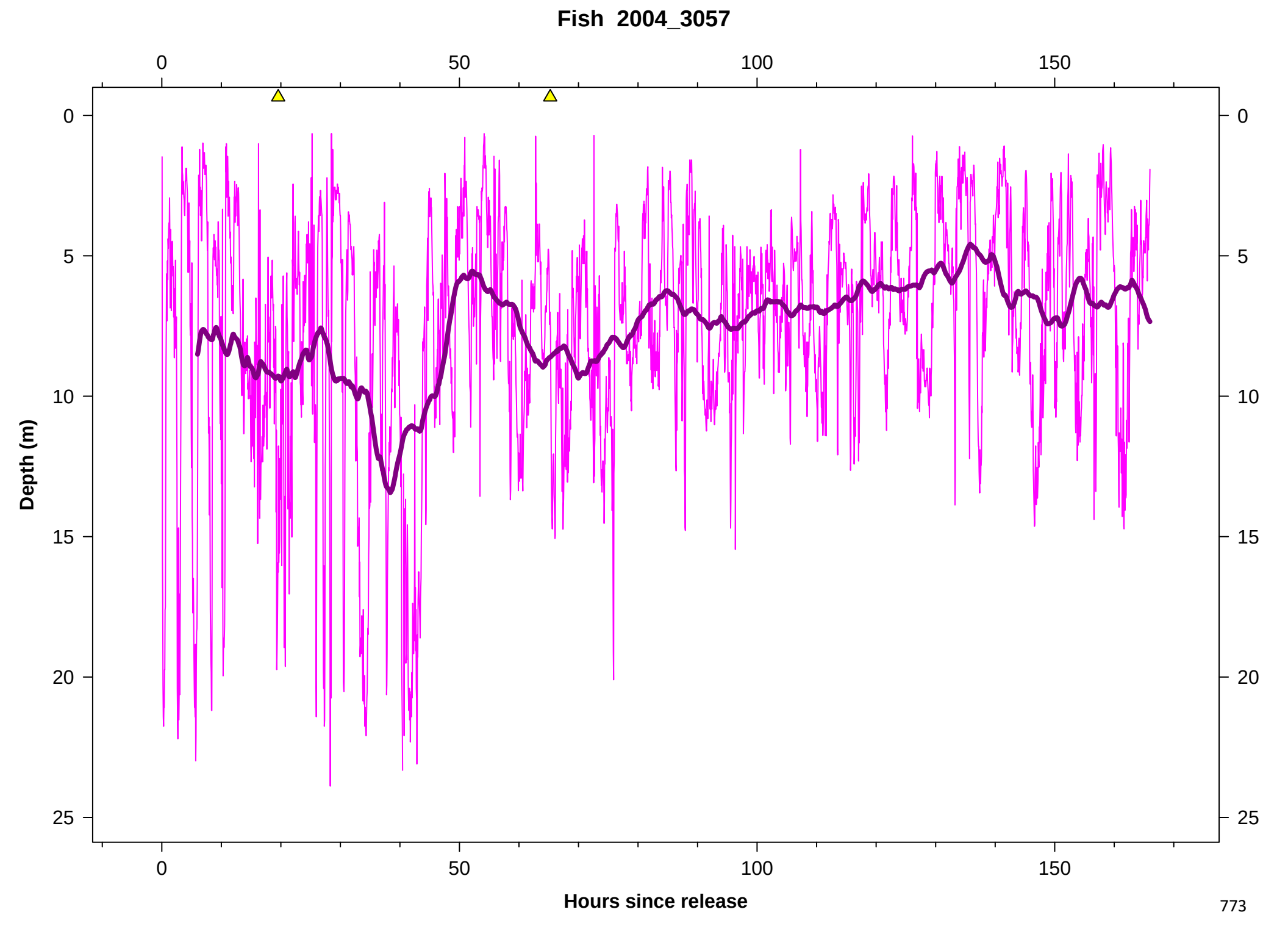

Fish 2004_3045
0
50
100
150
200
20
19
18
17
16
Temperature (C)
Hours since release

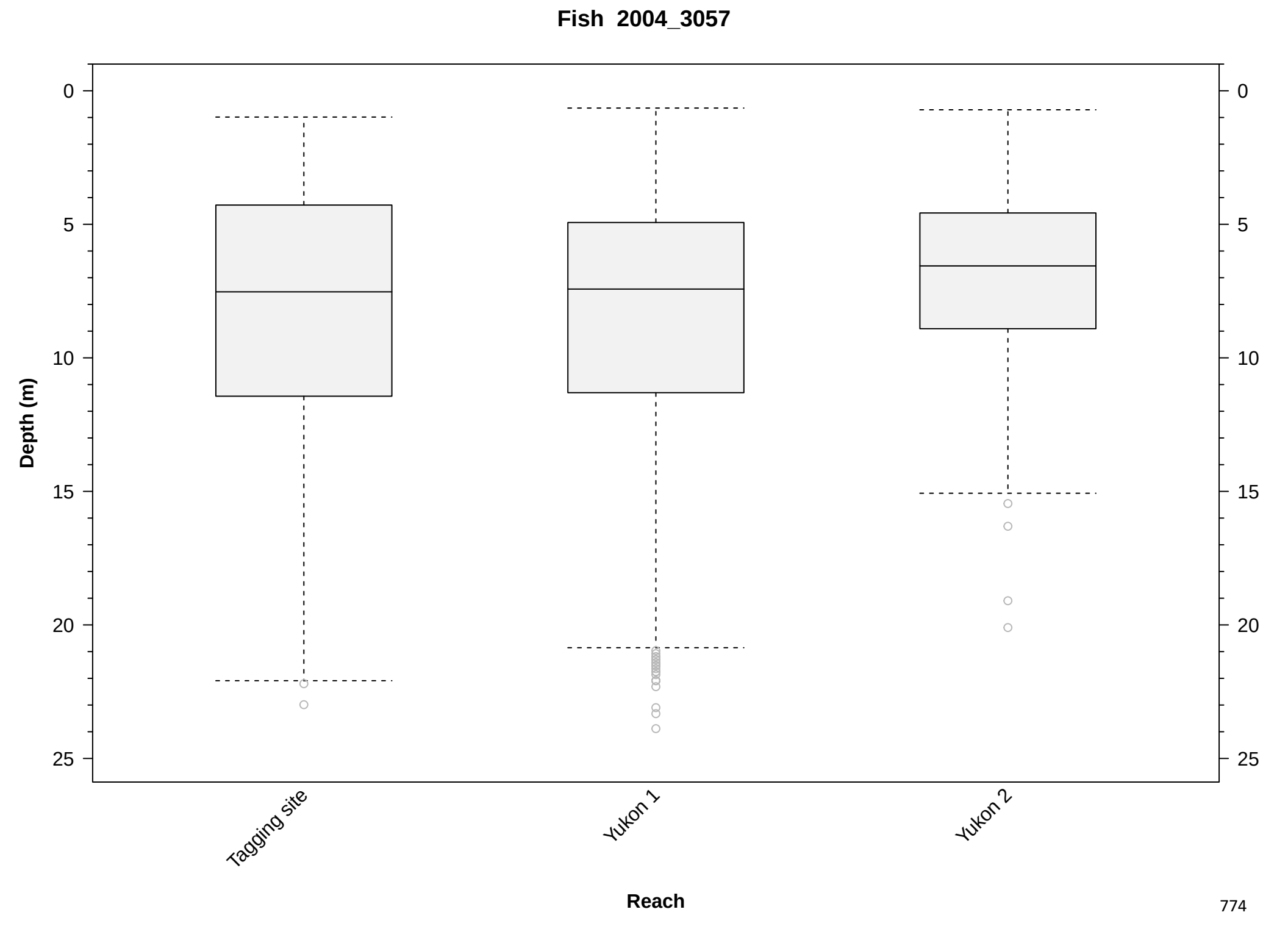

Fish 2004_3045
Temperature (C)
19.5
19.0
18.5
18.0
17.5
17.0
Tagging site
Yukon 1
Yukon 2
Reach

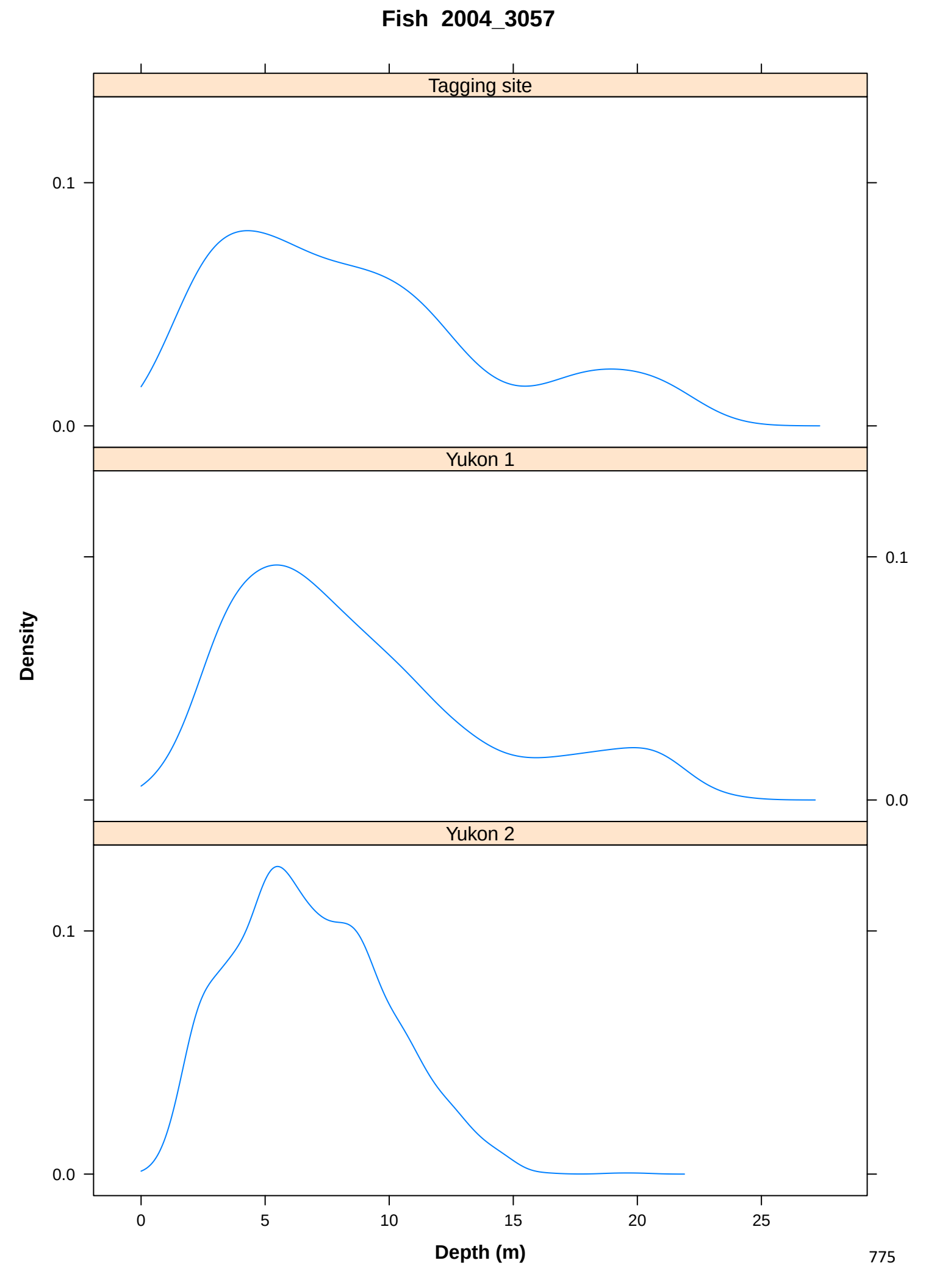

Fish 2004_3045
16.5
17.0
17.5
18.0
18.5
19.0
19.5
20.0
Tagging site
Yukon 1
Yukon 2
5
0
Density
Temperature (C)

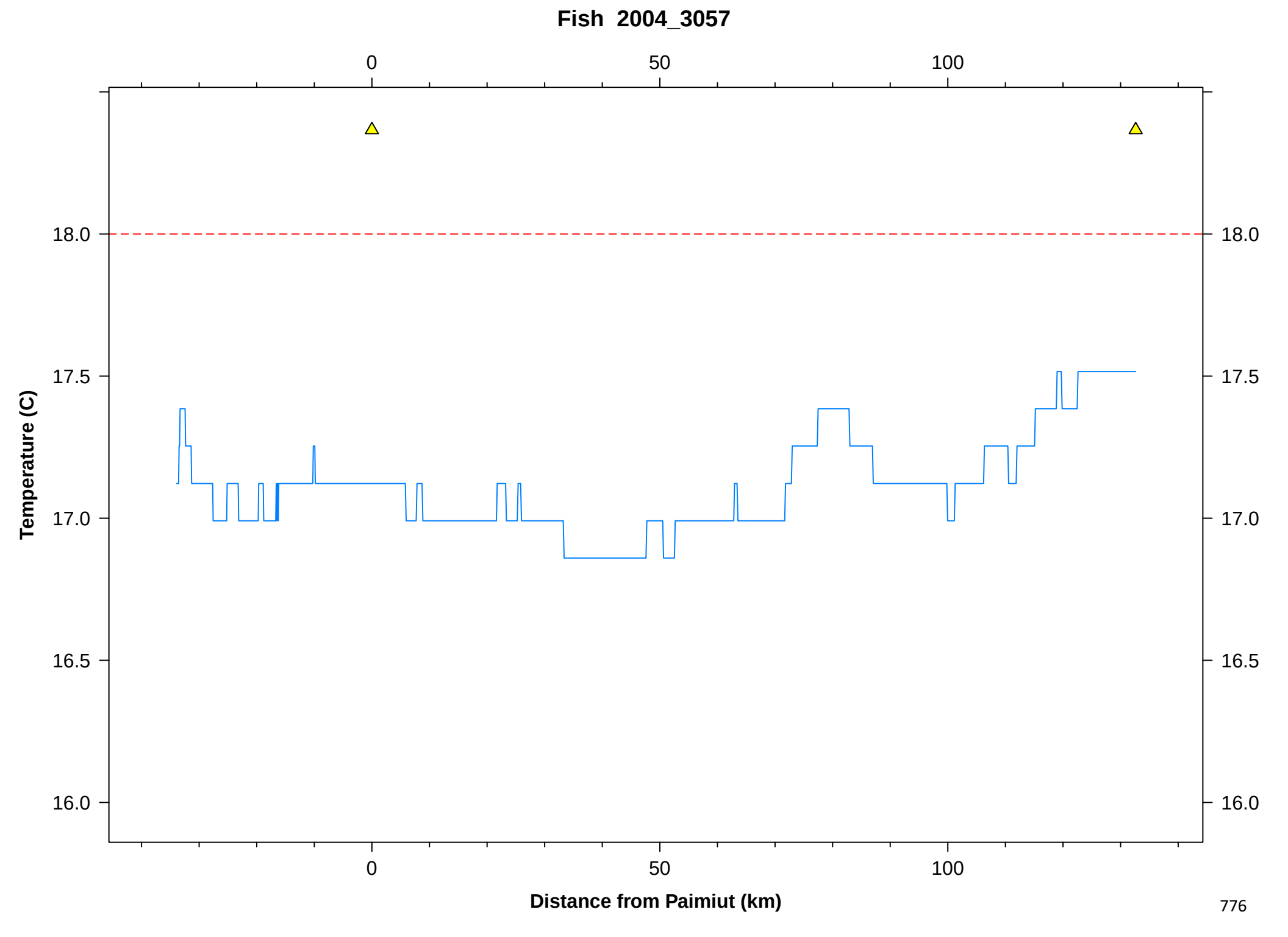

Fish 2004_3045
Tagging site
Yukon 1
Yukon 2
Depth (m)
Temperature (C)
17.0
17.5
18.0
18.5
19.0
19.5
0
10
20

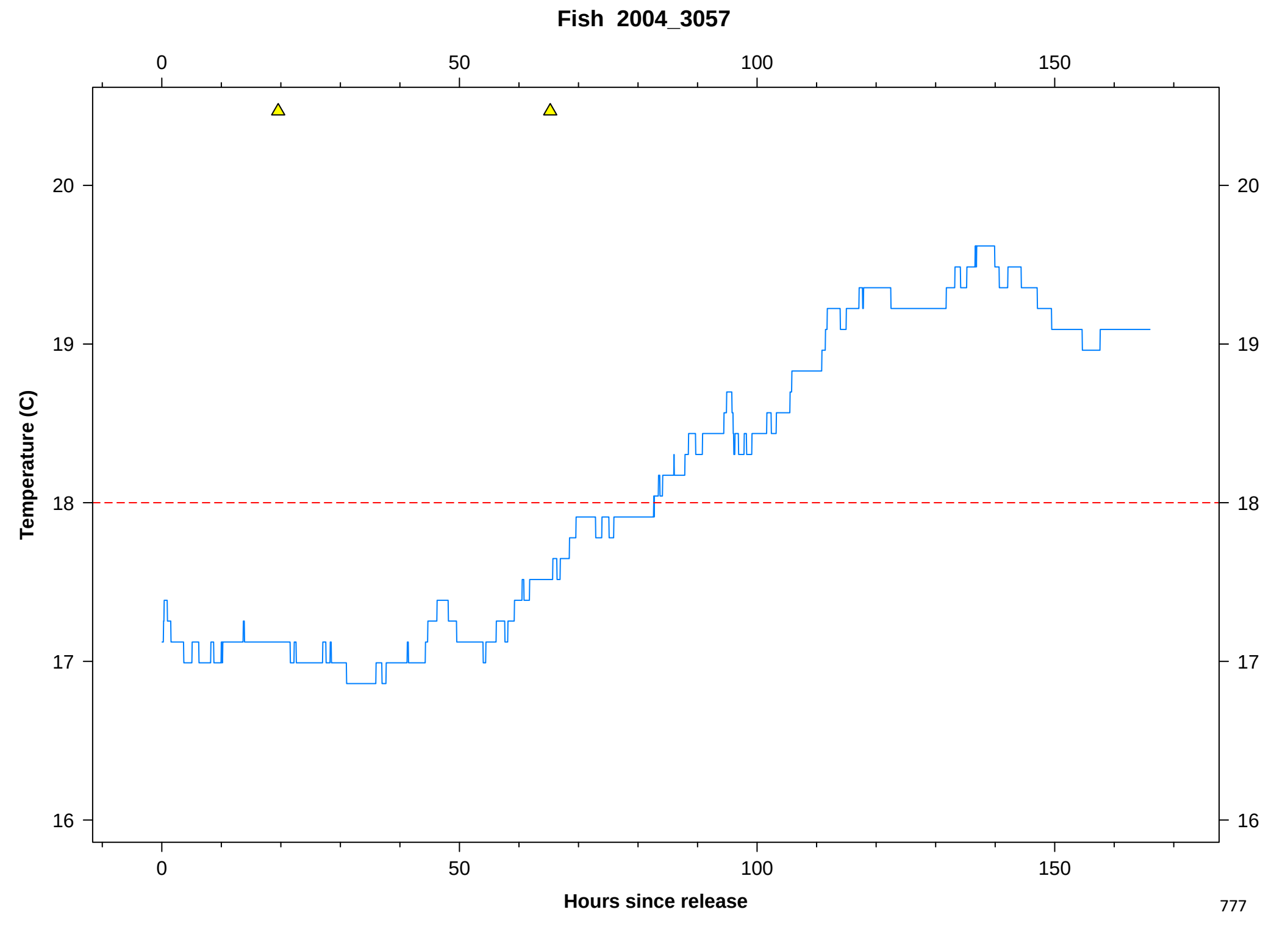

Fish 2004_3057
0
50
100
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

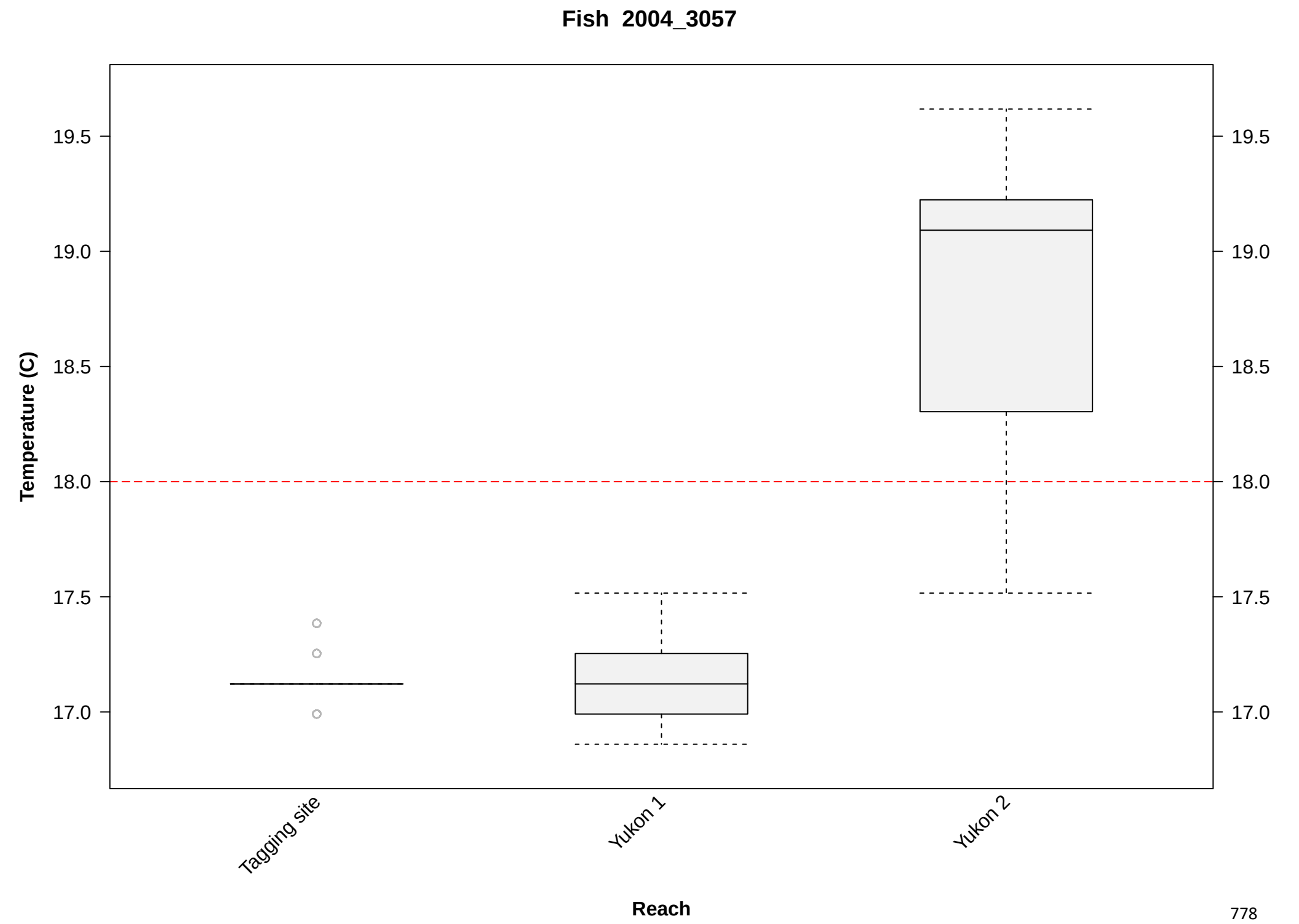

Fish 2004_3057
0
50
100
150
0
5
10
15
20
25
Depth (m)
Hours since release

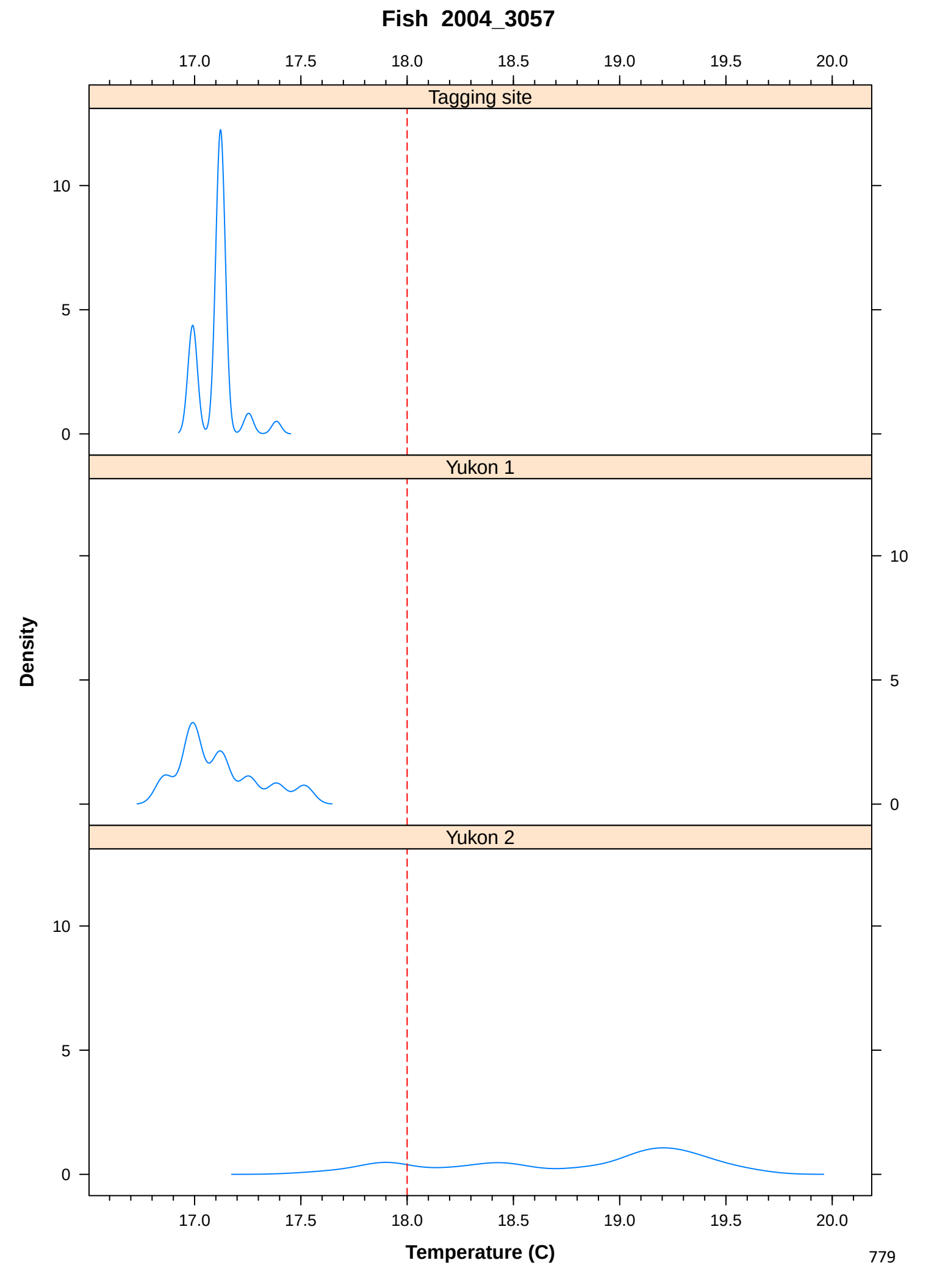

Fish 2004_3057
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Reach

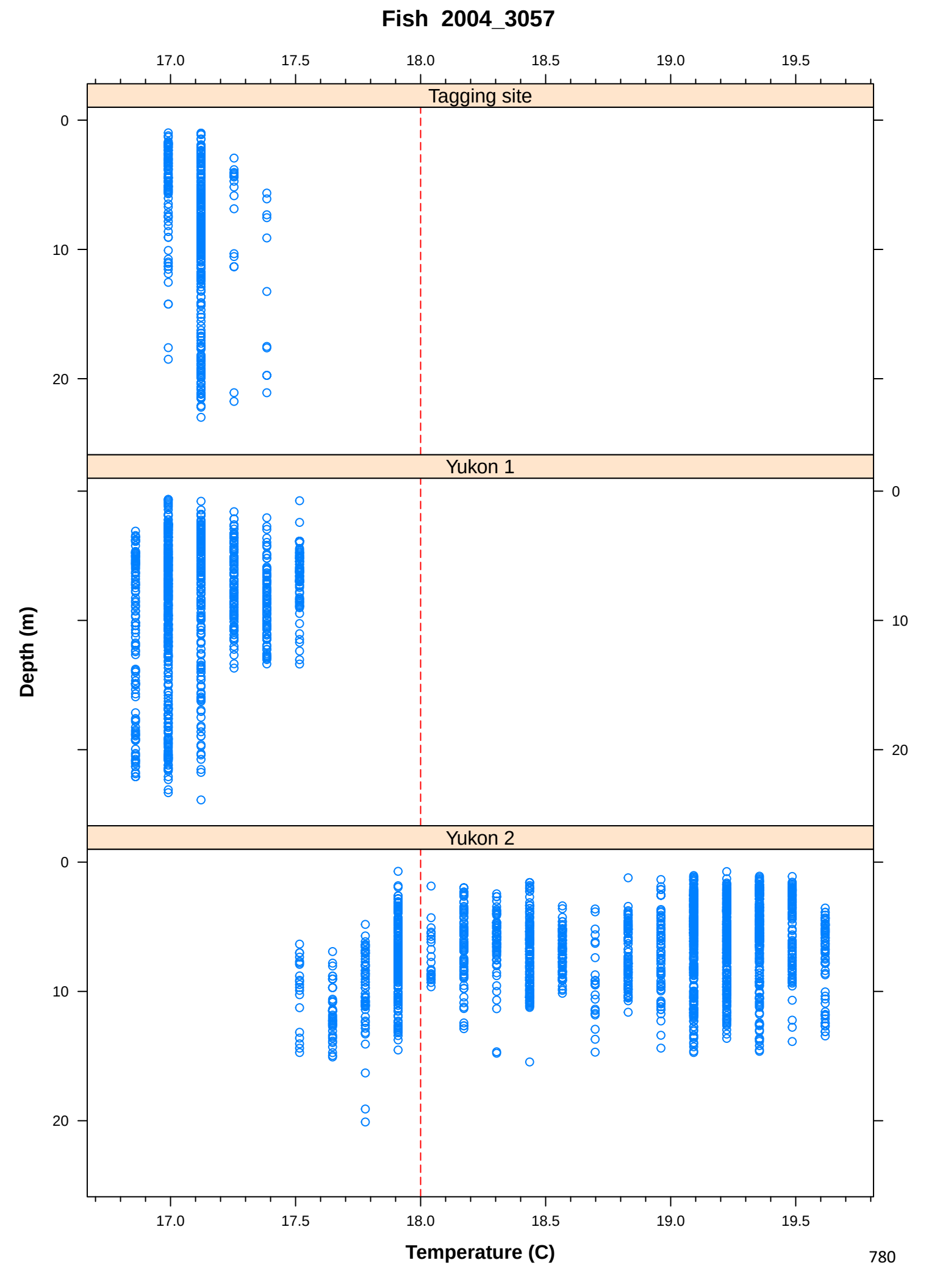

Fish 2004_3057
Tagging site
Yukon 1
Yukon 2
Density
0.1
0.0
0
5
10
15
20
25
Depth (m)


Fish 2004_3057
0
50
100
18.0
17.5
17.0
16.5
16.0
Temperature (C)
Distance from Paimiut (km)

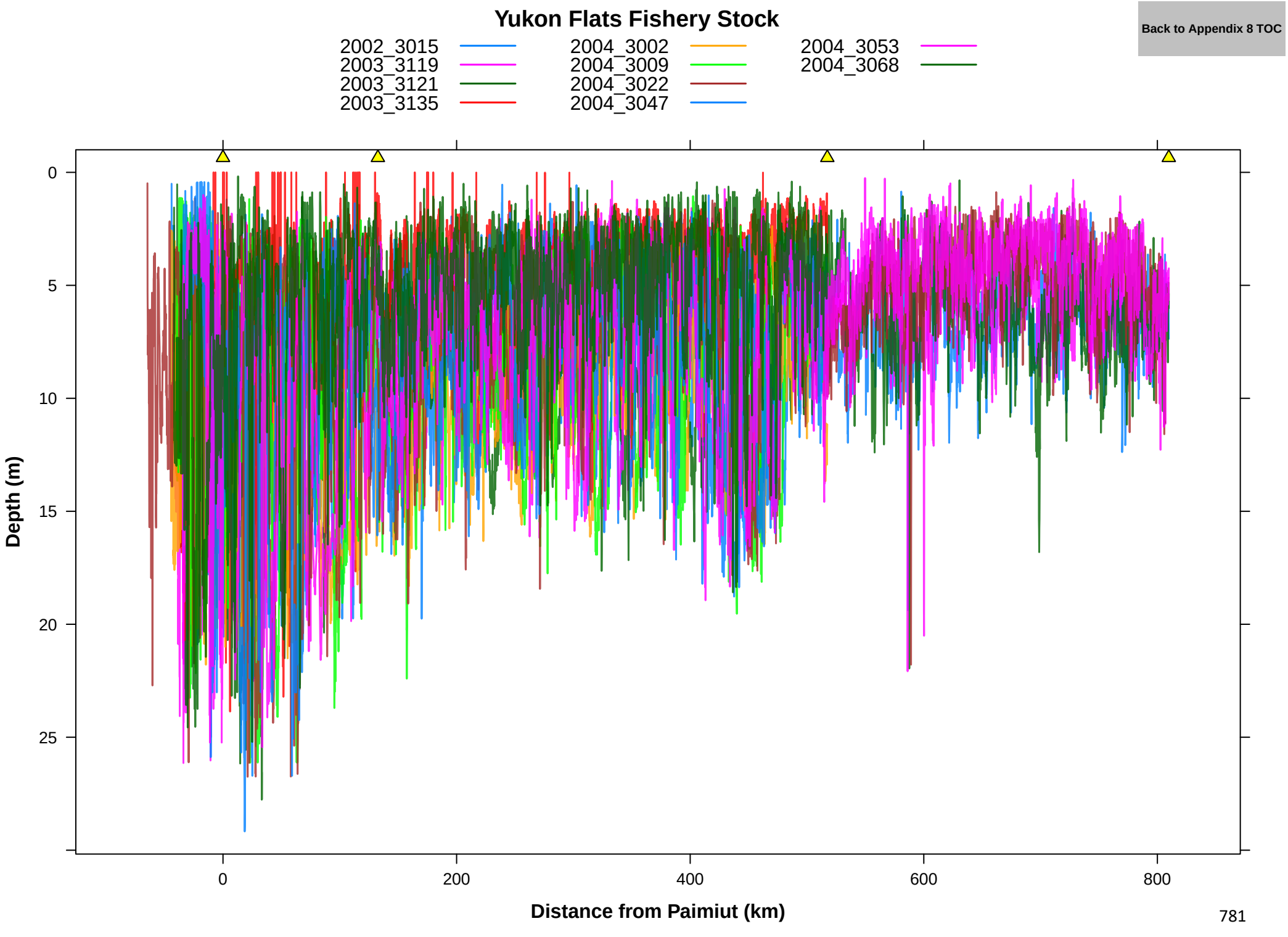

Fish 2004_3057
0
50
100
150
20
19
18
17
16
Temperature (C)
Hours since release
777

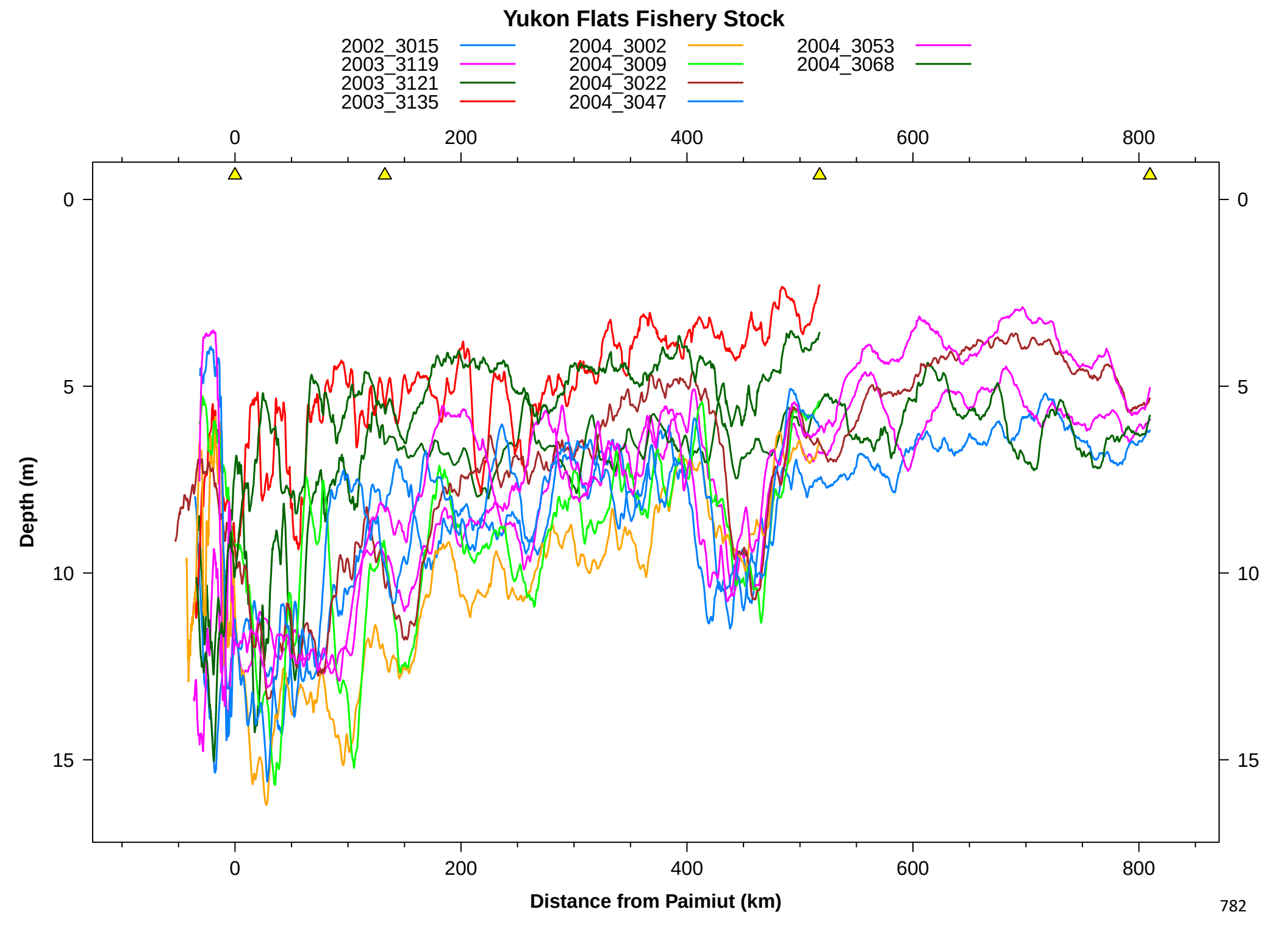

Fish 2004_3057
Temperature (C)
19.5
19.0
18.5
18.0
17.5
17.0
Tagging site
Yukon 1
Yukon 2
Reach

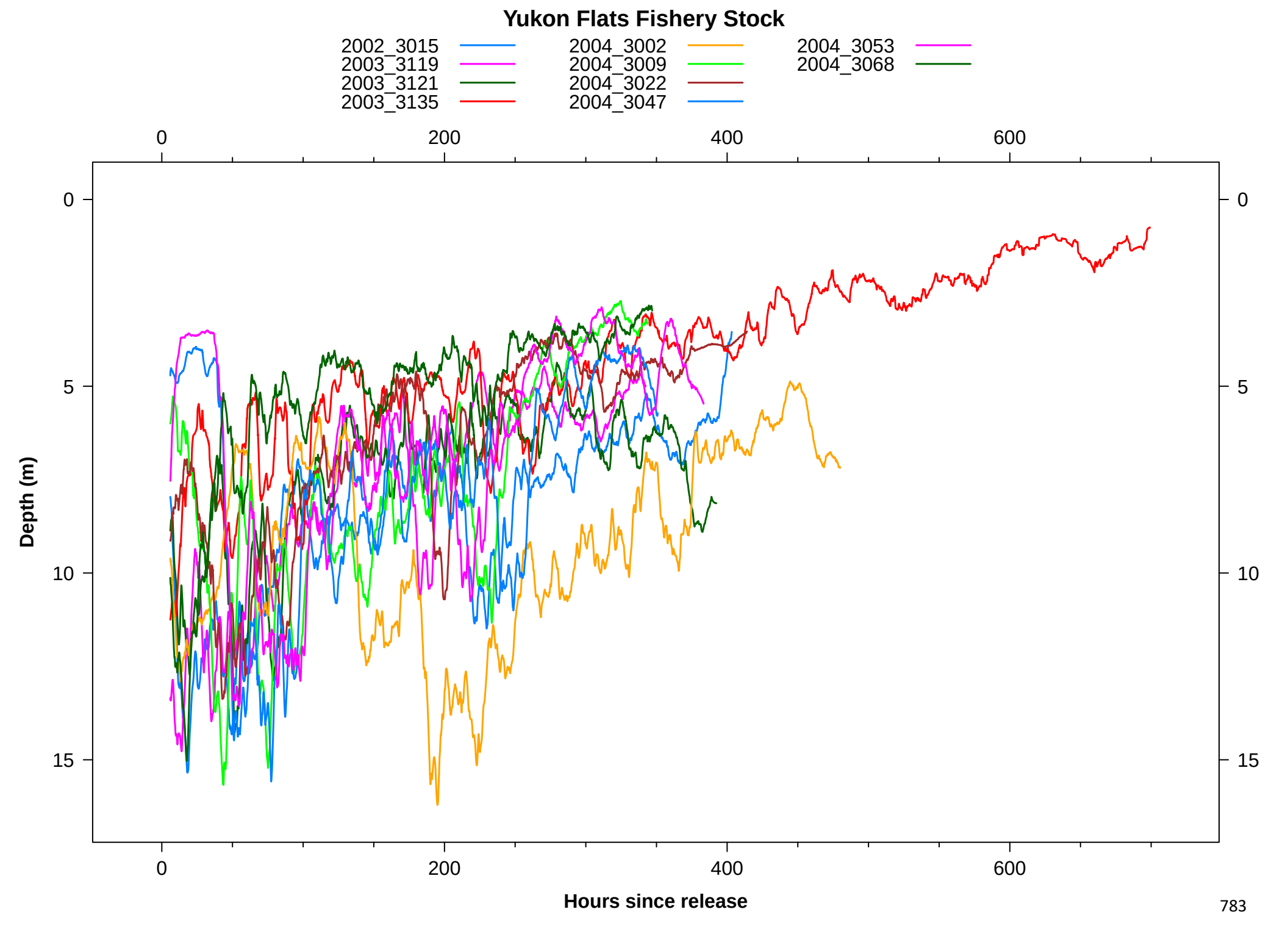

Fish 2004_3057
17.0
17.5
18.0
18.5
19.0
19.5
20.0
Tagging site
Yukon 1
Yukon 2
10
5
0
Density
Temperature (C)

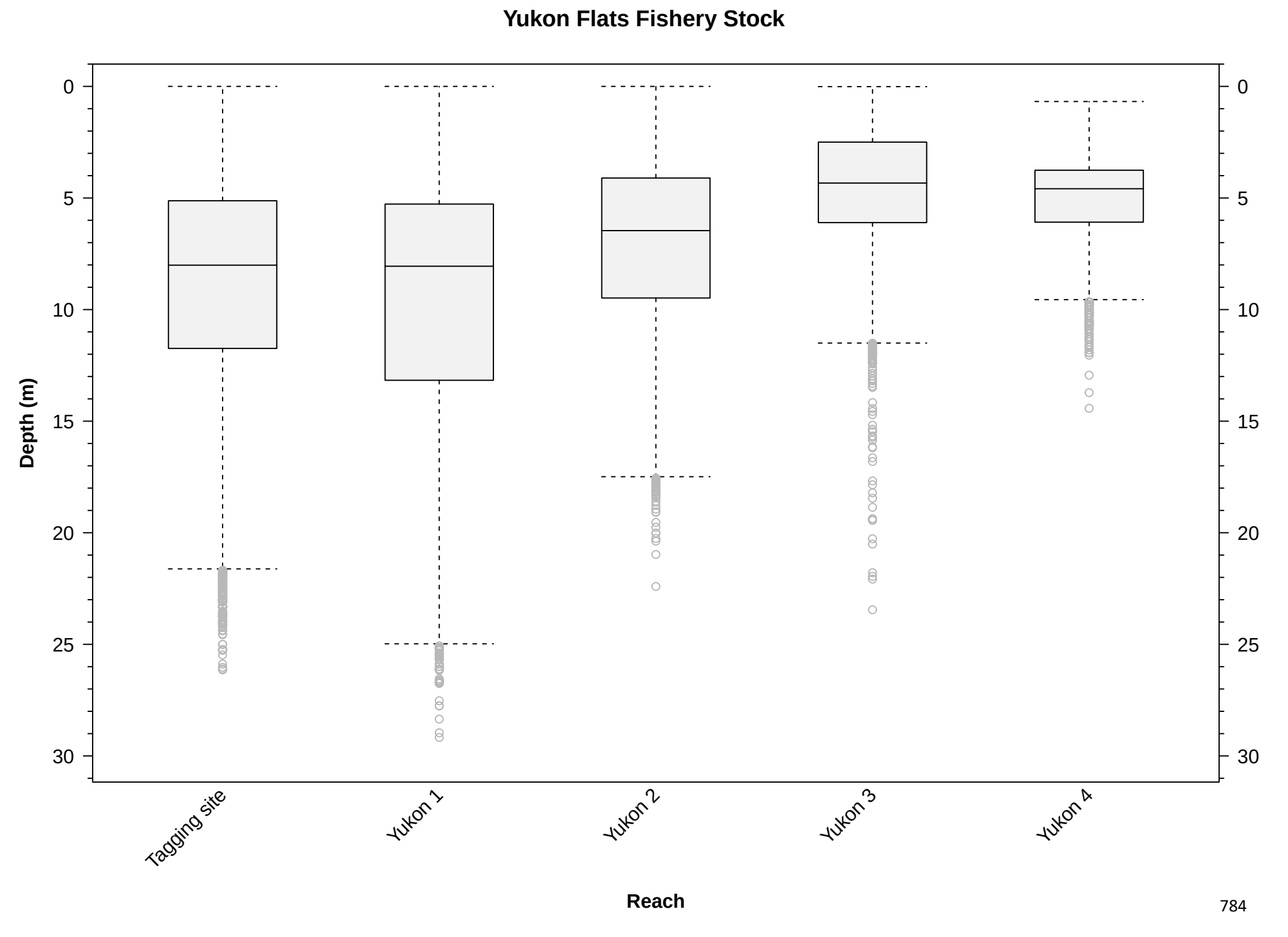

Fish 2004_3057
Tagging site
Yukon 1
Yukon 2
Depth (m)
Temperature (C)
17.0
17.5
18.0
18.5
19.0
19.5
0
10
20

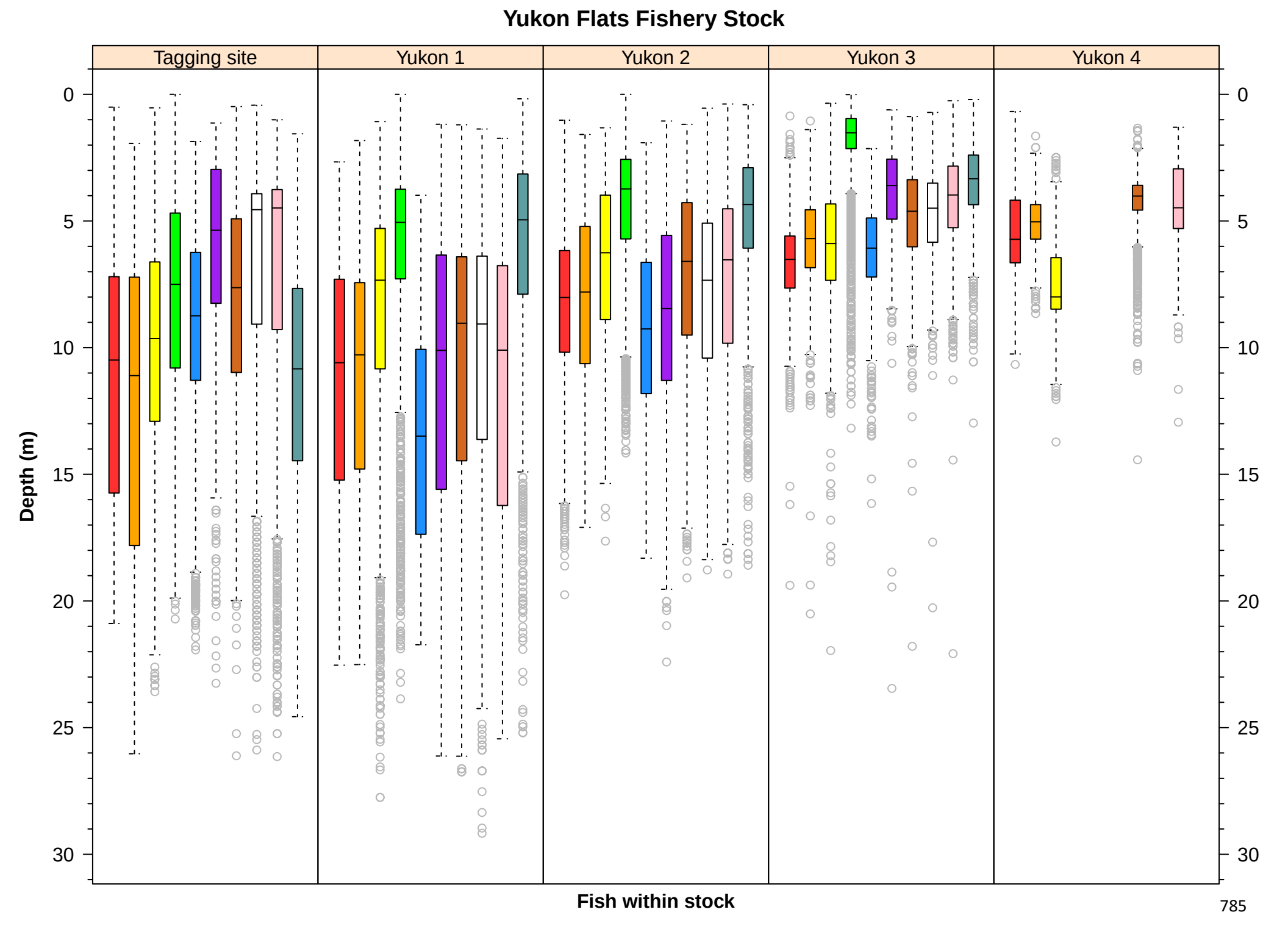
Back to Appendix 8 TOC

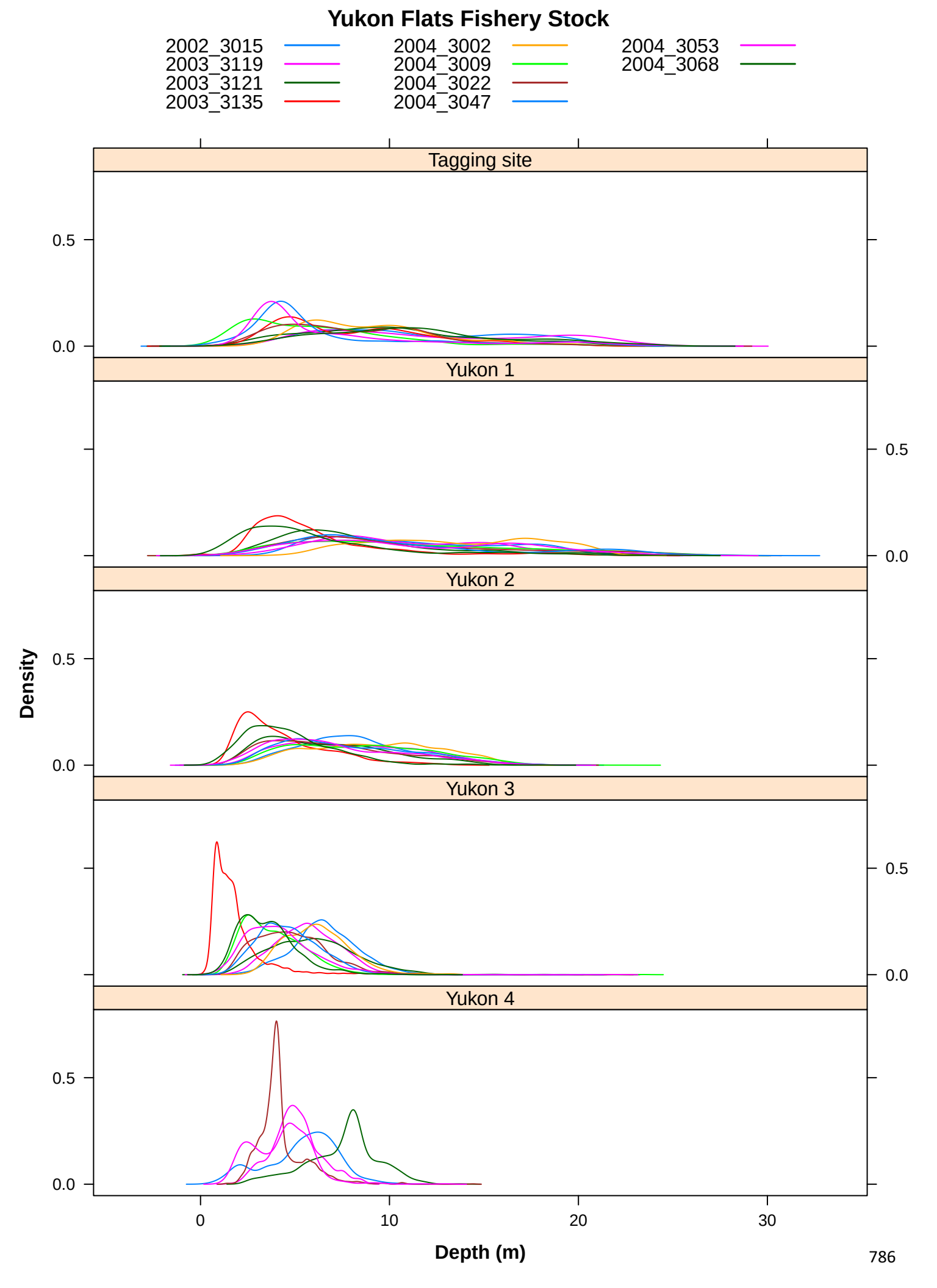


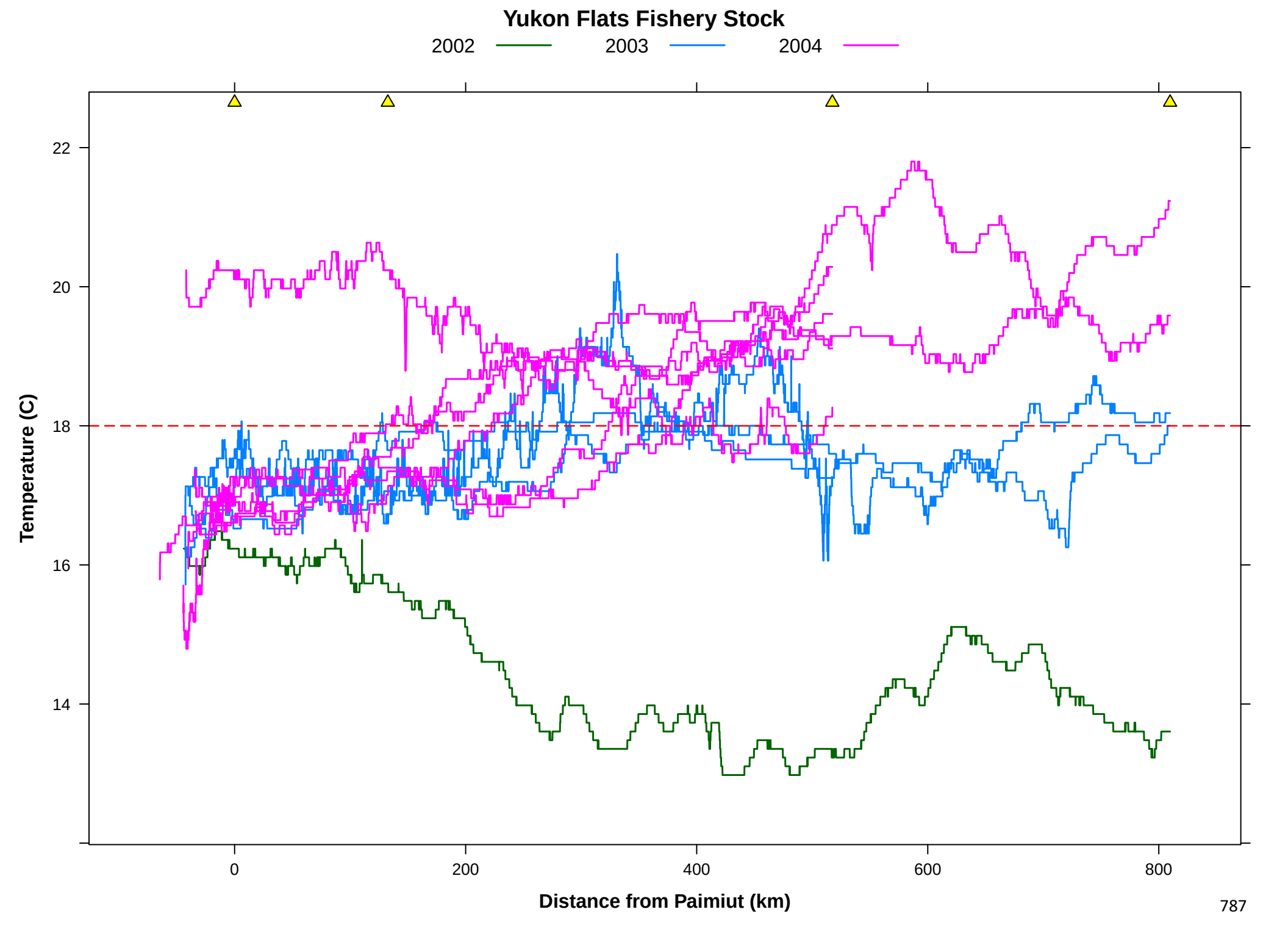

Yukon Flats Fishery Stock
2002_3015
2003_3119
2003_3121
2003_3135
2004_3002
2004_3009
2004_3022
2004_3047
2004_3053
2004_3068
0
200
400
600
800
0
5
10
15
Depth (m)
Distance from Paimiut (km)

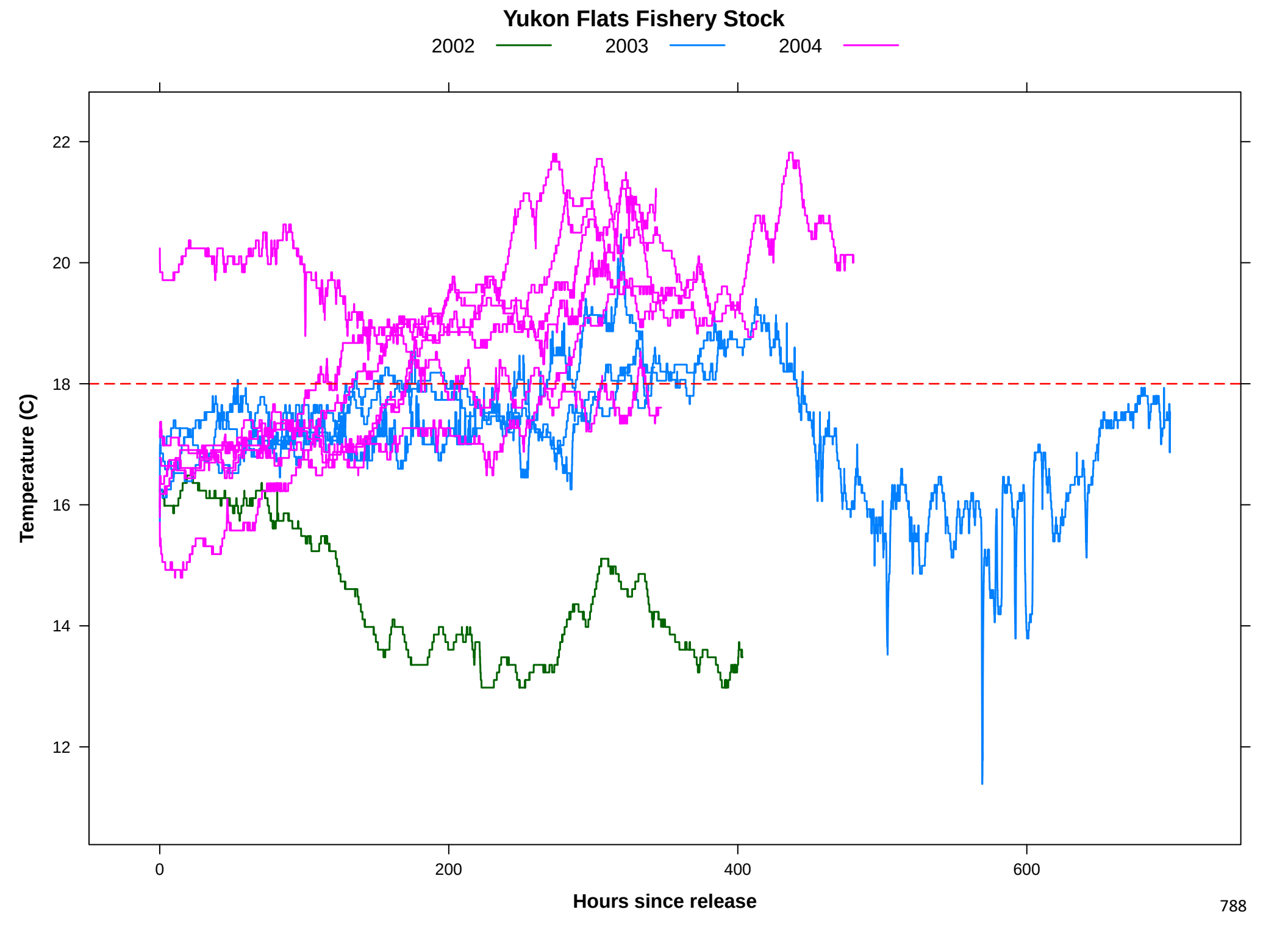

Yukon Flats Fishery Stock
2002_3015
2003_3119
2003_3121
2003_3135
2004_3002
2004_3009
2004_3022
2004_3047
2004_3053
2004_3068
0
200
400
600
0
5
10
15
Depth (m)
Hours since release

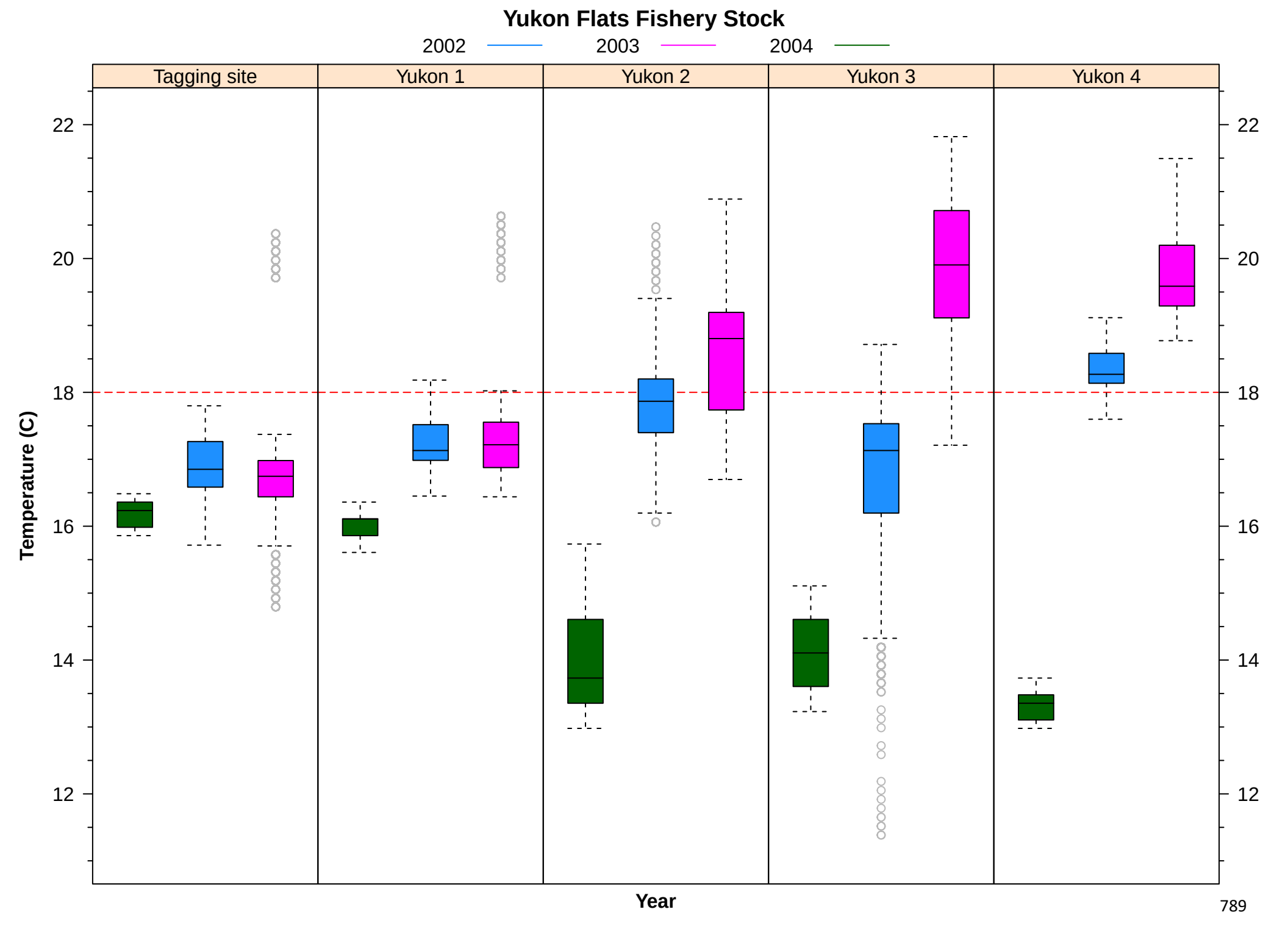

Yukon Flats Fishery Stock
Depth (m)
0
5
10
15
20
25
30
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach
784

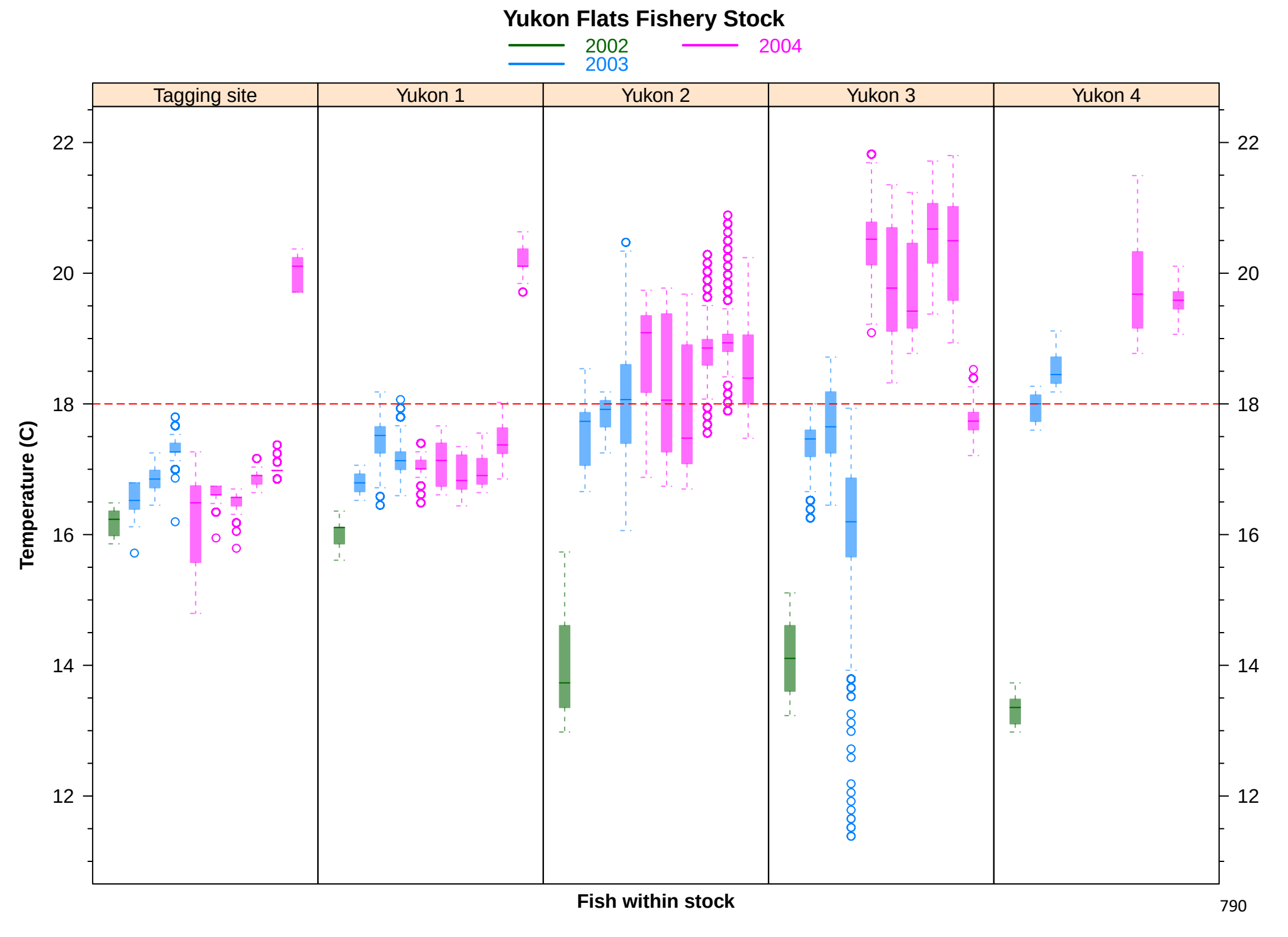

Yukon Flats Fishery Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Depth (m)
0
5
10
15
20
25
30
Fish within stock
785

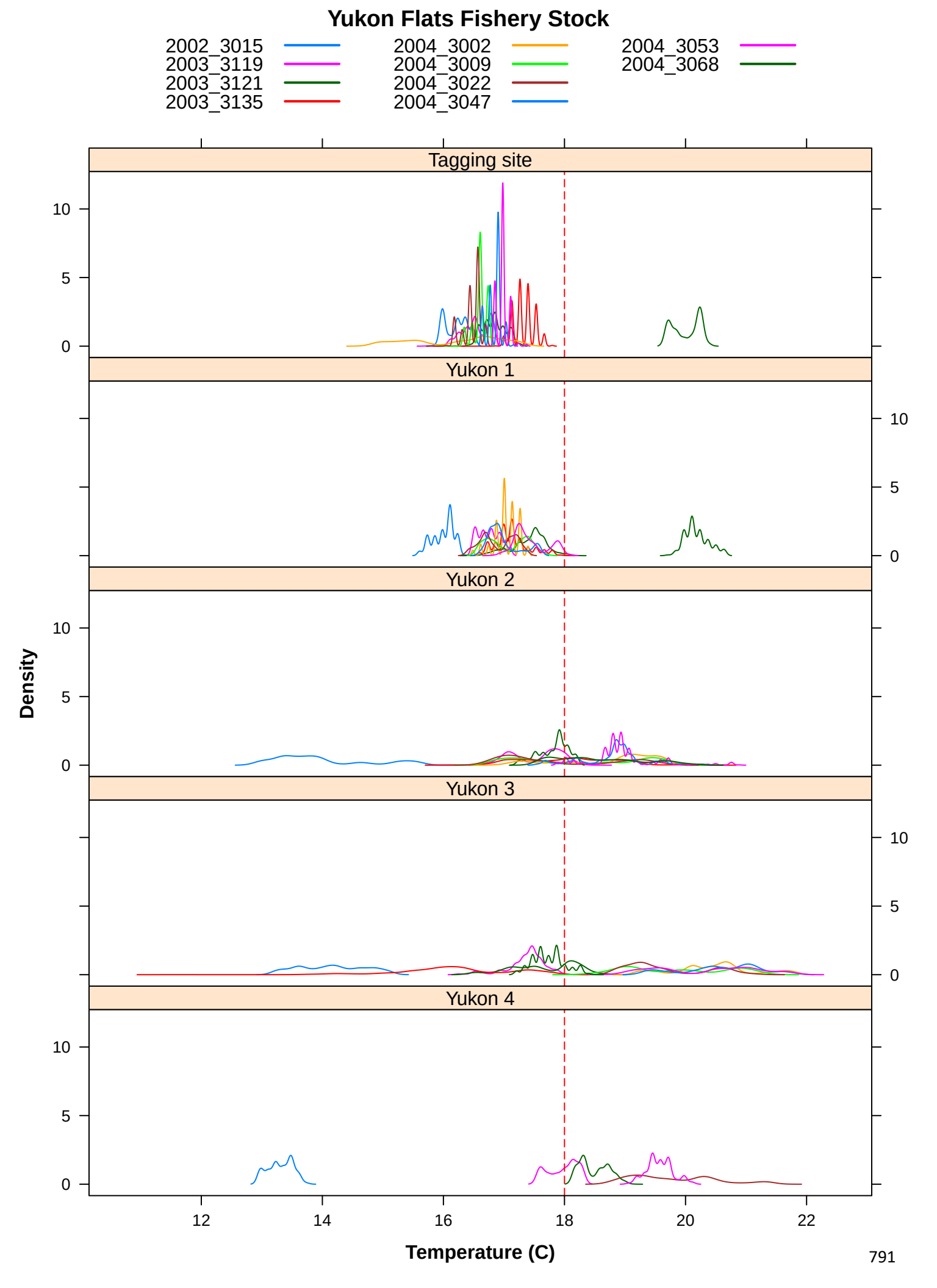

Yukon Flats Fishery Stock
2002_3015
2003_3119
2003_3121
2003_3135
2004_3002
2004_3009
2004_3022
2004_3047
2004_3053
2004_3068
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
0.5
0.0
0
10
20
30
Depth (m)
786

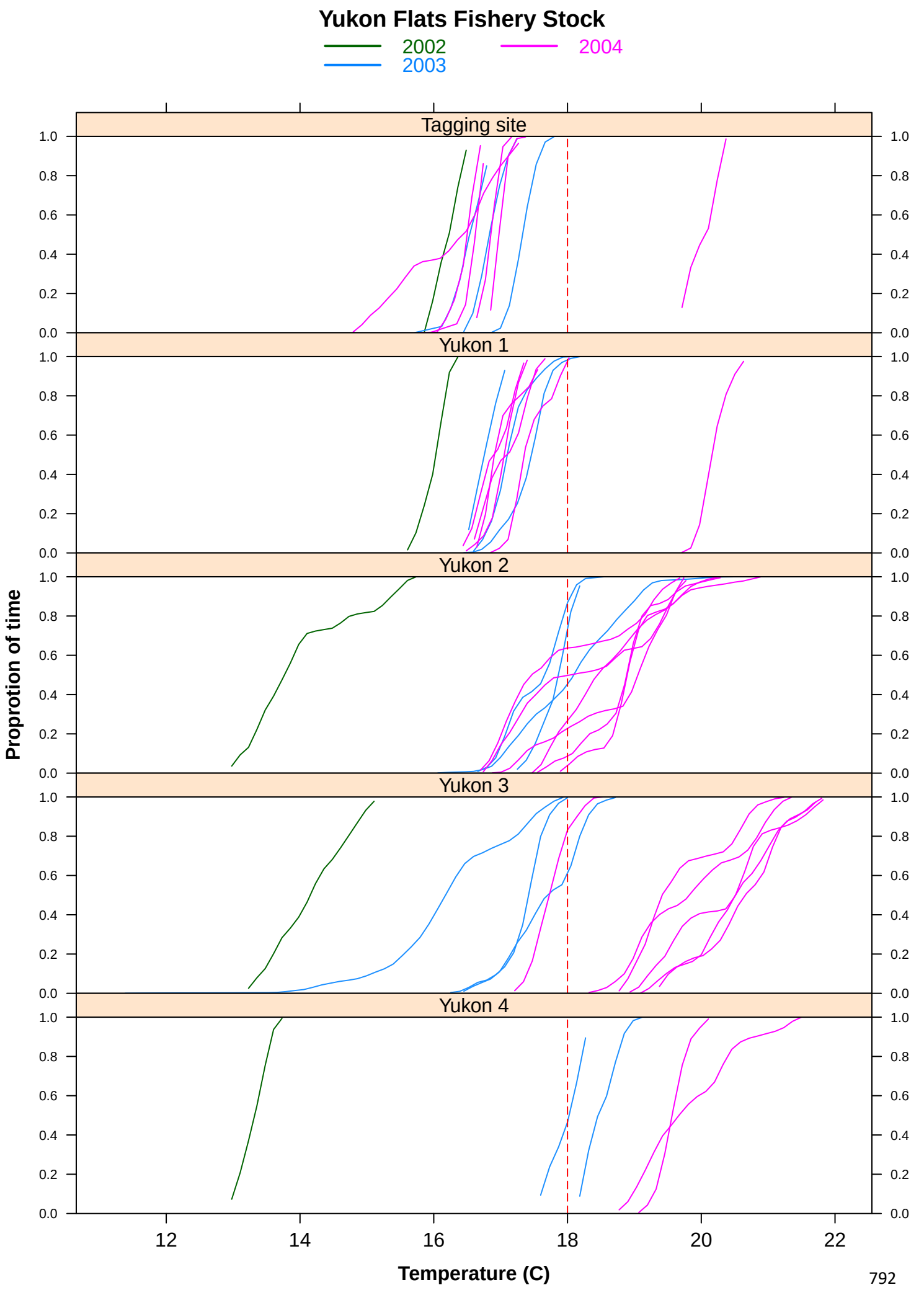

Yukon Flats Fishery Stock
2002
2003
2004
Temperature (C)
22
20
18
16
14
0
200
400
600
800
Distance from Paimiut (km)

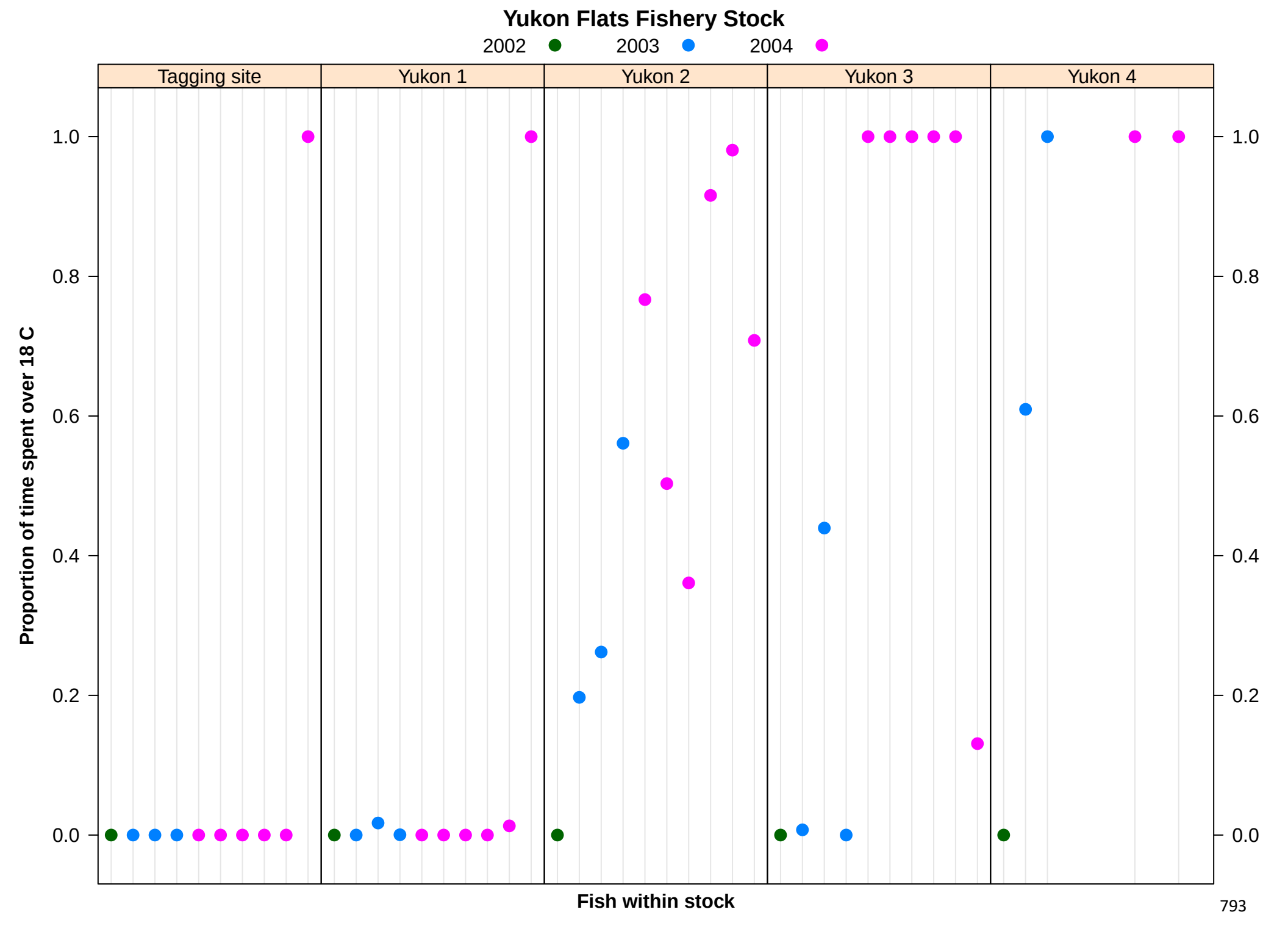

Yukon Flats Fishery Stock
2002
2003
2004
Temperature (C)
22
20
18
16
14
12
0
200
400
600
Hours since release
788

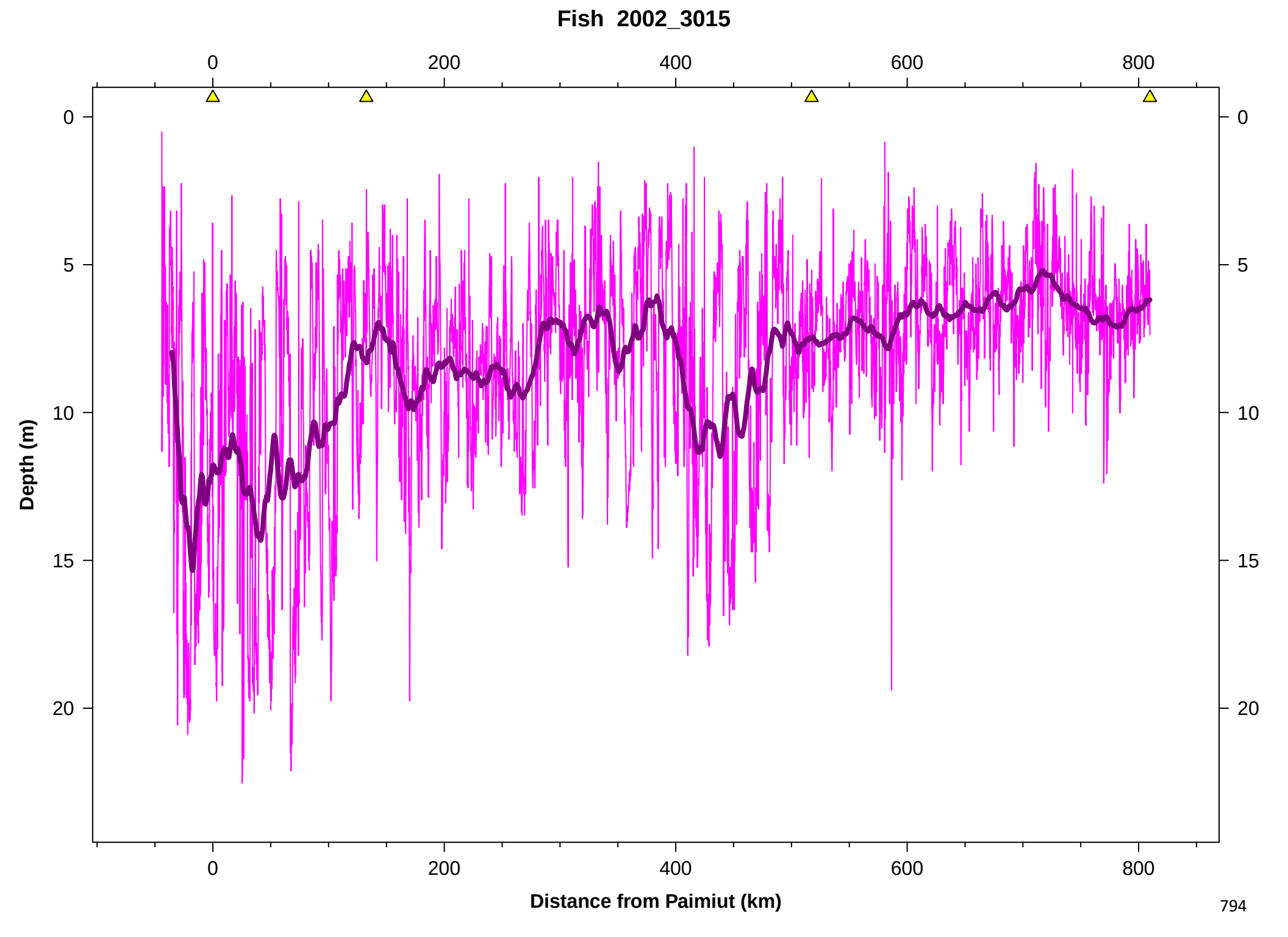

Yukon Flats Fishery Stock
2002
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Temperature (C)
22
20
18
16
14
12
Year
789

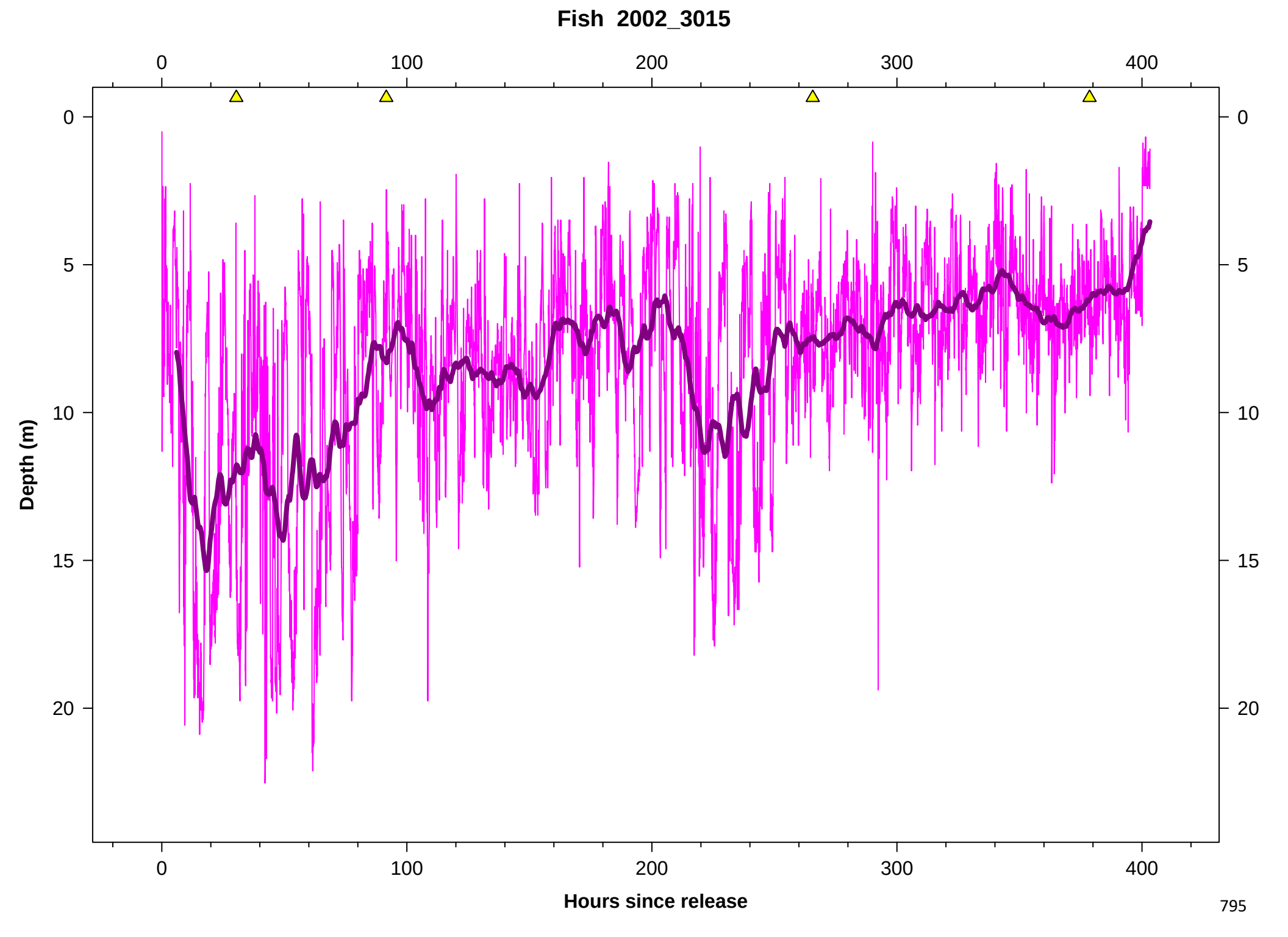

Yukon Flats Fishery Stock
2002
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Temperature (C)
22
20
18
16
14
12
Fish within stock
790

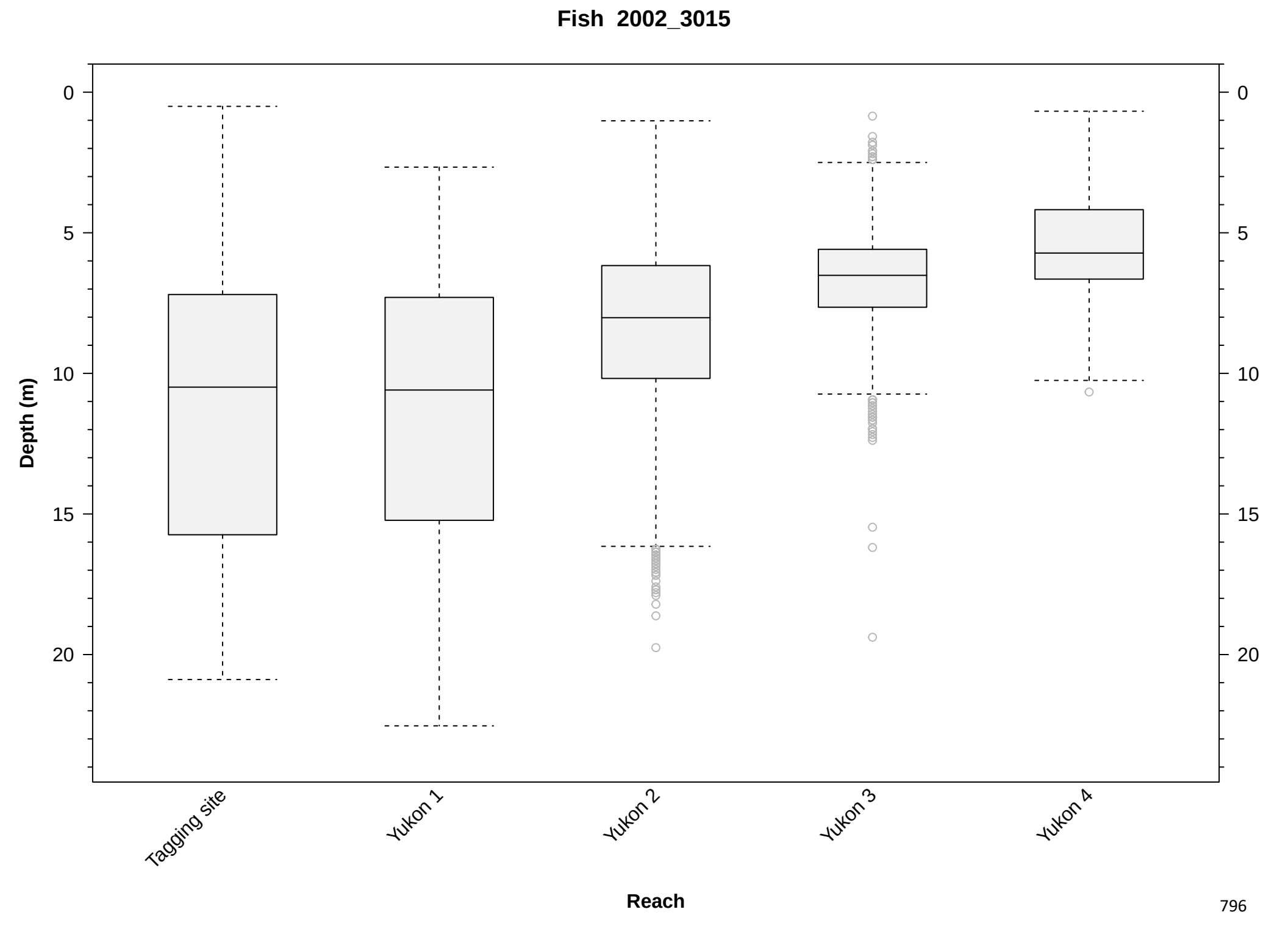

Yukon Flats Fishery Stock
2002_3015
2003_3119
2003_3121
2003_3135
2004_3002
2004_3009
2004_3022
2004_3047
2004_3053
2004_3068
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
Temperature (C)
0
5
10
12
14
16
18
20
22
791

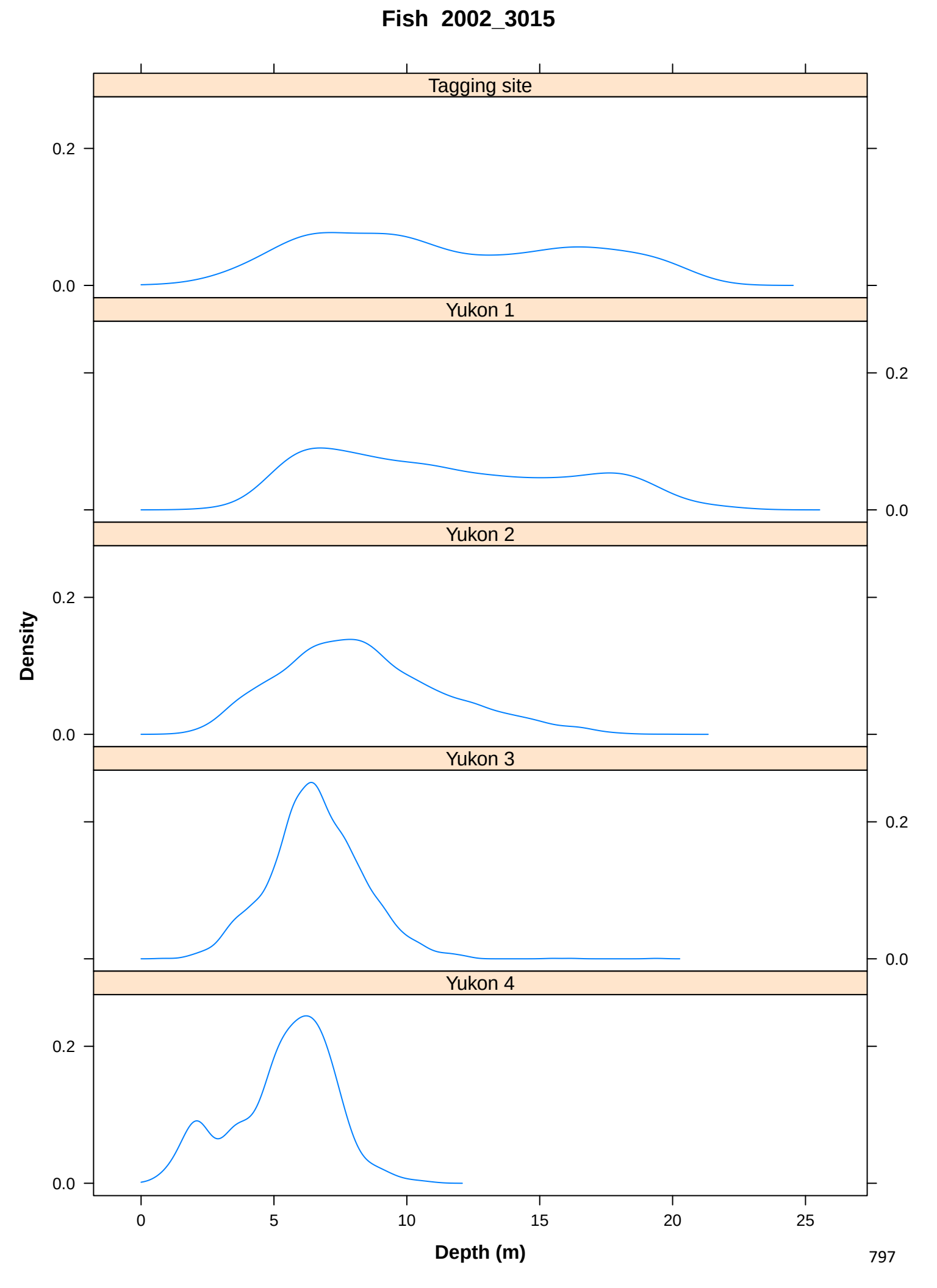

Yukon Flats Fishery Stock
2002
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Proprotion of time
Temperature (C)
792

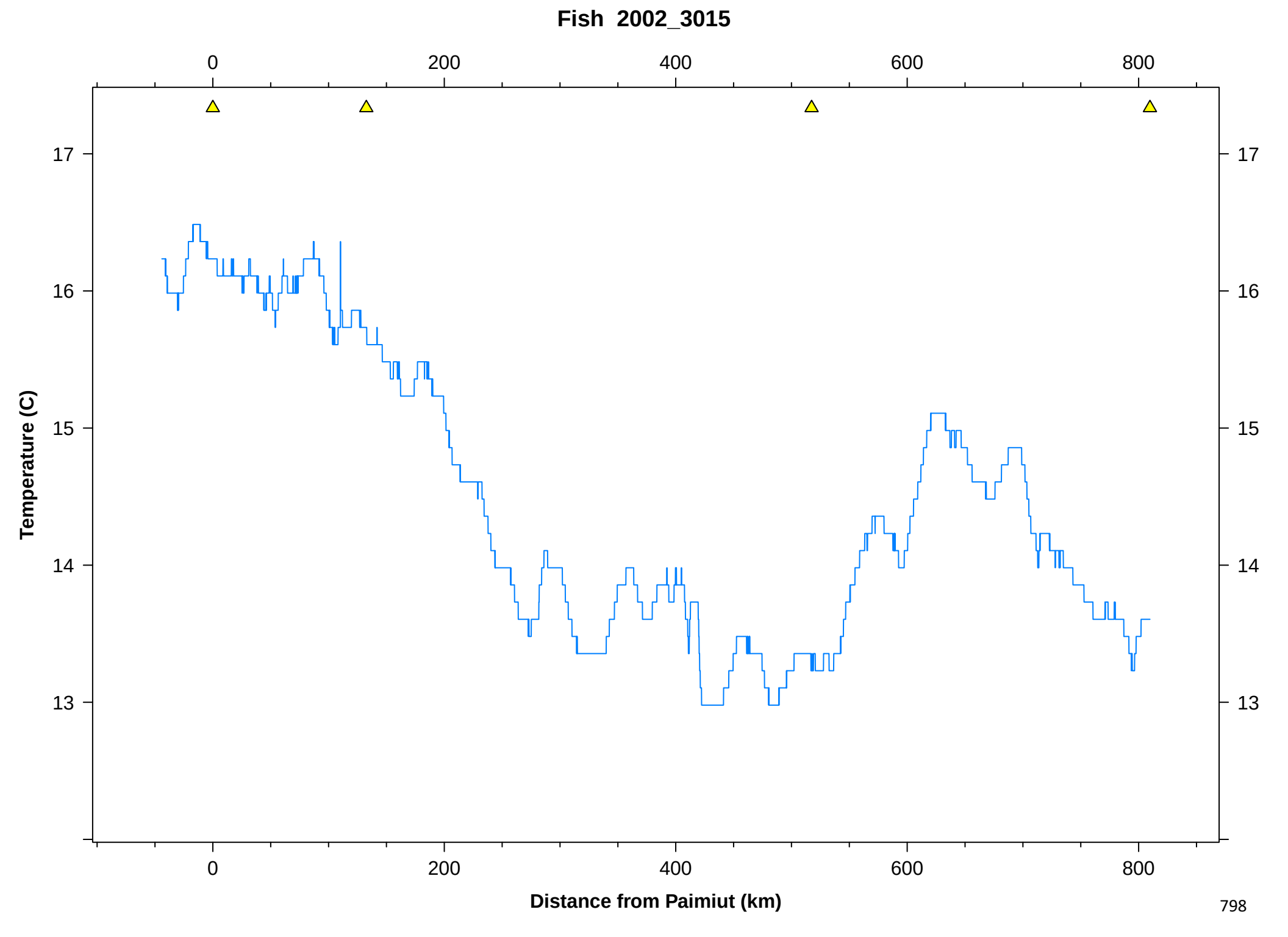

Yukon Flats Fishery Stock
2002
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Proportion of time spent over 18 C
1.0
0.8
0.6
0.4
0.2
0.0
Fish within stock
793

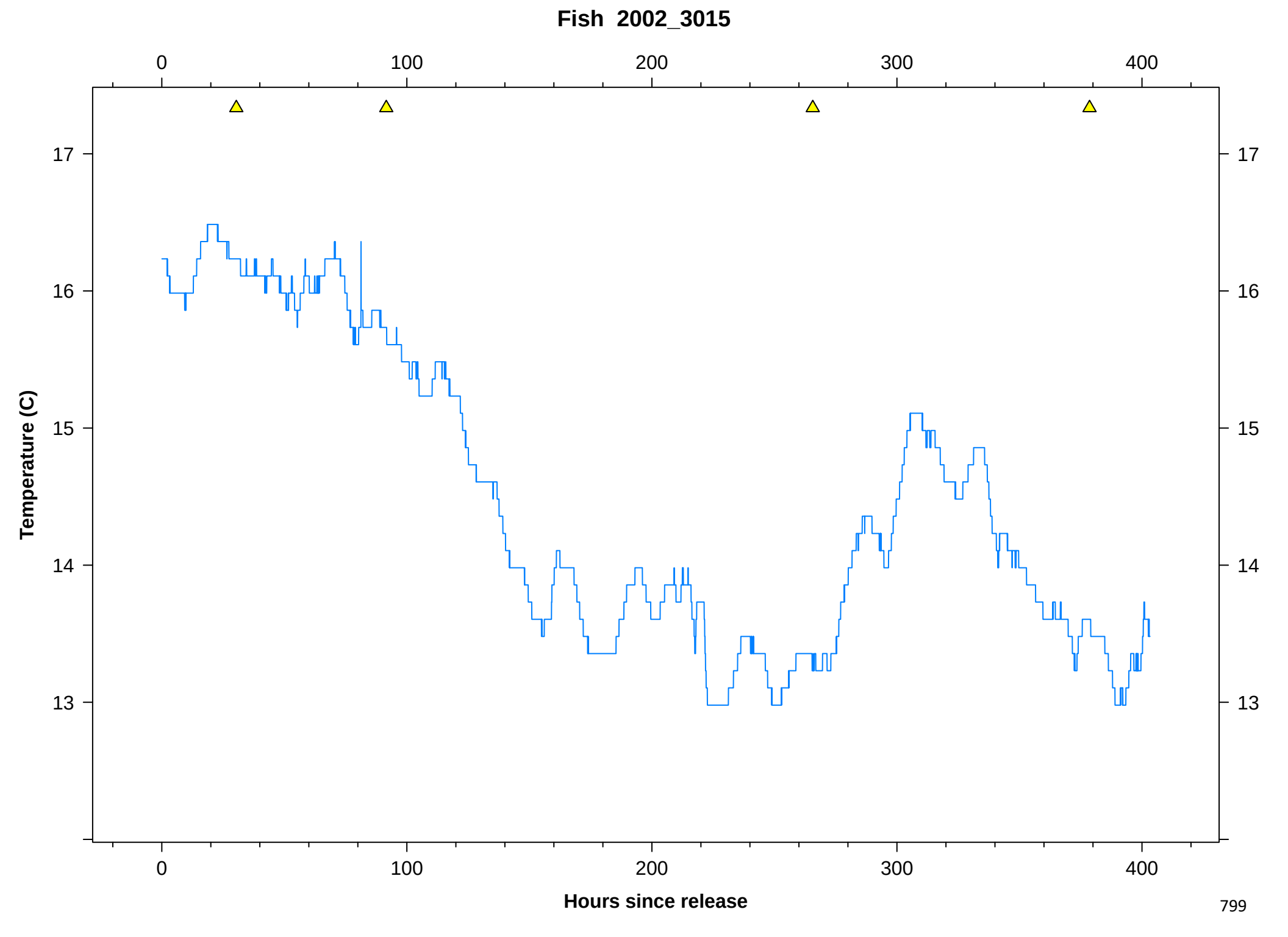

Fish 2002_3015
0
200
400
600
800
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

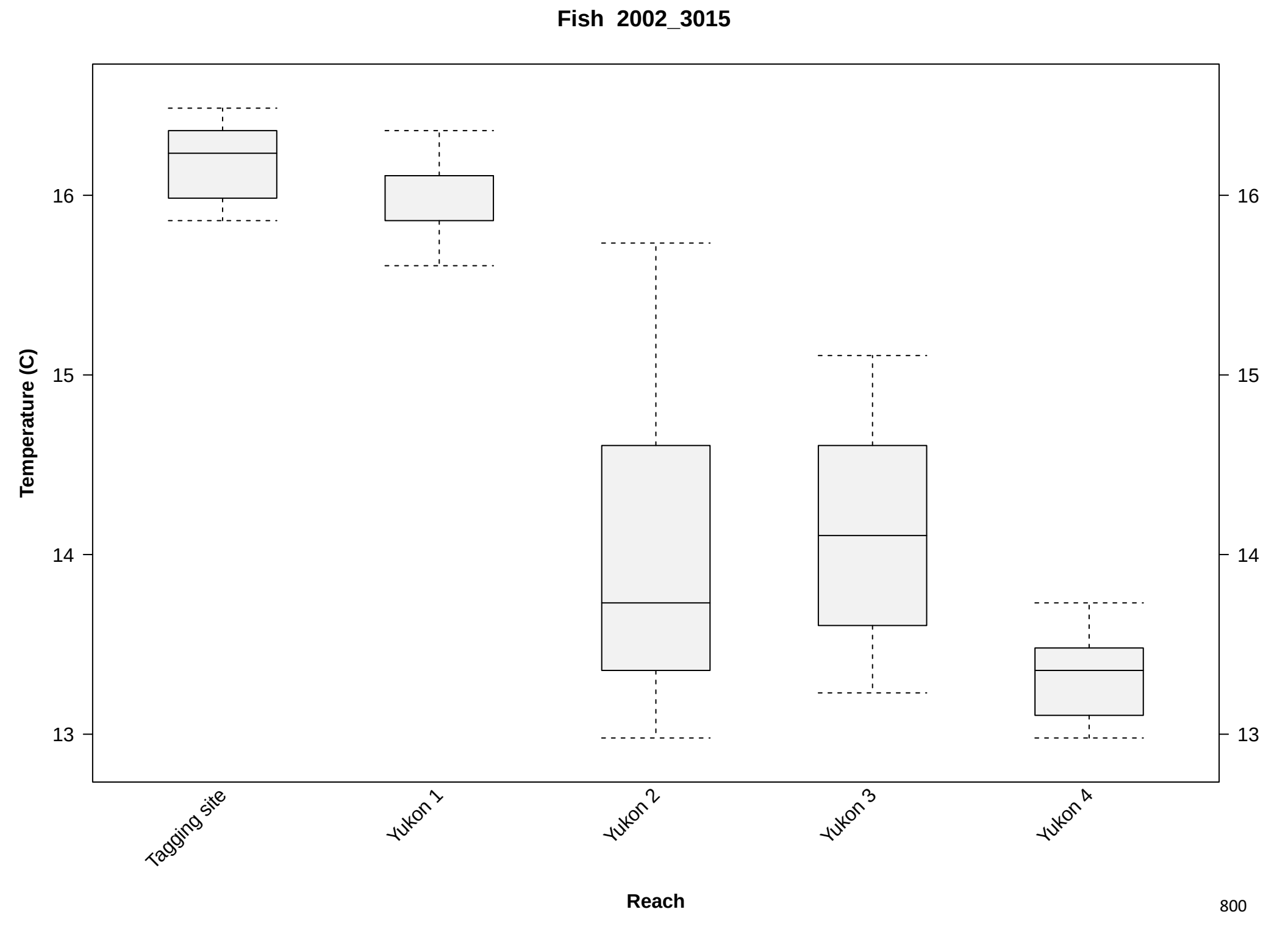

Fish 2002_3015
0
100
200
300
400
0
5
10
15
20
Depth (m)
Hours since release

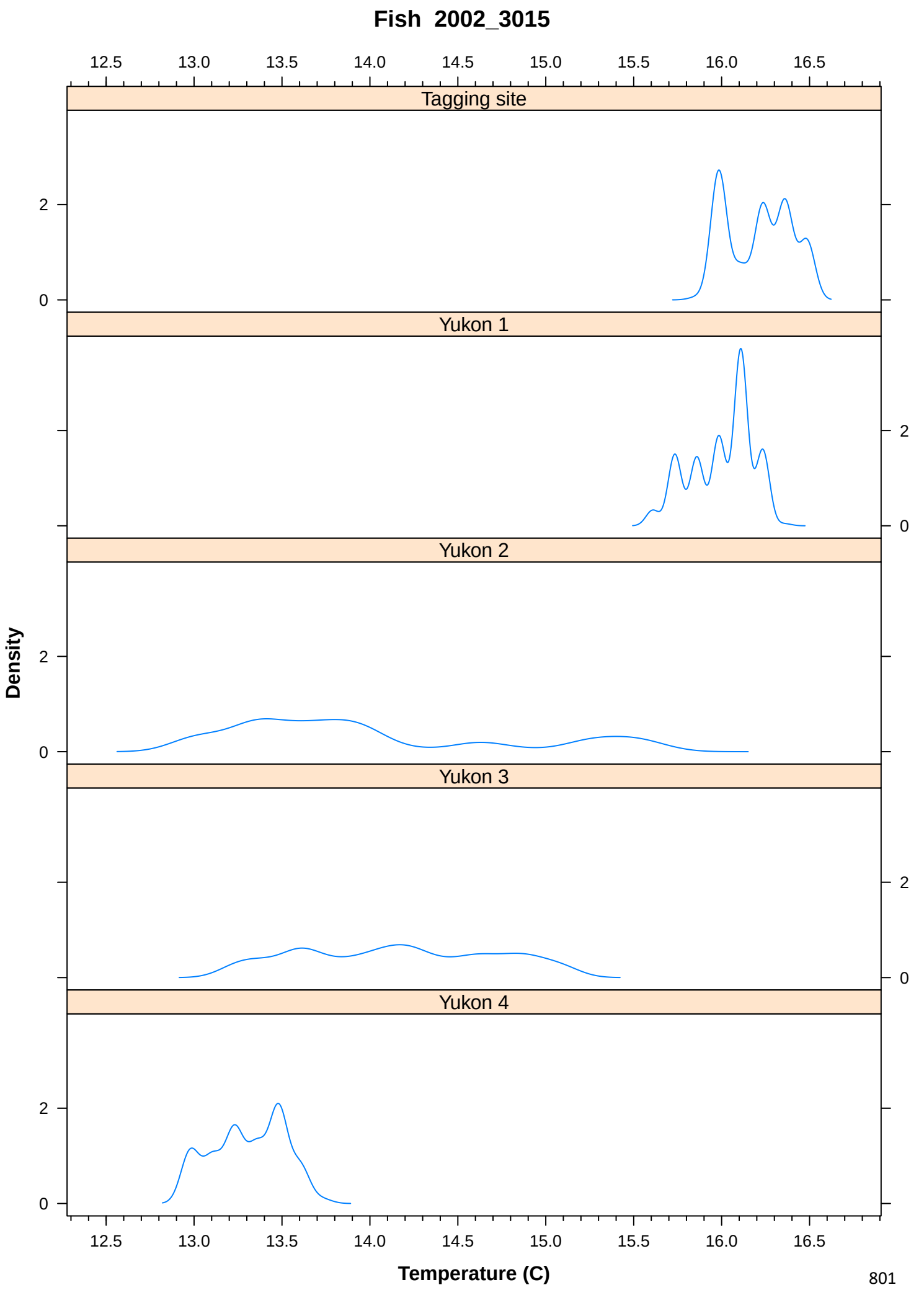

Fish 2002_3015
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach

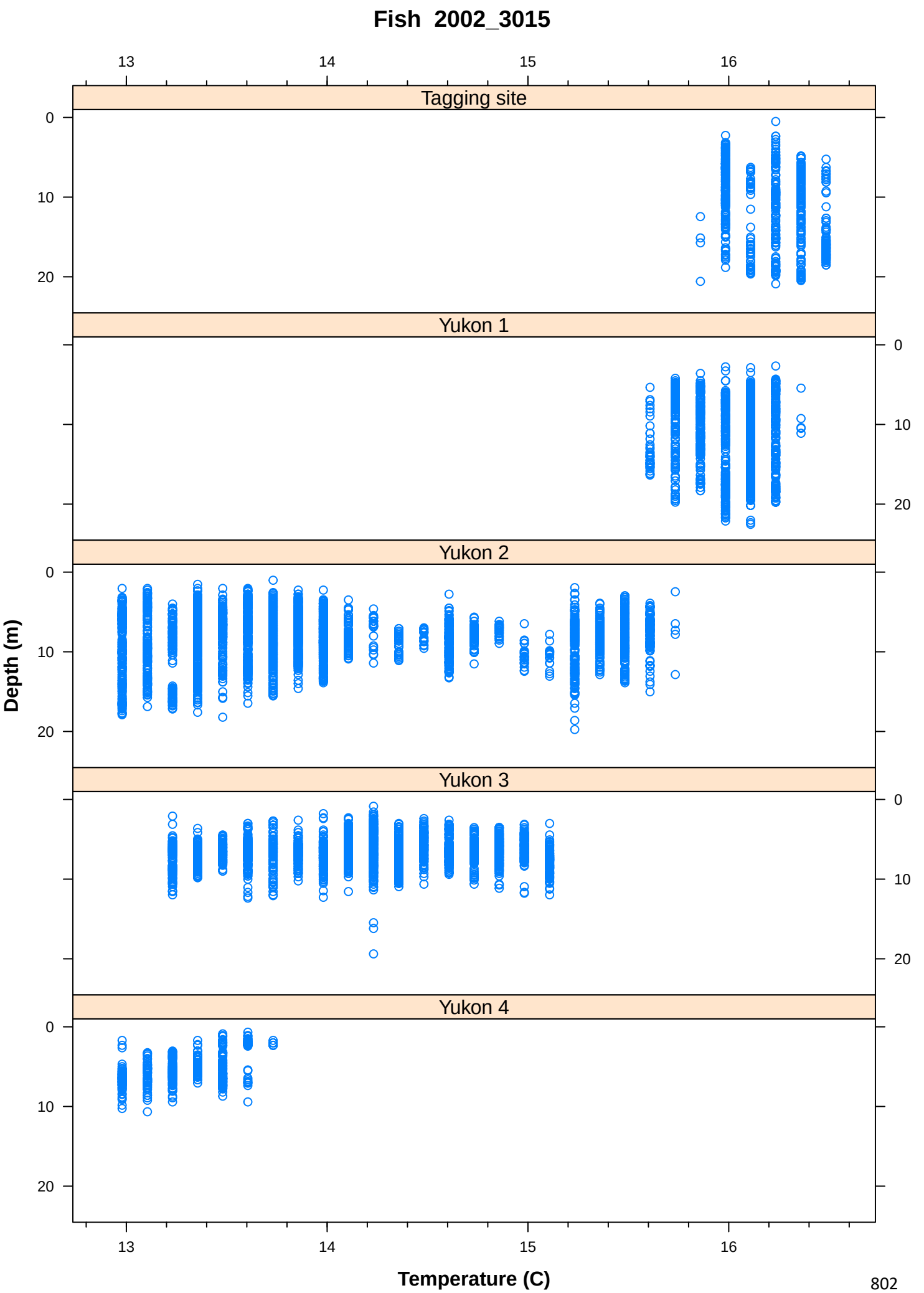

Fish 2002_3015
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
0.0
0.2
0
5
10
15
20
25
Depth (m)
797

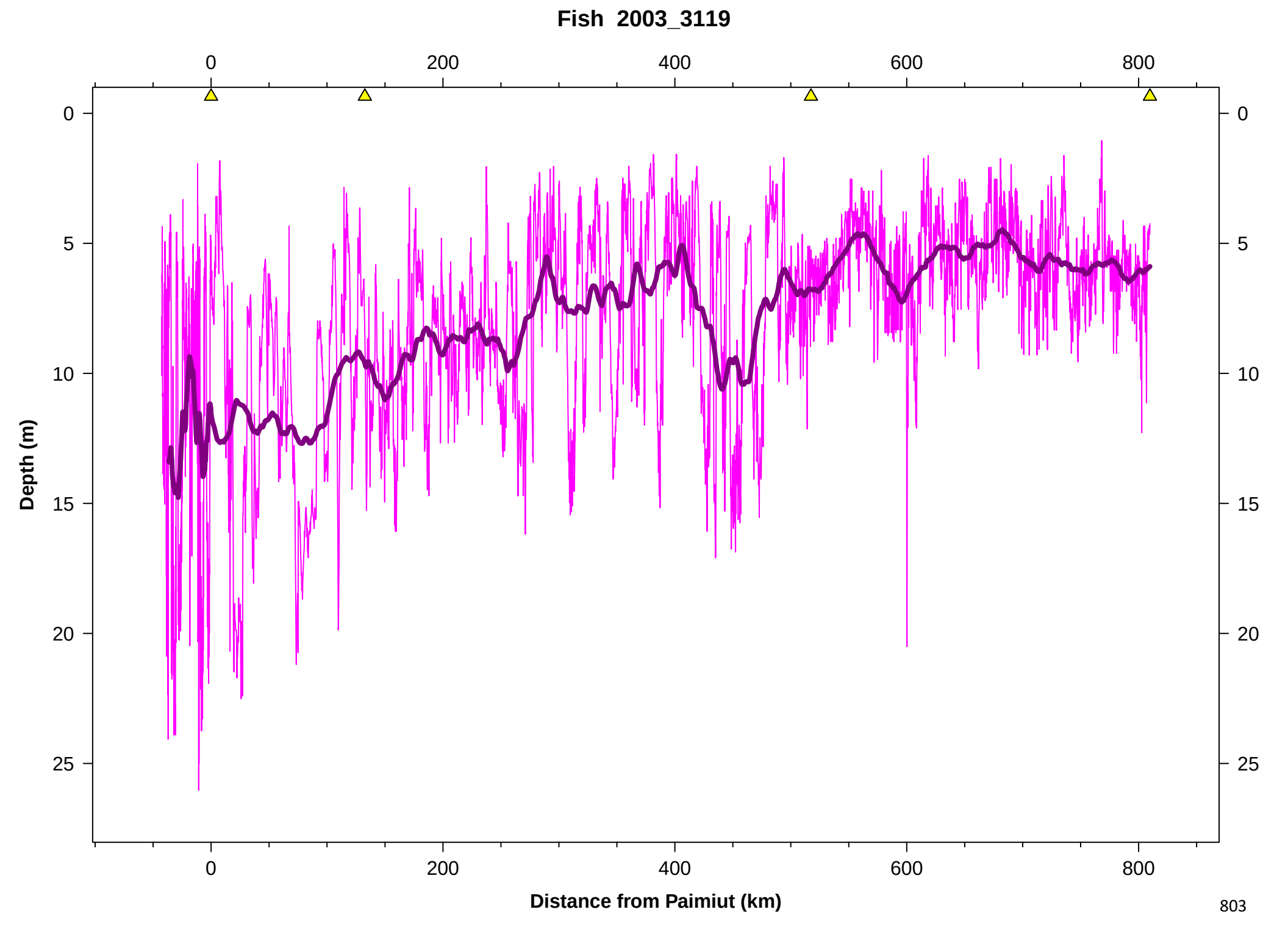

Fish 2002_3015
0
200
400
600
800
17
16
15
14
13
Temperature (C)
Distance from Paimiut (km)

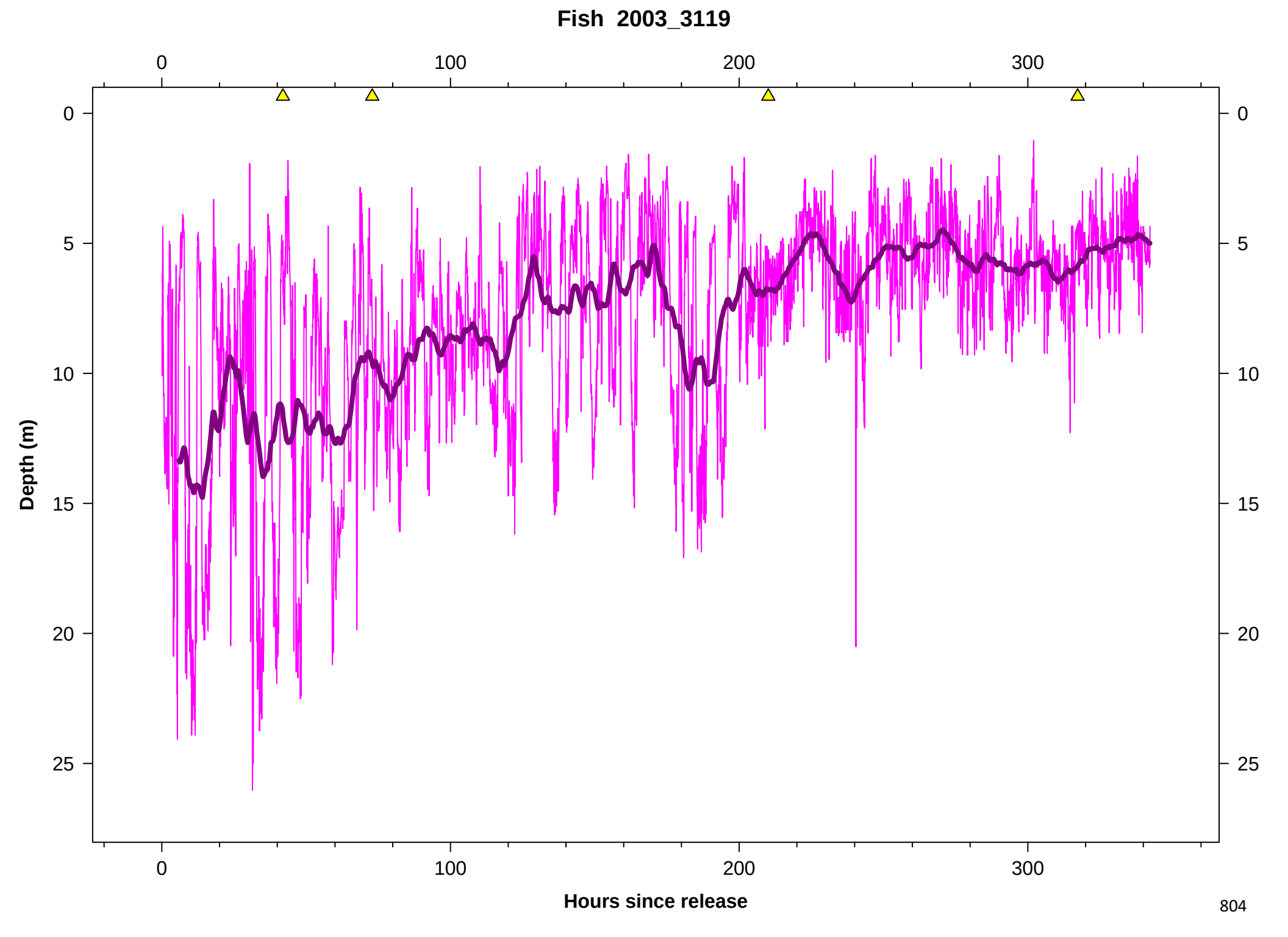

Fish 2002_3015
0
100
200
300
400
17
16
15
14
13
Temperature (C)
Hours since release

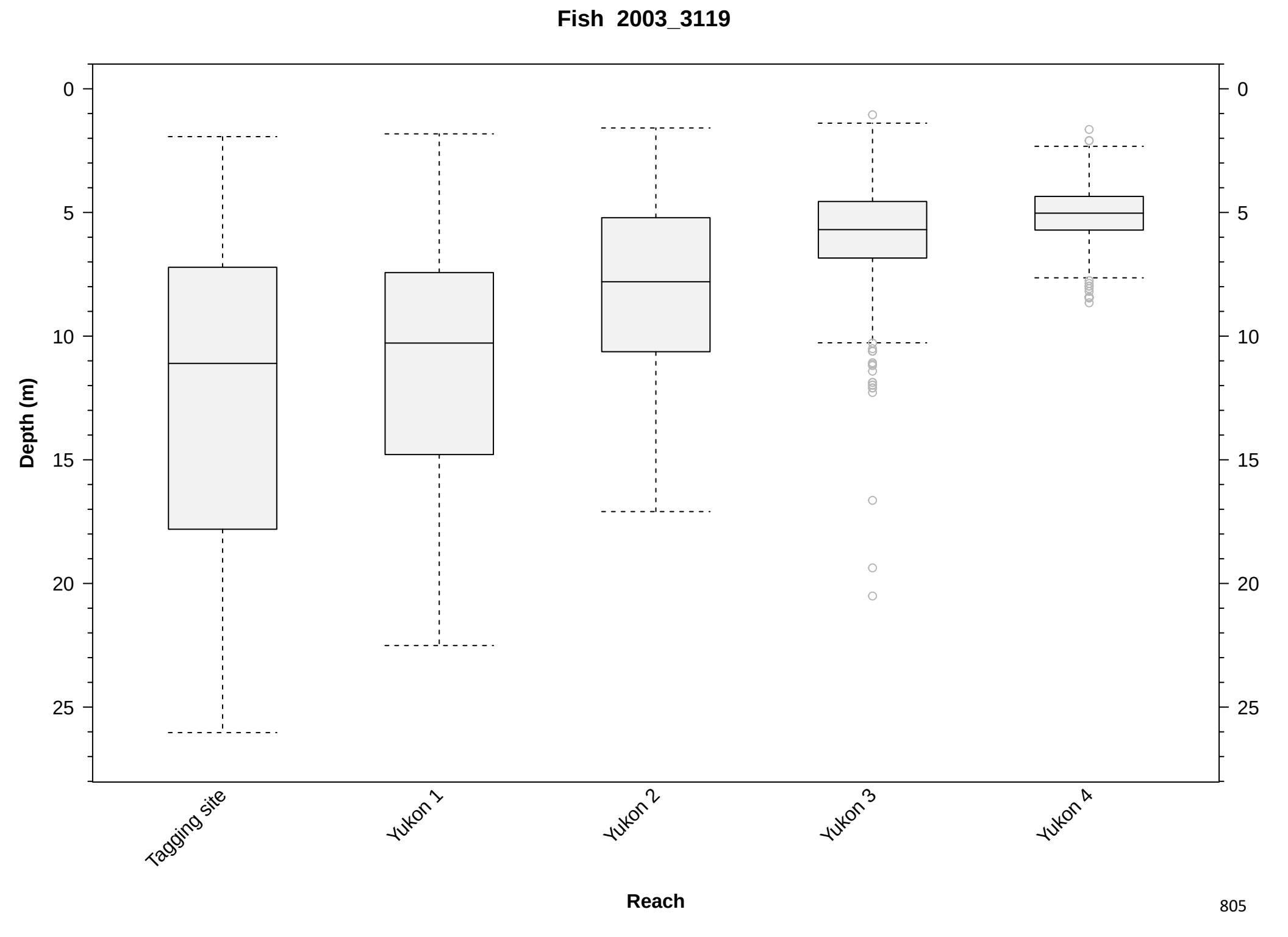

Fish 2002_3015
Temperature (C)
16
15
14
13
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach
800

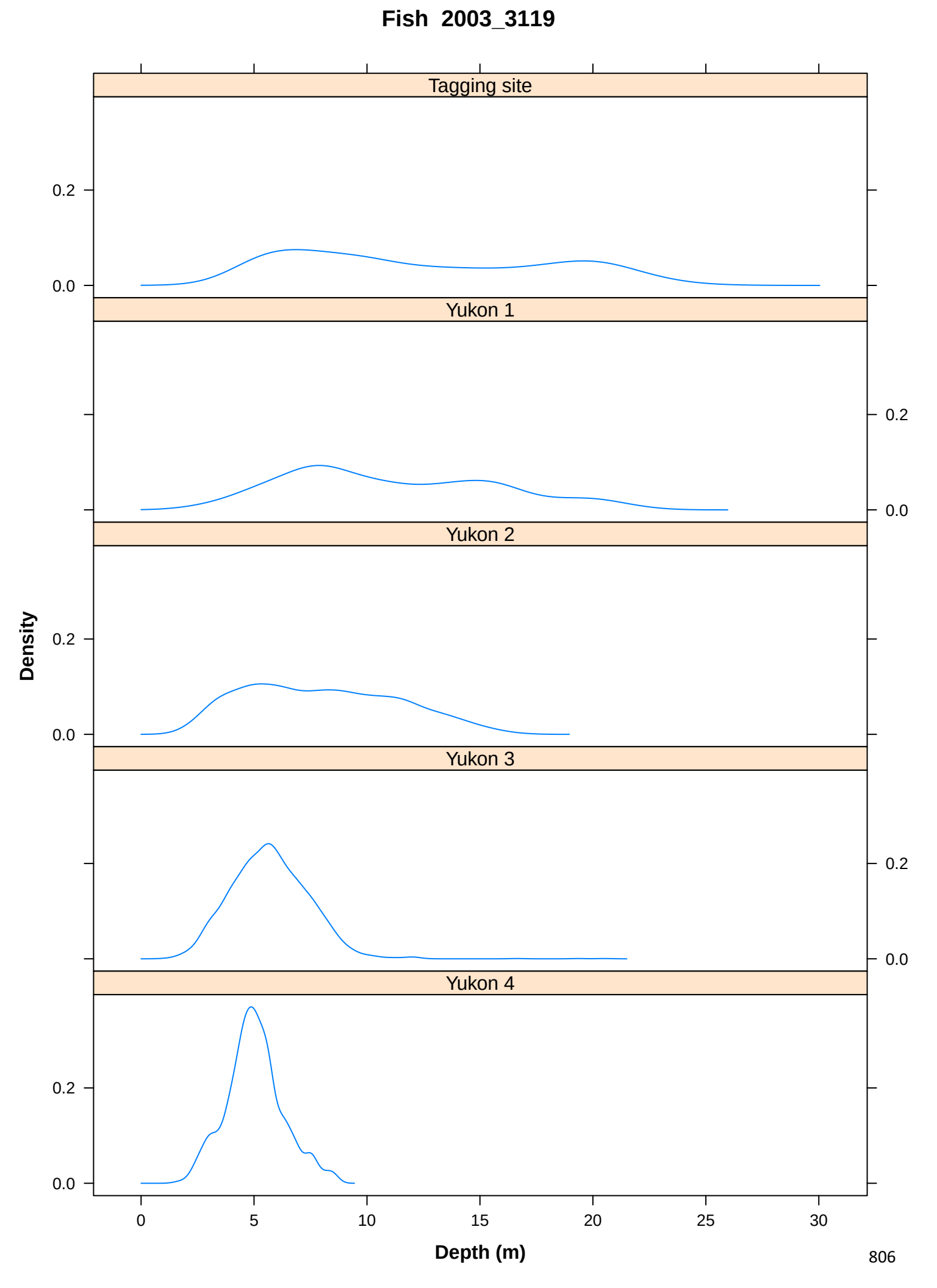

Fish 2002_3015
12.5
13.0
13.5
14.0
14.5
15.0
15.5
16.0
16.5
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
0
2
Temperature (C)

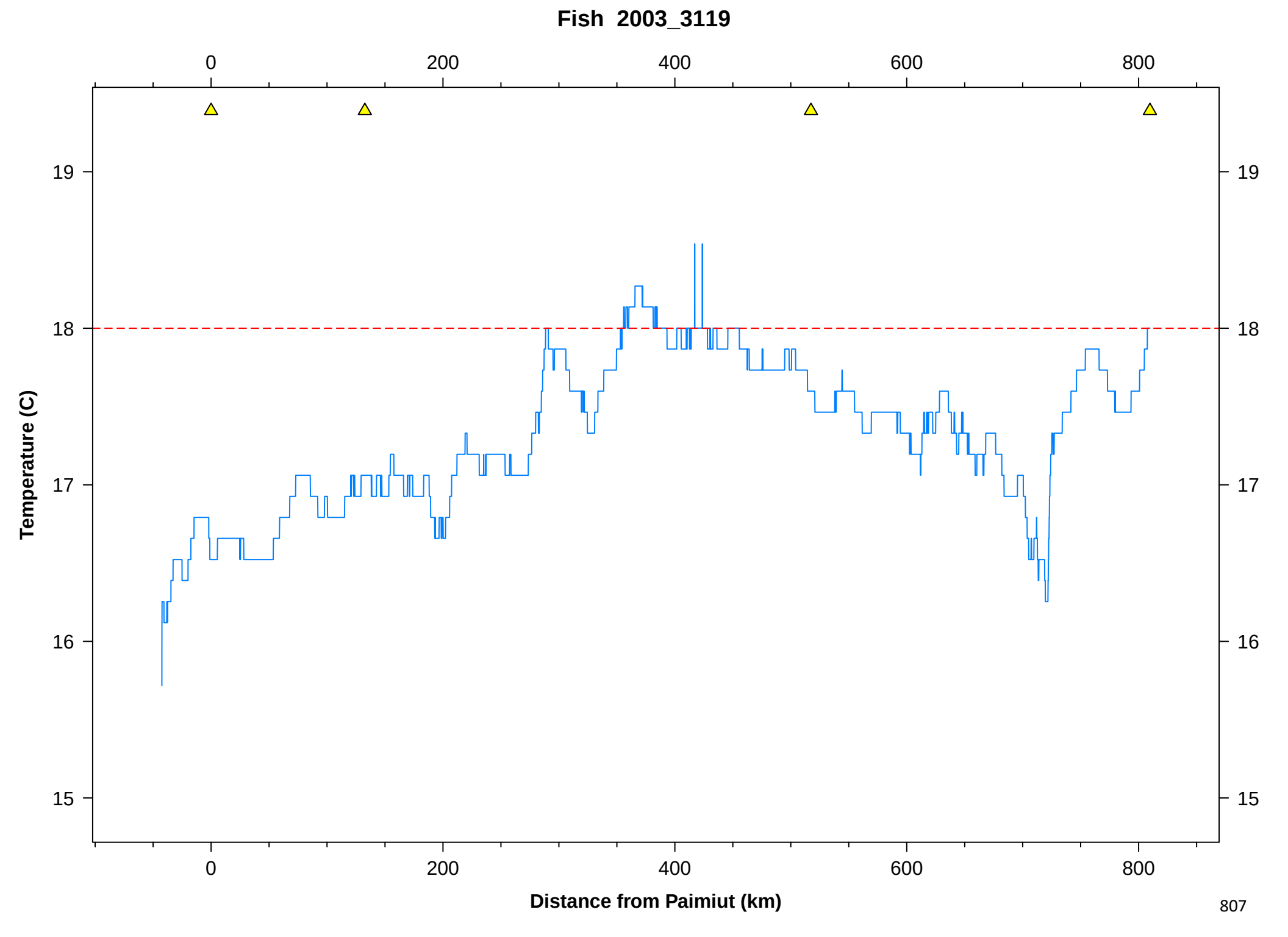

Fish 2002_3015
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Depth (m)
Temperature (C)
13
14
15
16
0
10
20

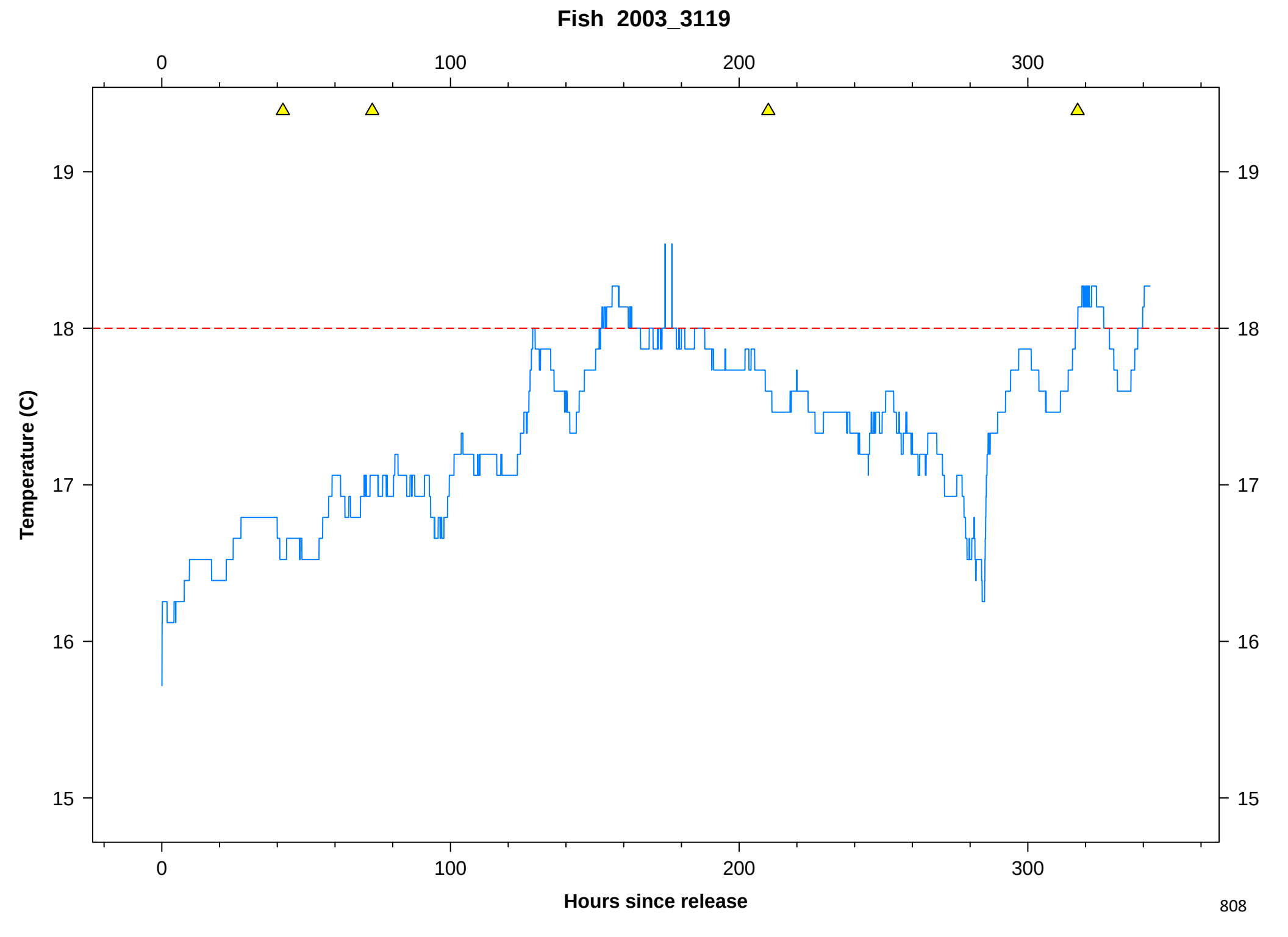

Fish 2003_3119
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
803

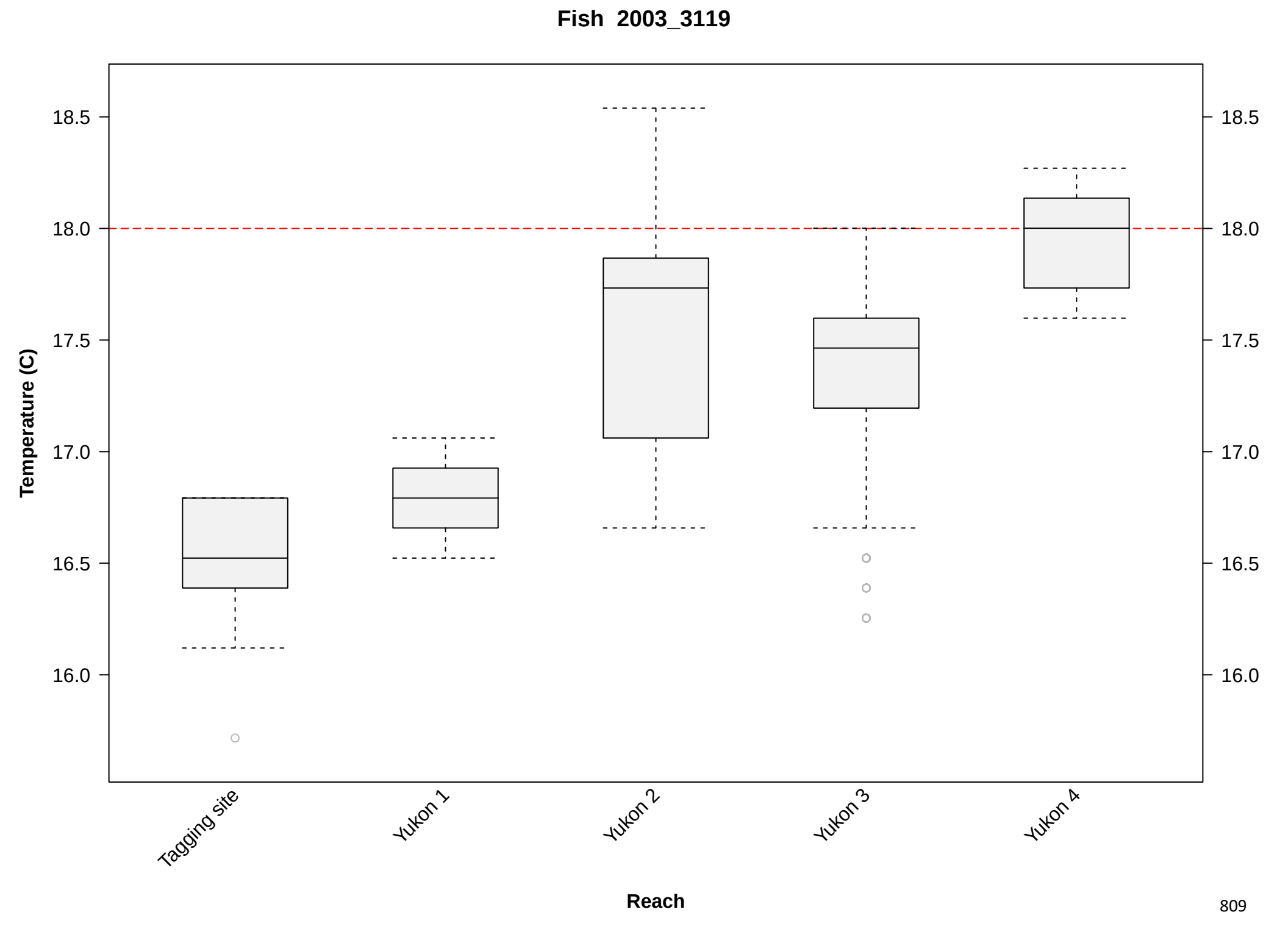

Fish 2003_3119
0
100
200
300
0
5
10
15
20
25
Depth (m)
Hours since release
804

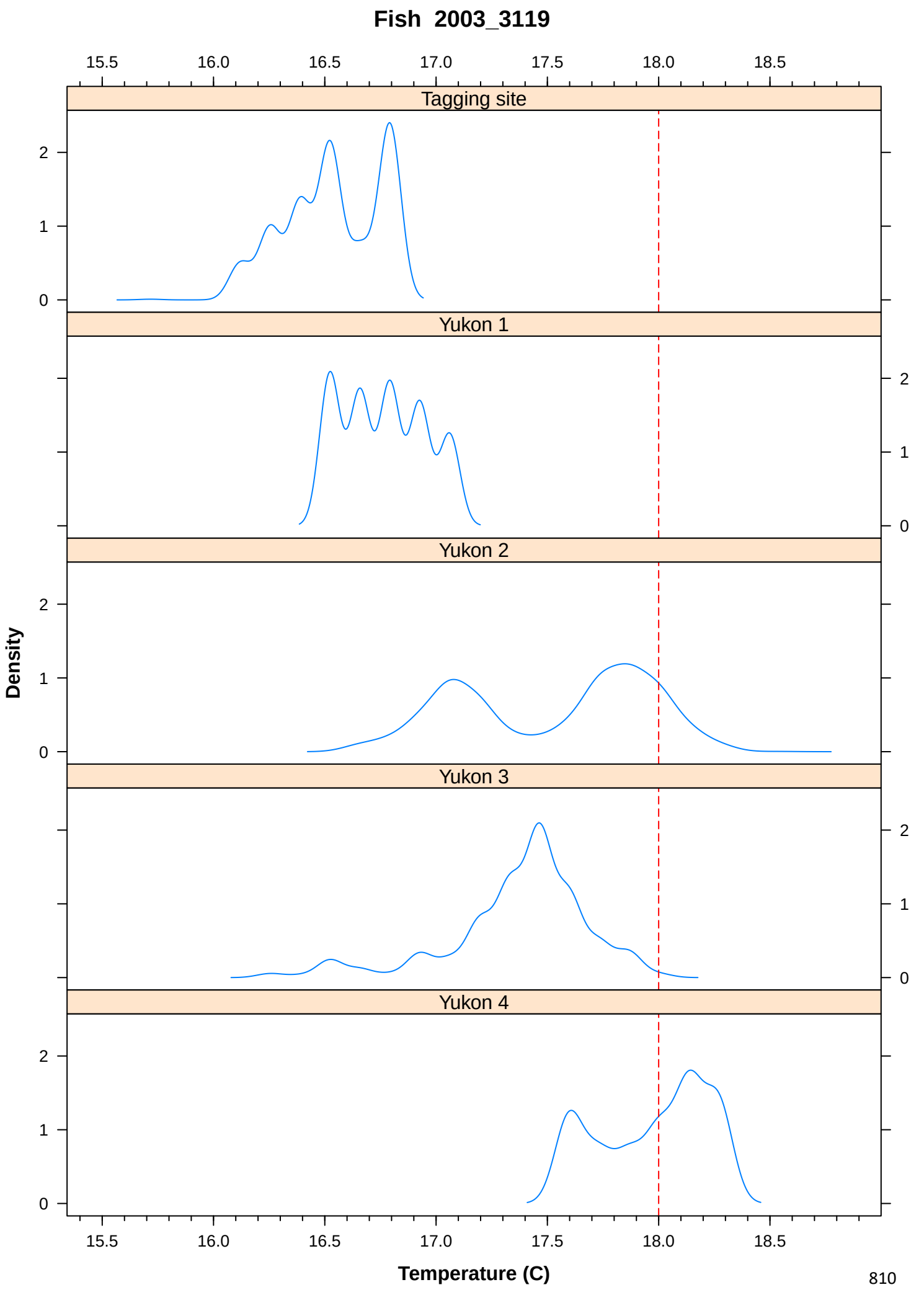

Fish 2003_3119
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach
805

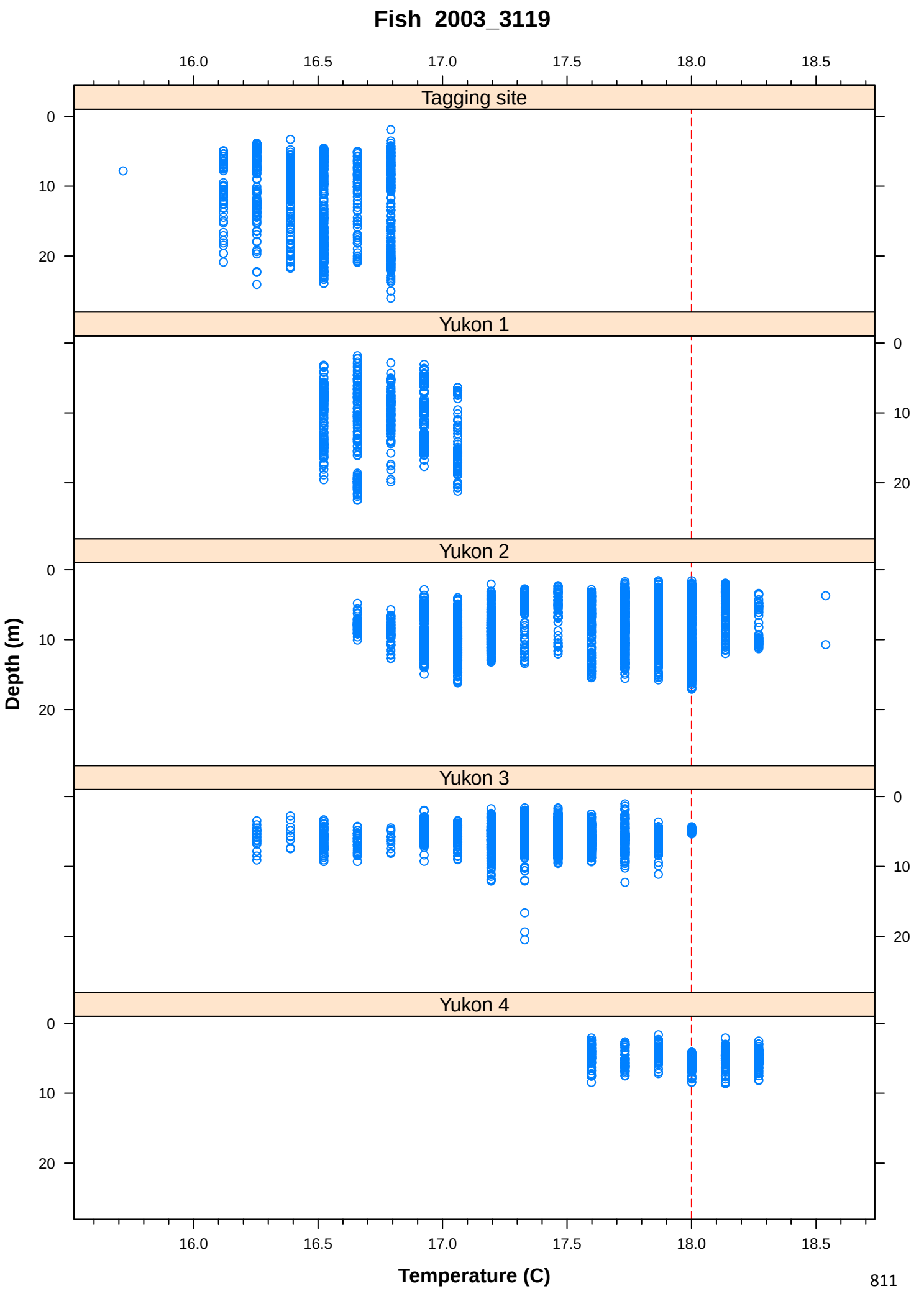

Fish 2003_3119
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
0.0
0.2
0
5
10
15
20
25
30
Depth (m)
806

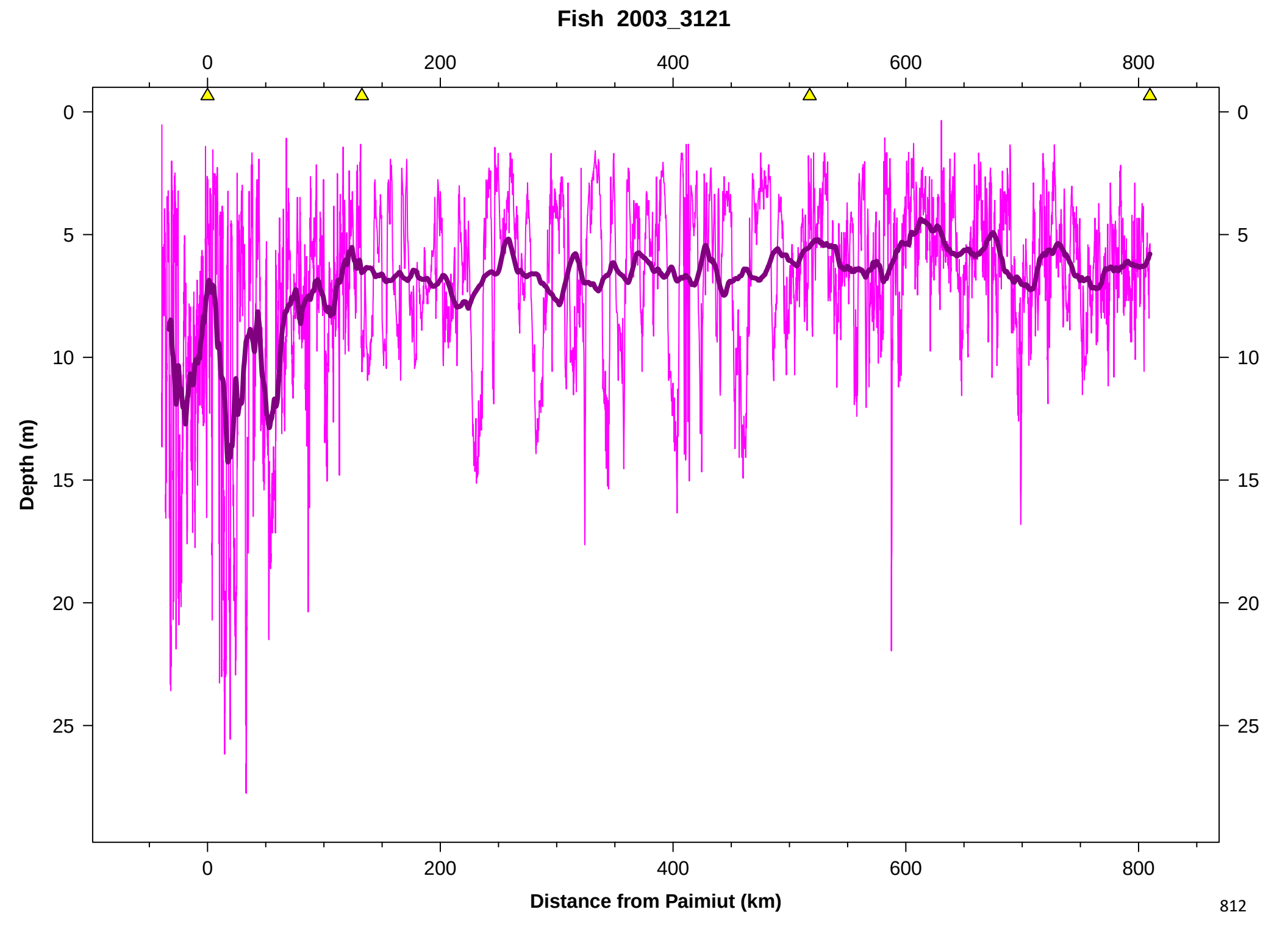

Fish 2003_3119
0
200
400
600
800
19
18
17
16
15
Temperature (C)
Distance from Paimiut (km)
807

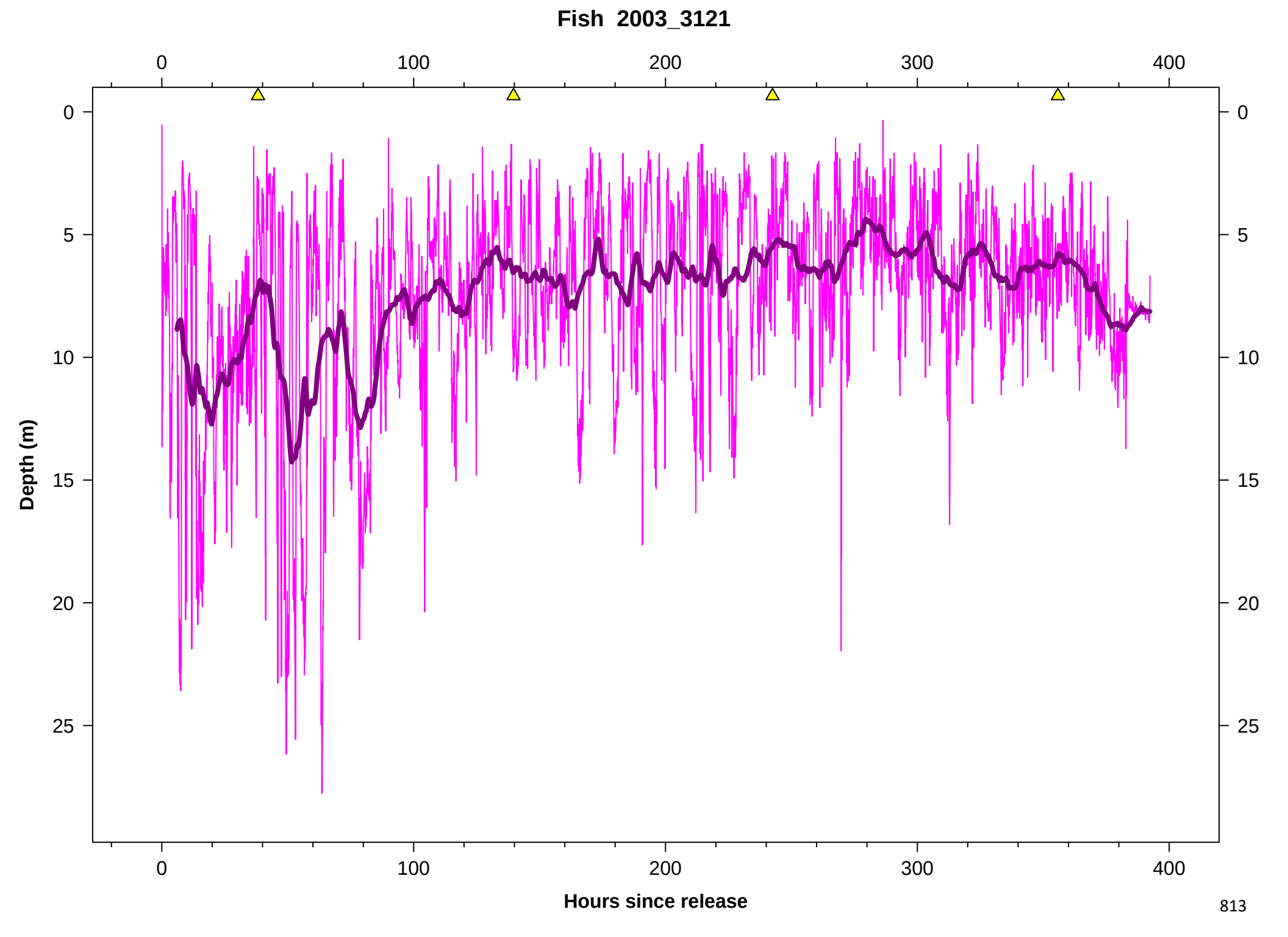

Fish 2003_3119
0
100
200
300
19
18
17
16
15
Temperature (C)
Hours since release
808

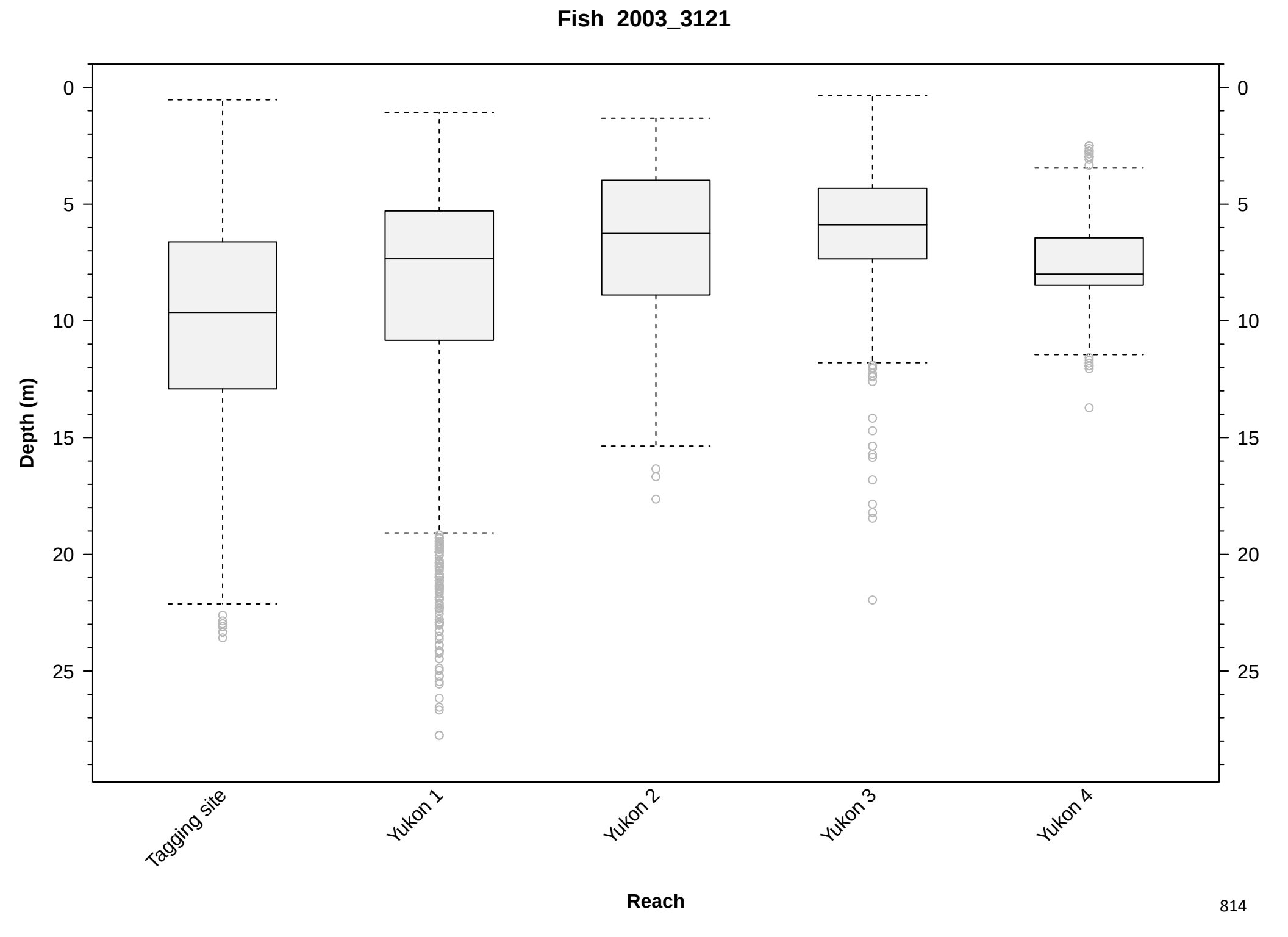

Fish 2003_3119
Temperature (C)
18.5
18.0
17.5
17.0
16.5
16.0
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach
809

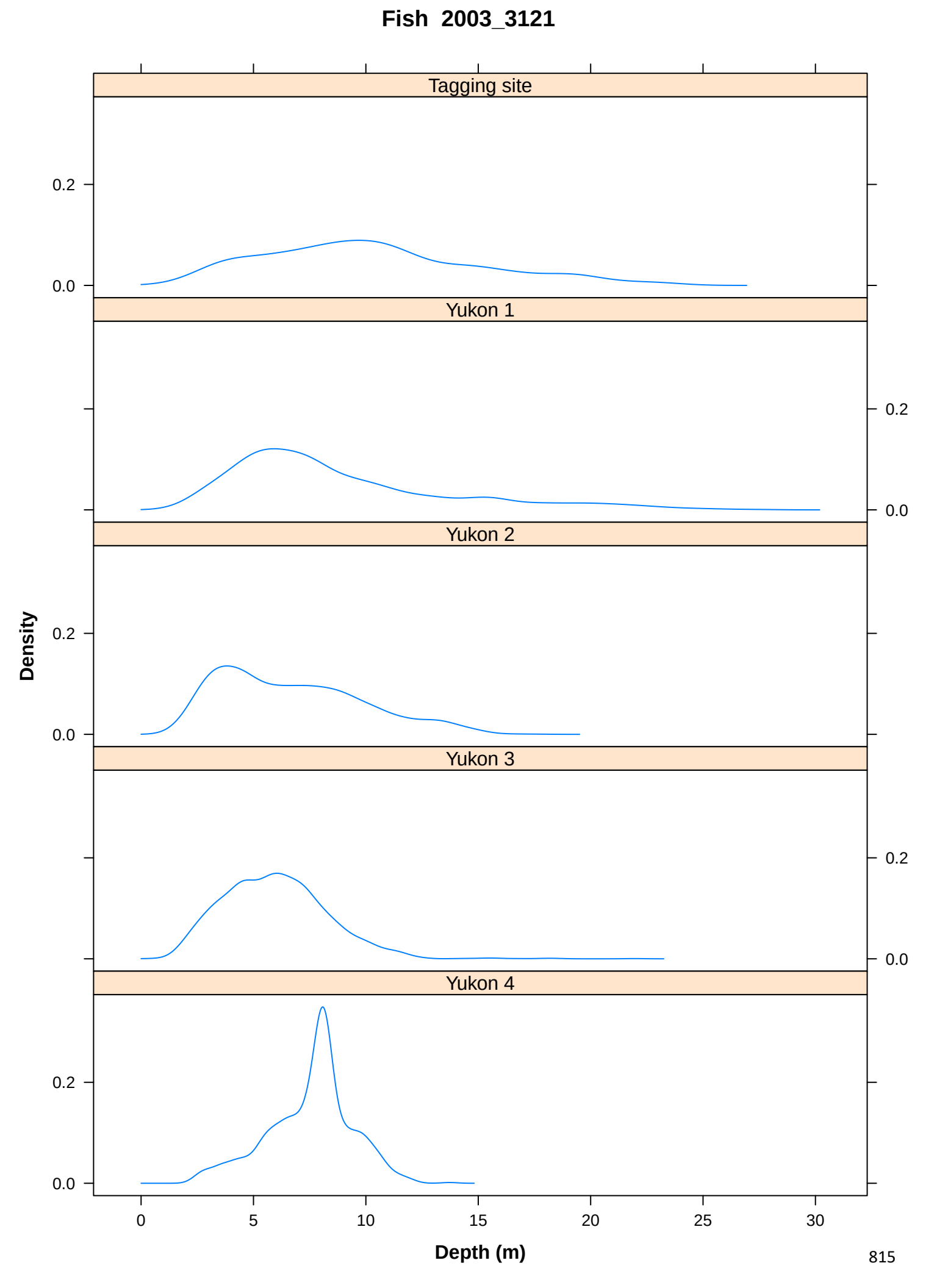

Fish 2003_3119
15.5
16.0
16.5
17.0
17.5
18.0
18.5
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
0
1
2
Temperature (C)

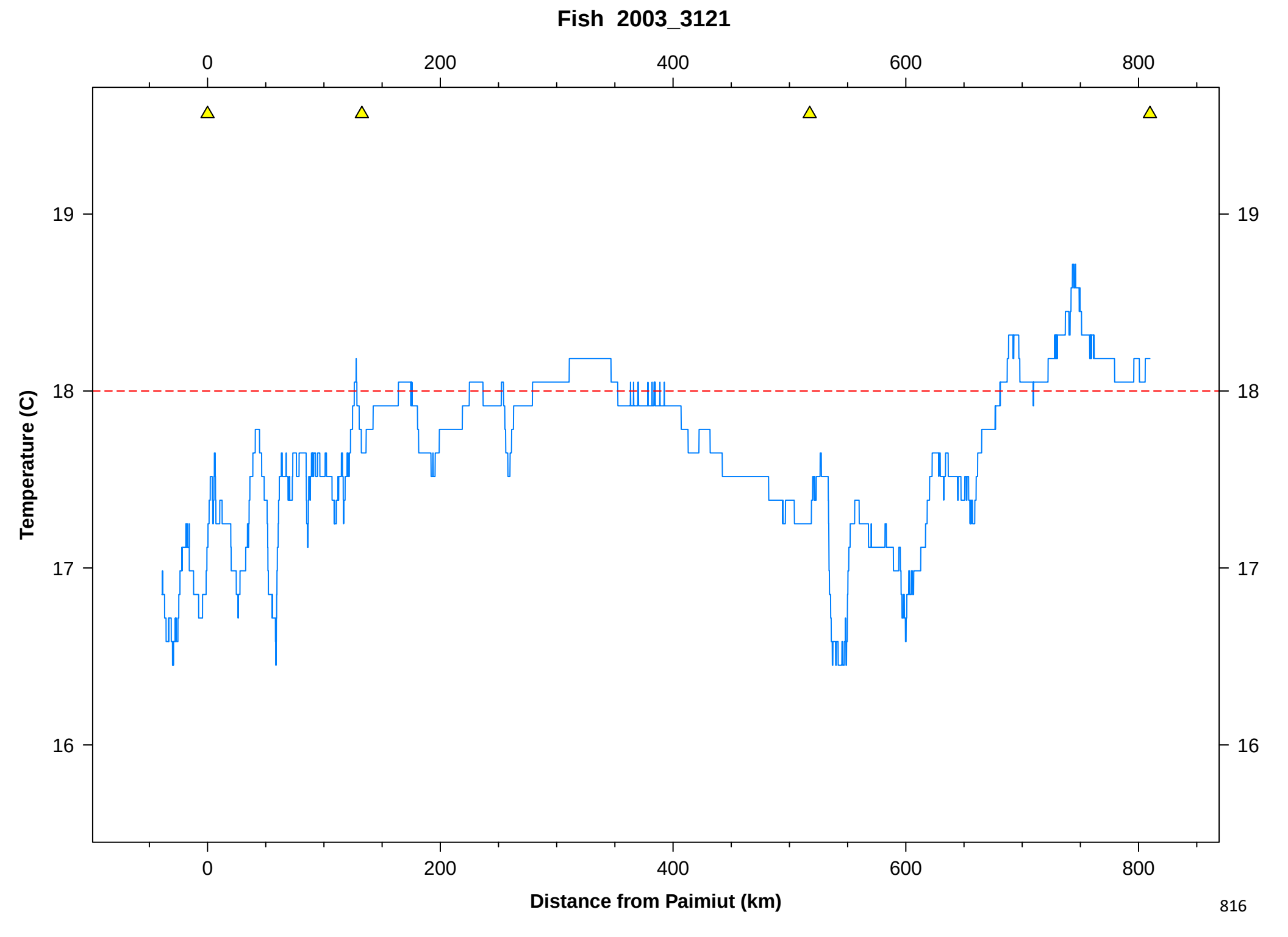

Fish 2003_3119
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Depth (m)
Temperature (C)
16.0
16.5
17.0
17.5
18.0
18.5
0
10
20
811

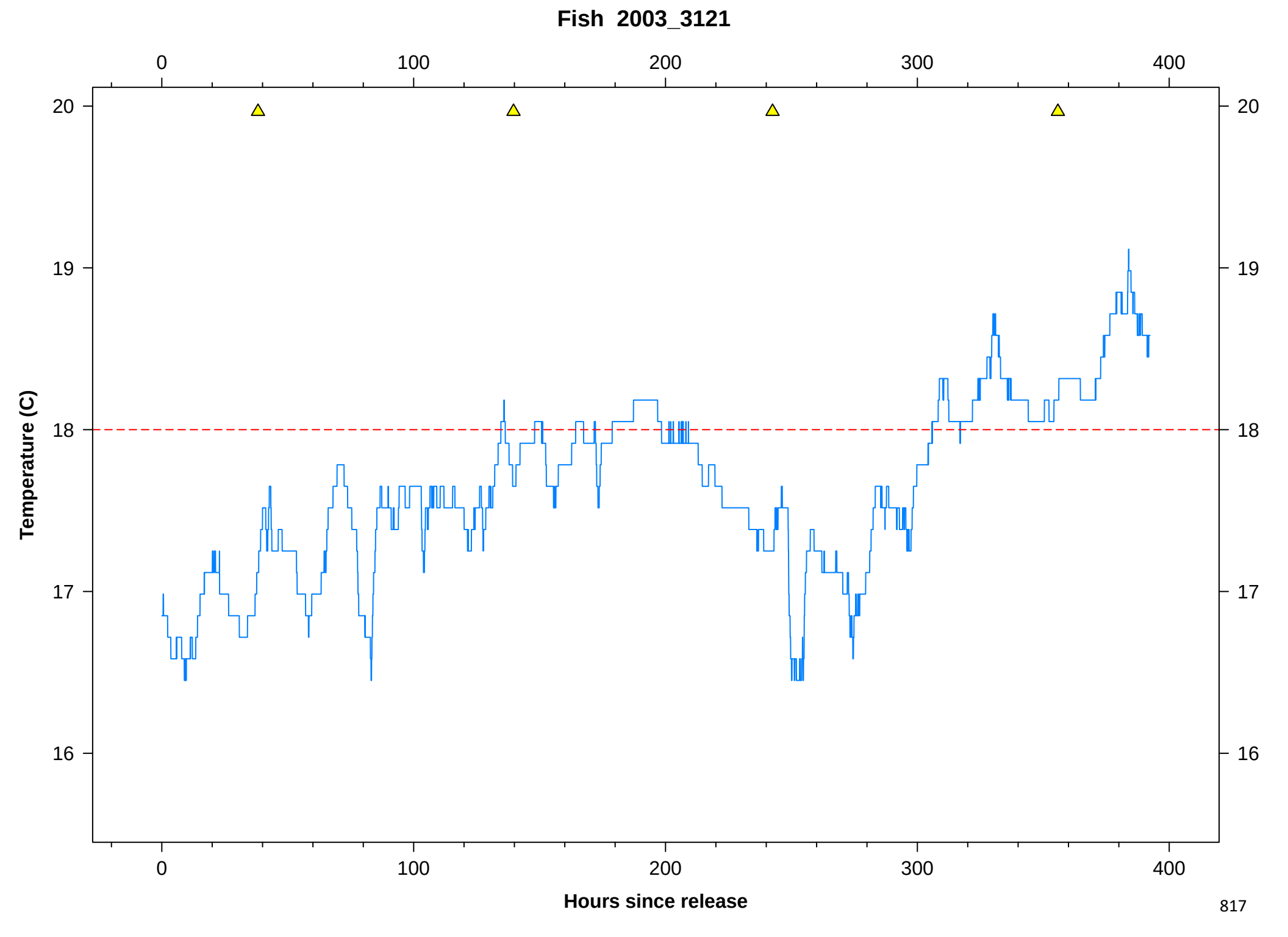

Fish 2003_3121
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

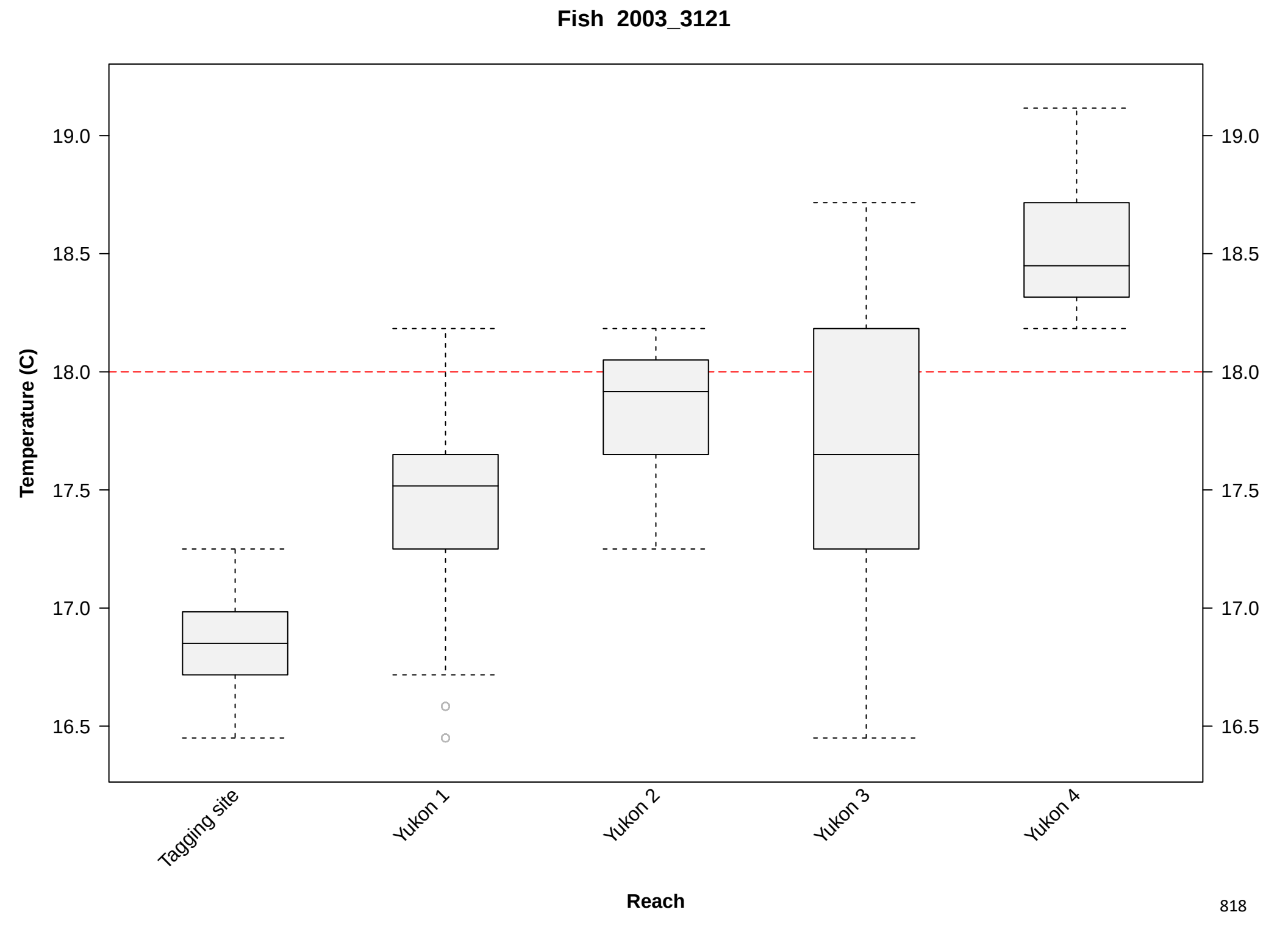

Fish 2003_3121
0
100
200
300
400
0
5
10
15
20
25
Depth (m)
Hours since release

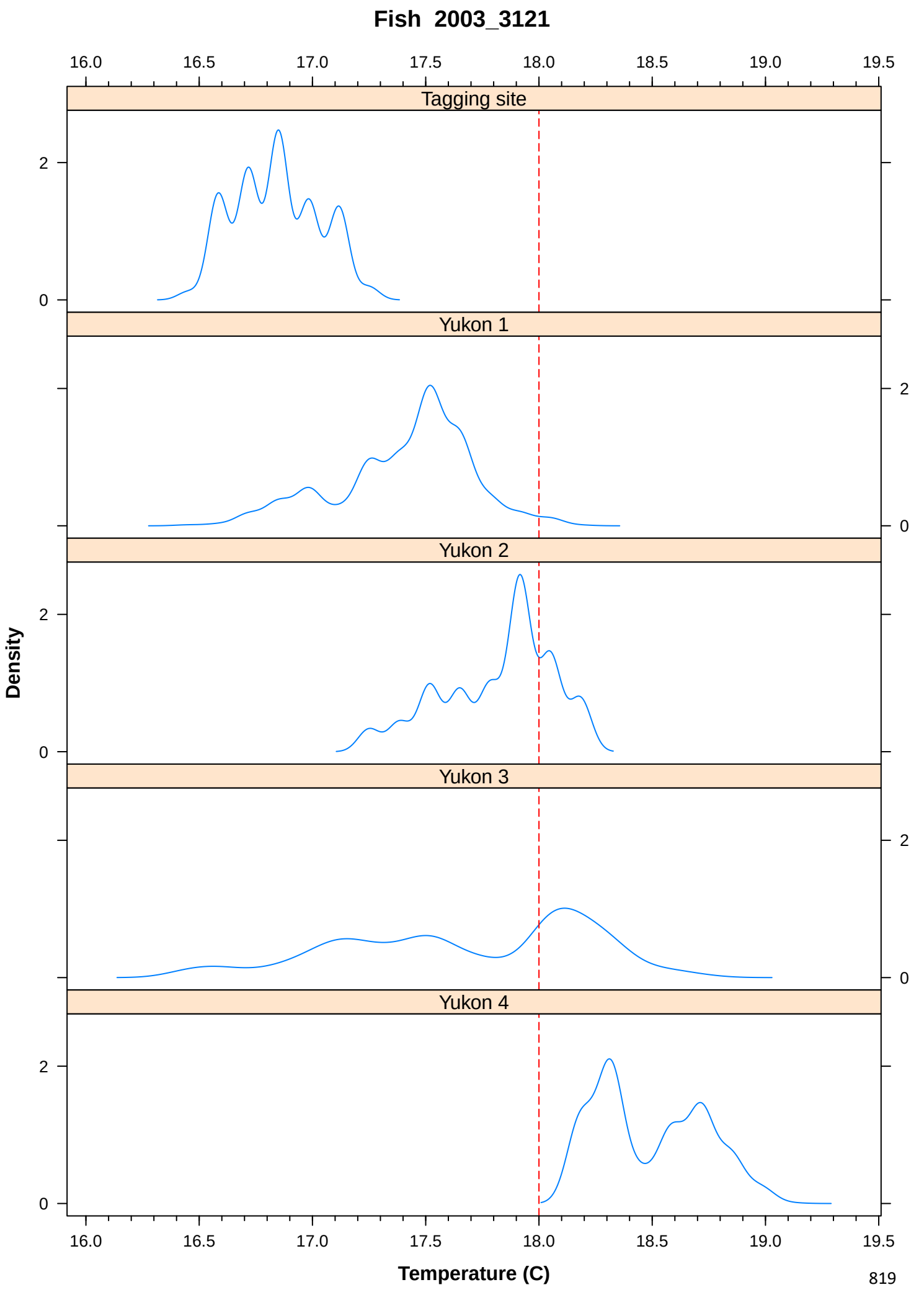

Fish 2003_3121
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach
814

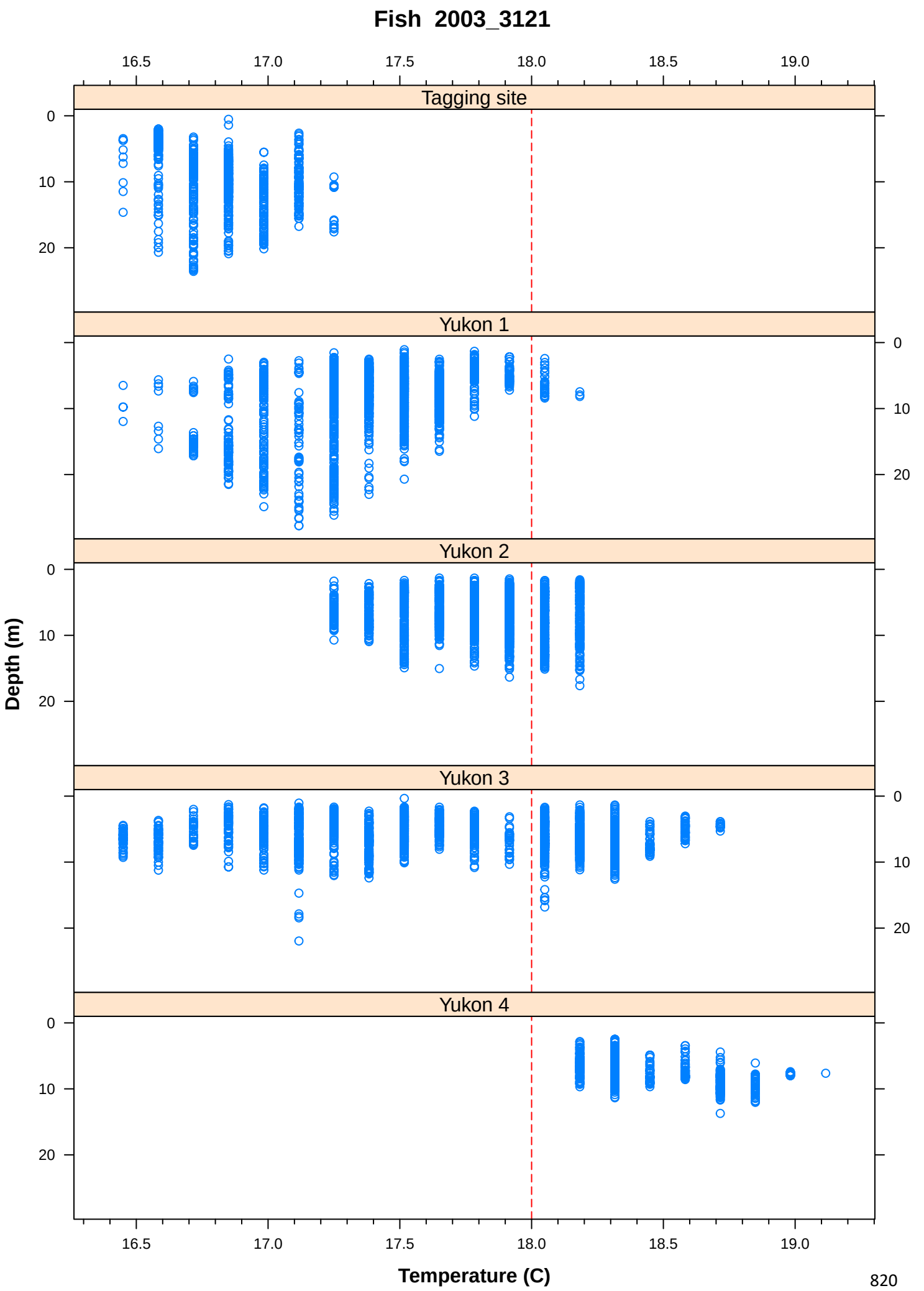

Fish 2003_3121
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
0.0
0.2
0
5
10
15
20
25
30
Depth (m)
815

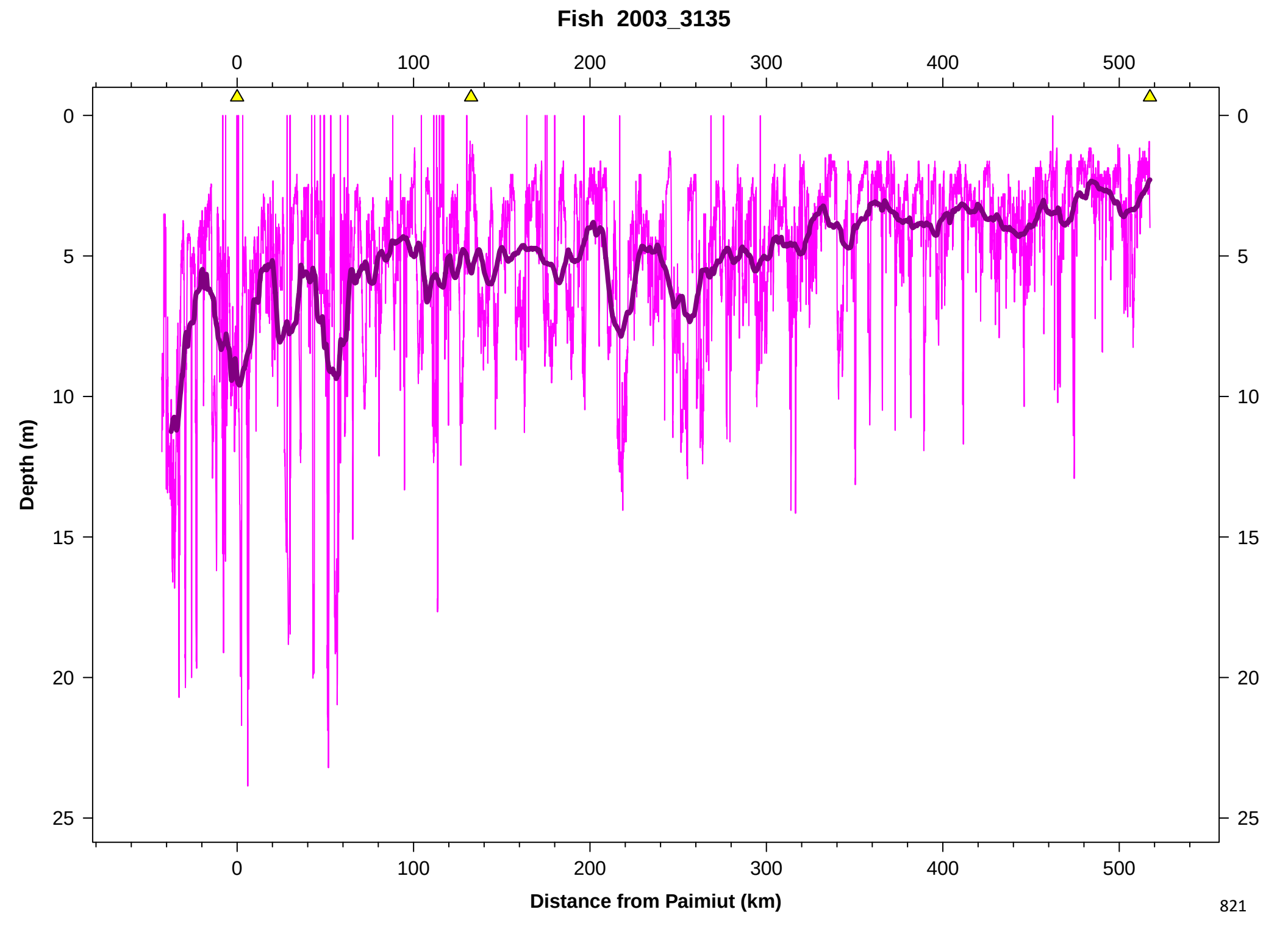

Fish 2003_3121
0
200
400
600
800
19
18
17
16
Temperature (C)
Distance from Paimiut (km)
816

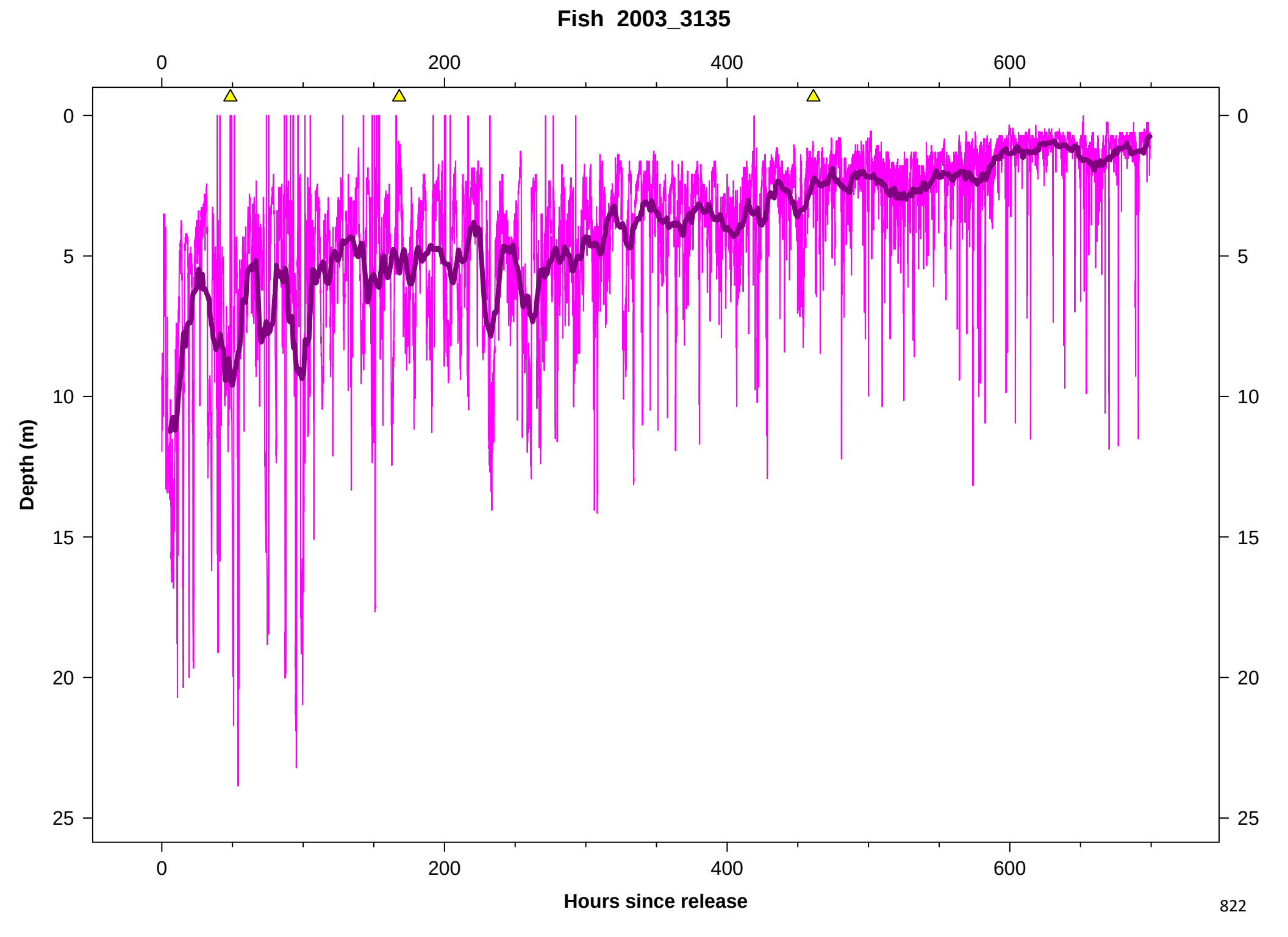

Fish 2003_3121
0
100
200
300
400
20
19
18
17
16
Temperature (C)
Hours since release

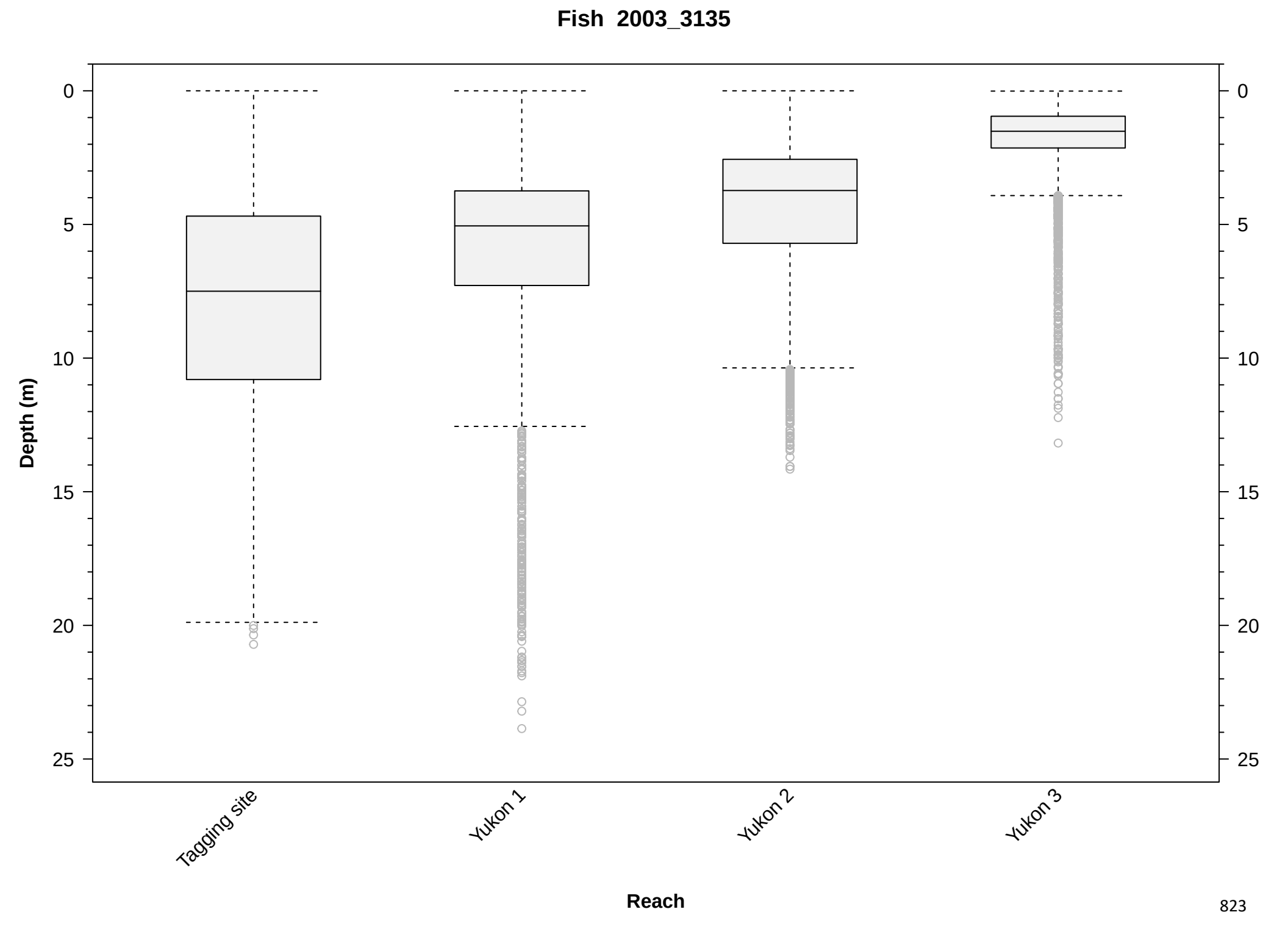

Fish 2003_3121
Temperature (C)
19.0
18.5
18.0
17.5
17.0
16.5
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach
818

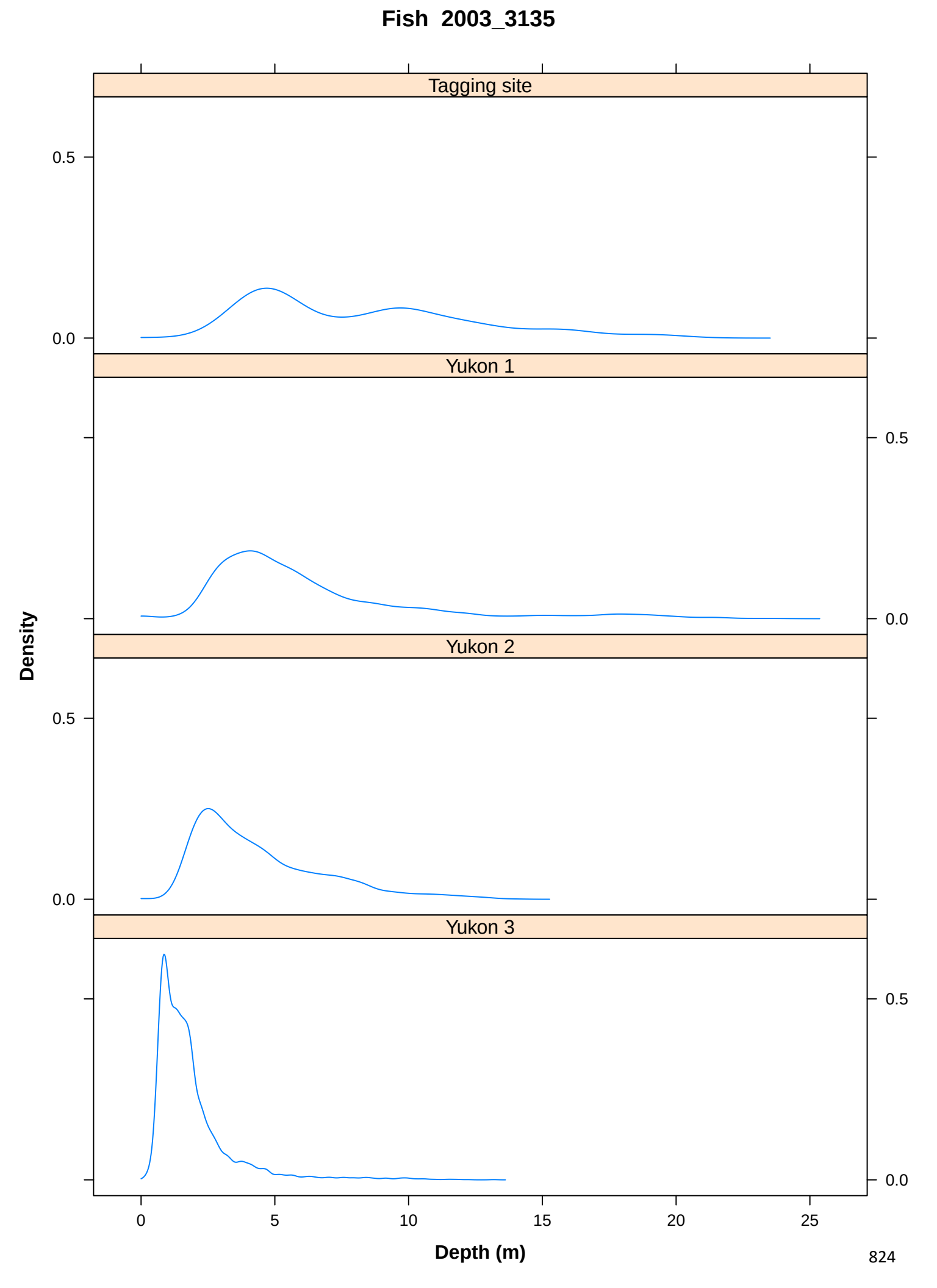

Fish 2003_3121
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
Temperature (C)
16.0
16.5
17.0
17.5
18.0
18.5
19.0
19.5
0
2

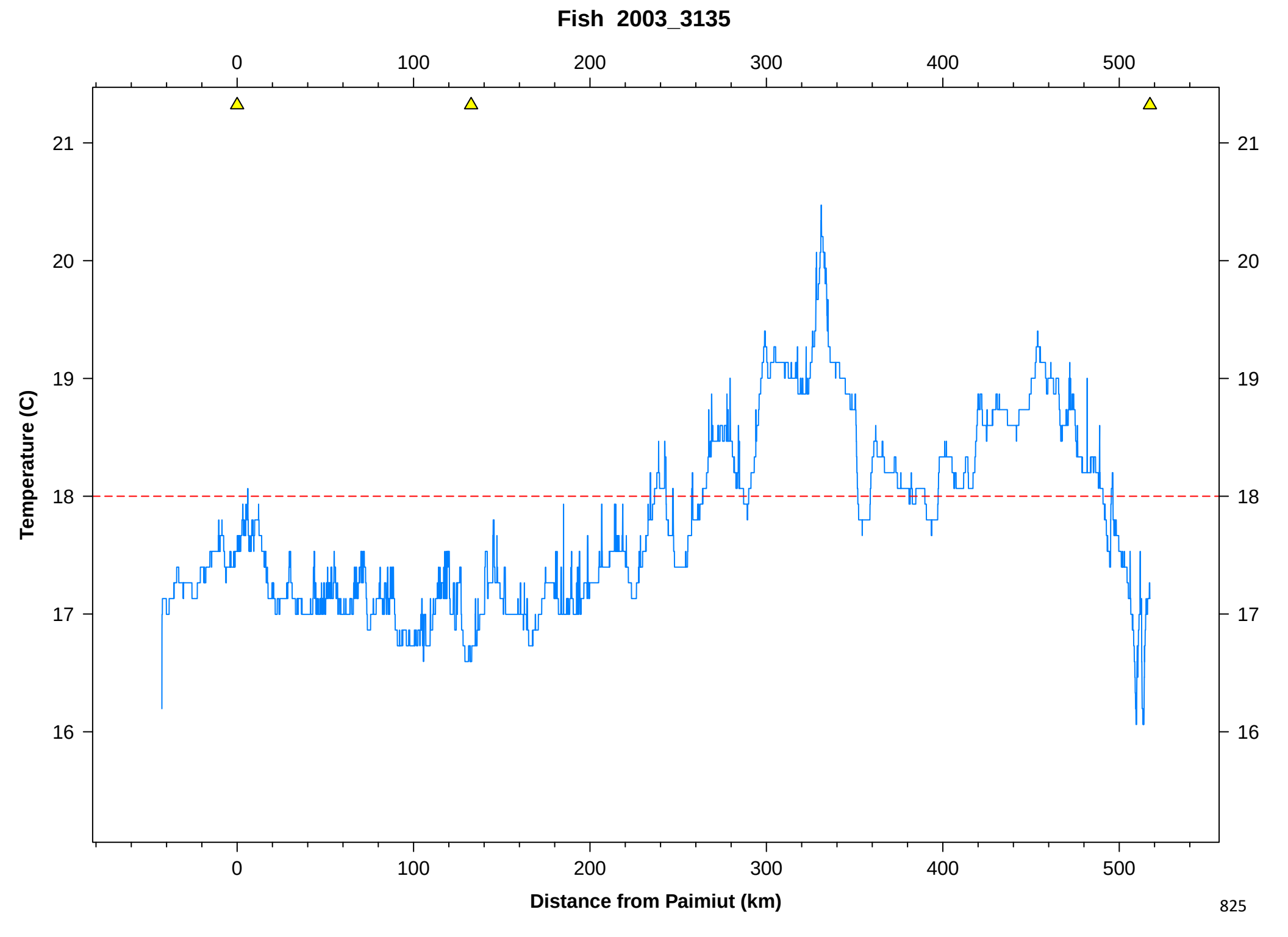

Fish 2003_3121
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Depth (m)
Temperature (C)
16.5
17.0
17.5
18.0
18.5
19.0
0
10
20

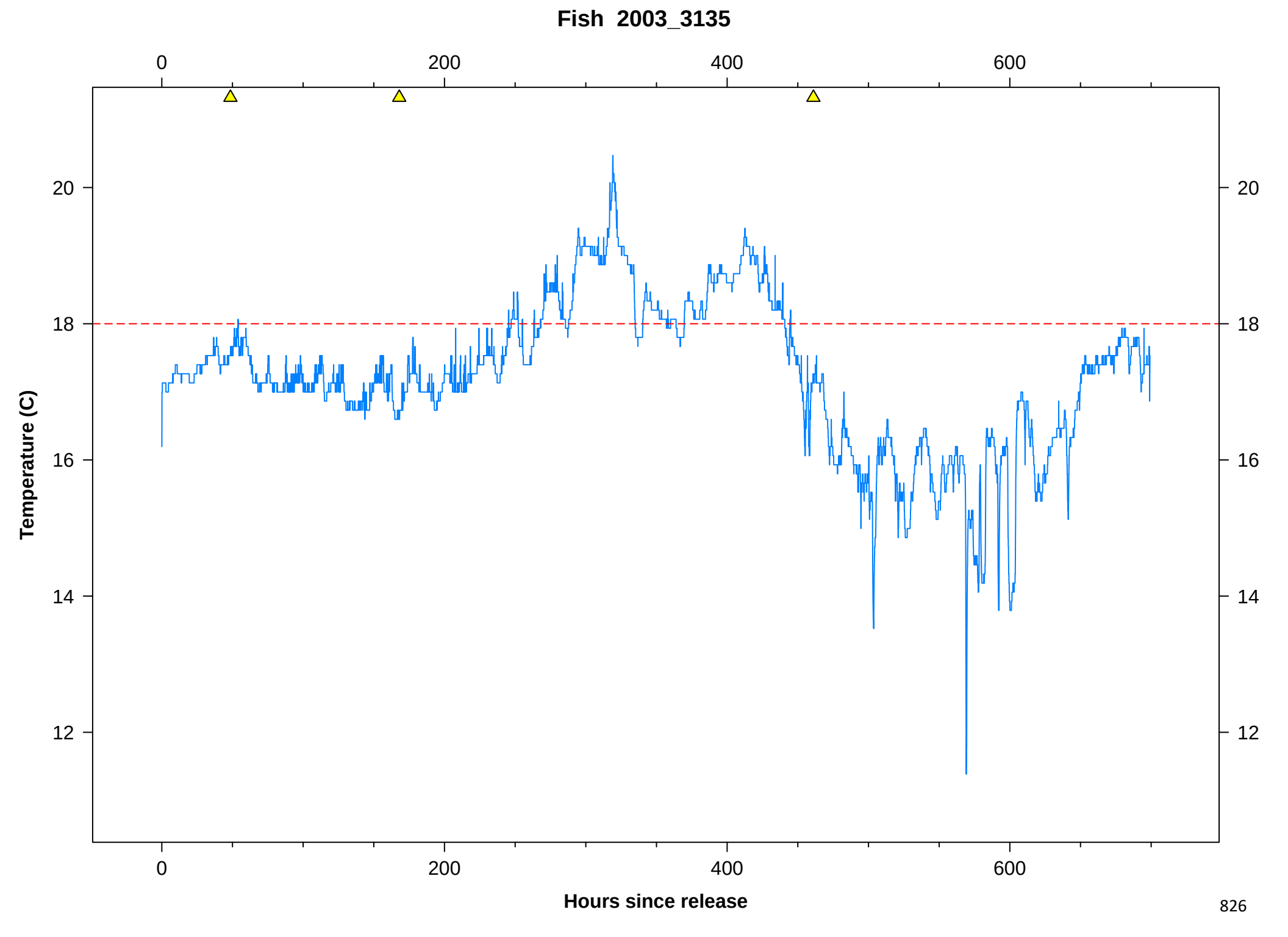

Fish 2003_3135
0
100
200
300
400
500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

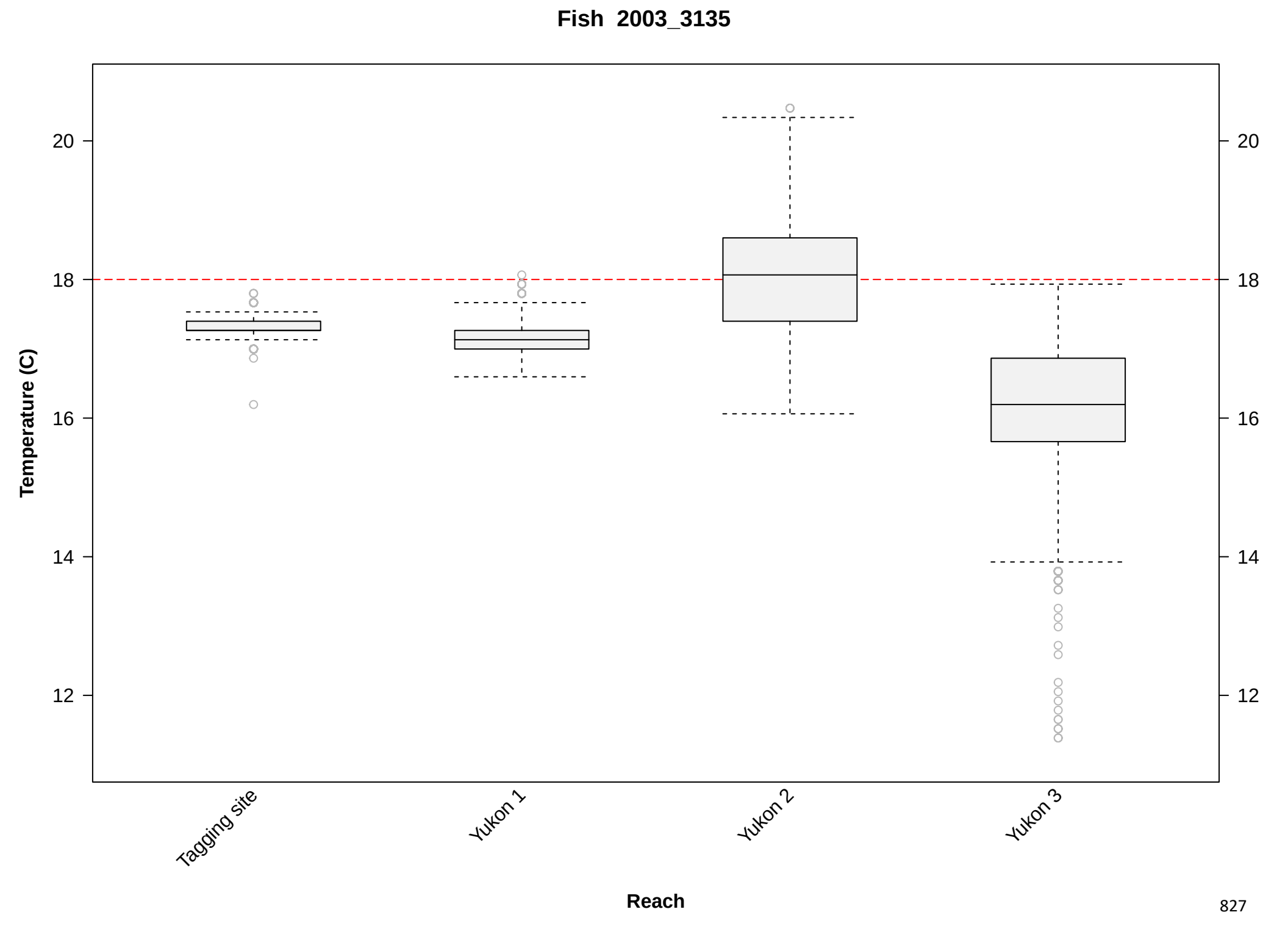

Fish 2003_3135
0
200
400
600
0
5
10
15
20
25
Depth (m)
Hours since release

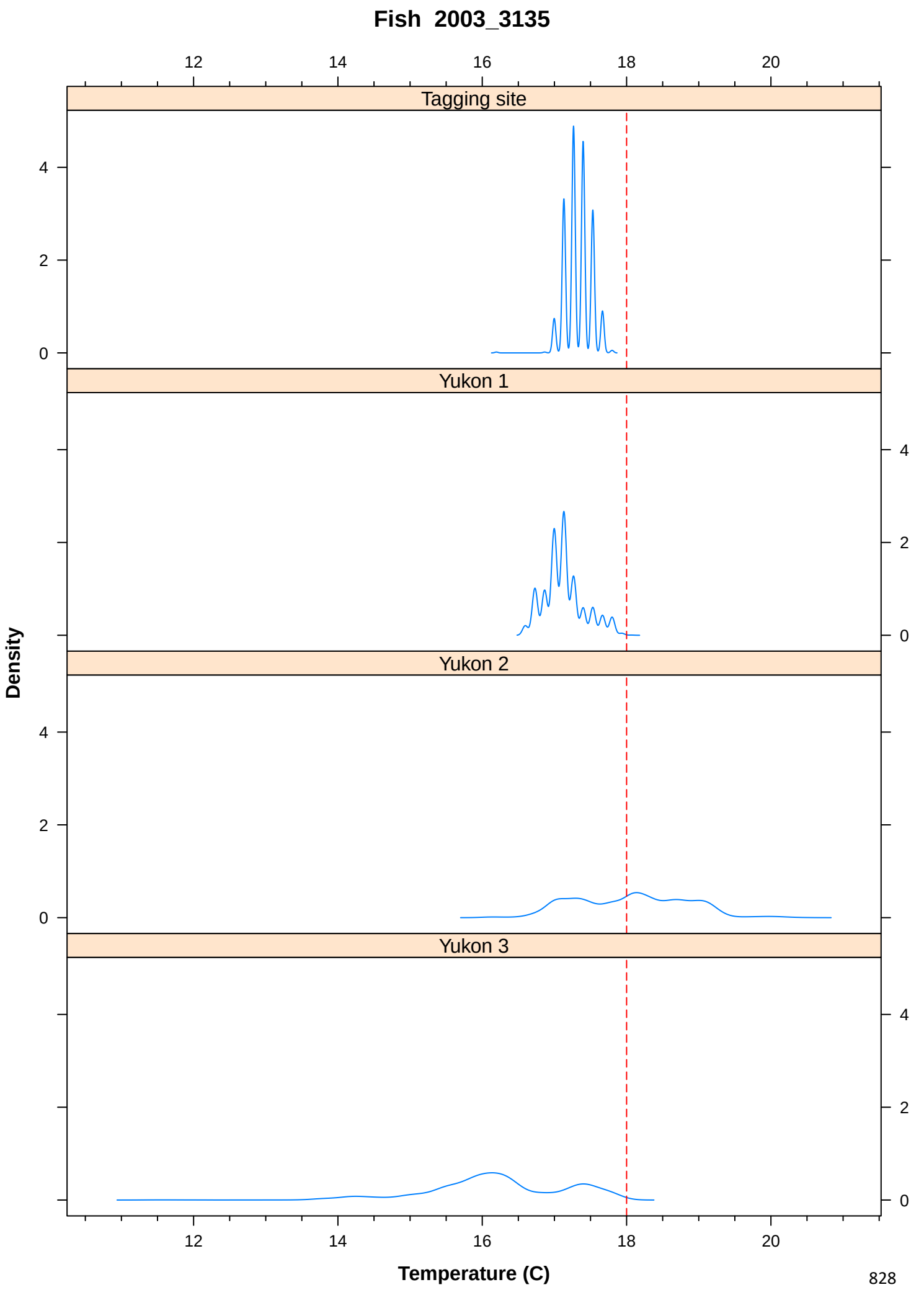

Fish 2003_3135
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach
823

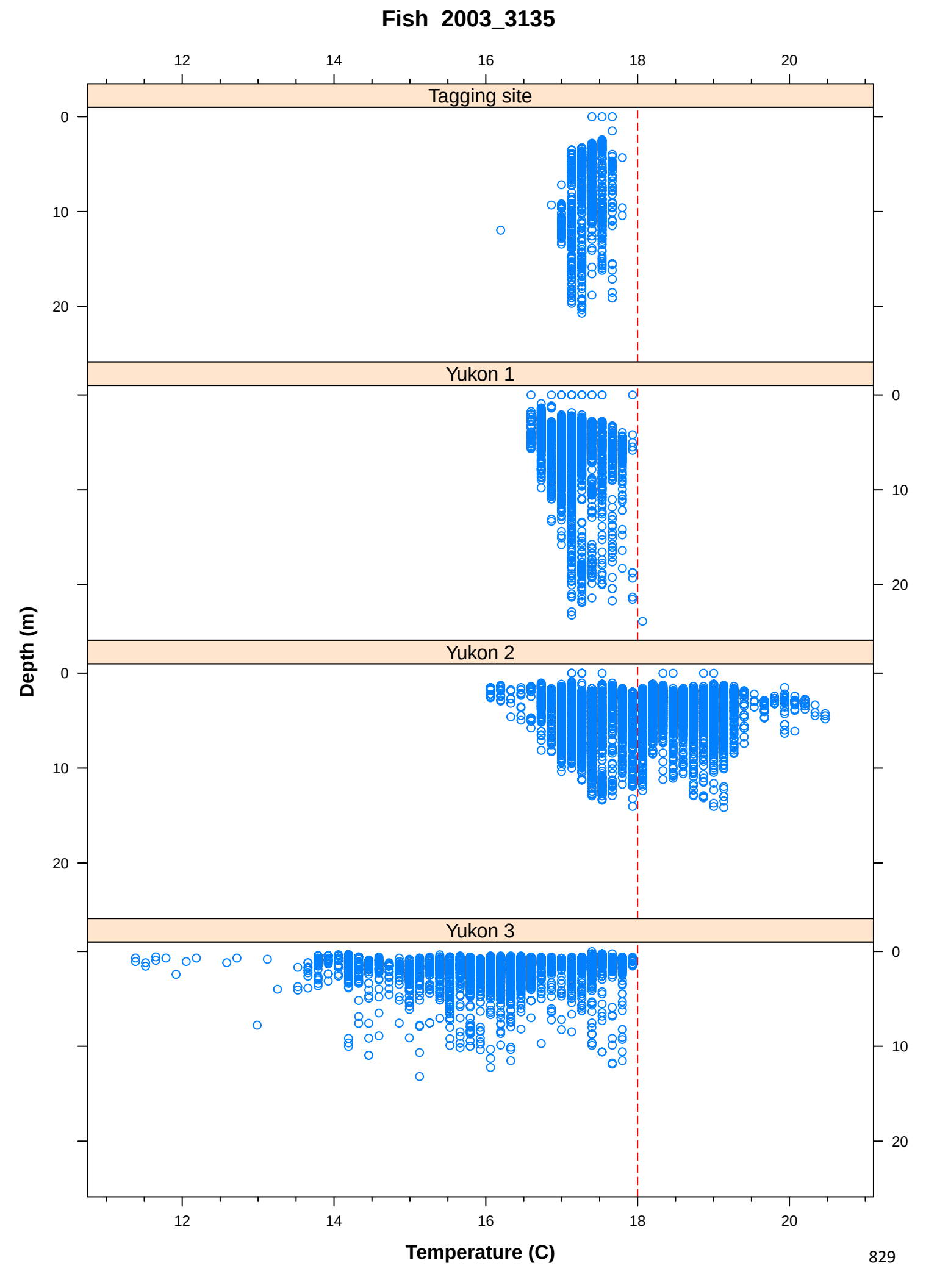

Fish 2003_3135
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
0.5
0.0
0
5
10
15
20
25
Depth (m)
824

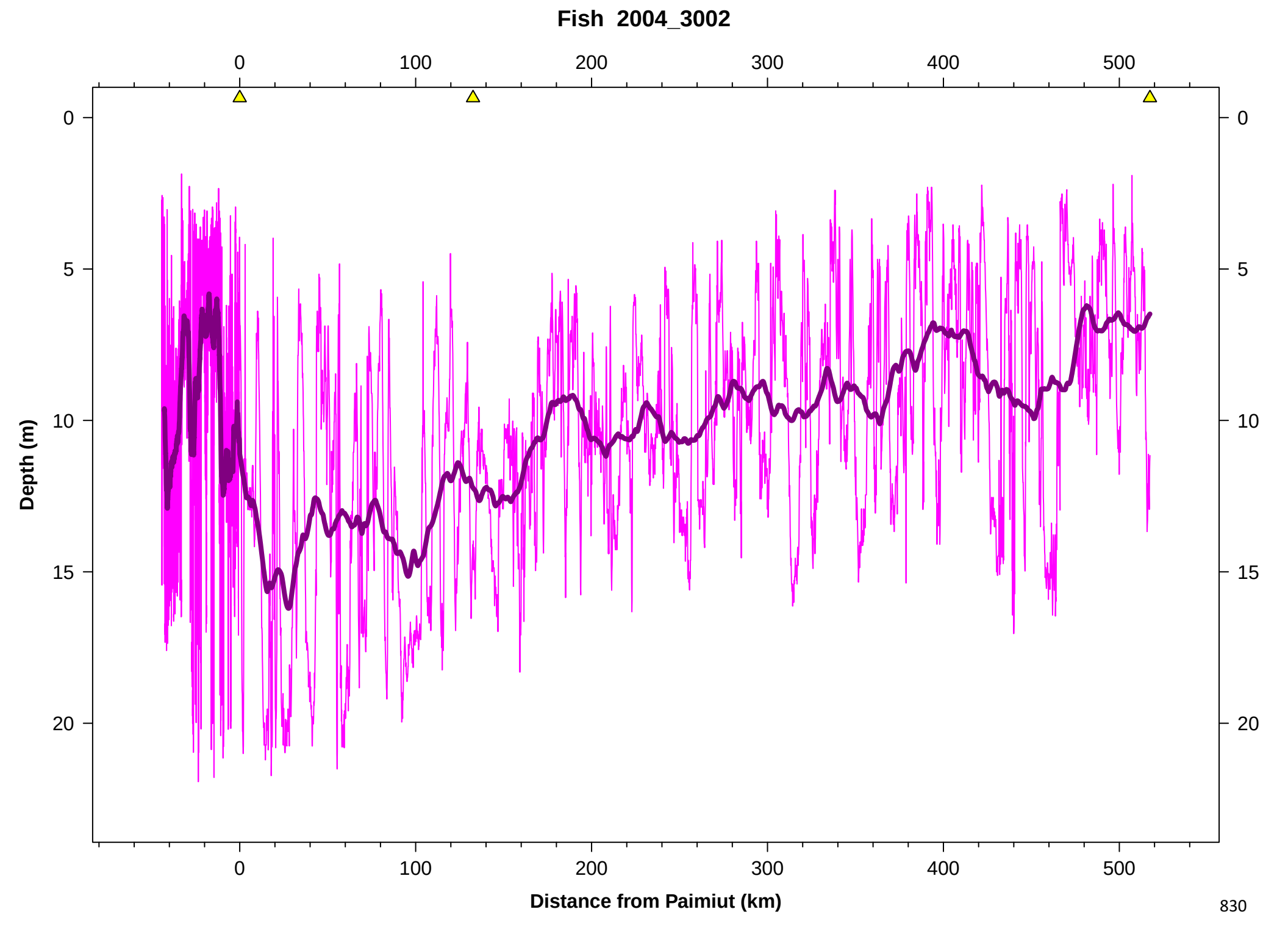

Fish 2003_3135
0
100
200
300
400
500
21
20
19
18
17
16
Temperature (C)
Distance from Paimiut (km)

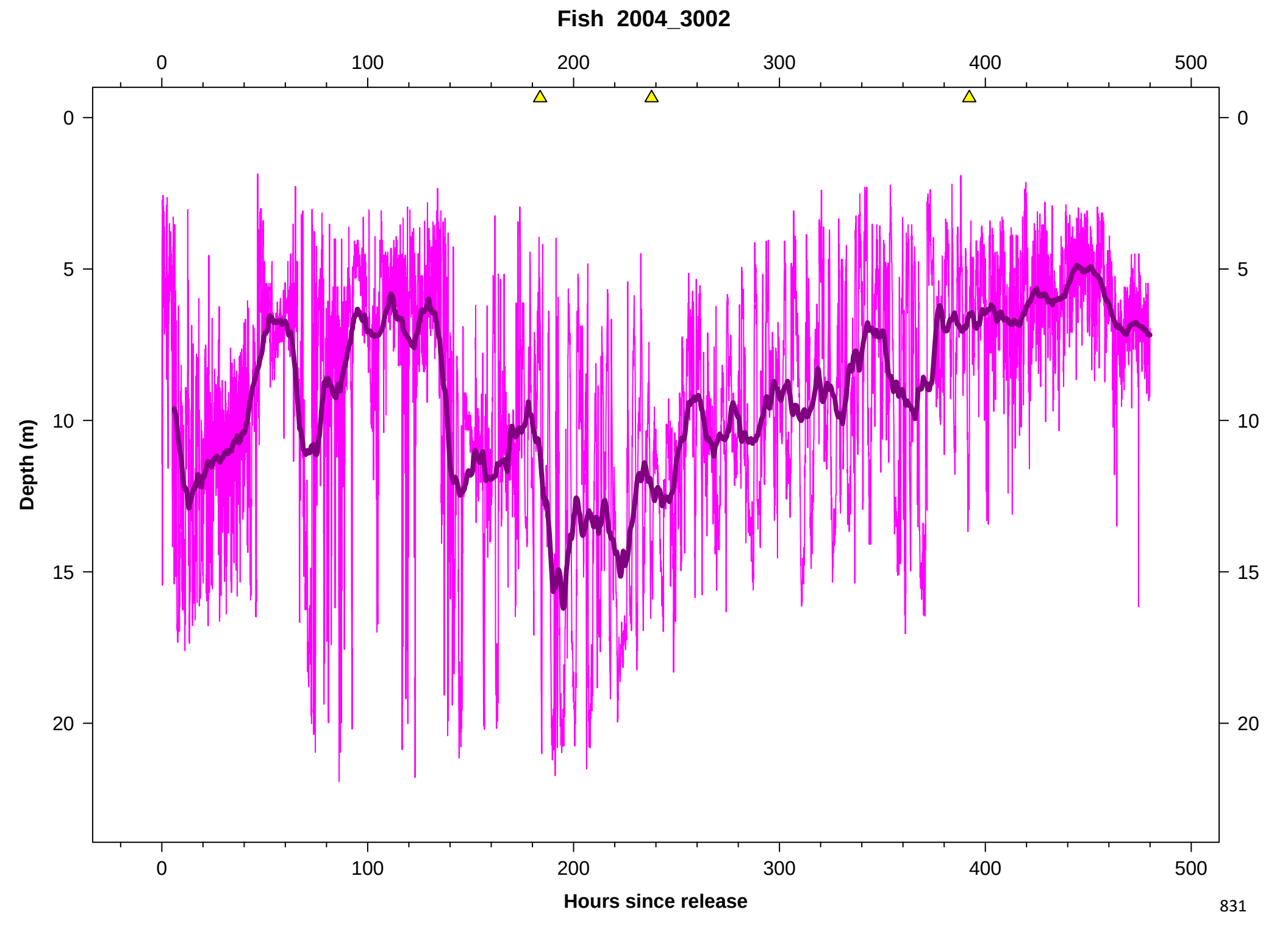

Fish 2003_3135
0
200
400
600
20
18
16
14
12
Temperature (C)
Hours since release
826

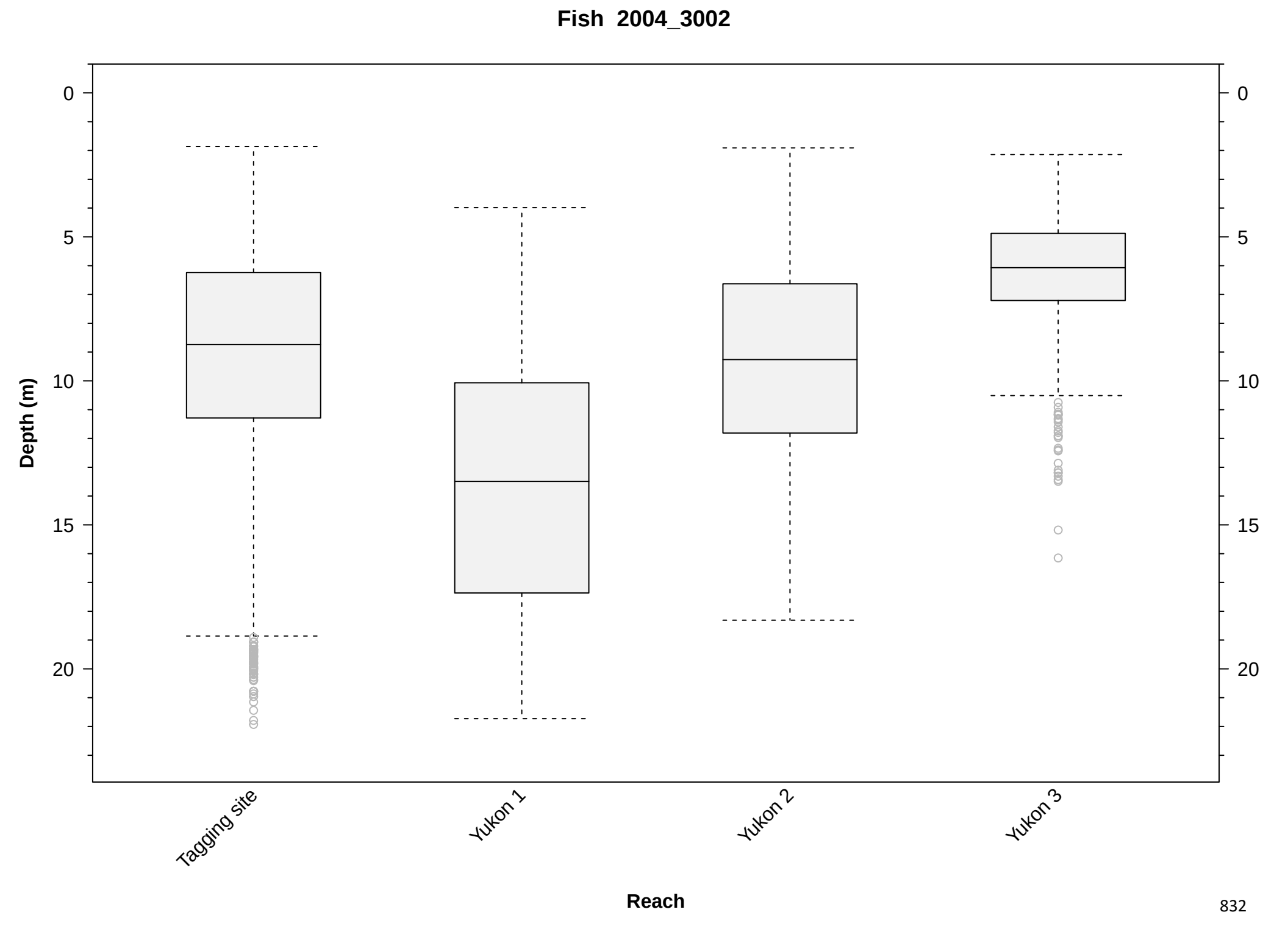

Fish 2003_3135
Temperature (C)
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach
827

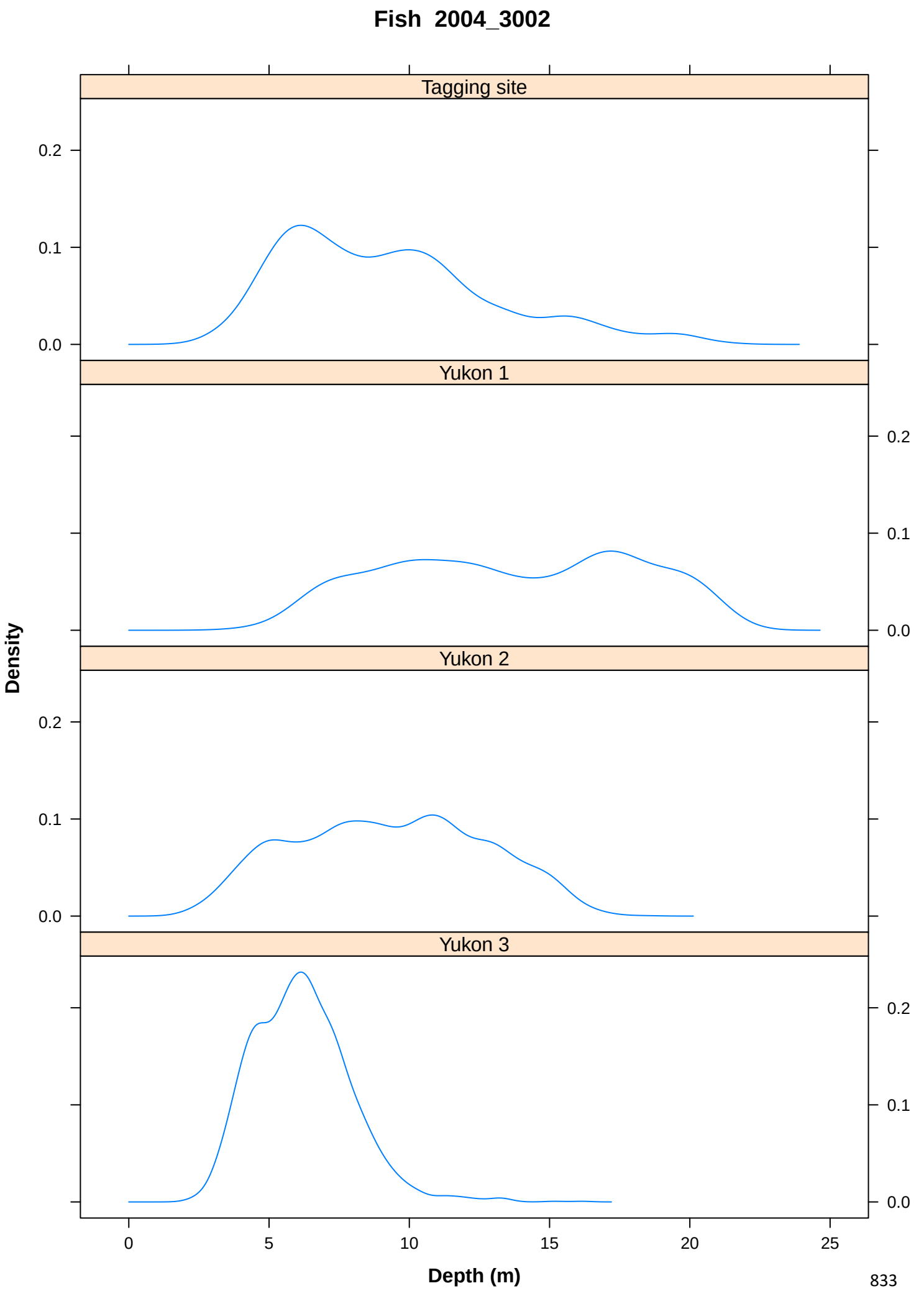

Fish 2003_3135
12
14
16
18
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
0
2
4
Density
Temperature (C)

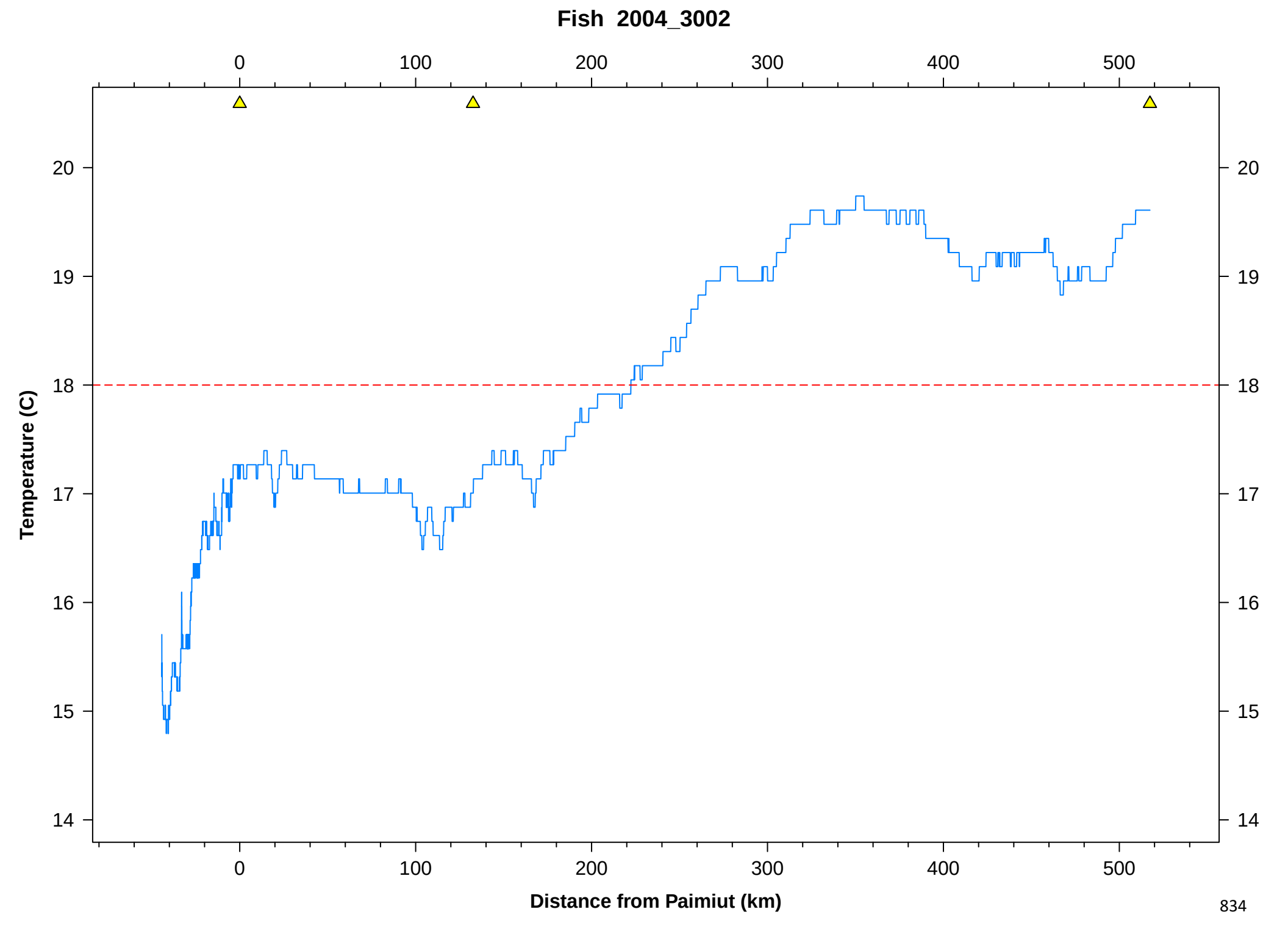

Fish 2003_3135
Tagging site
Yukon 1
Yukon 2
Yukon 3
Depth (m)
Temperature (C)
12
14
16
18
20
0
10
20
829

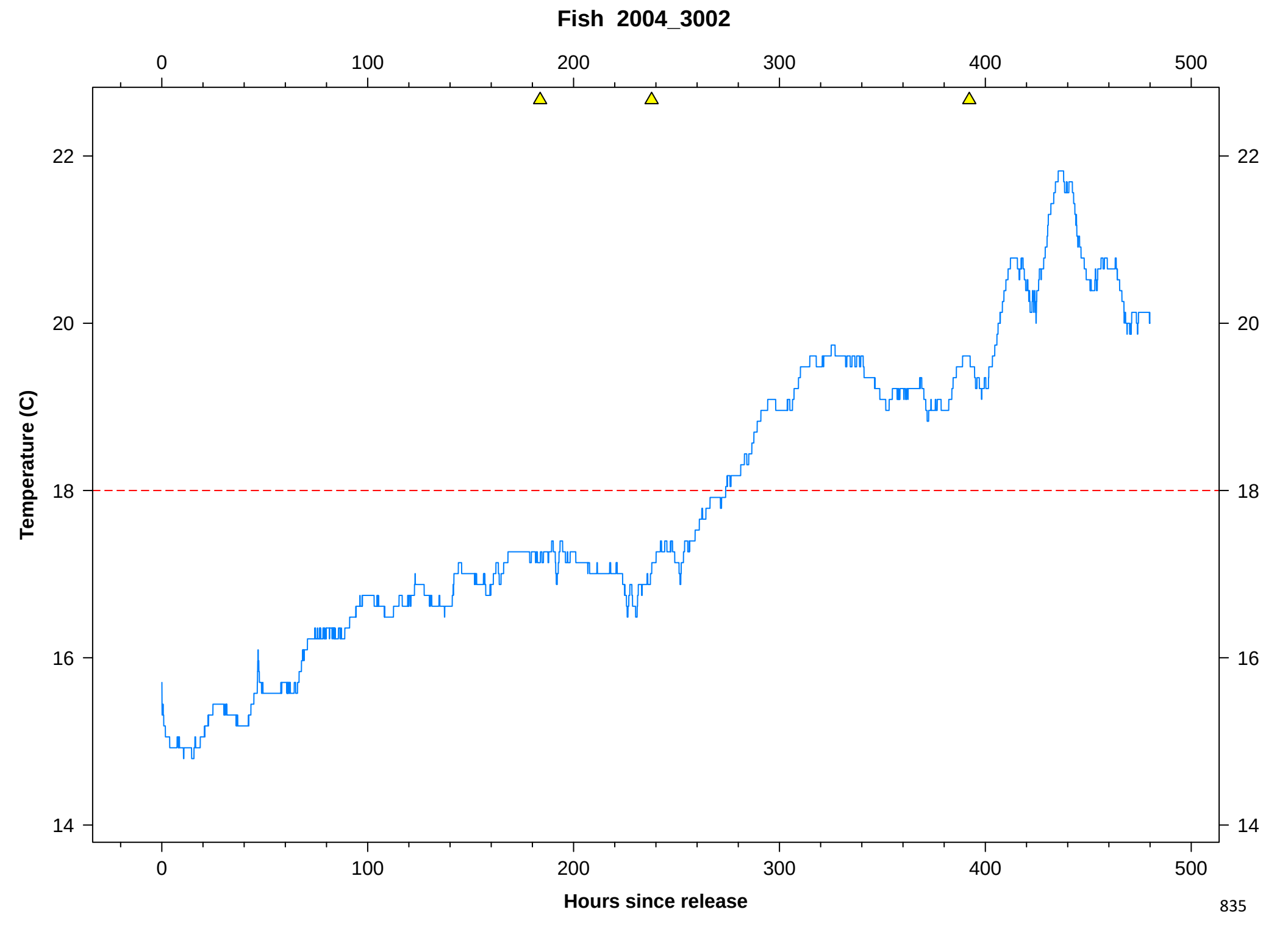

Fish 2004_3002
0
100
200
300
400
500
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)

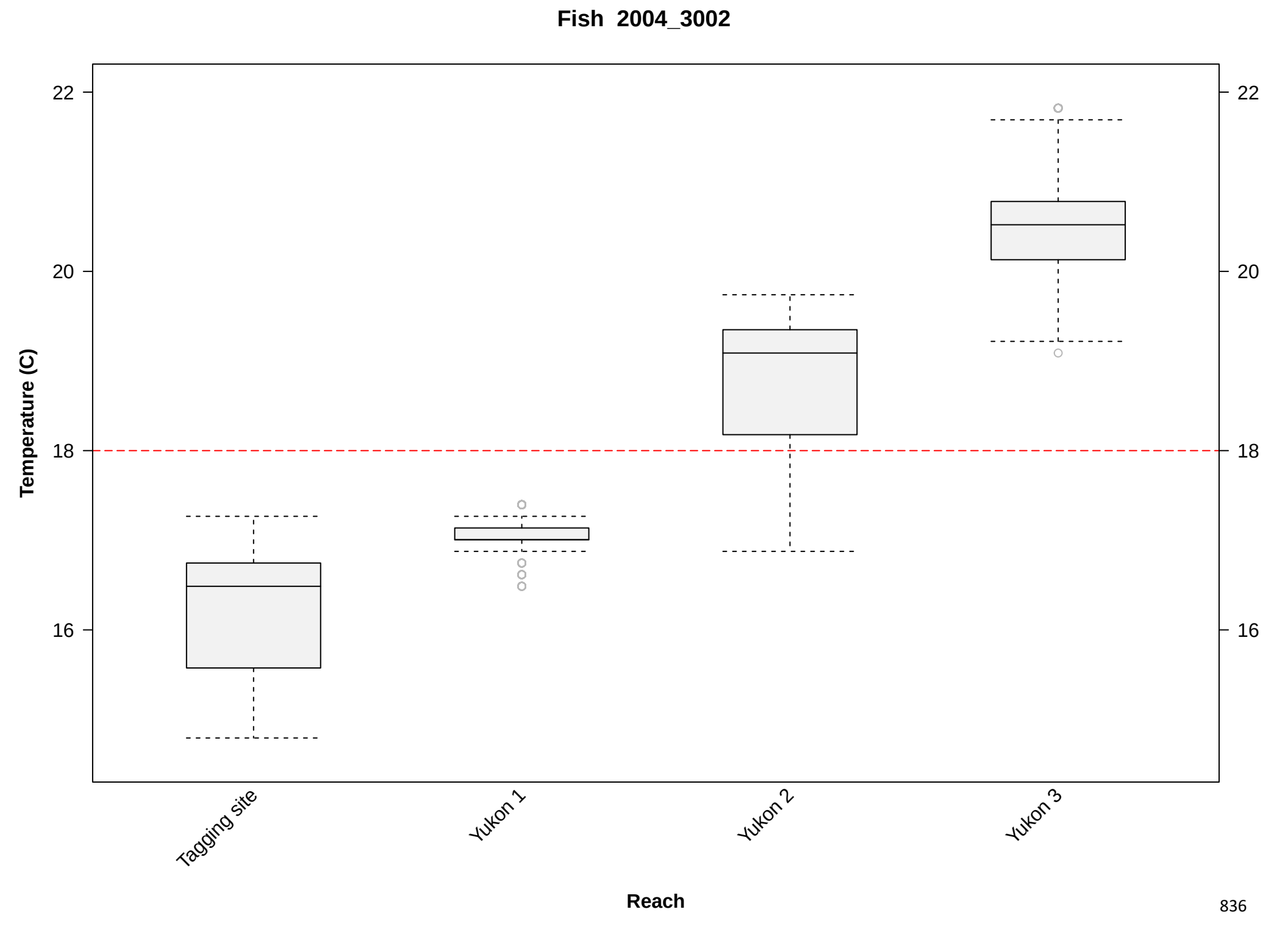

Fish 2004_3002
0
100
200
300
400
500
0
5
10
15
20
Depth (m)
Hours since release

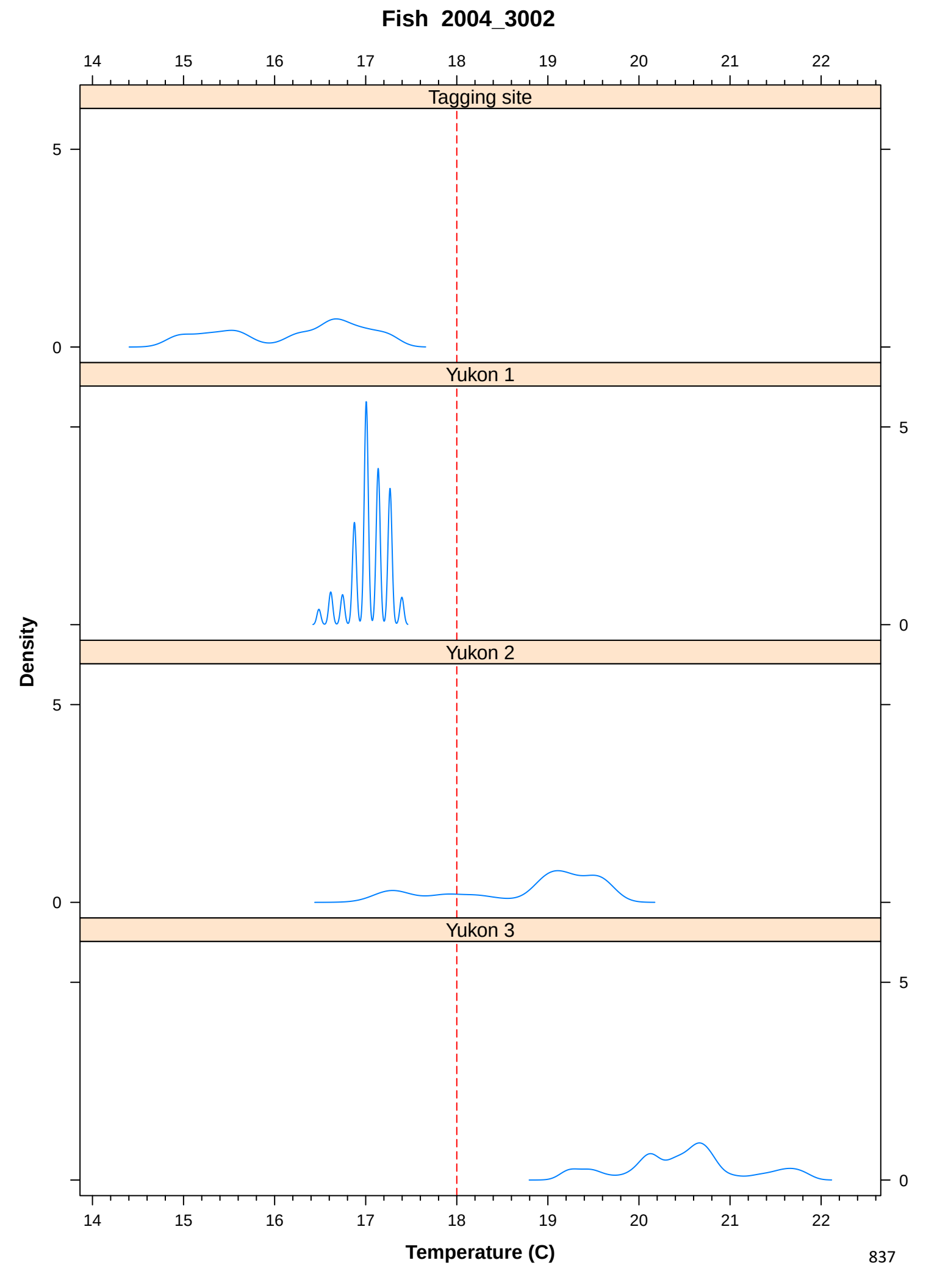

Fish 2004_3002
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach
832

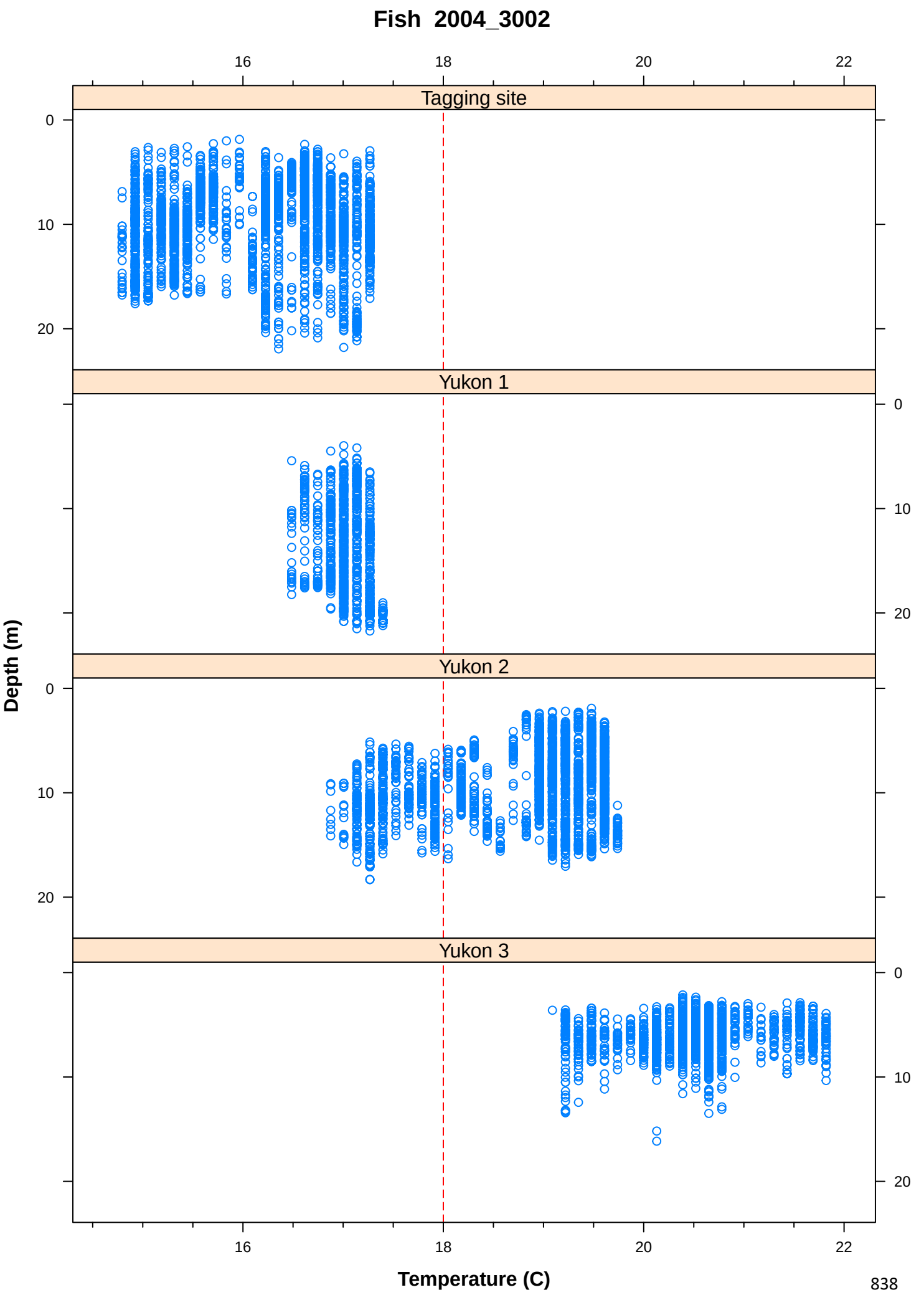

Fish 2004_3002
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
0.0
0.1
0.2
0
5
10
15
20
25
Depth (m)
833

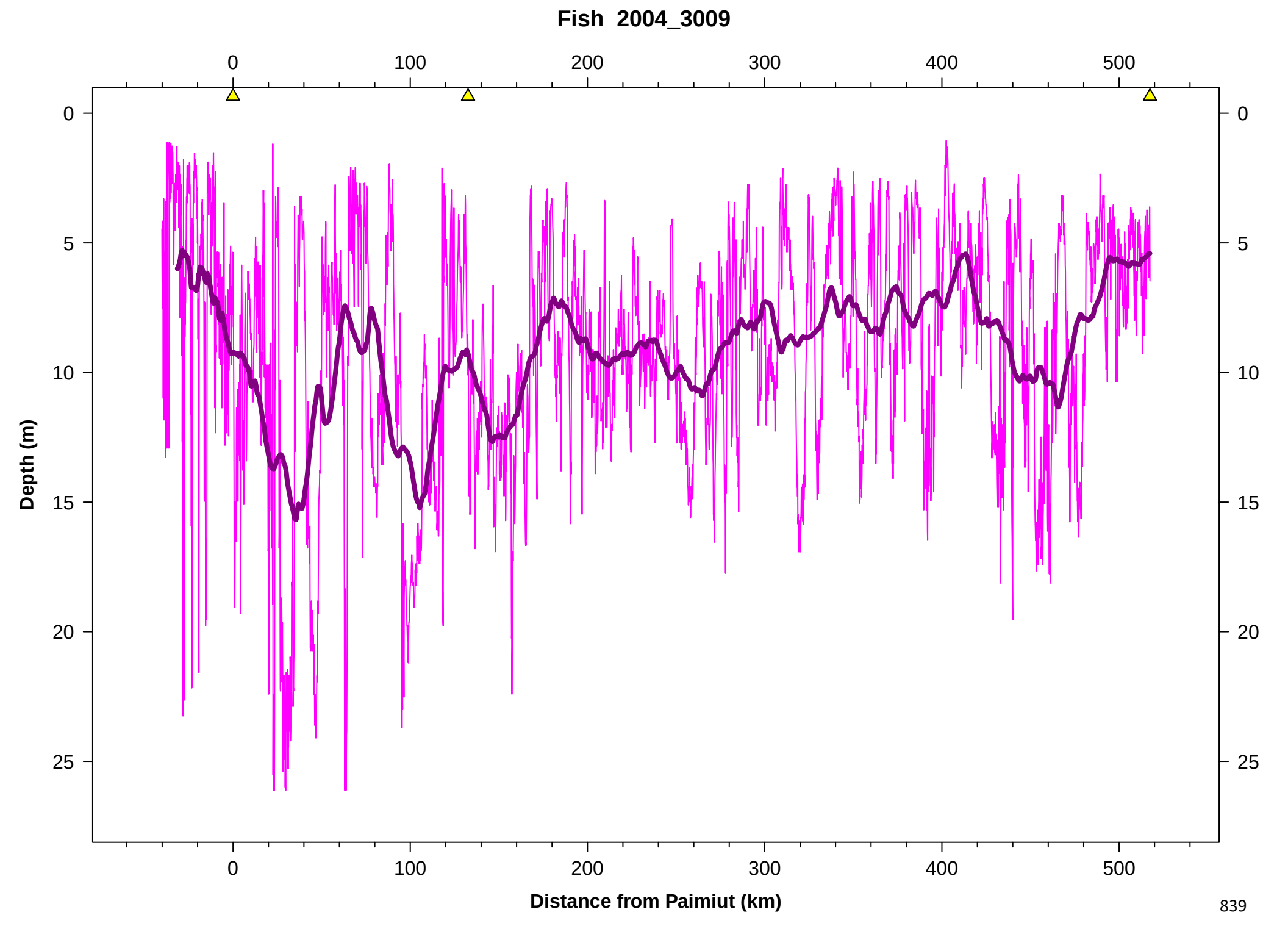

Fish 2004_3002
0
100
200
300
400
500
20
19
18
17
16
15
14
Temperature (C)
Distance from Paimiut (km)
834

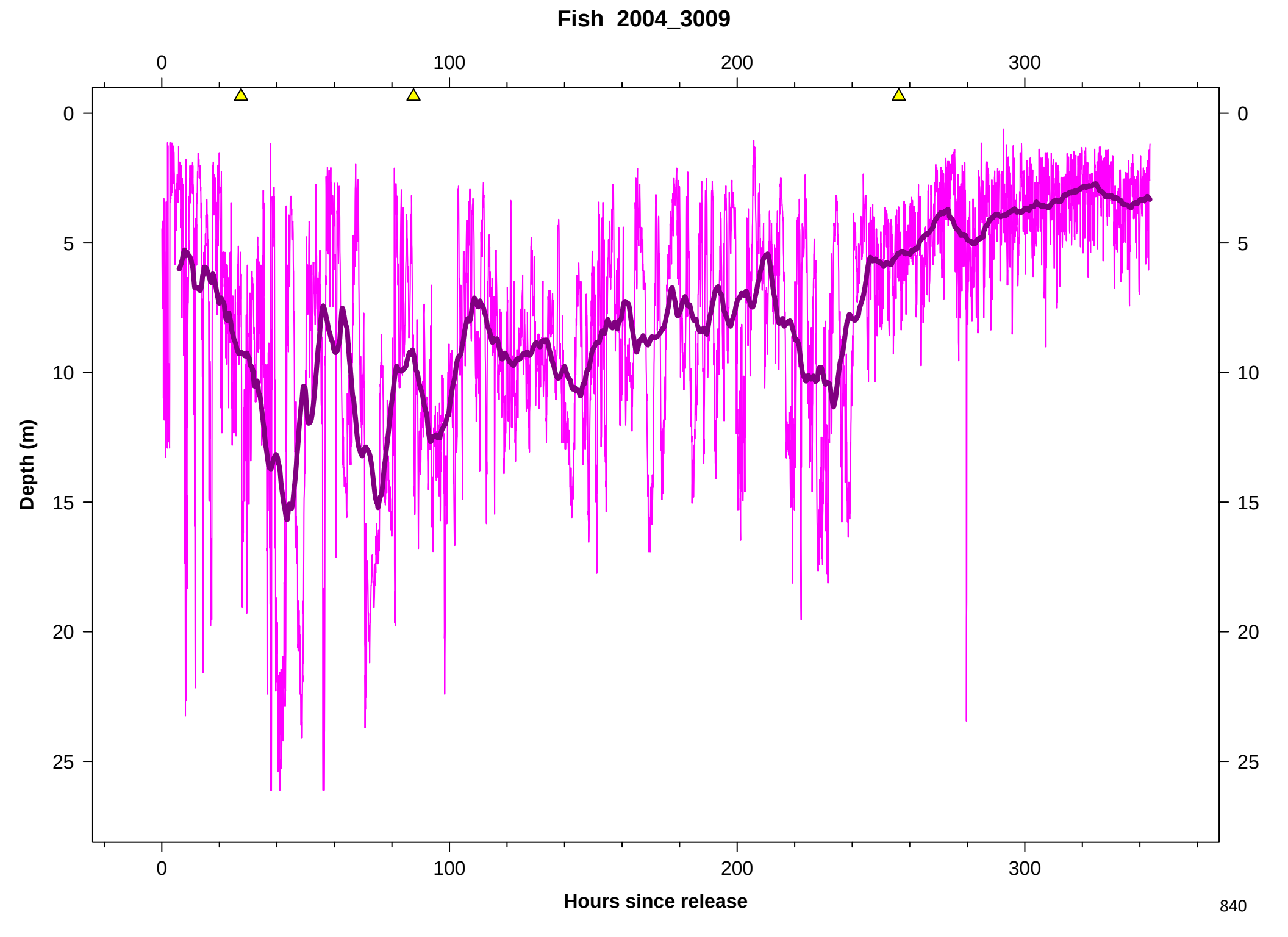

Fish 2004_3002
0
100
200
300
400
500
22
20
18
16
14
Temperature (C)
Hours since release
835

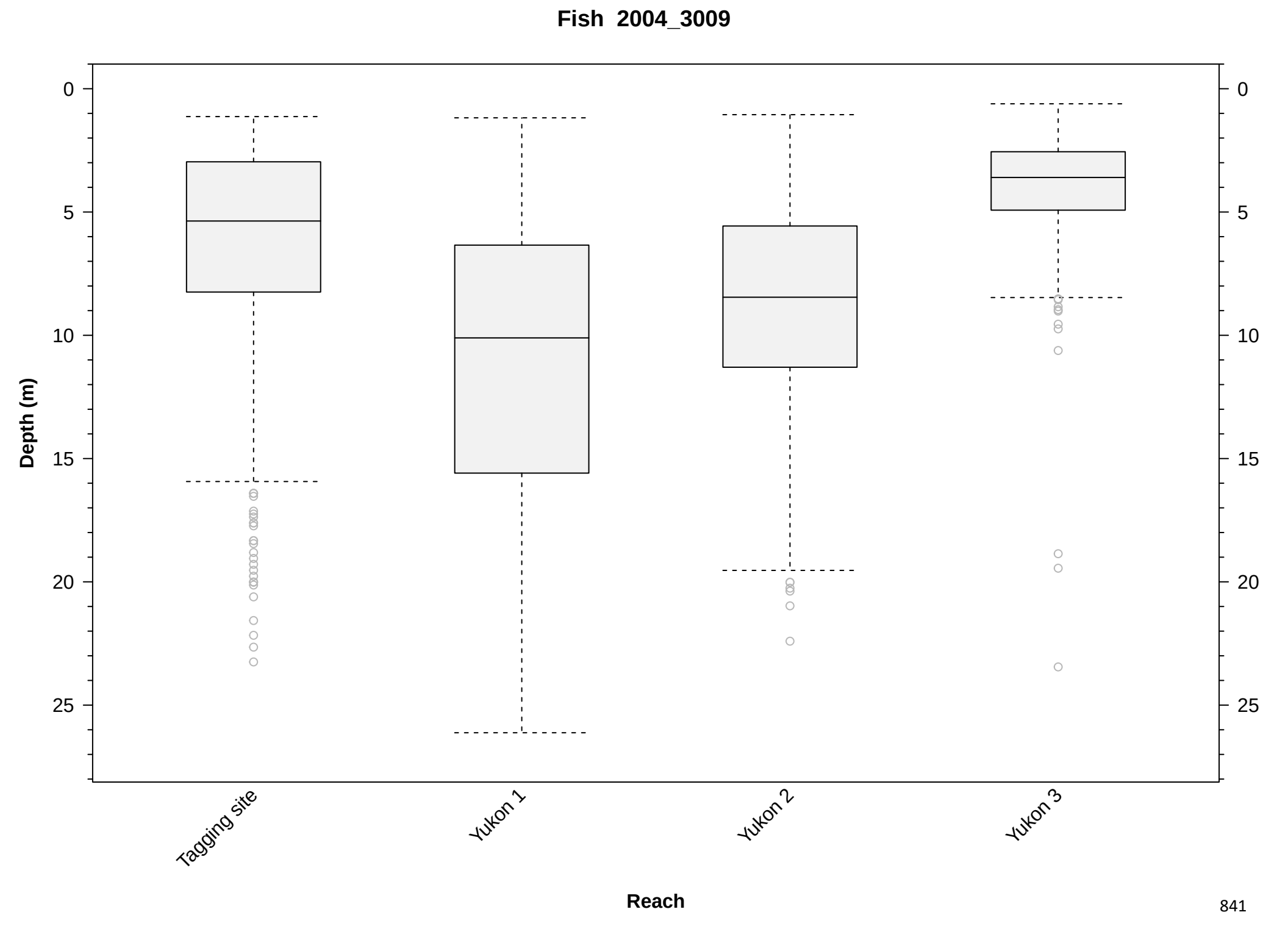

Fish 2004_3002
Temperature (C)
22
20
18
16
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach
836

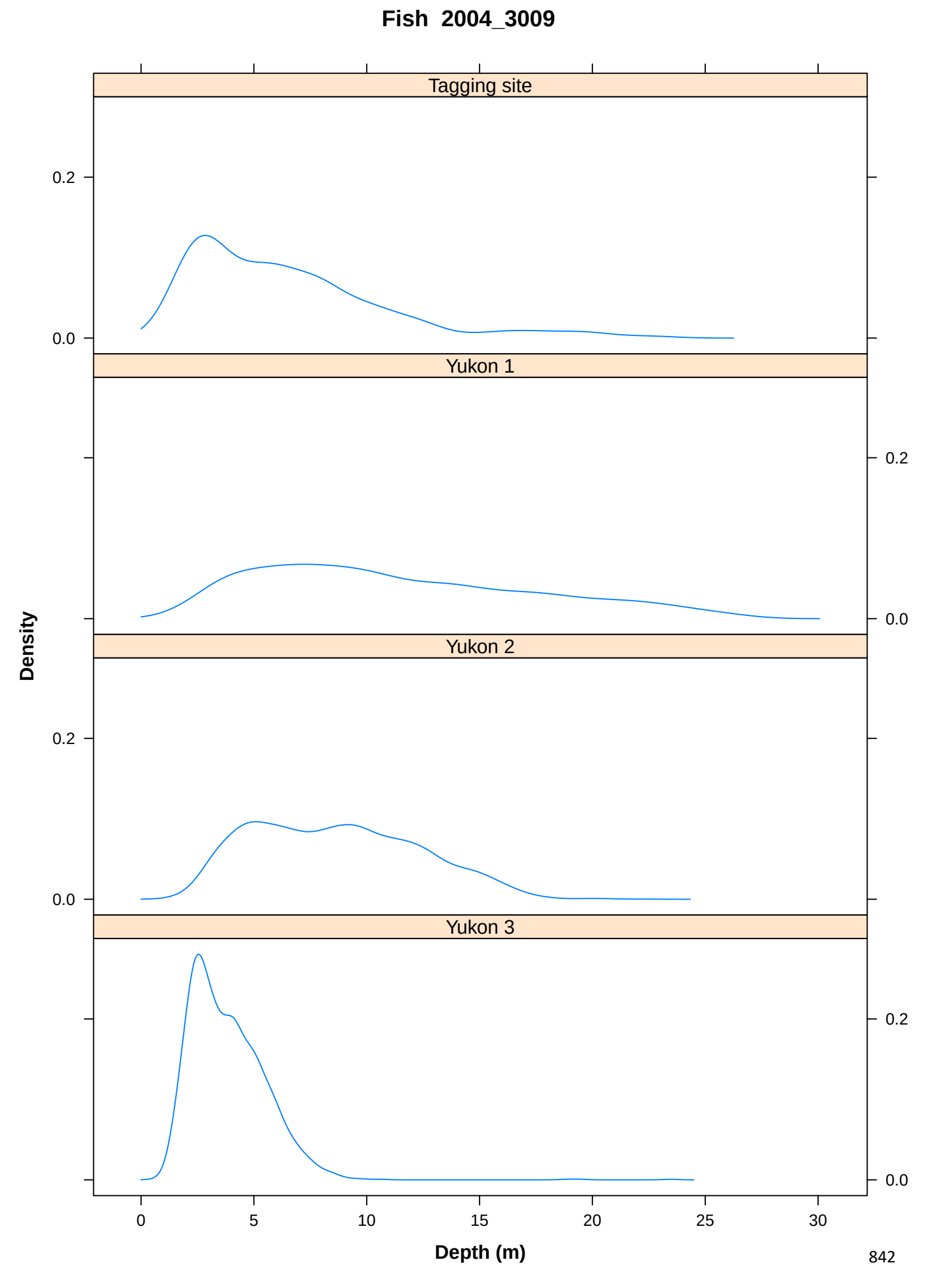

Fish 2004_3002
14
15
16
17
18
19
20
21
22
Tagging site
Yukon 1
Yukon 2
Yukon 3
5
0
Density
Temperature (C)
837

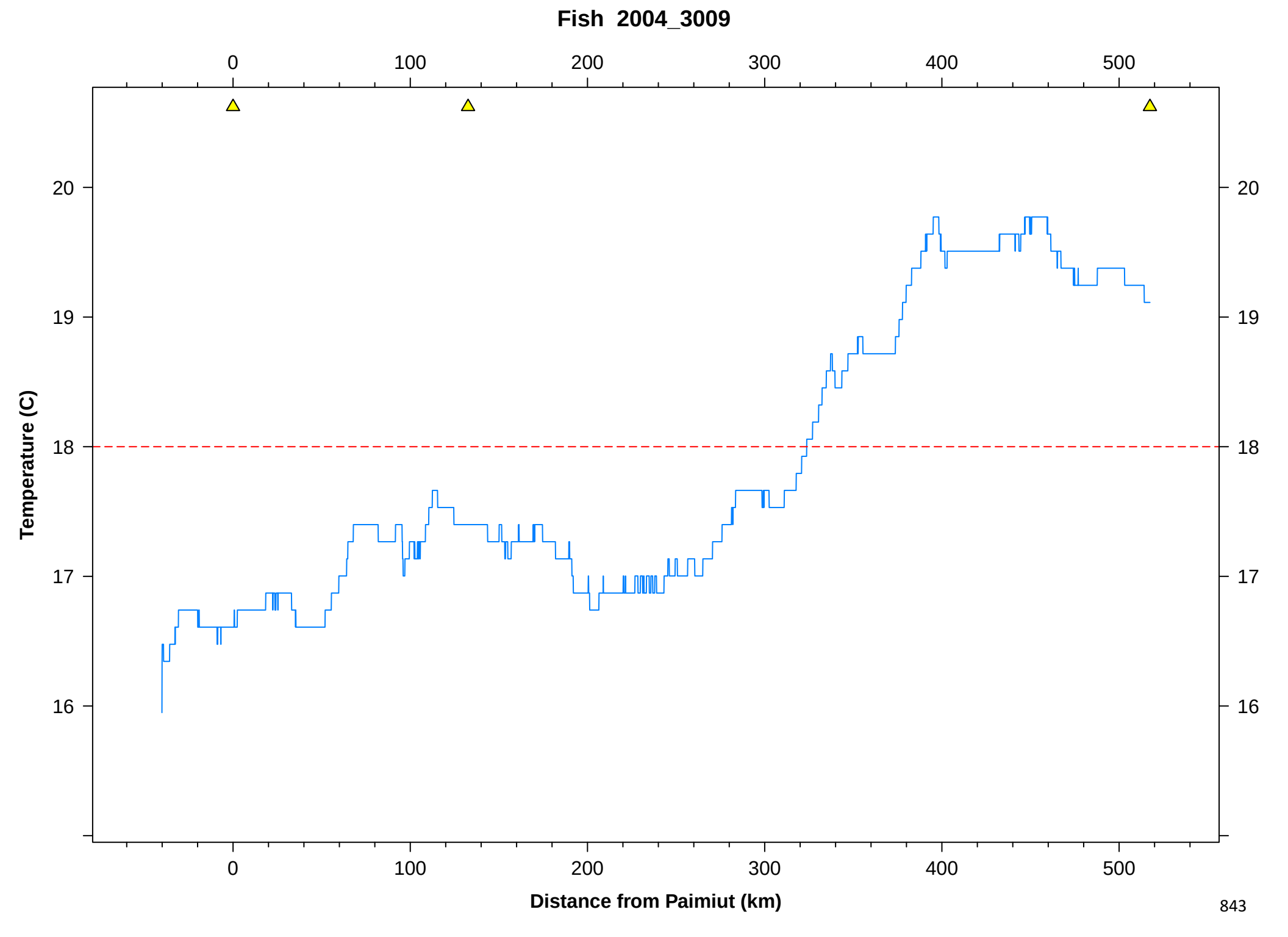

Fish 2004_3002
Tagging site
Yukon 1
Yukon 2
Yukon 3
Depth (m)
Temperature (C)
16
18
20
22
0
10
20

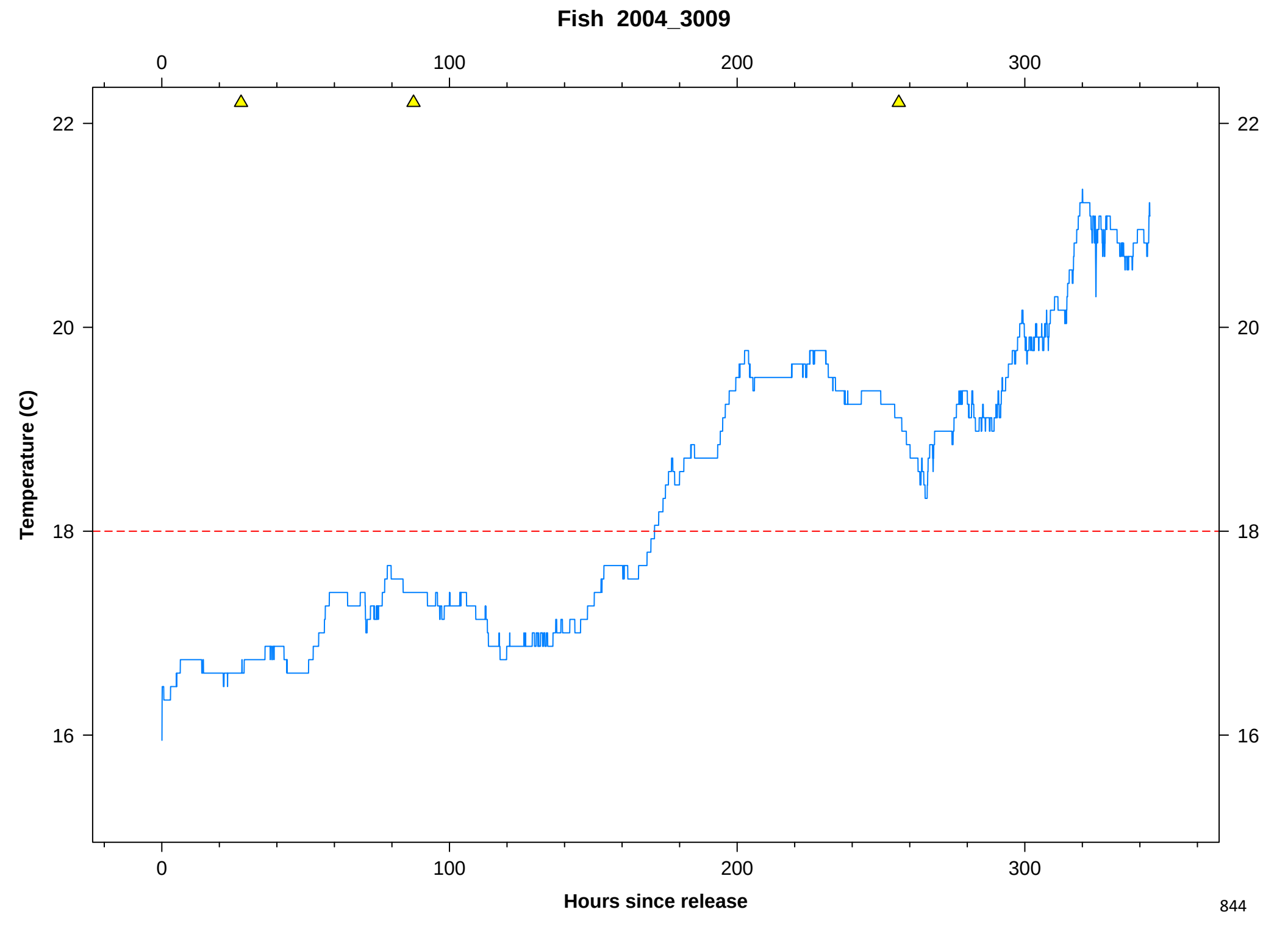

Fish 2004_3009
0
100
200
300
400
500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

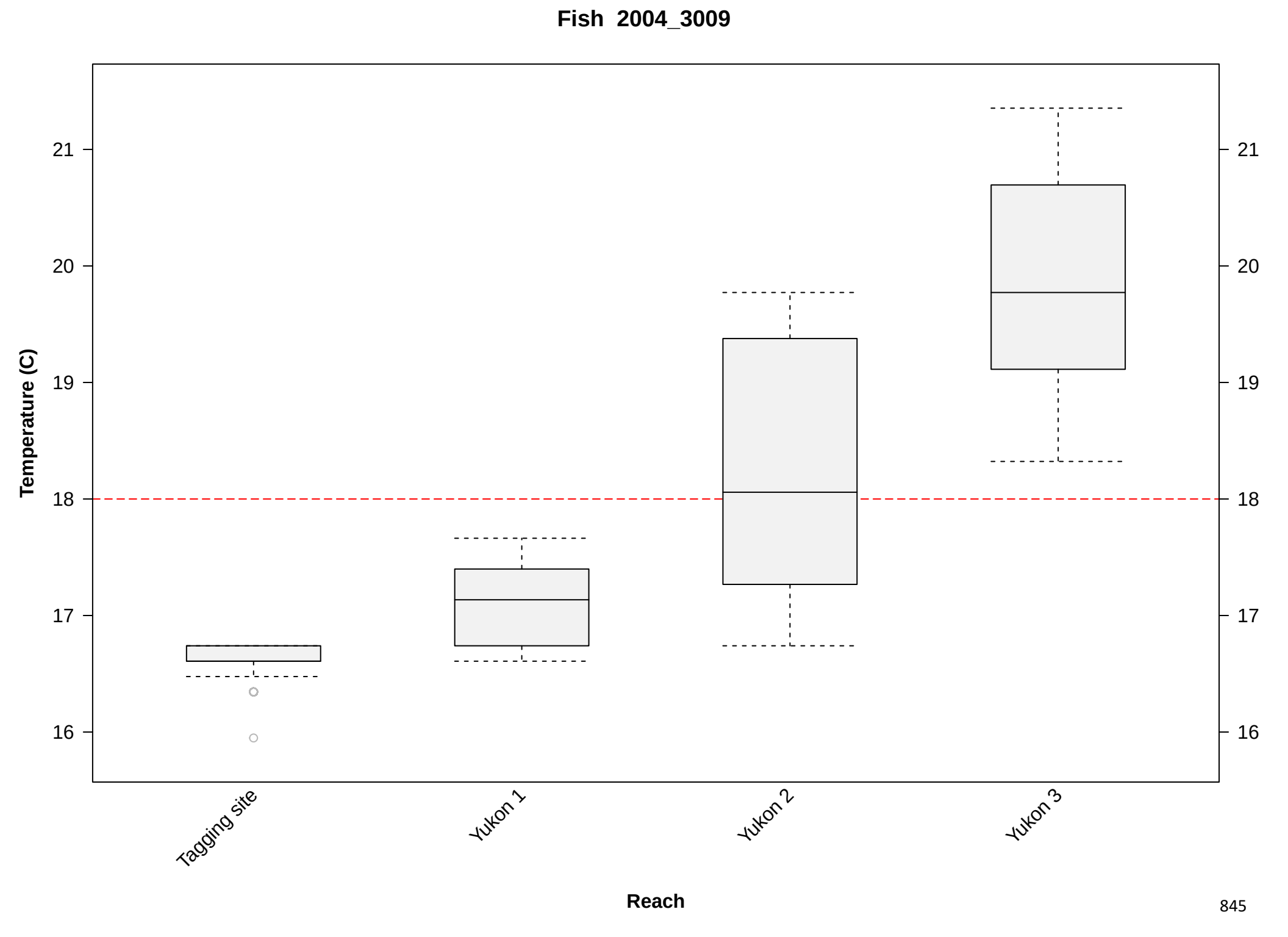

Fish 2004_3009
0
100
200
300
0
5
10
15
20
25
Depth (m)
Hours since release

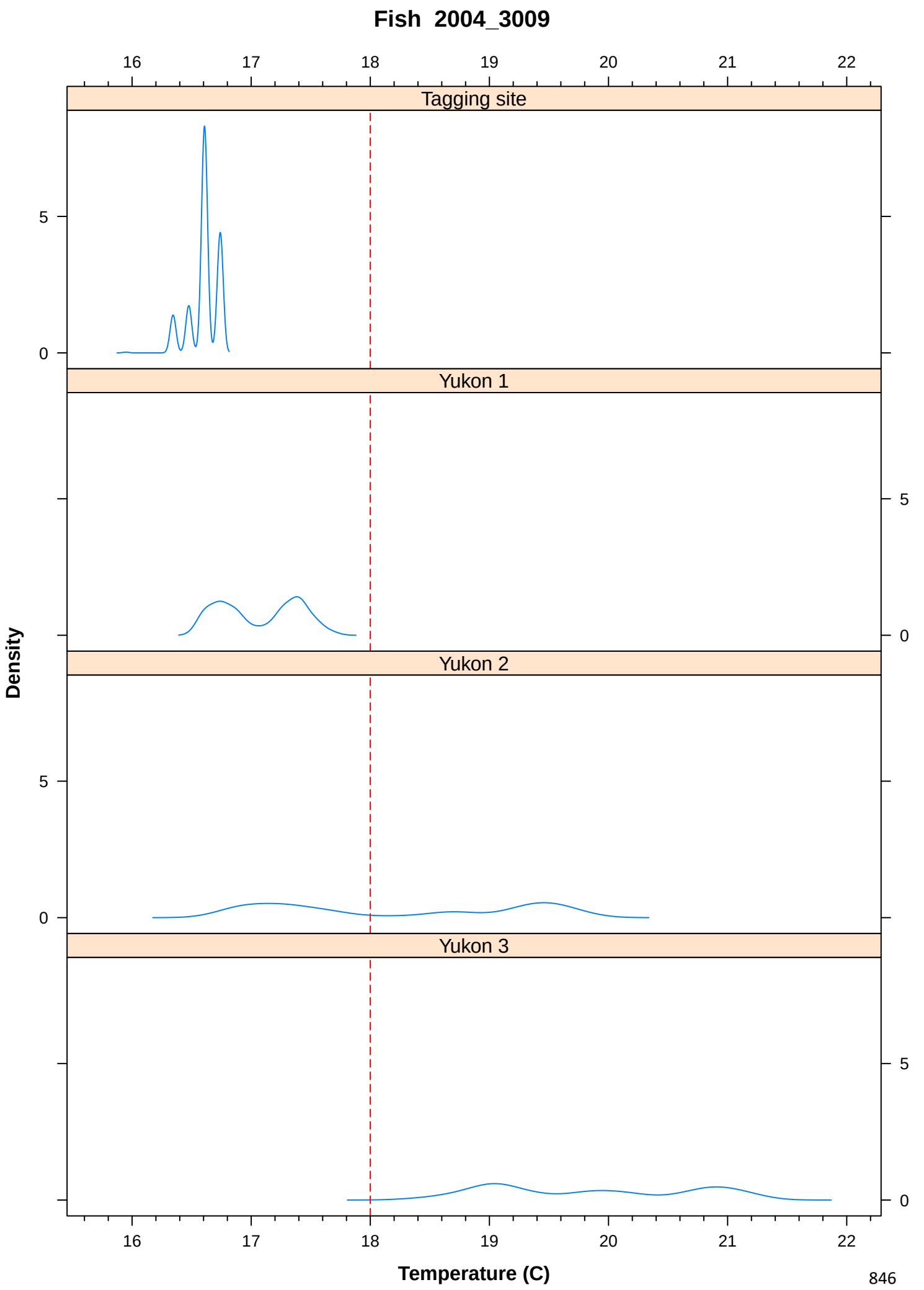

Fish 2004_3009
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach
841

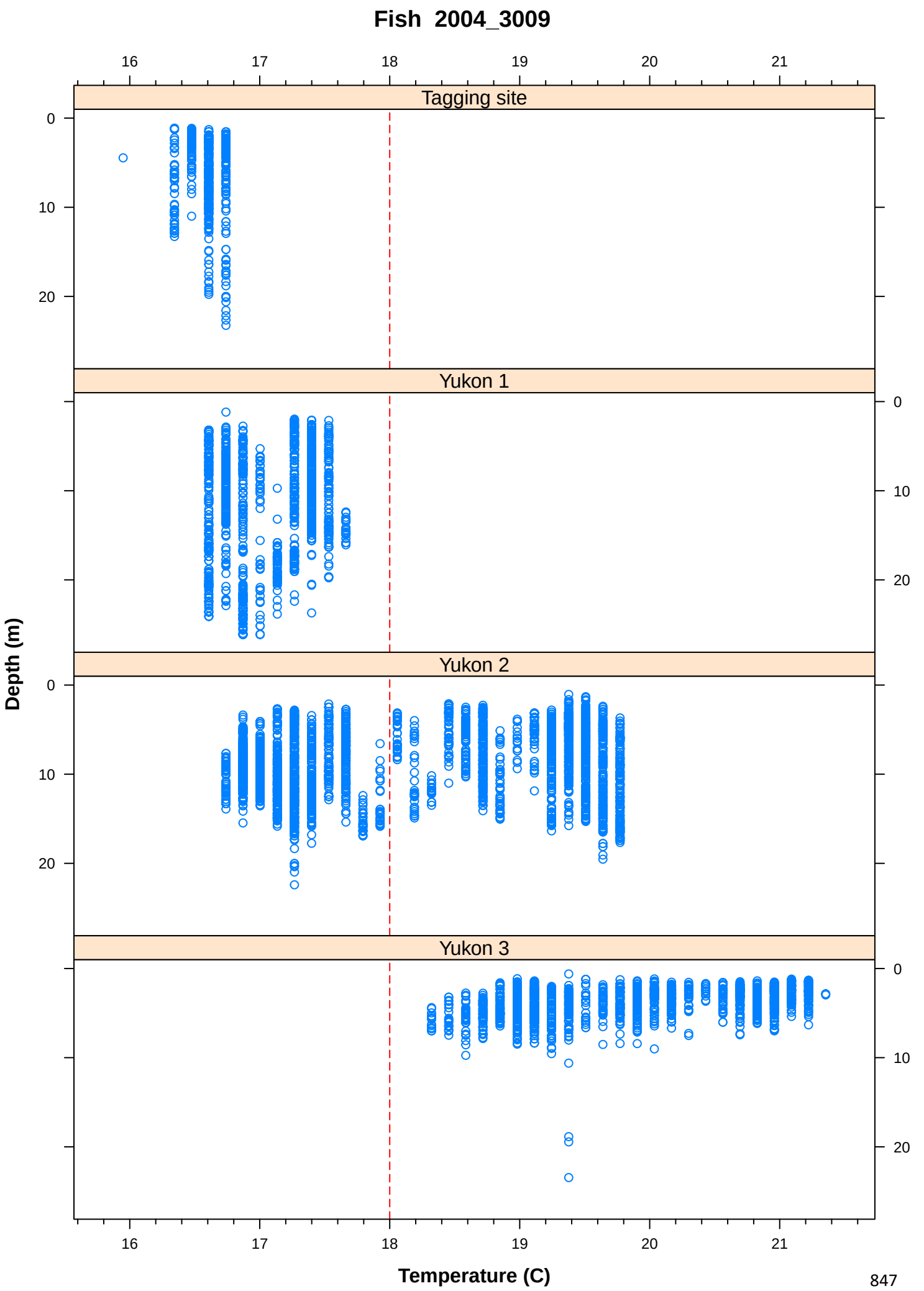

Fish 2004_3009
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
0.2
0.0
0
5
10
15
20
25
30
Depth (m)
842

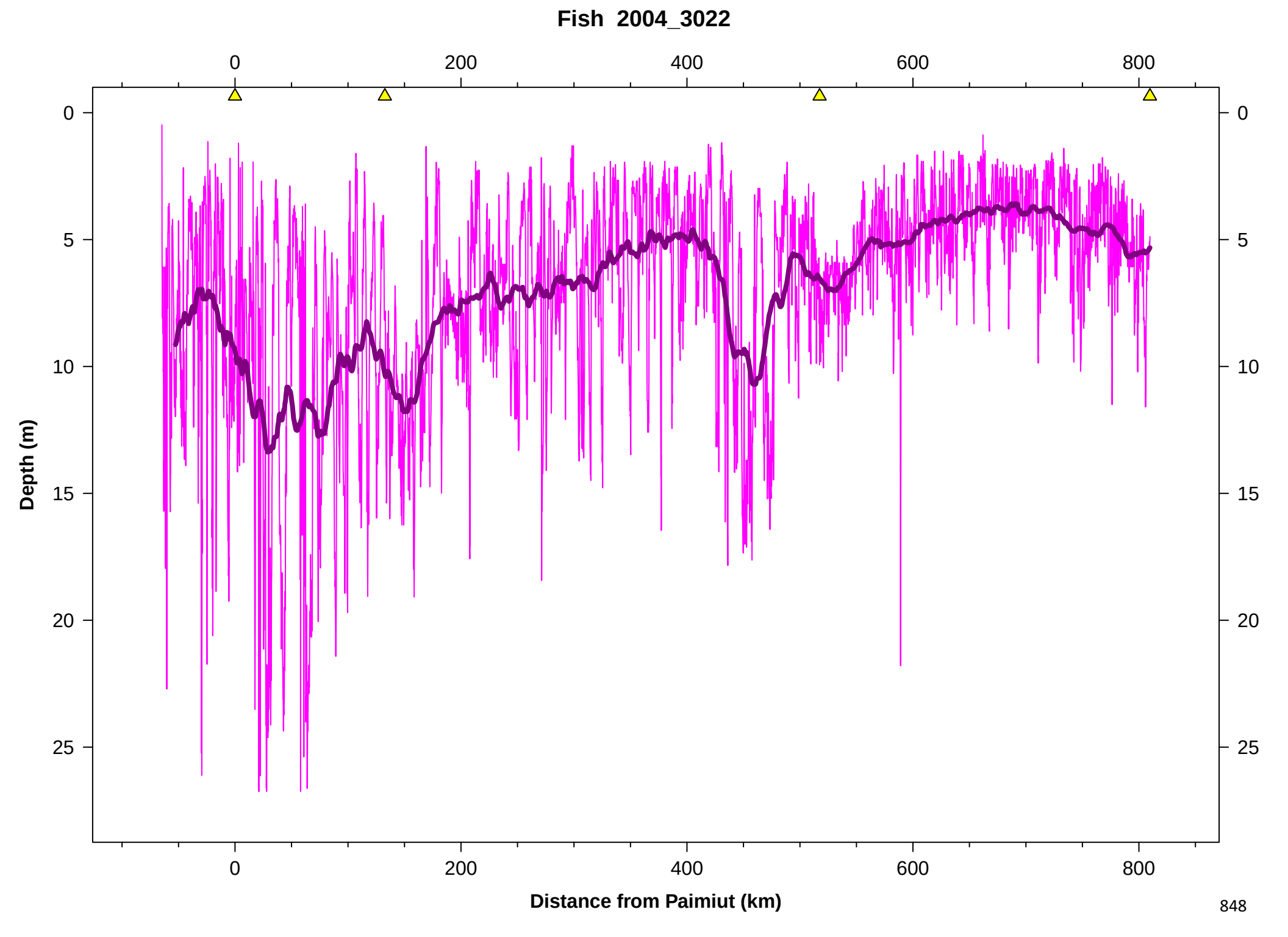

Fish 2004_3009
0
100
200
300
400
500
20
19
18
17
16
Temperature (C)
Distance from Paimiut (km)

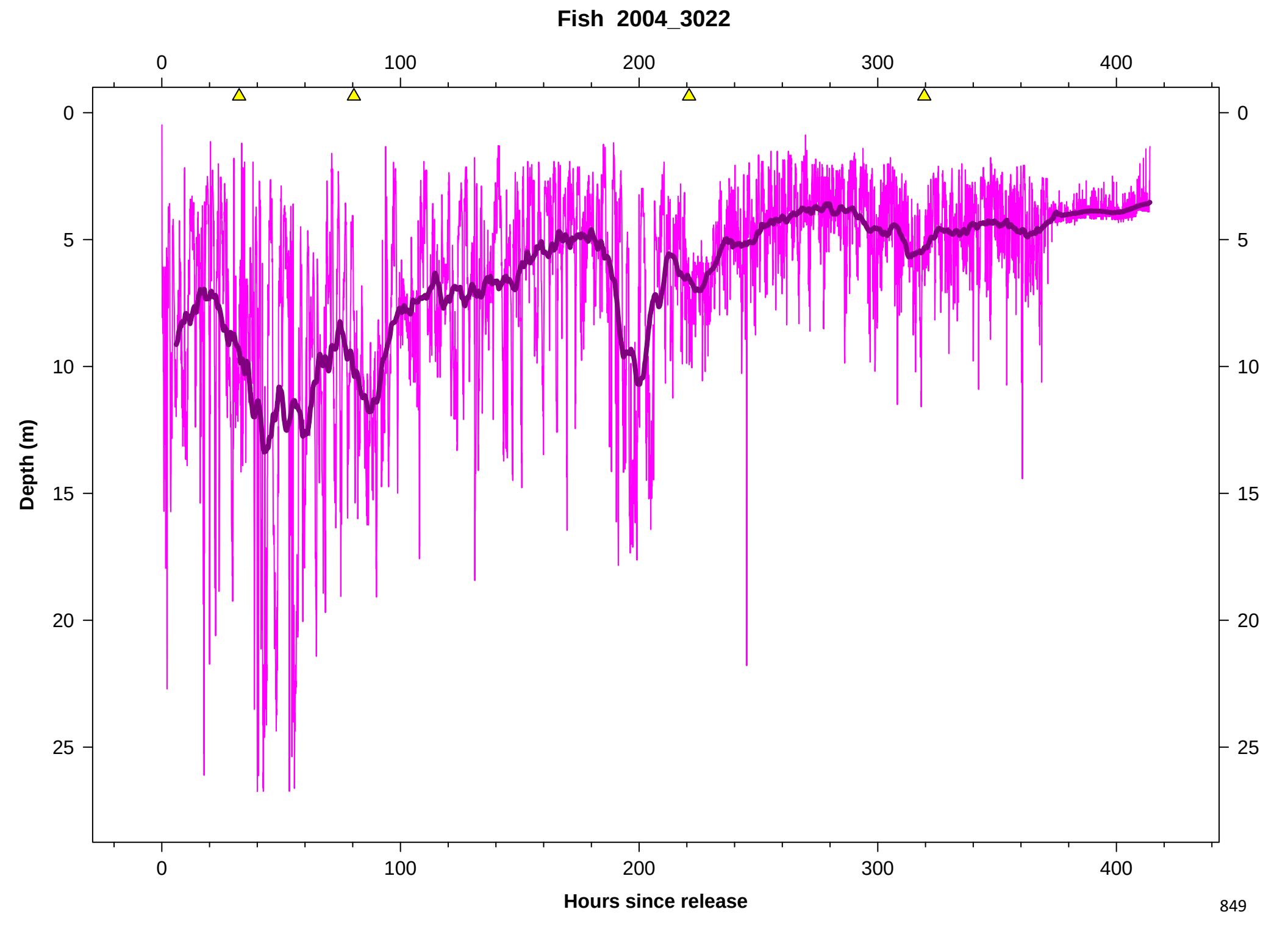

Fish 2004_3009
0
100
200
300
22
20
18
16
Temperature (C)
Hours since release
844

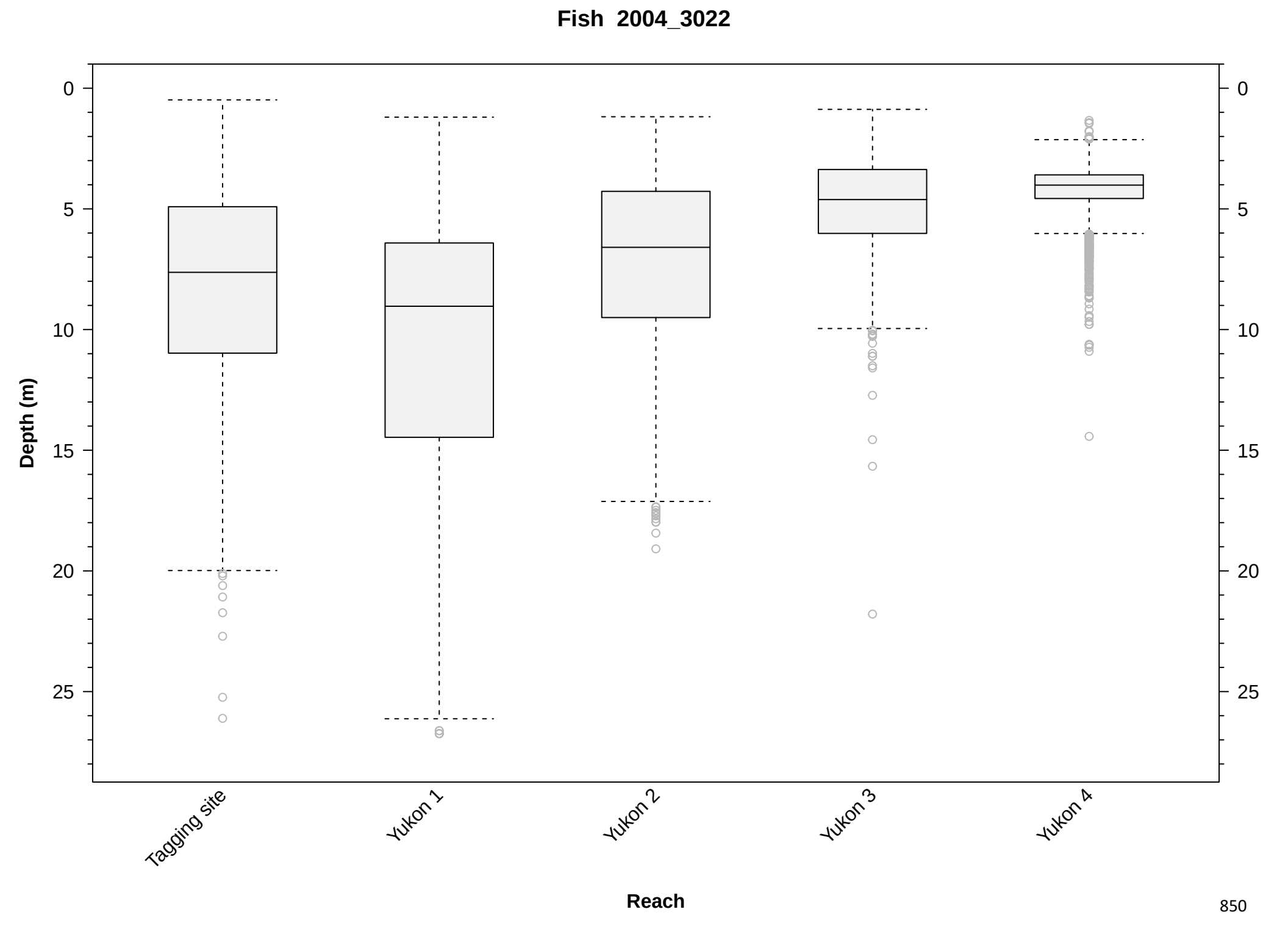

Fish 2004_3009
Temperature (C)
21
20
19
18
17
16
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach

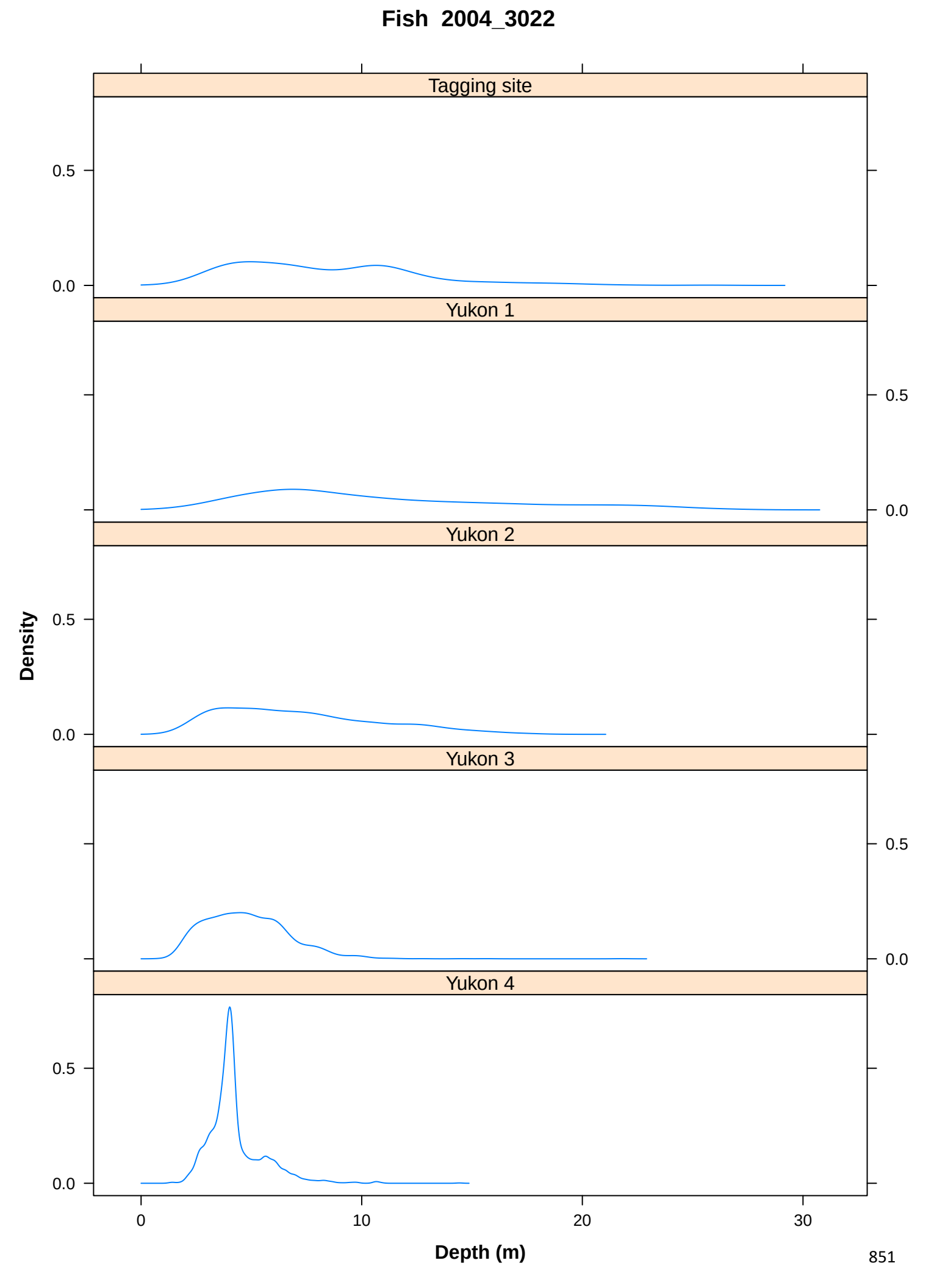

Fish 2004_3009
16
17
18
19
20
21
22
Tagging site
Yukon 1
Yukon 2
Yukon 3
5
0
Density
Temperature (C)

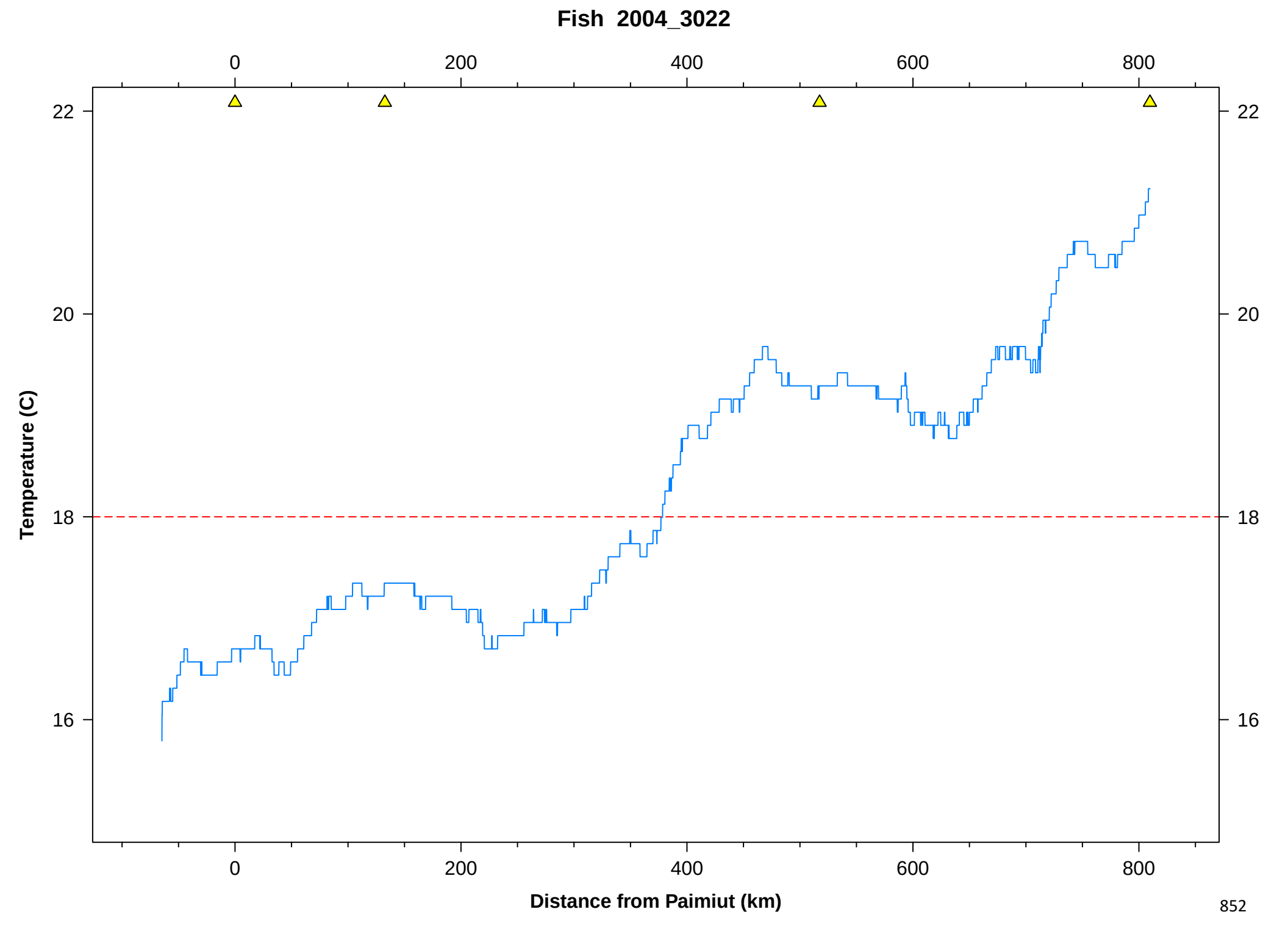

Fish 2004_3009
Tagging site
Yukon 1
Yukon 2
Yukon 3
Depth (m)
Temperature (C)
16
17
18
19
20
21
0
10
20

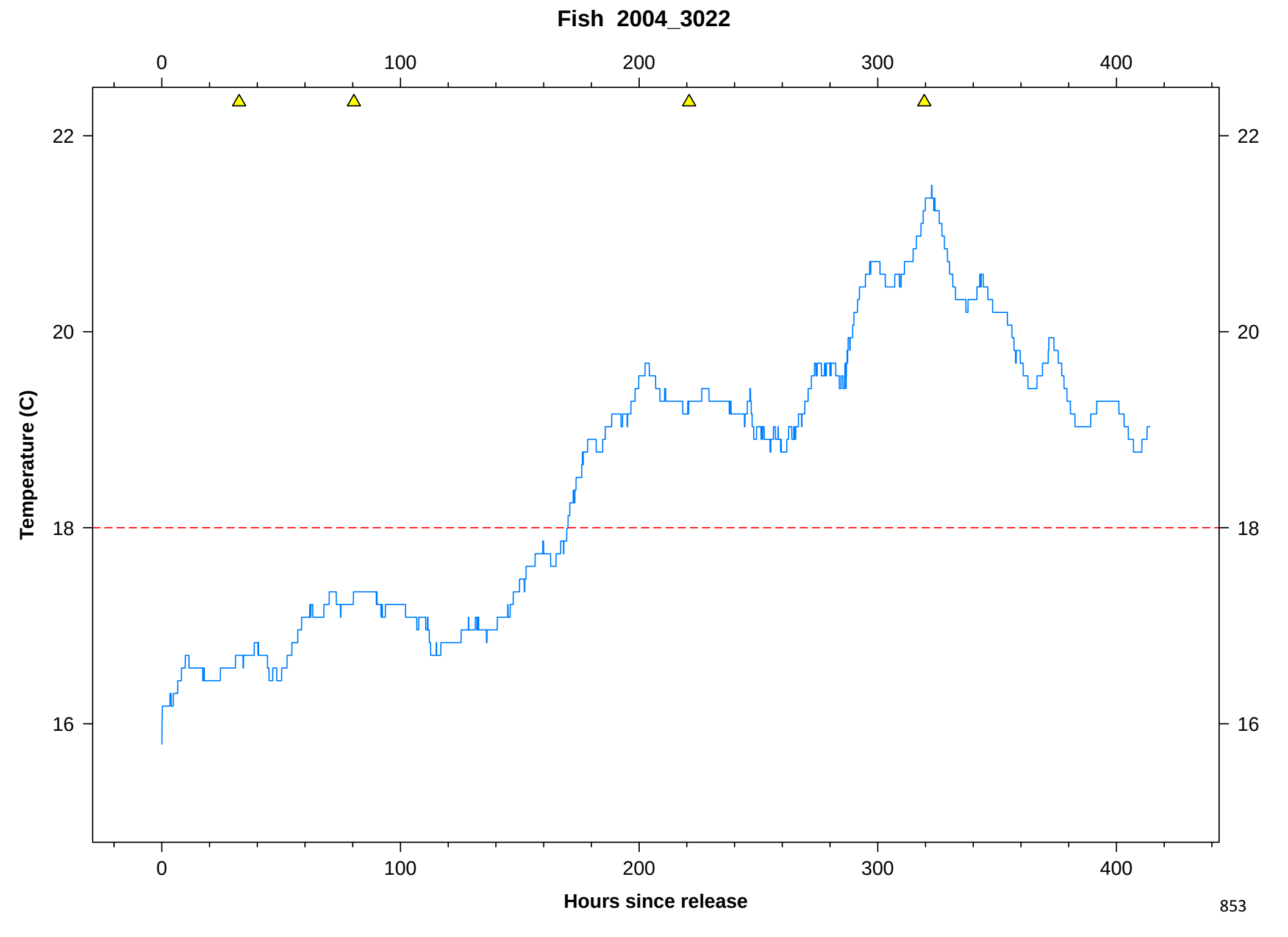

Fish 2004_3022
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

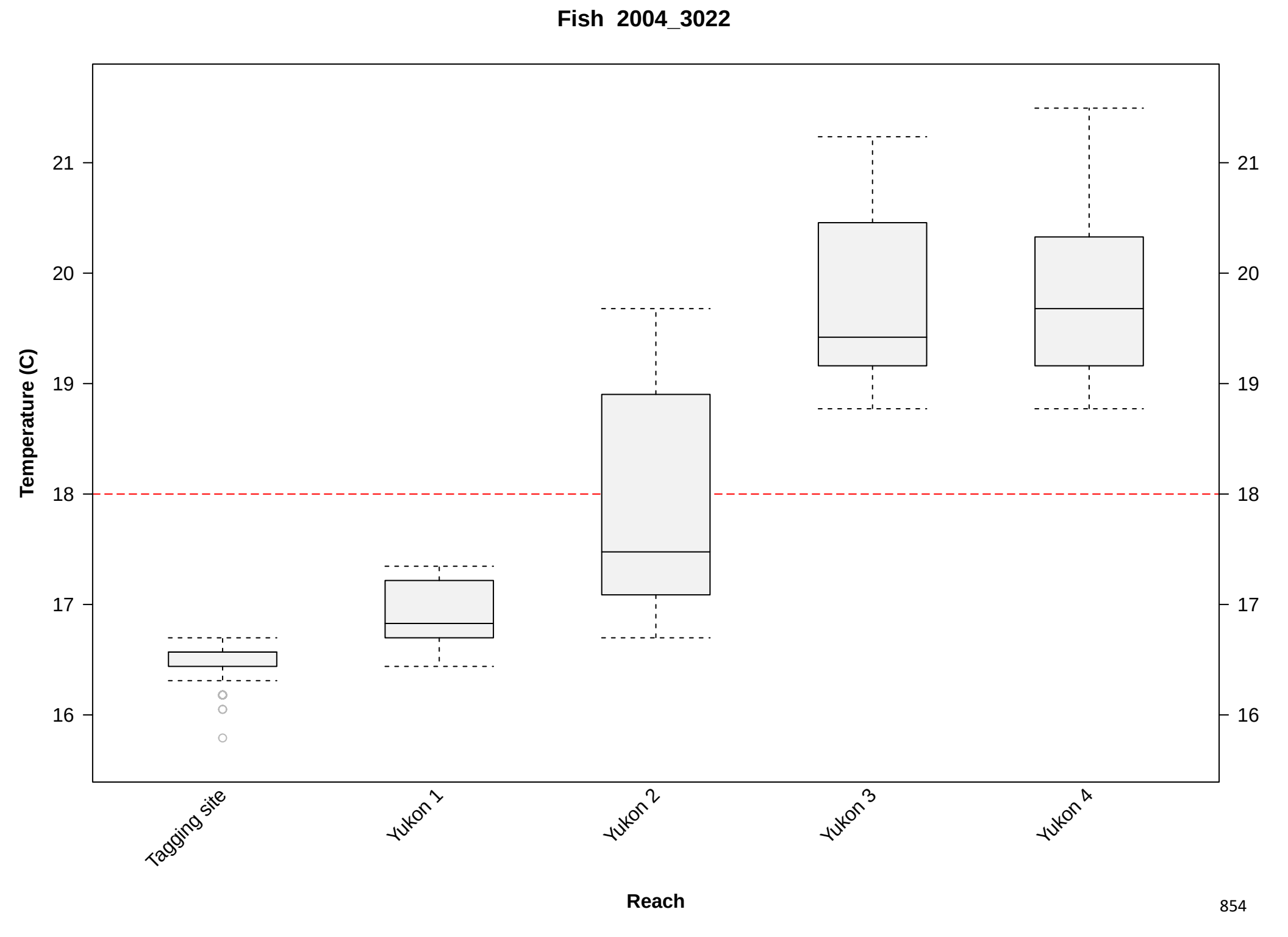

Fish 2004_3022
0
100
200
300
400
0
5
10
15
20
25
Depth (m)
Hours since release

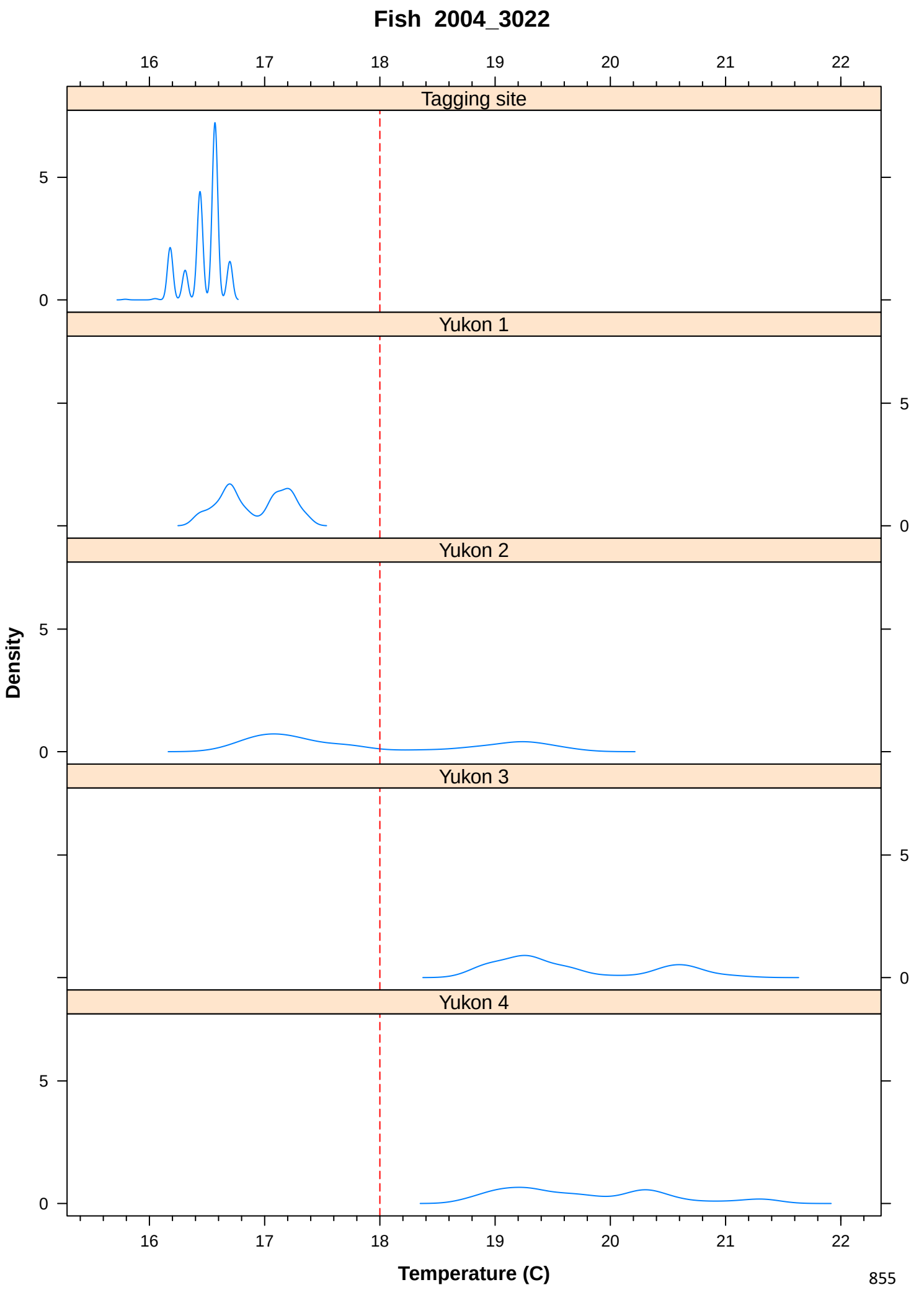

Fish 2004_3022
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach

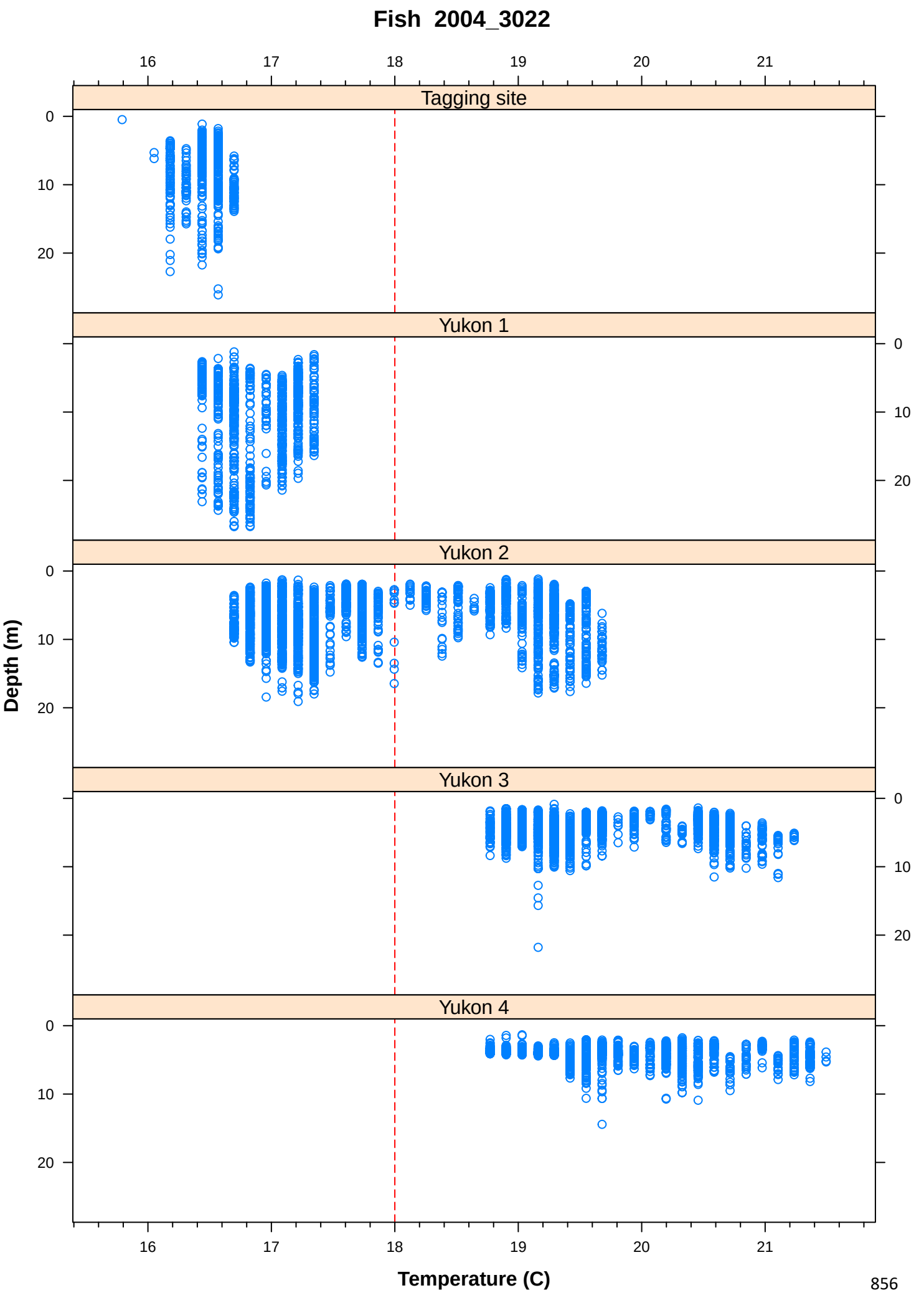

Fish 2004_3022
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
0.5
0.0
0
10
20
30
Depth (m)

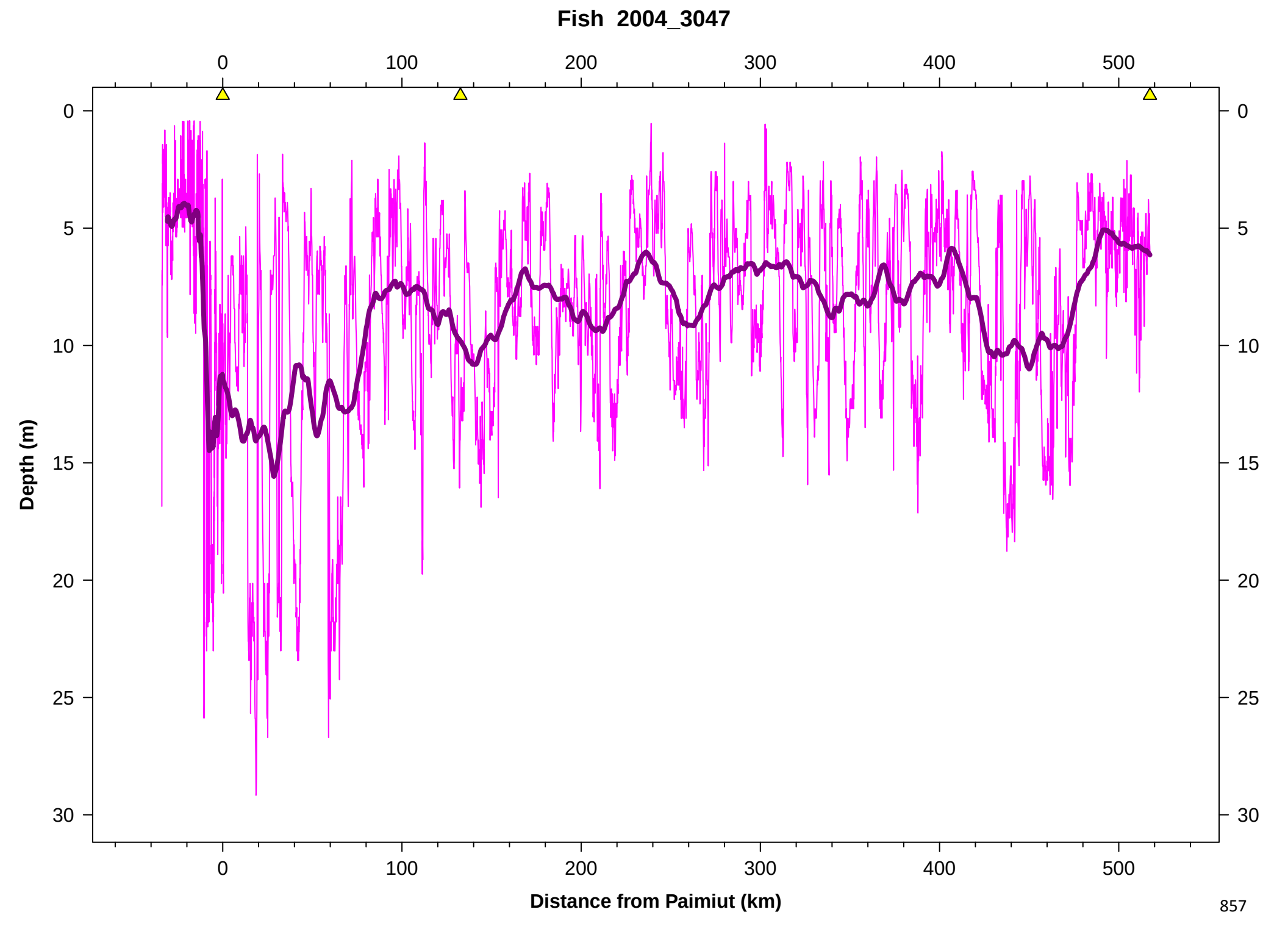

Fish 2004_3022
0
200
400
600
800
22
20
18
16
Temperature (C)
Distance from Paimiut (km)
852

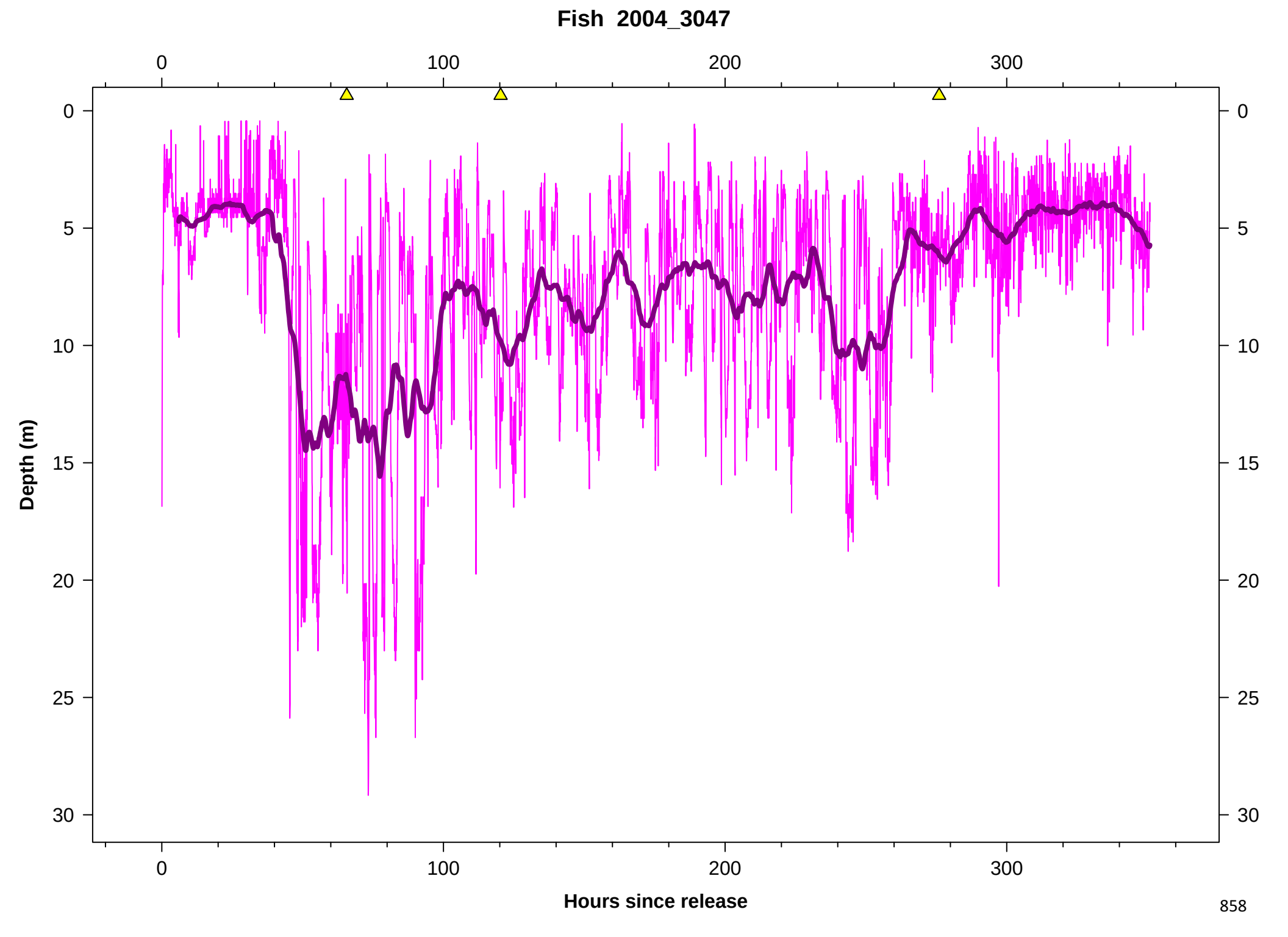

Fish 2004_3022
0
100
200
300
400
22
20
18
16
Temperature (C)
Hours since release
853

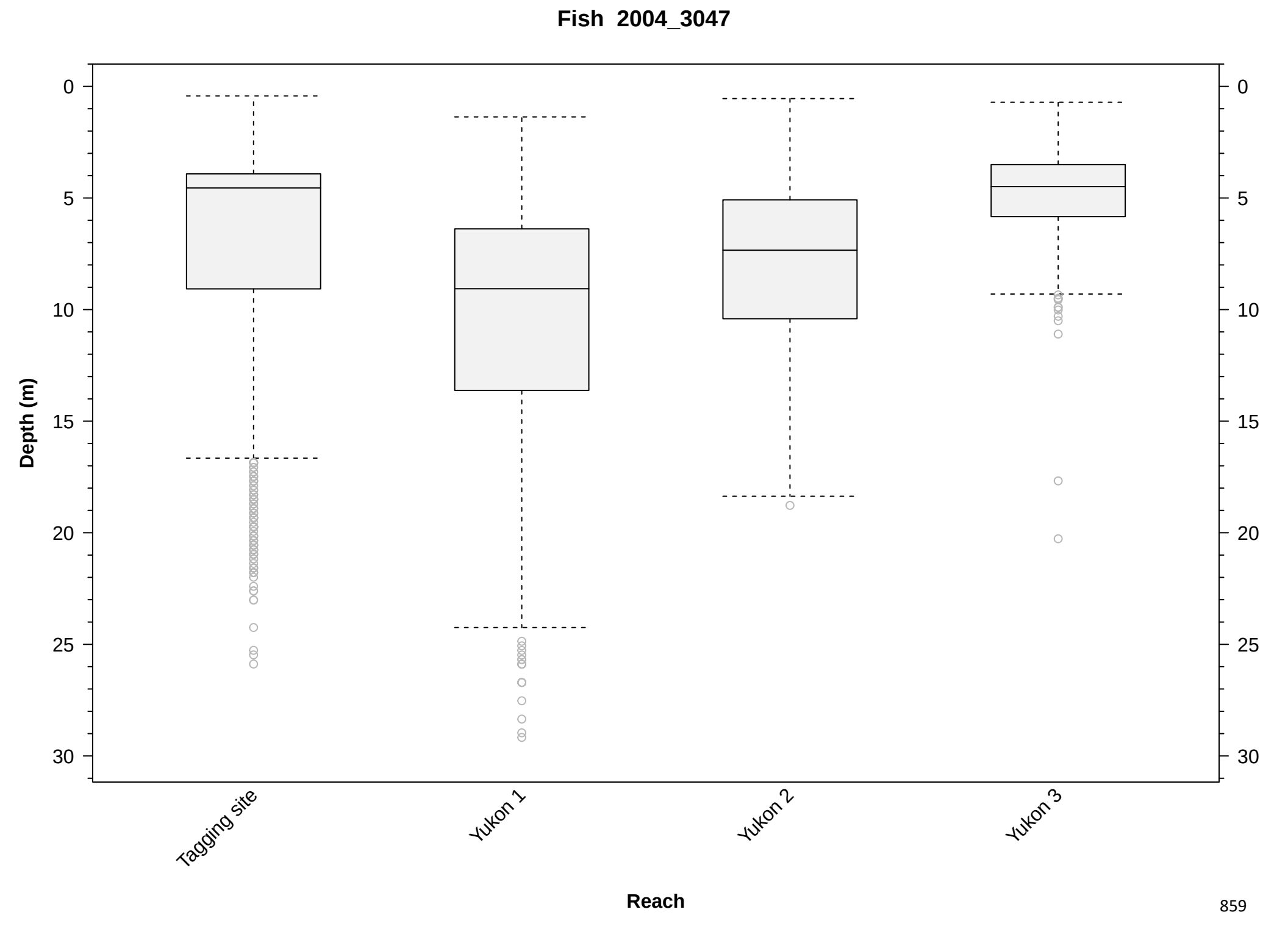

Fish 2004_3022
Temperature (C)
21
20
19
18
17
16
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach

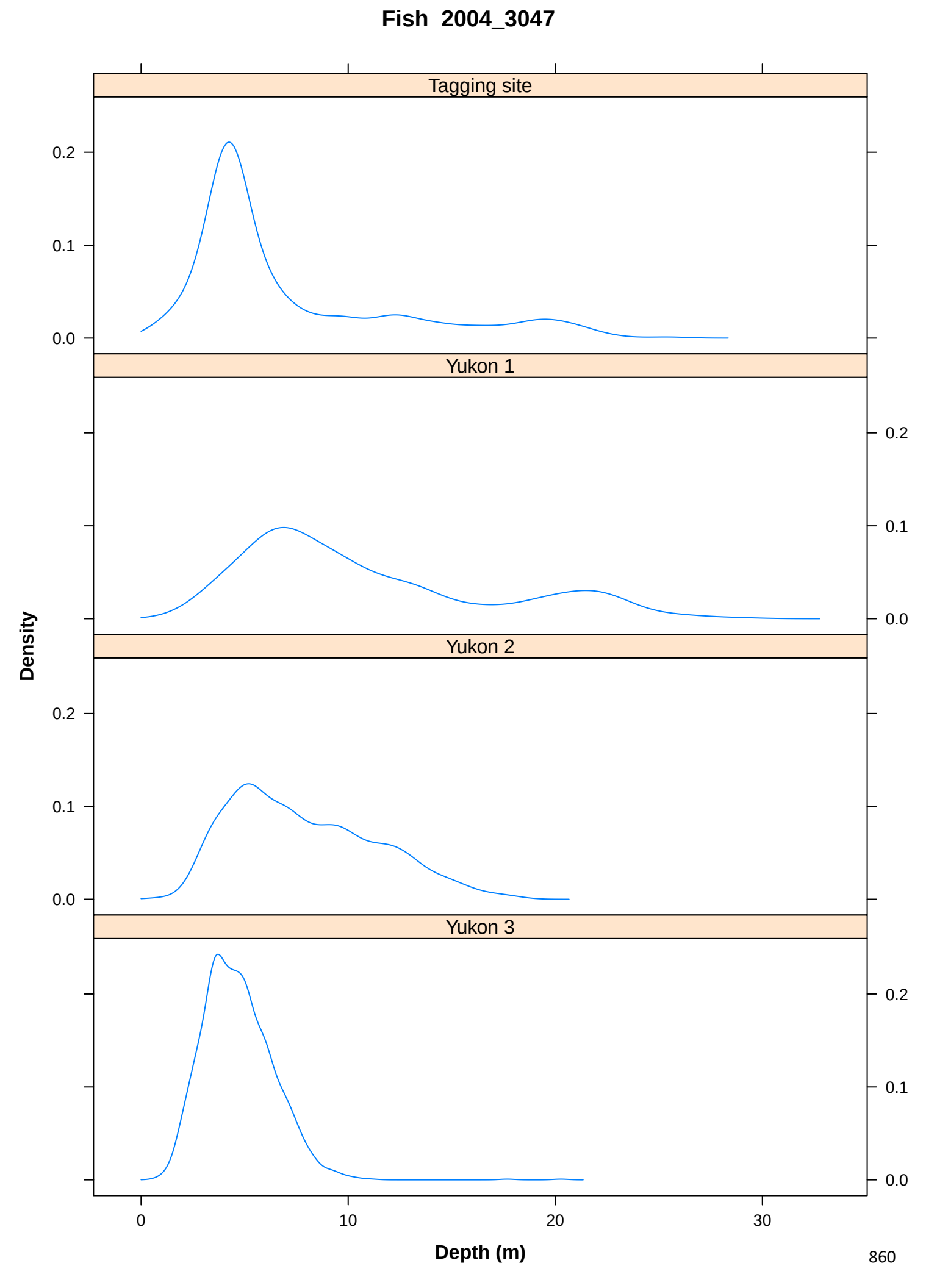

Fish 2004_3022
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
Temperature (C)
16
17
18
19
20
21
22
0
5

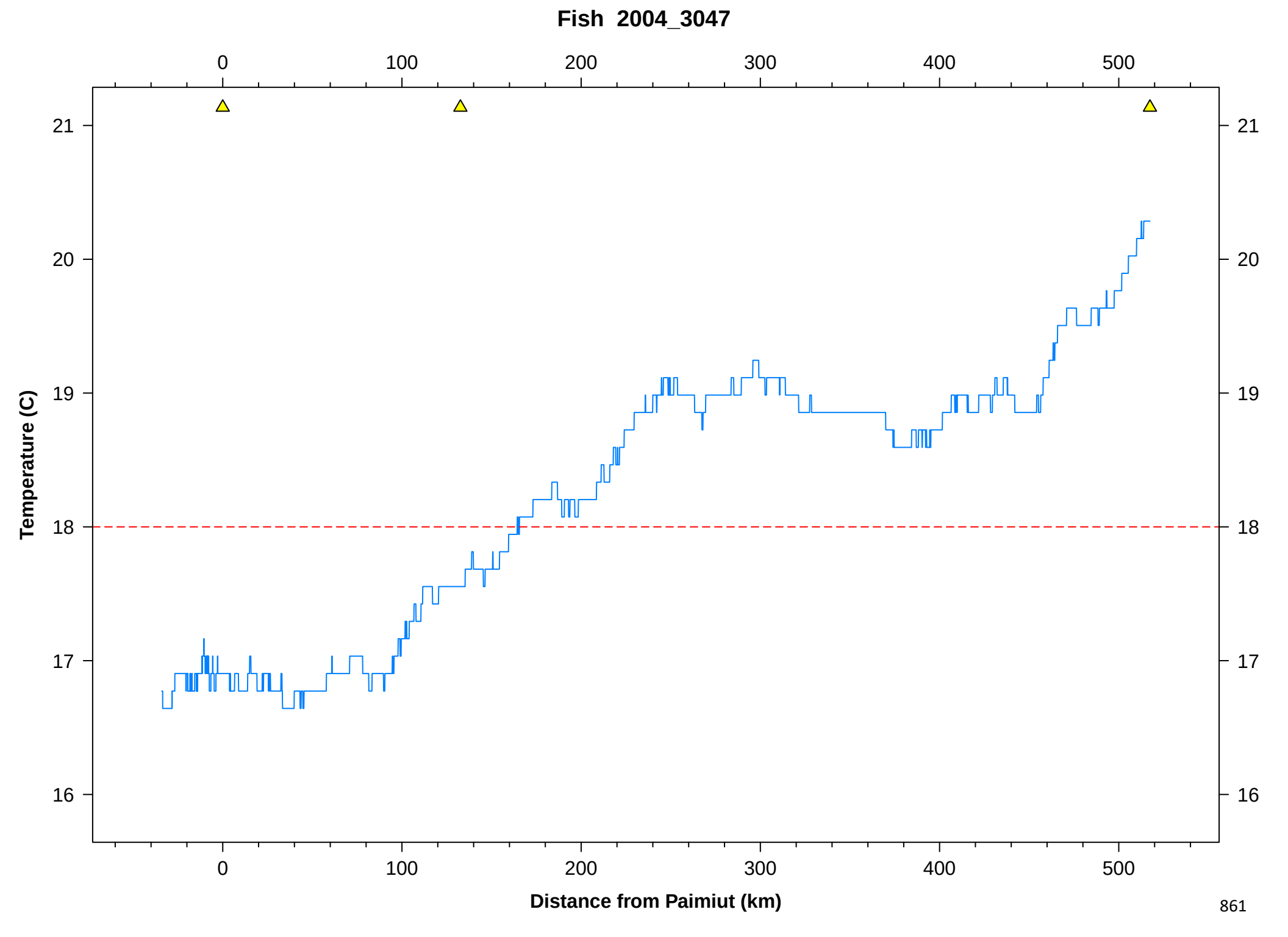

Fish 2004_3022
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Depth (m)
Temperature (C)
16
17
18
19
20
21
0
10
20

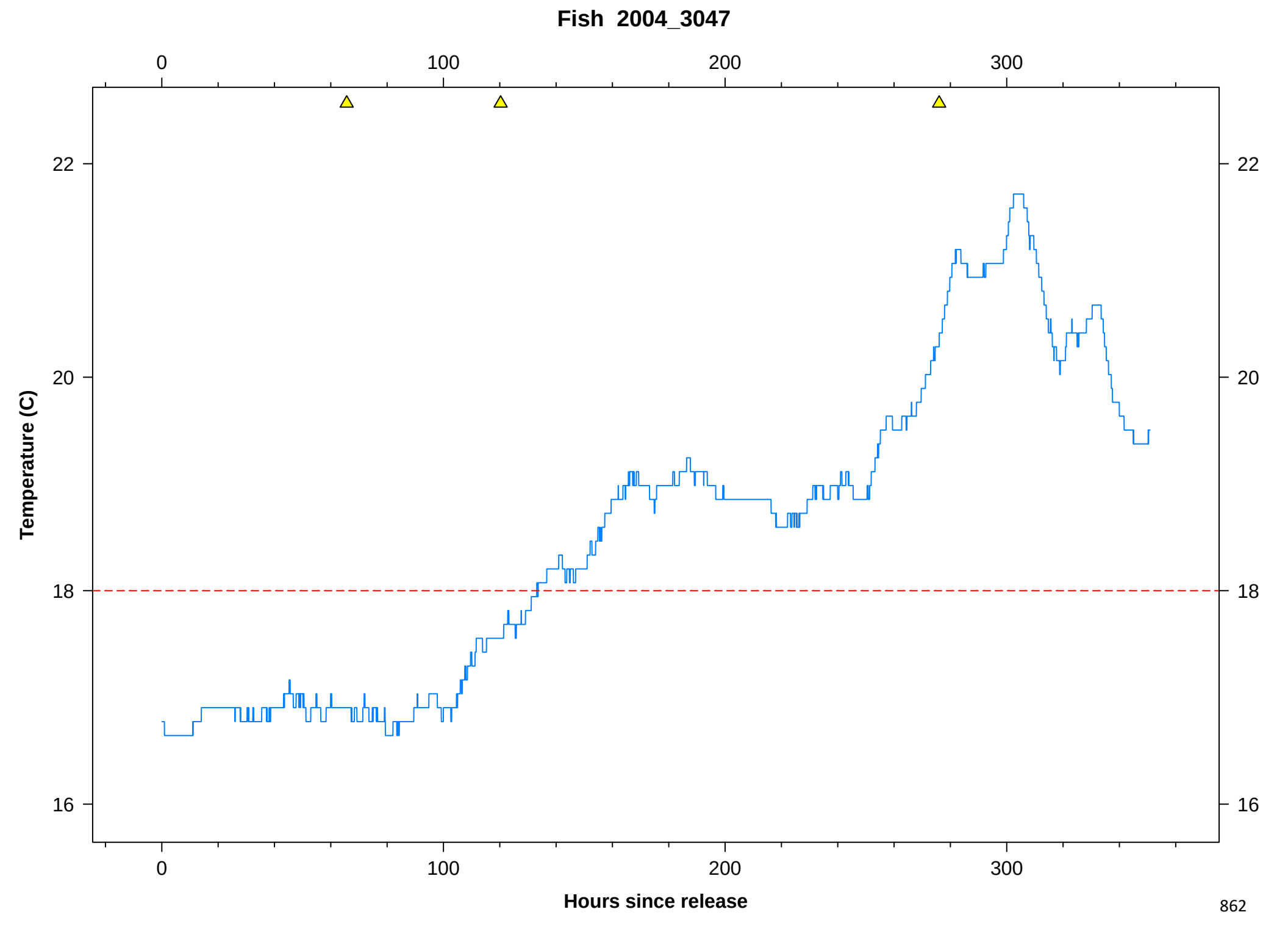

Fish 2004_3047
0
100
200
300
400
500
0
5
10
15
20
25
30
Depth (m)
Distance from Paimiut (km)

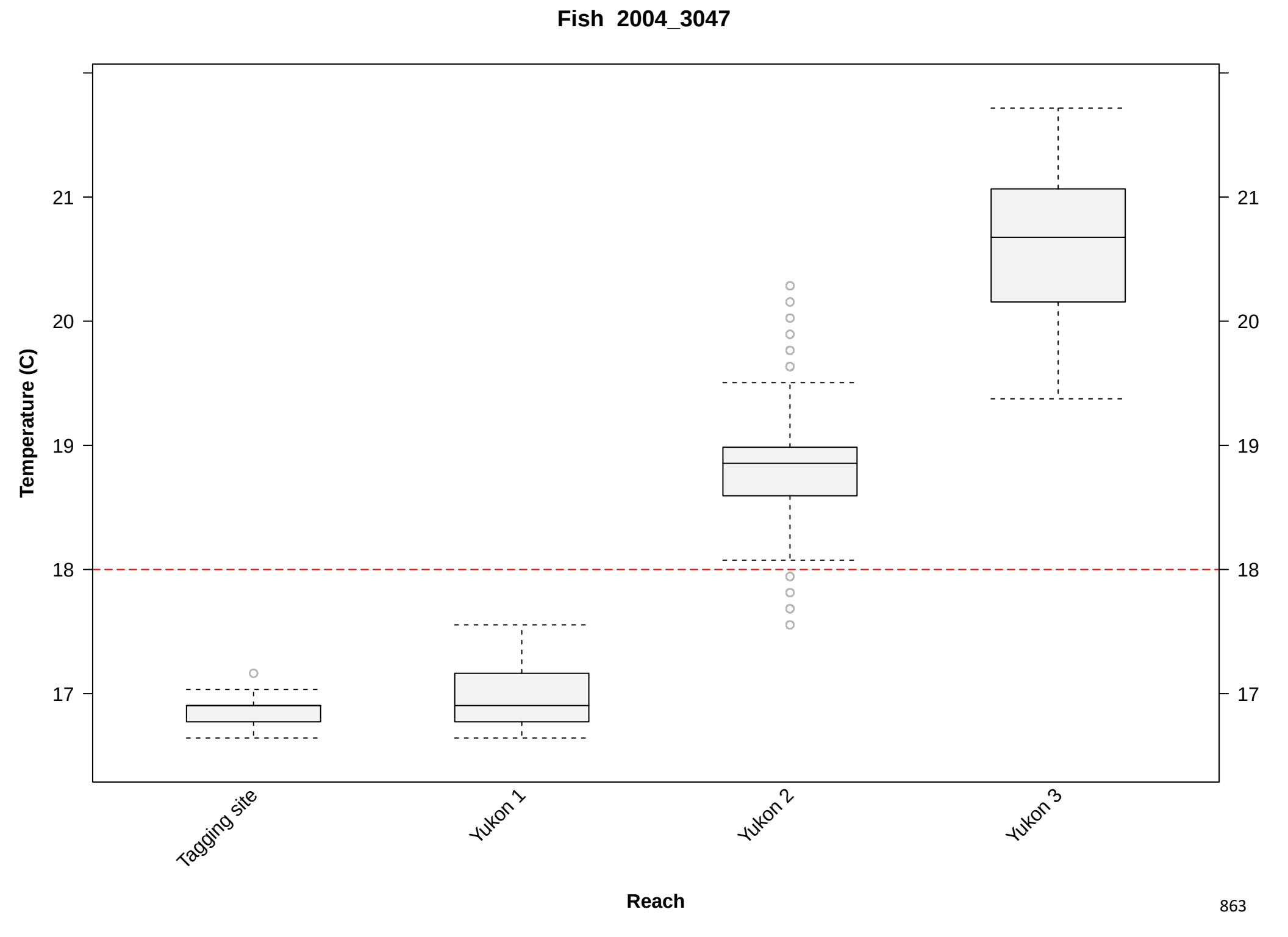

Fish 2004_3047
0
100
200
300
0
5
10
15
20
25
30
Depth (m)
Hours since release

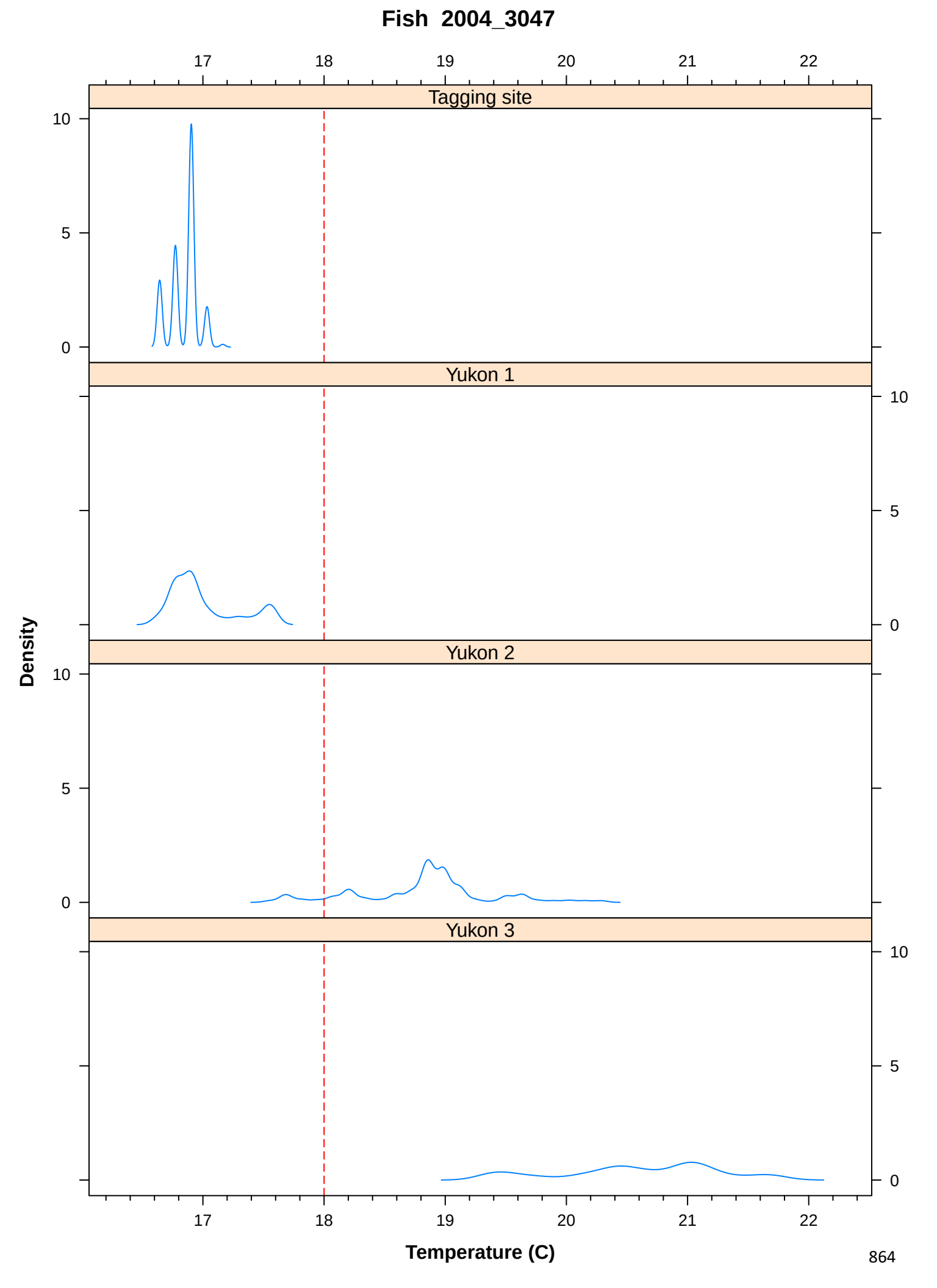

Fish 2004_3047
Depth (m)
0
5
10
15
20
25
30
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach

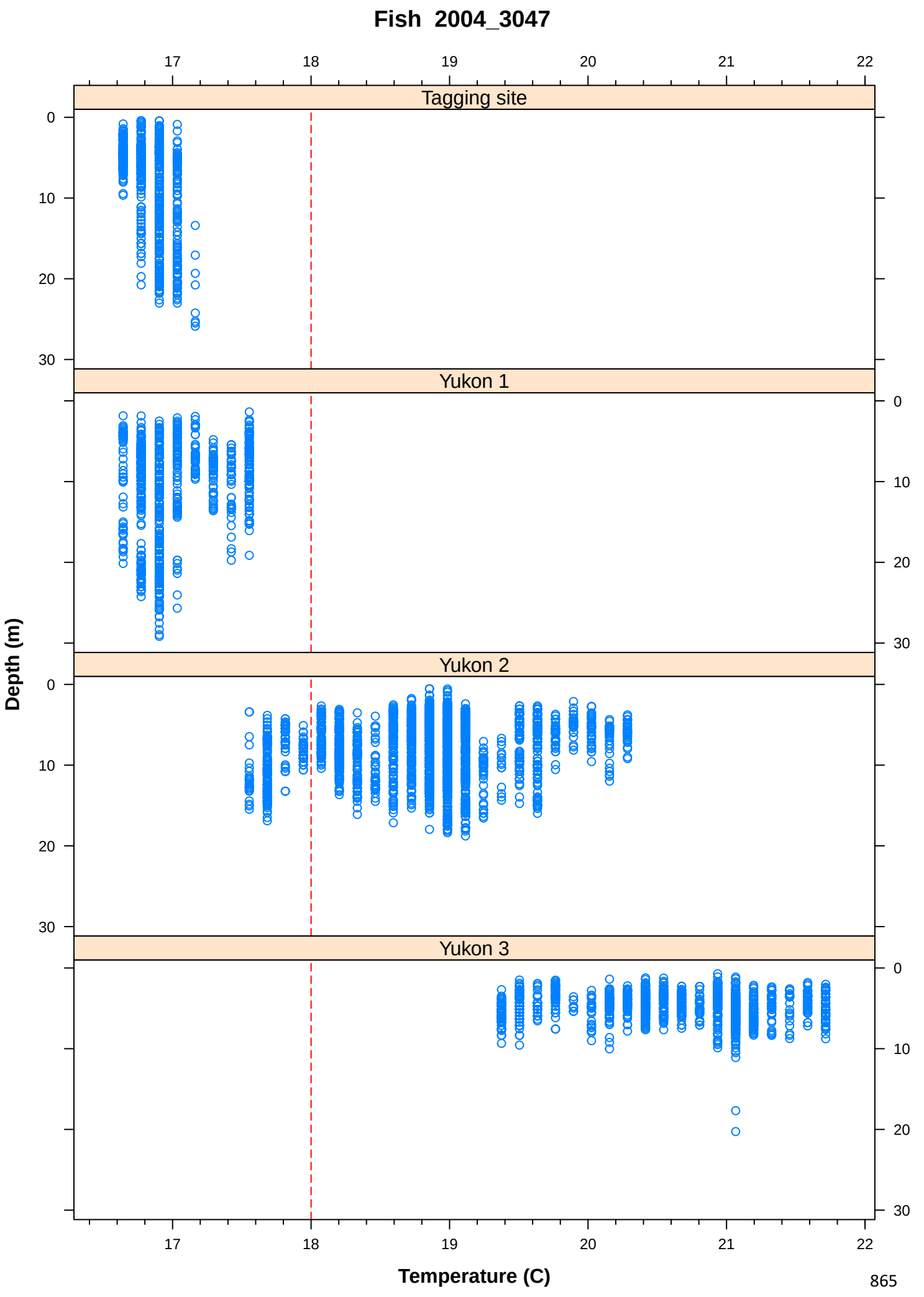

Fish 2004_3047
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
0.0
0.1
0.2
0
10
20
30
Depth (m)
860

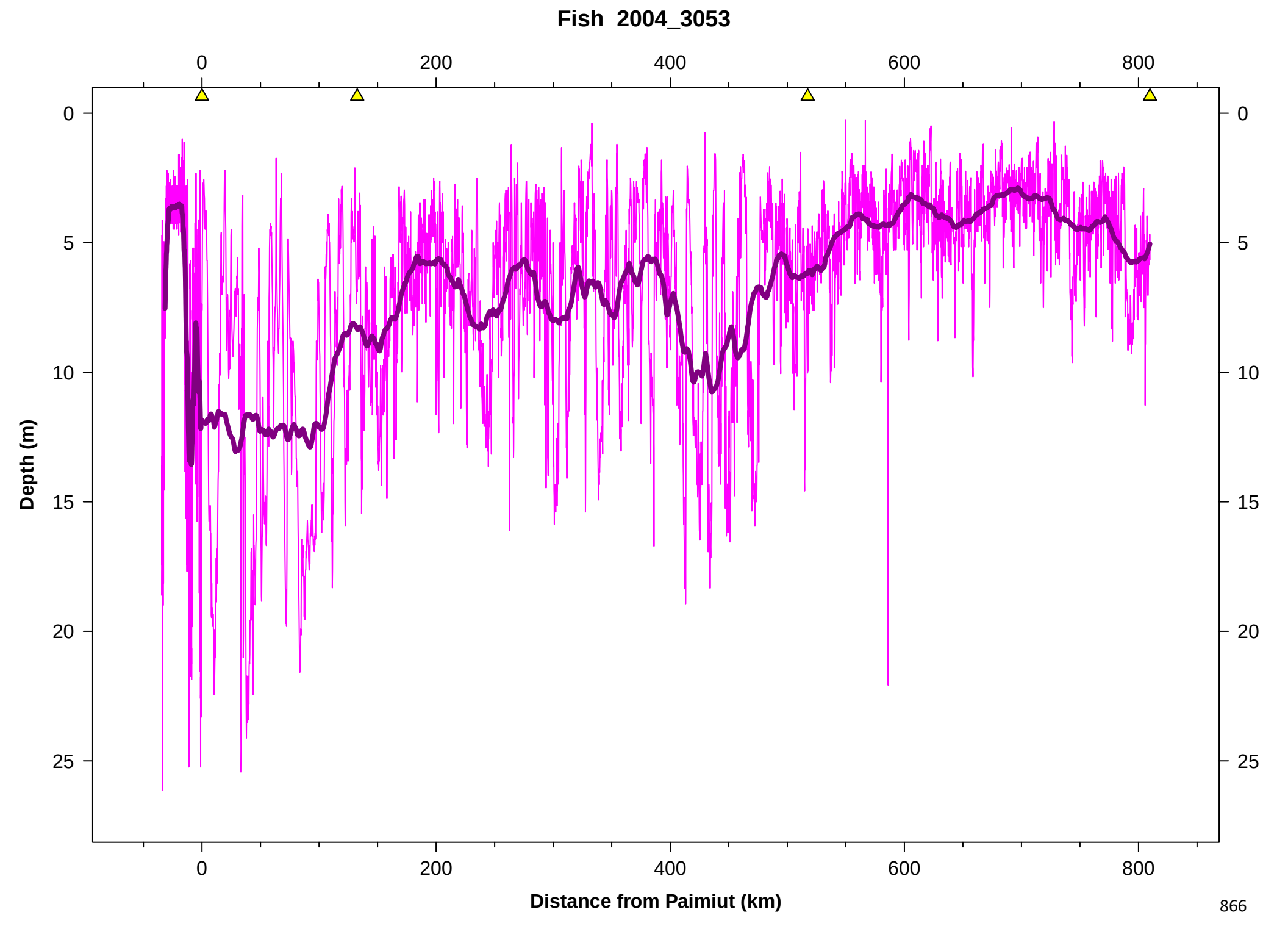

Fish 2004_3047
0
100
200
300
400
500
21
20
19
18
17
16
Temperature (C)
Distance from Paimiut (km)
861

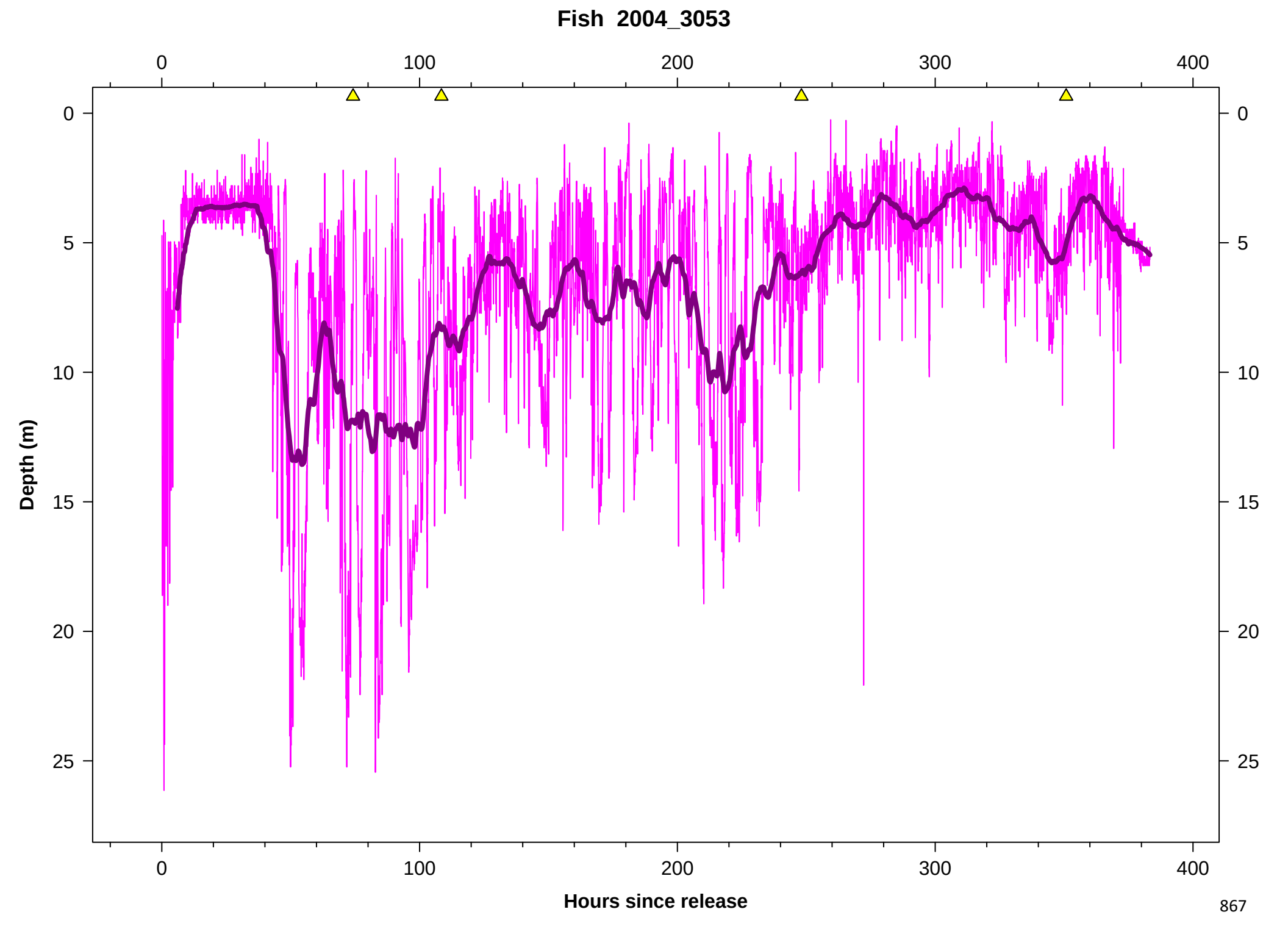

Fish 2004_3047
0
100
200
300
22
20
18
16
Temperature (C)
Hours since release
862

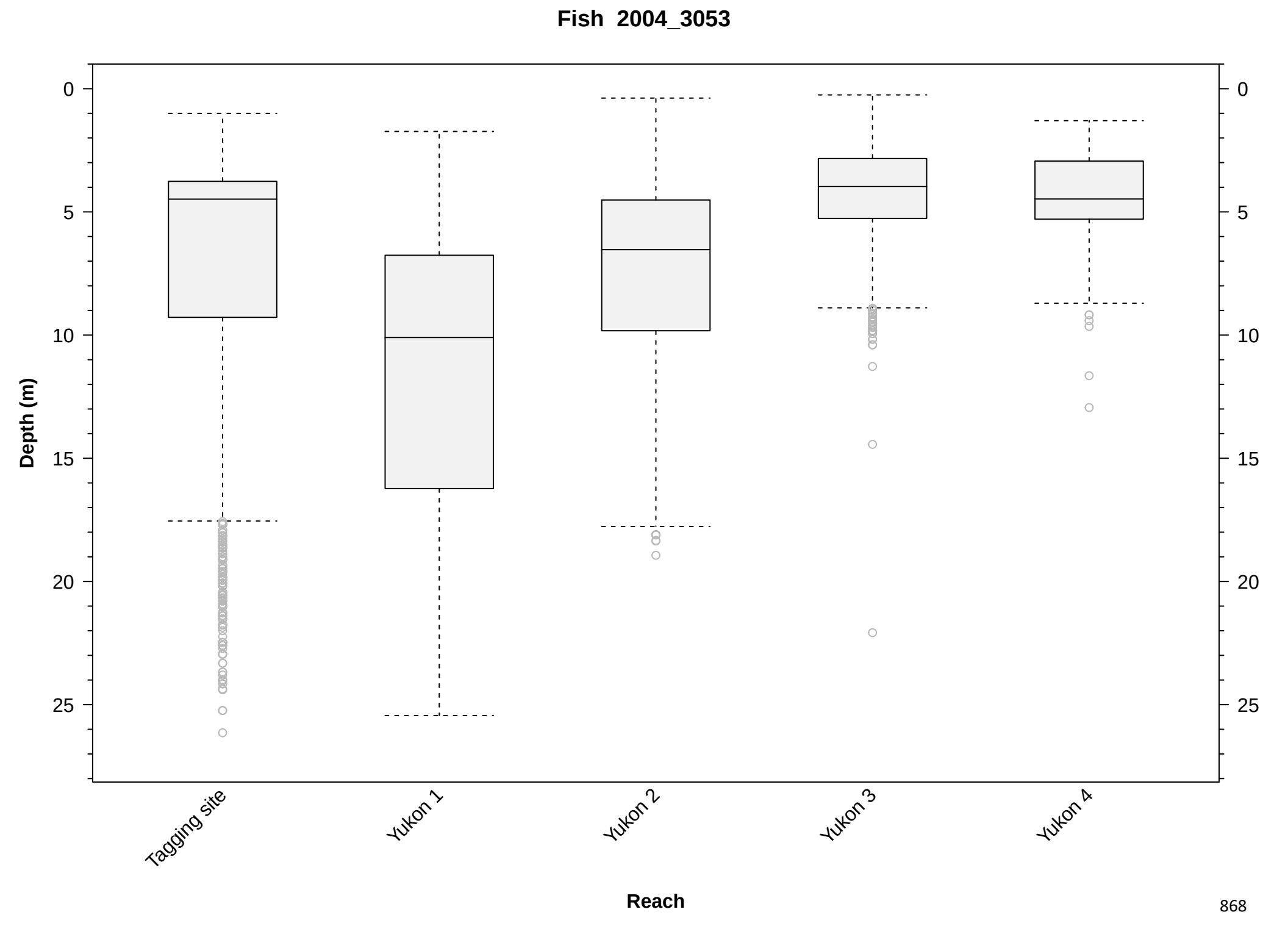

Fish 2004_3047
Temperature (C)
21
20
19
18
17
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach
863

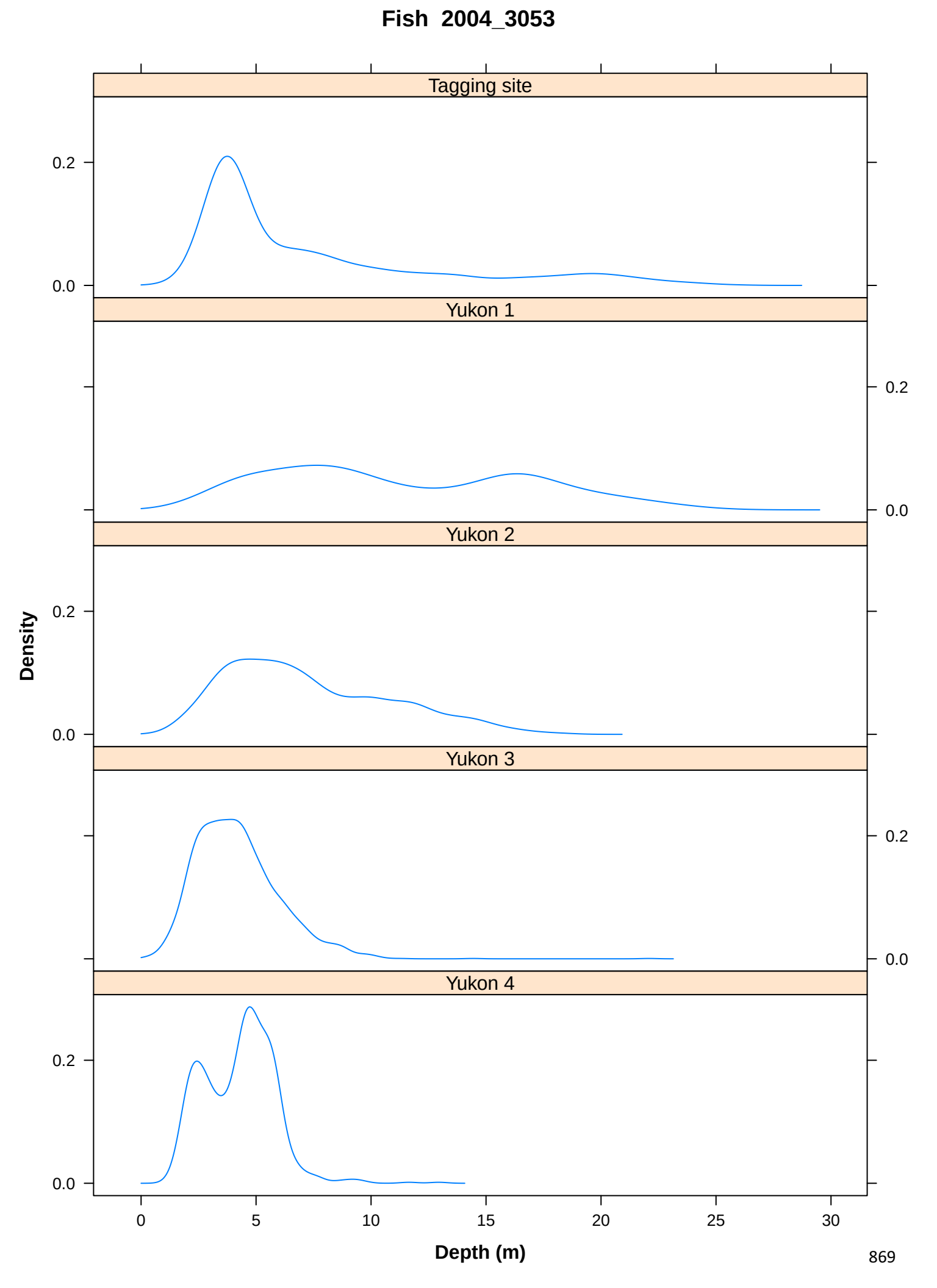

Fish 2004_3047
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
Temperature (C)
17
18
19
20
21
22
0
5
10

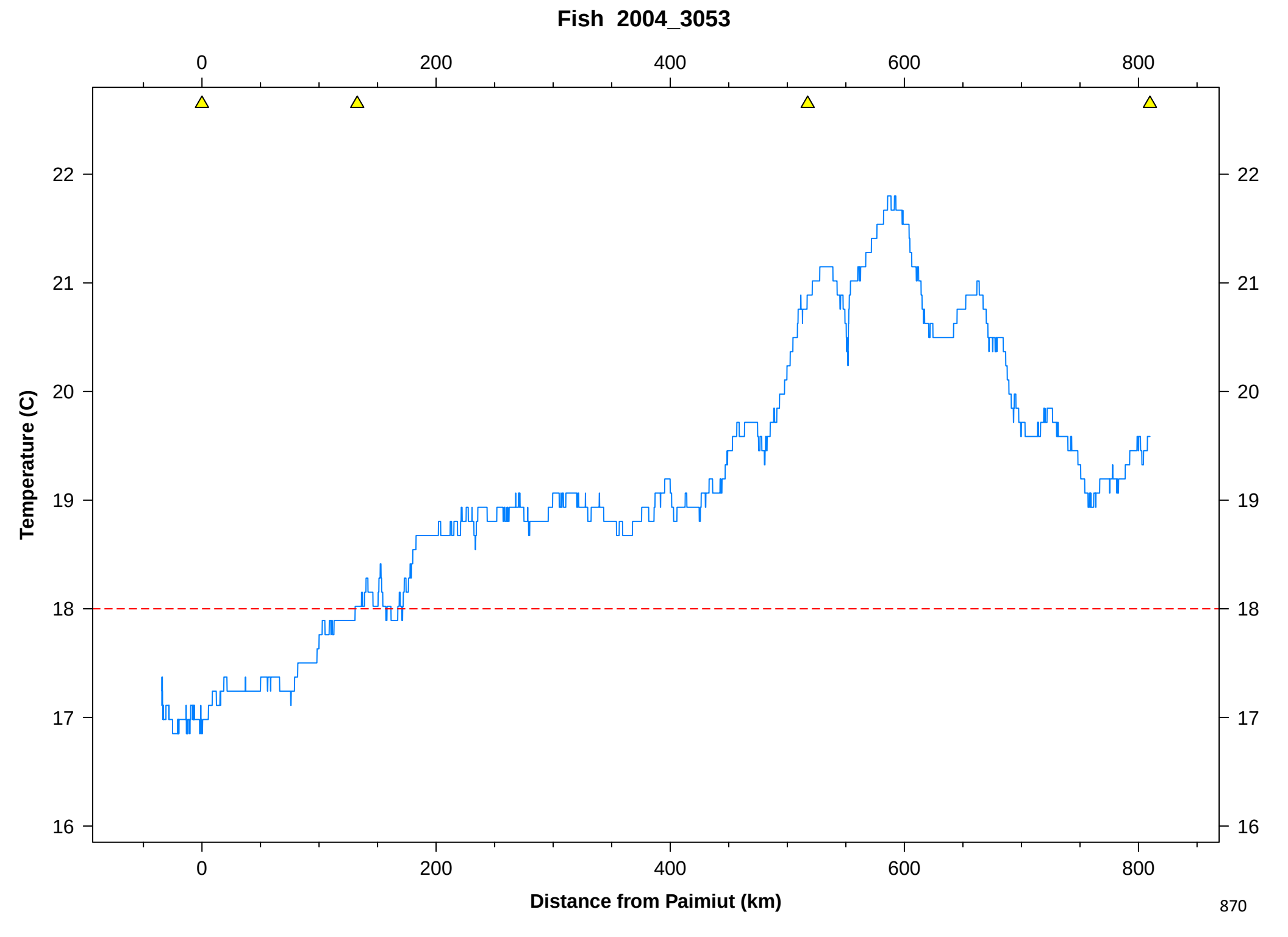

Fish 2004_3047
Tagging site
Yukon 1
Yukon 2
Yukon 3
Depth (m)
Temperature (C)
17
18
19
20
21
22
0
10
20
30
865

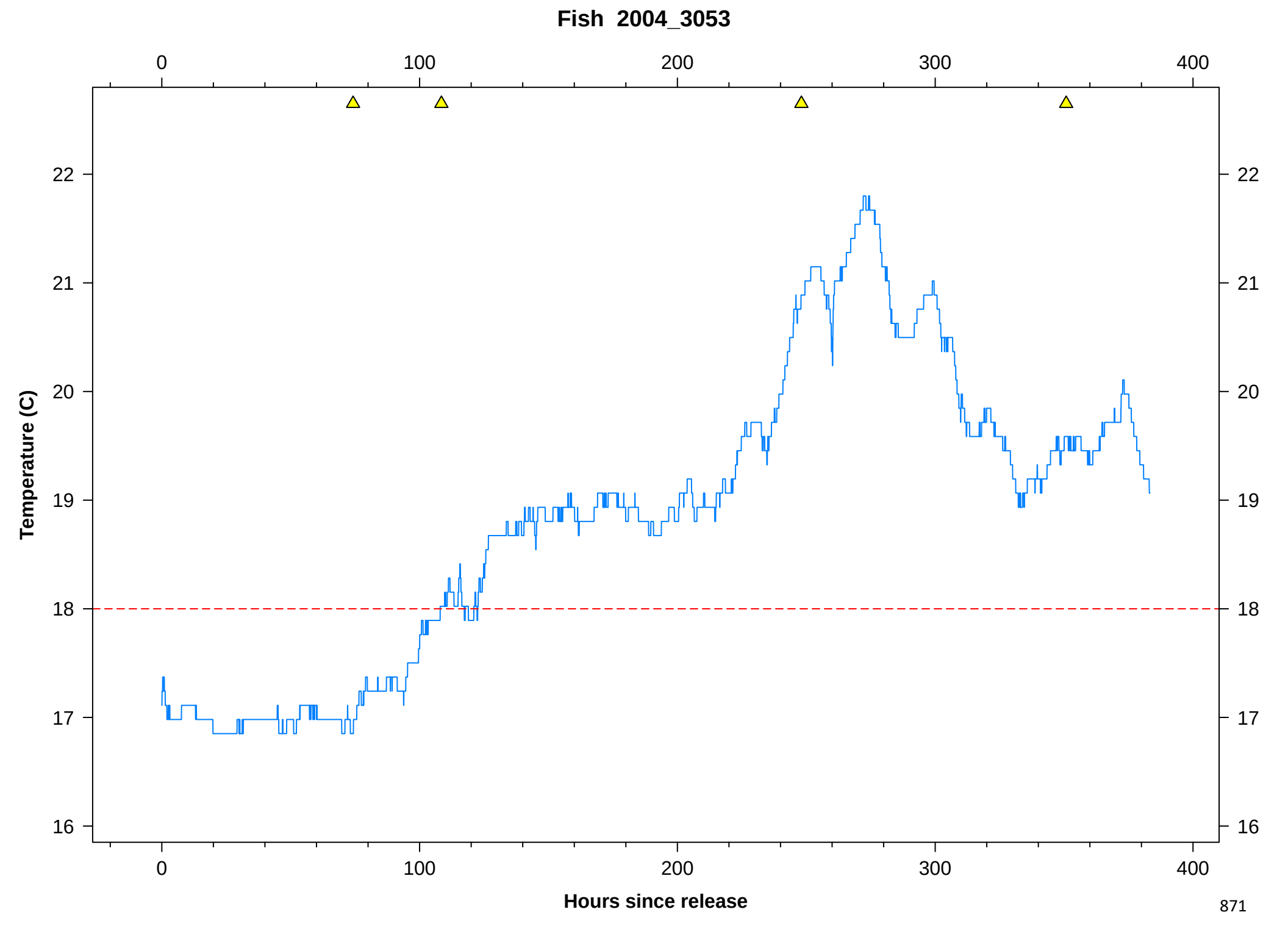

Fish 2004_3053
0
200
400
600
800
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

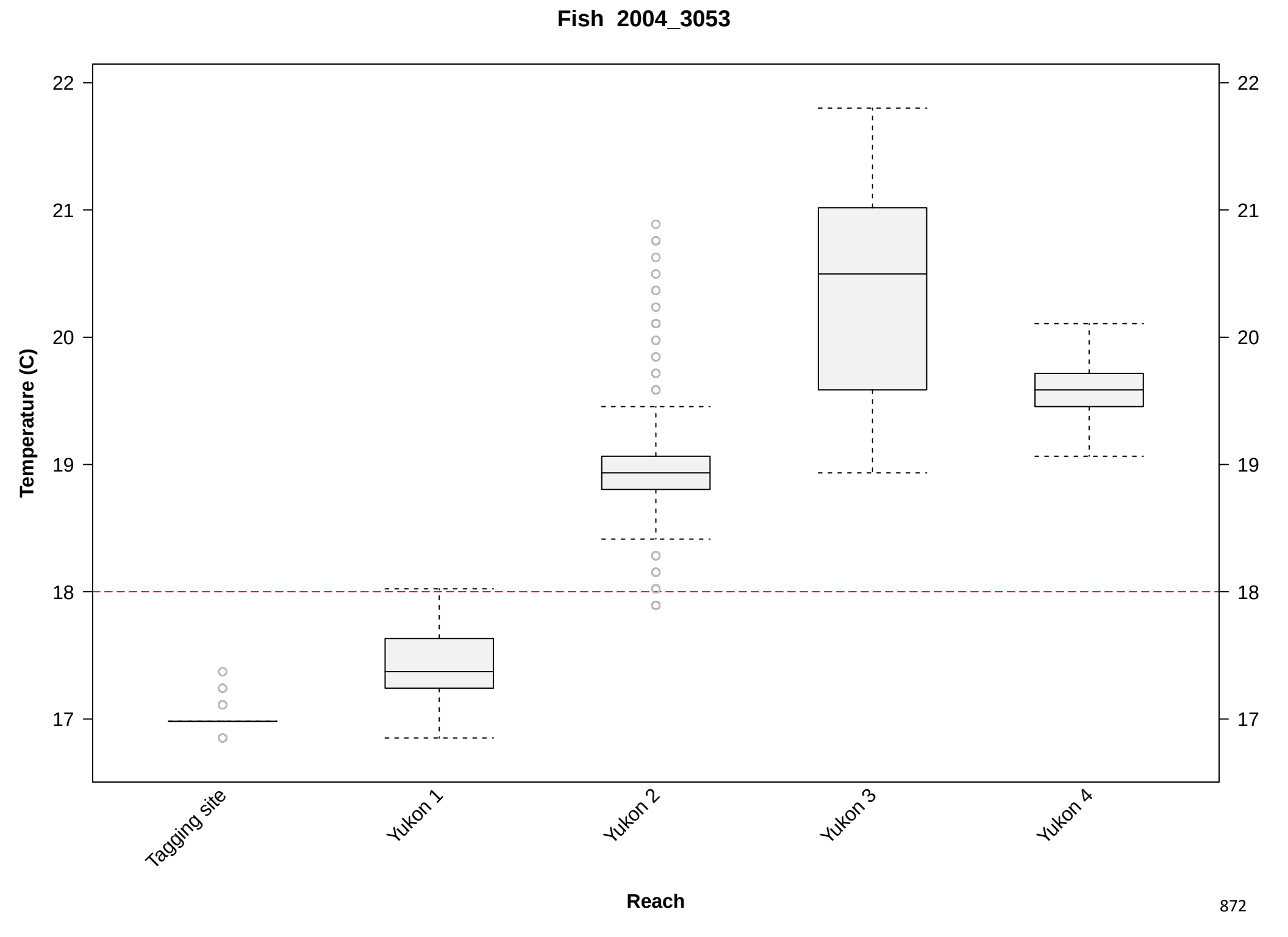

Fish 2004_3053
0
100
200
300
400
0
5
10
15
20
25
Depth (m)
Hours since release

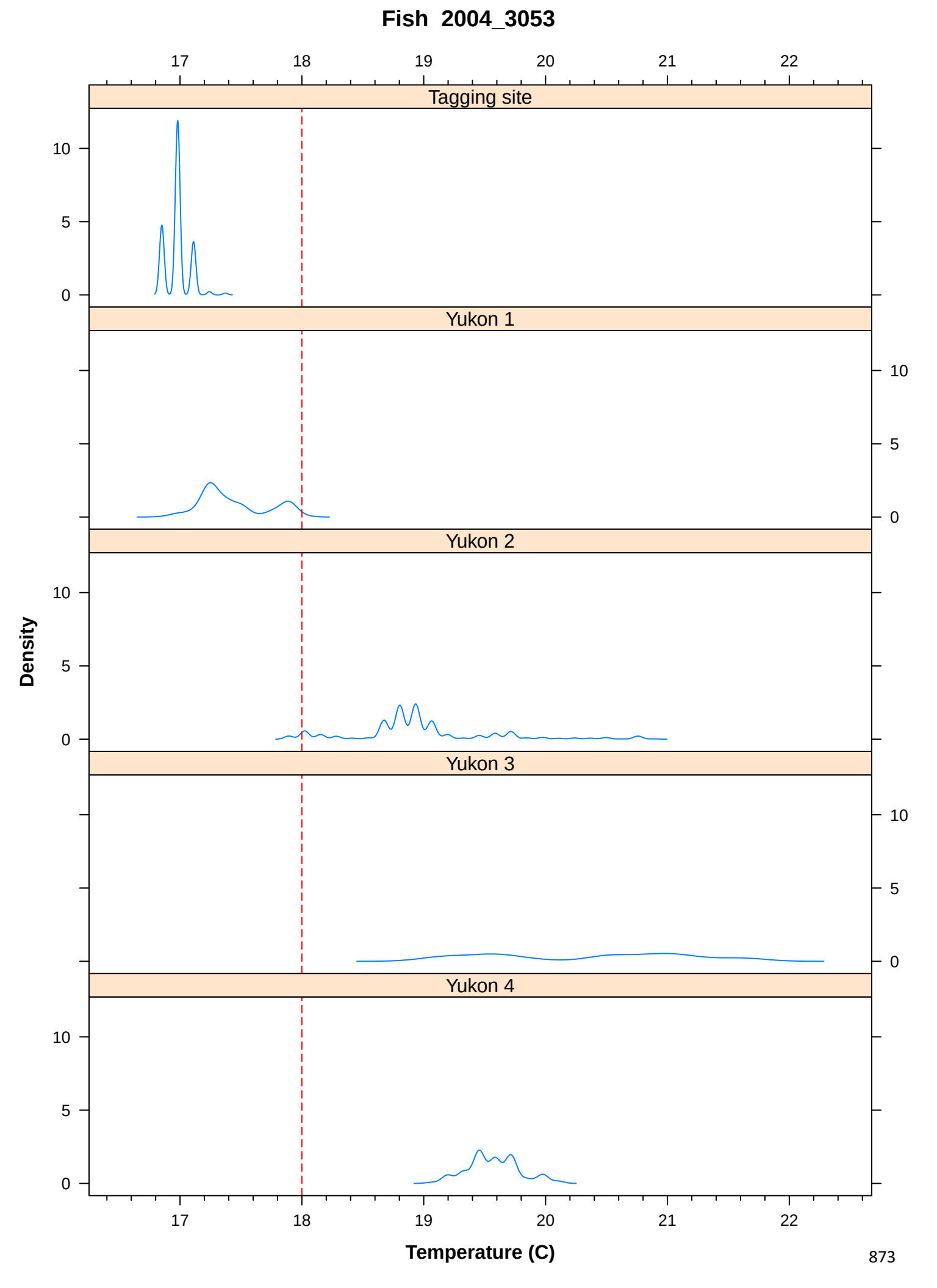

Fish 2004_3053
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach

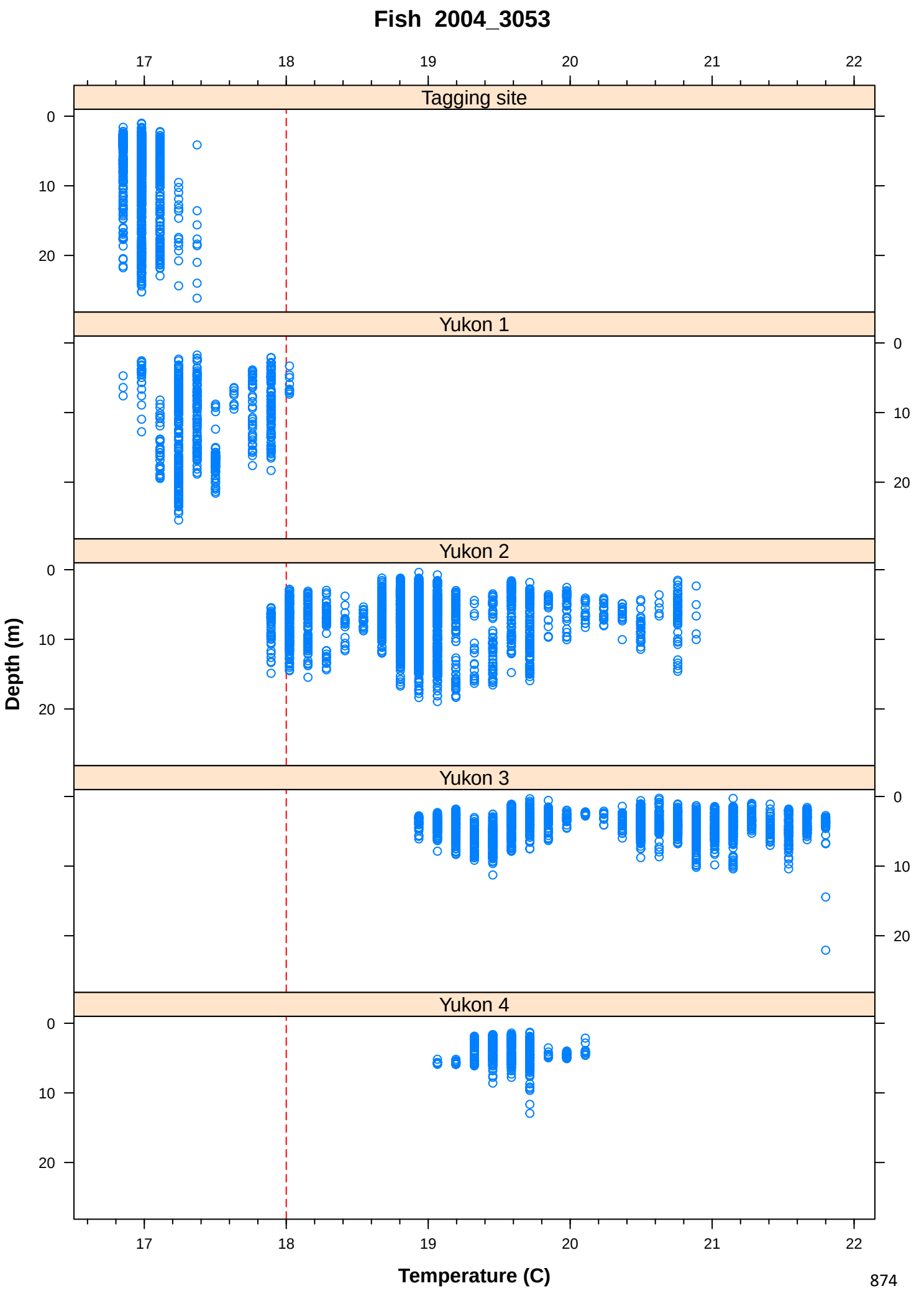

Fish 2004_3053
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
0.0
0.2
0
5
10
15
20
25
30
Depth (m)
869

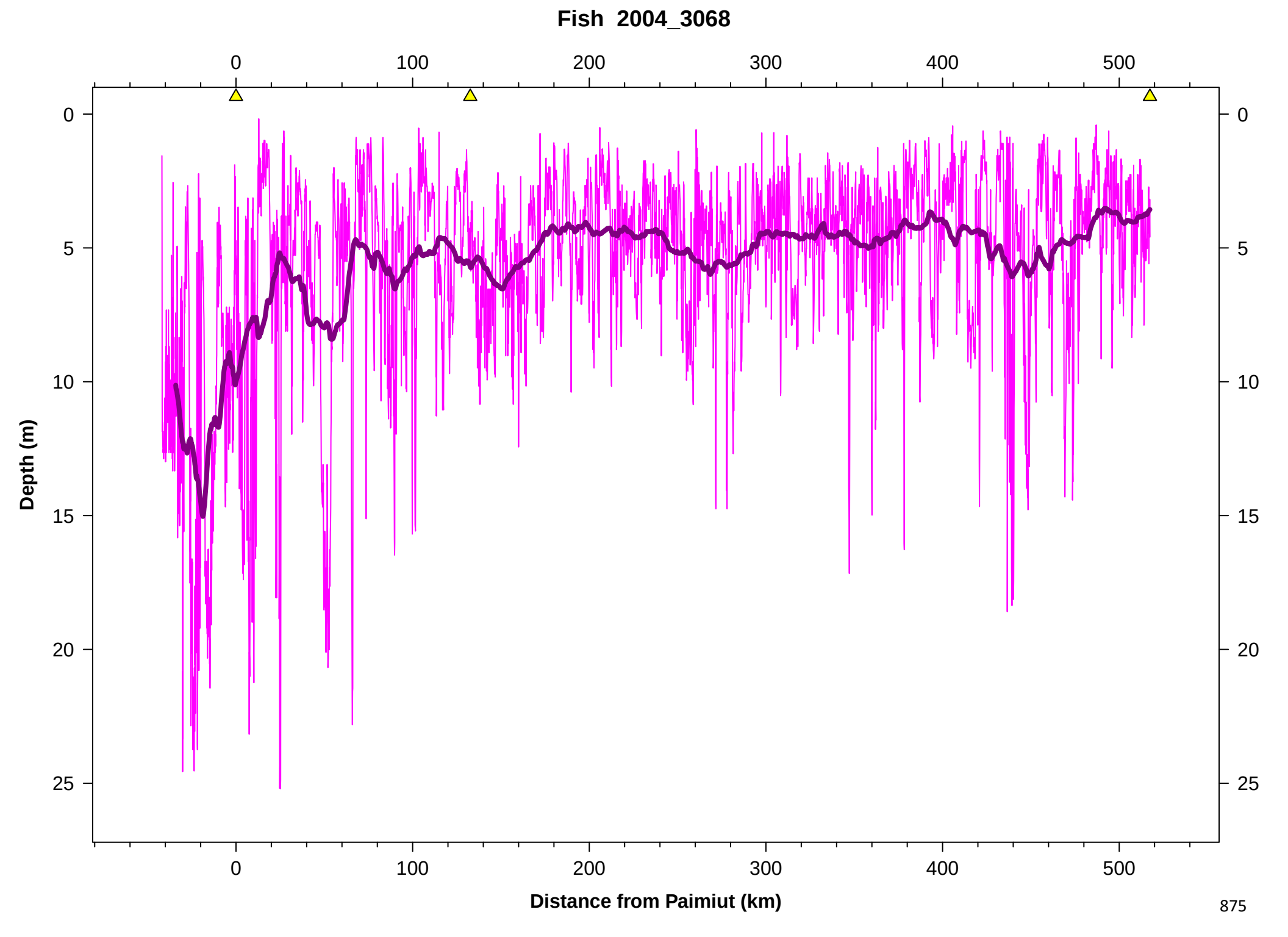

Fish 2004_3053
0
200
400
600
800
22
21
20
19
18
17
16
Temperature (C)
Distance from Paimiut (km)

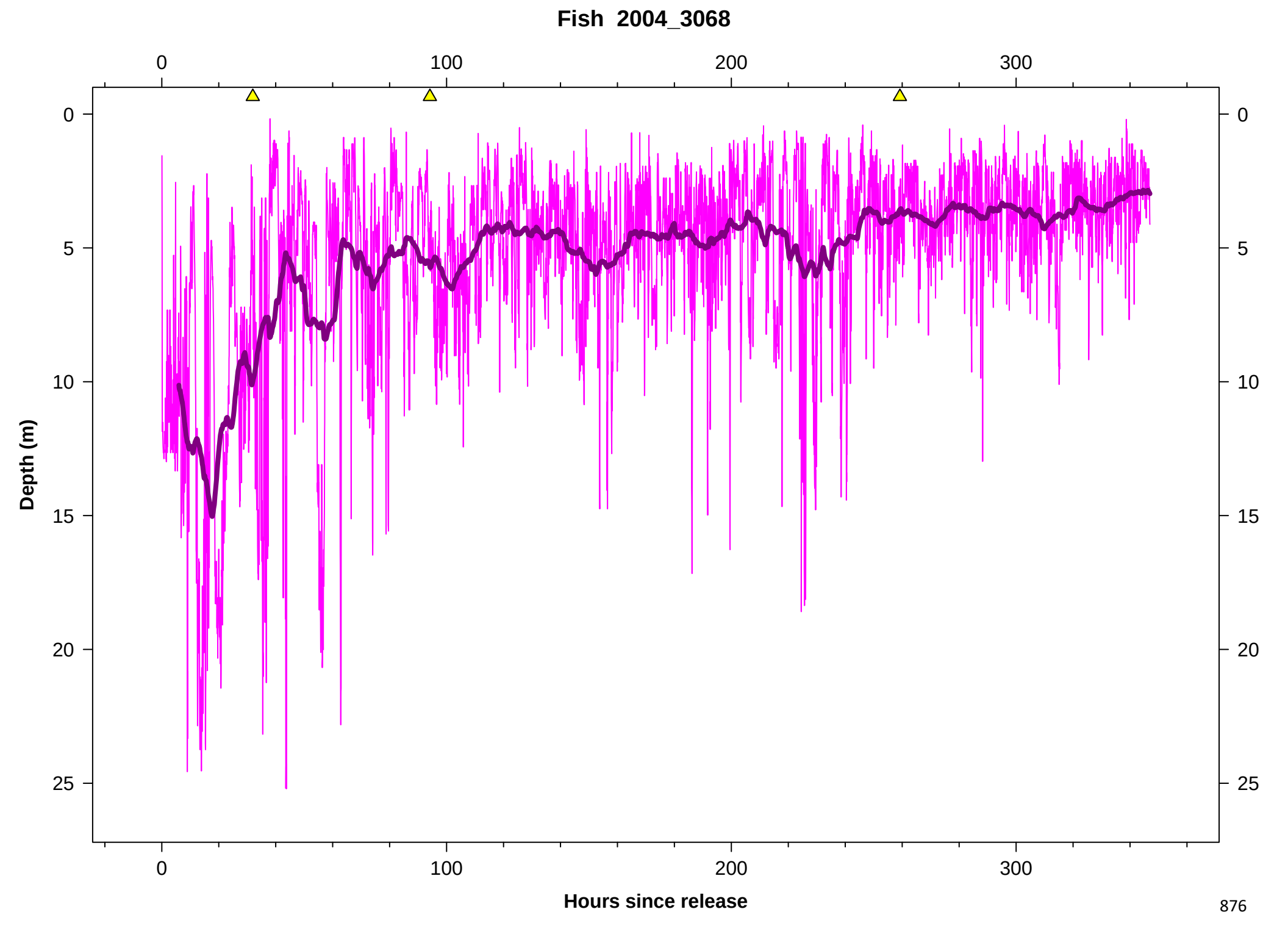

Fish 2004_3053
0
100
200
300
400
22
21
20
19
18
17
16
Temperature (C)
Hours since release
871

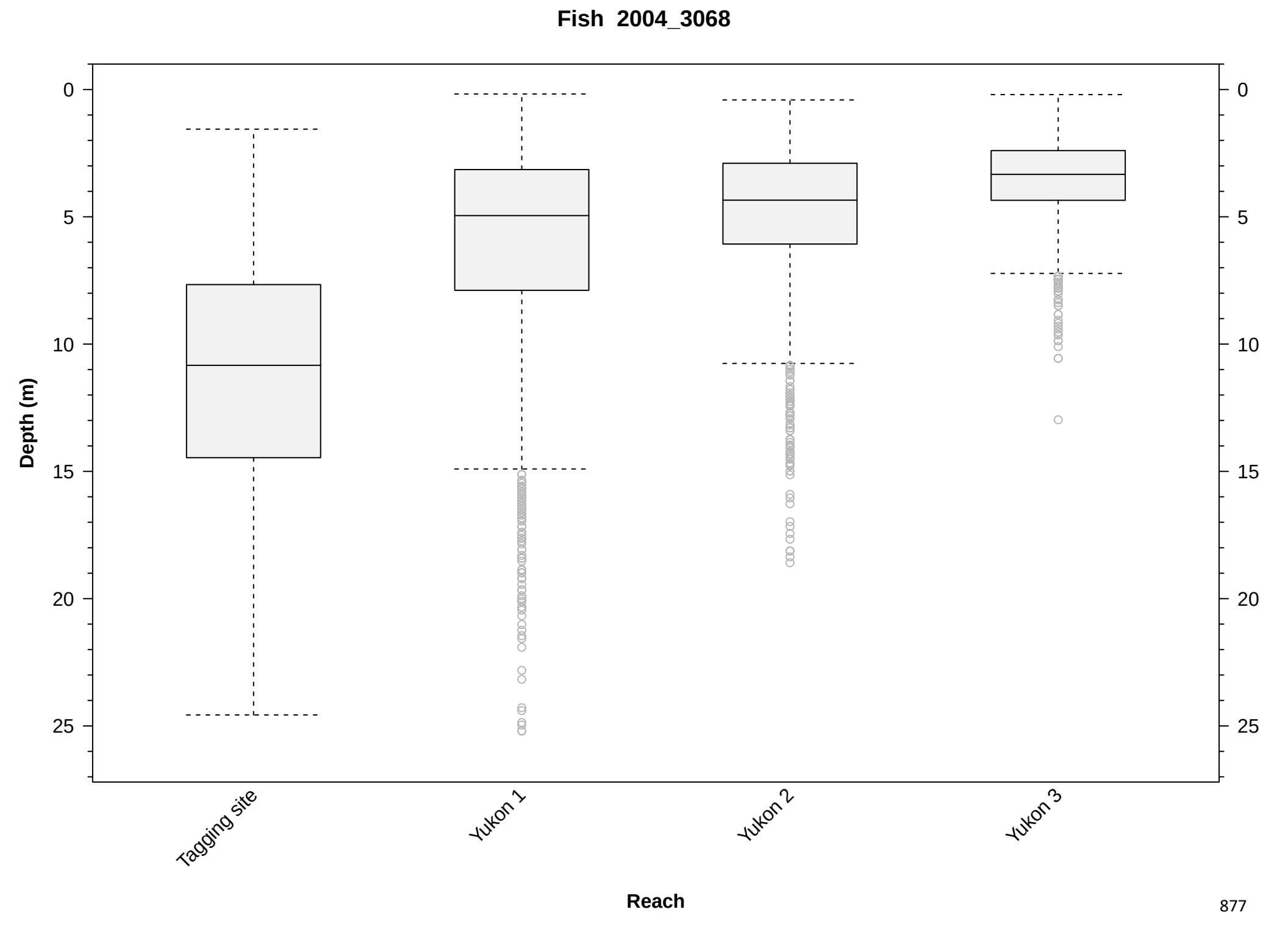

Fish 2004_3053
Temperature (C)
22
21
20
19
18
17
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Reach
872

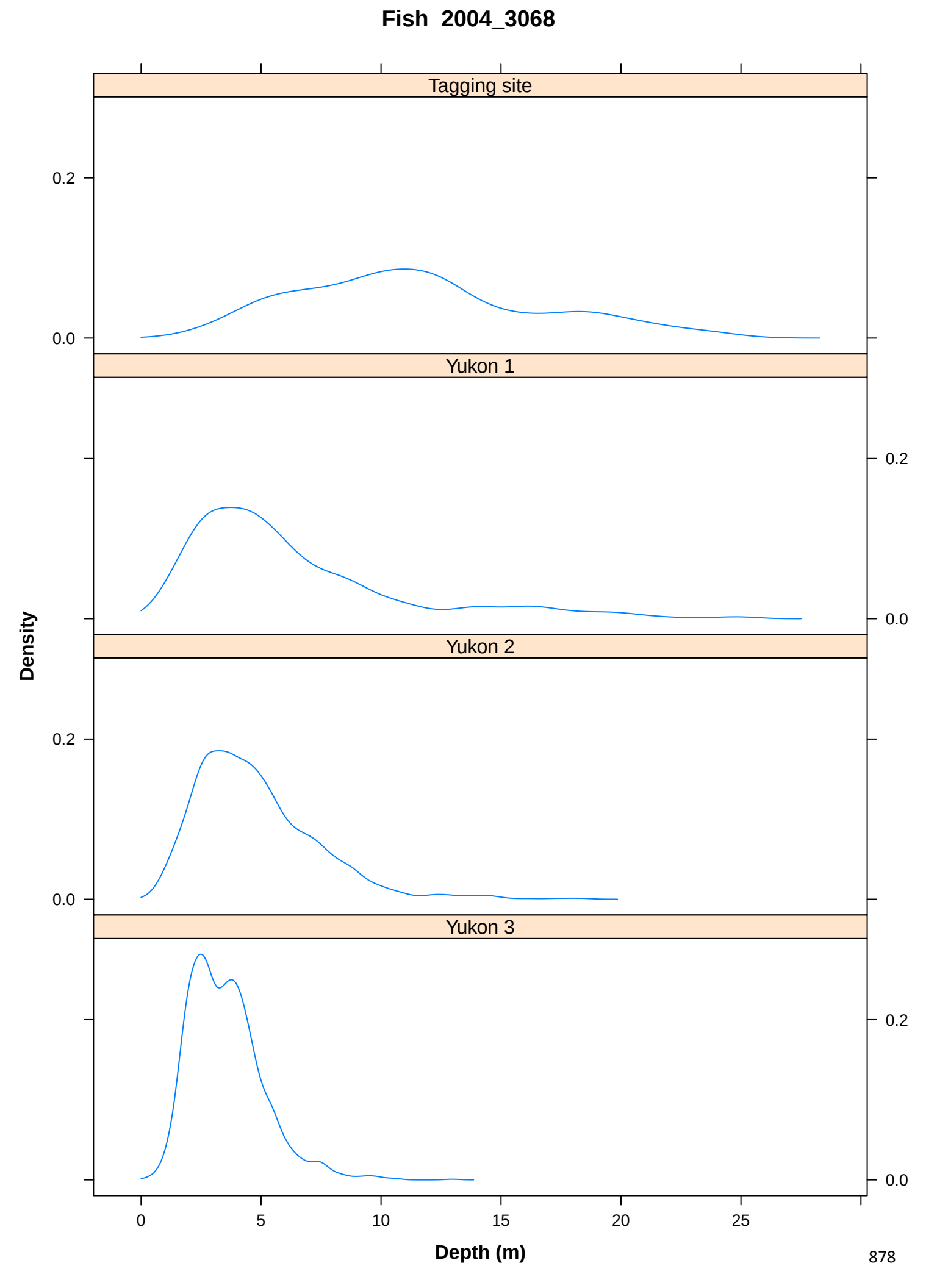

Fish 2004_3053
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Density
Temperature (C)
17
18
19
20
21
22
0
5
10

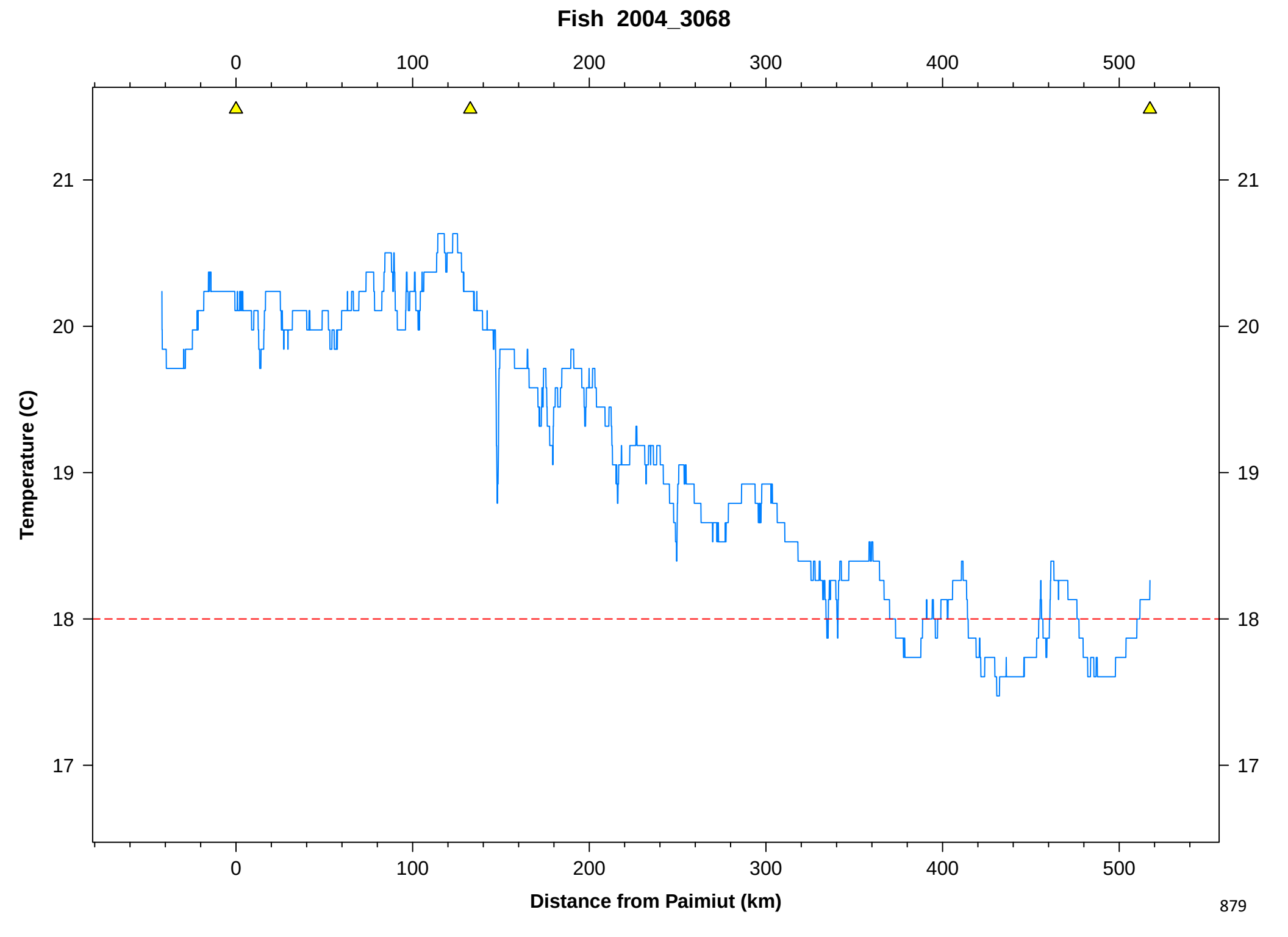

Fish 2004_3053
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Depth (m)
Temperature (C)
17
18
19
20
21
22
0
10
20

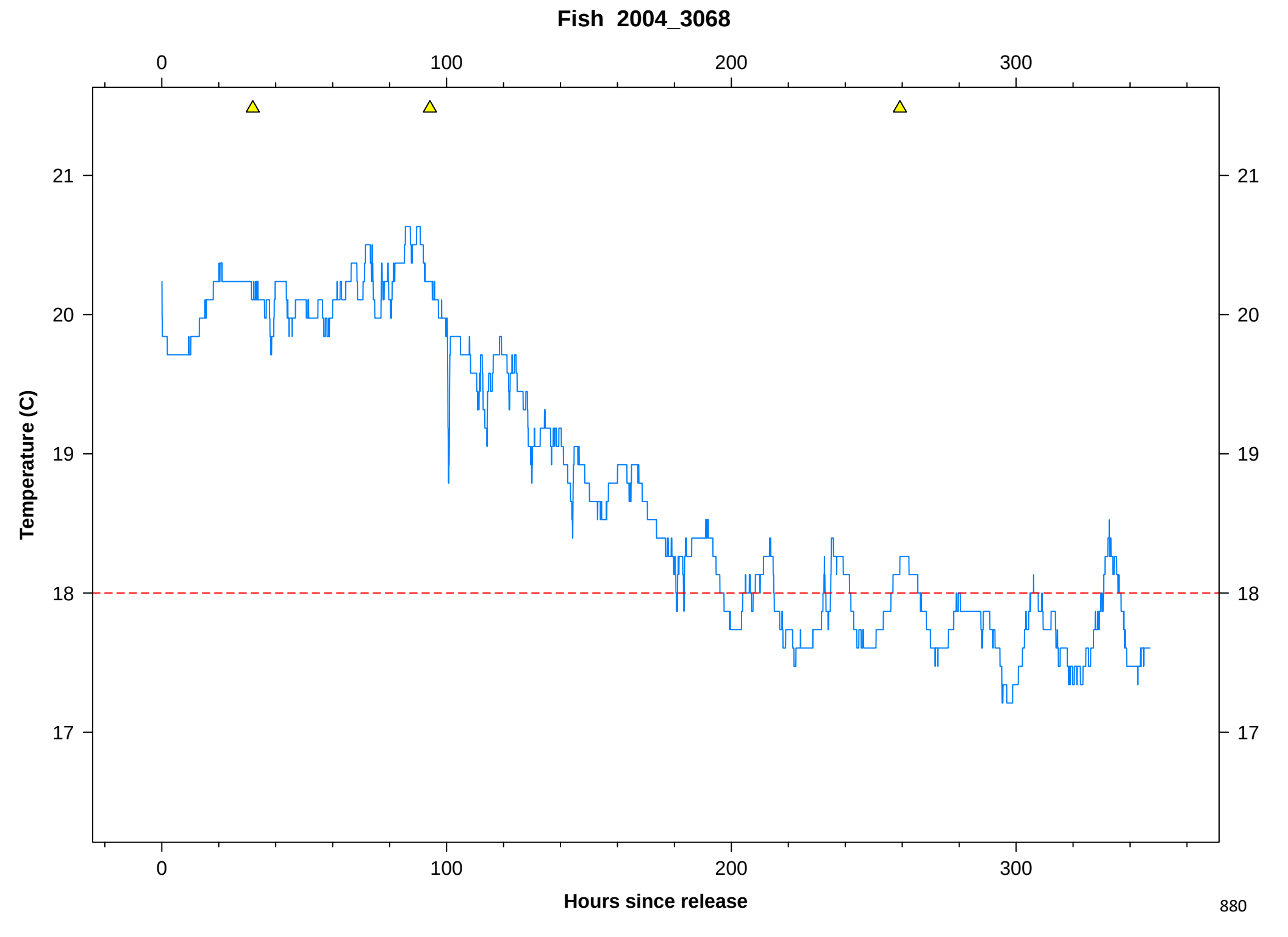

Fish 2004_3068
0
100
200
300
400
500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

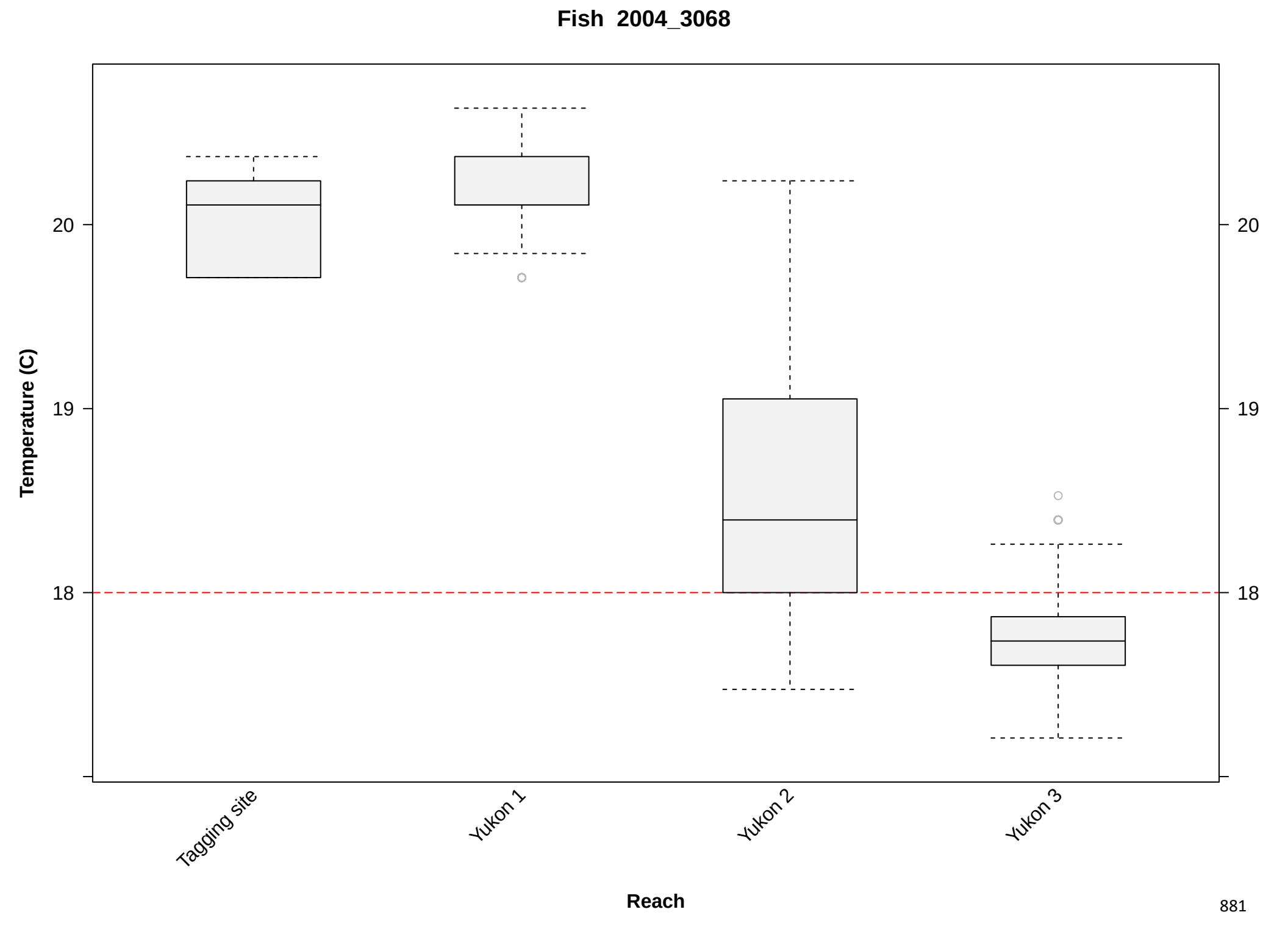

Fish 2004_3068
0
100
200
300
0
5
10
15
20
25
Depth (m)
Hours since release

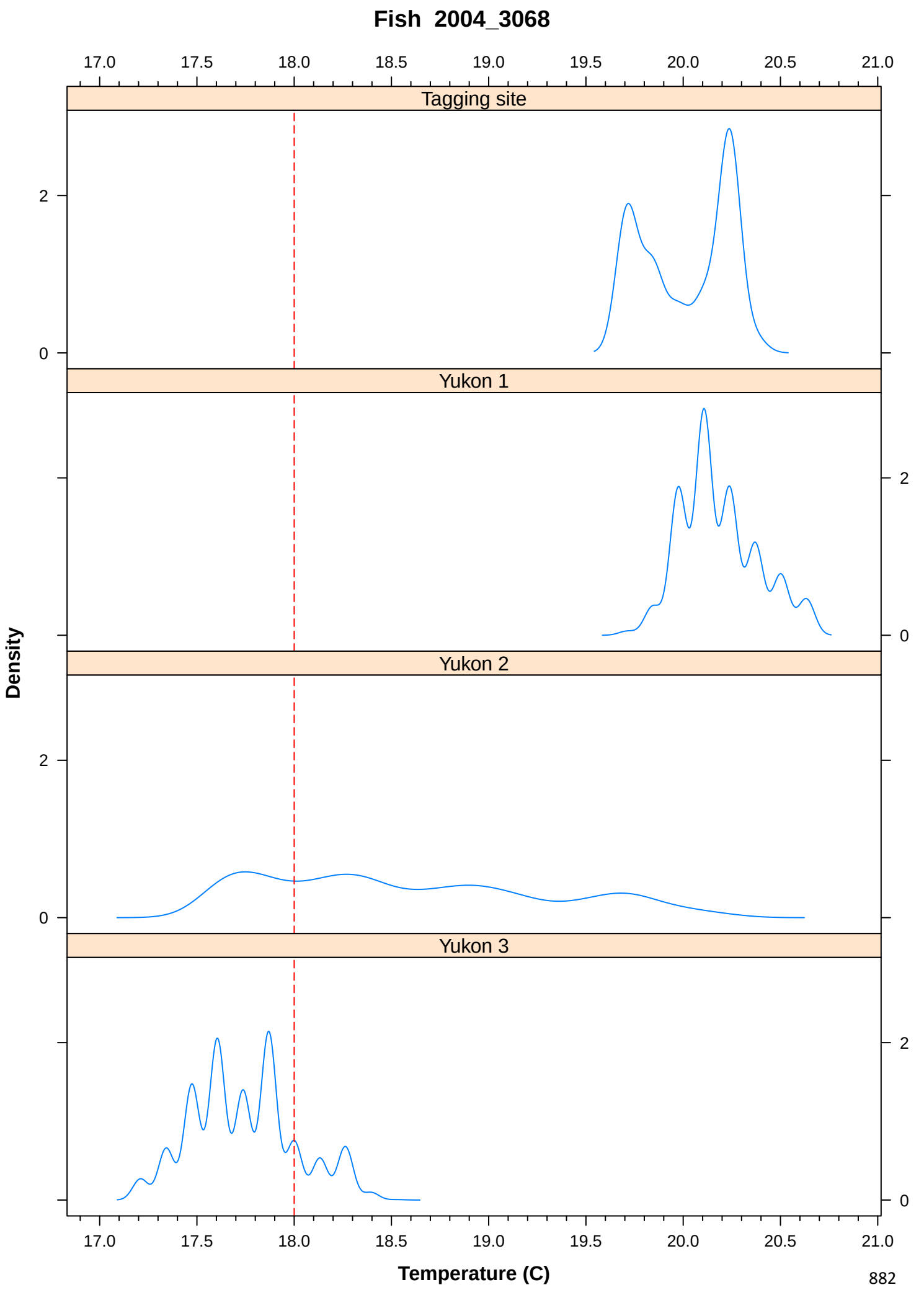

Fish 2004_3068
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach
877

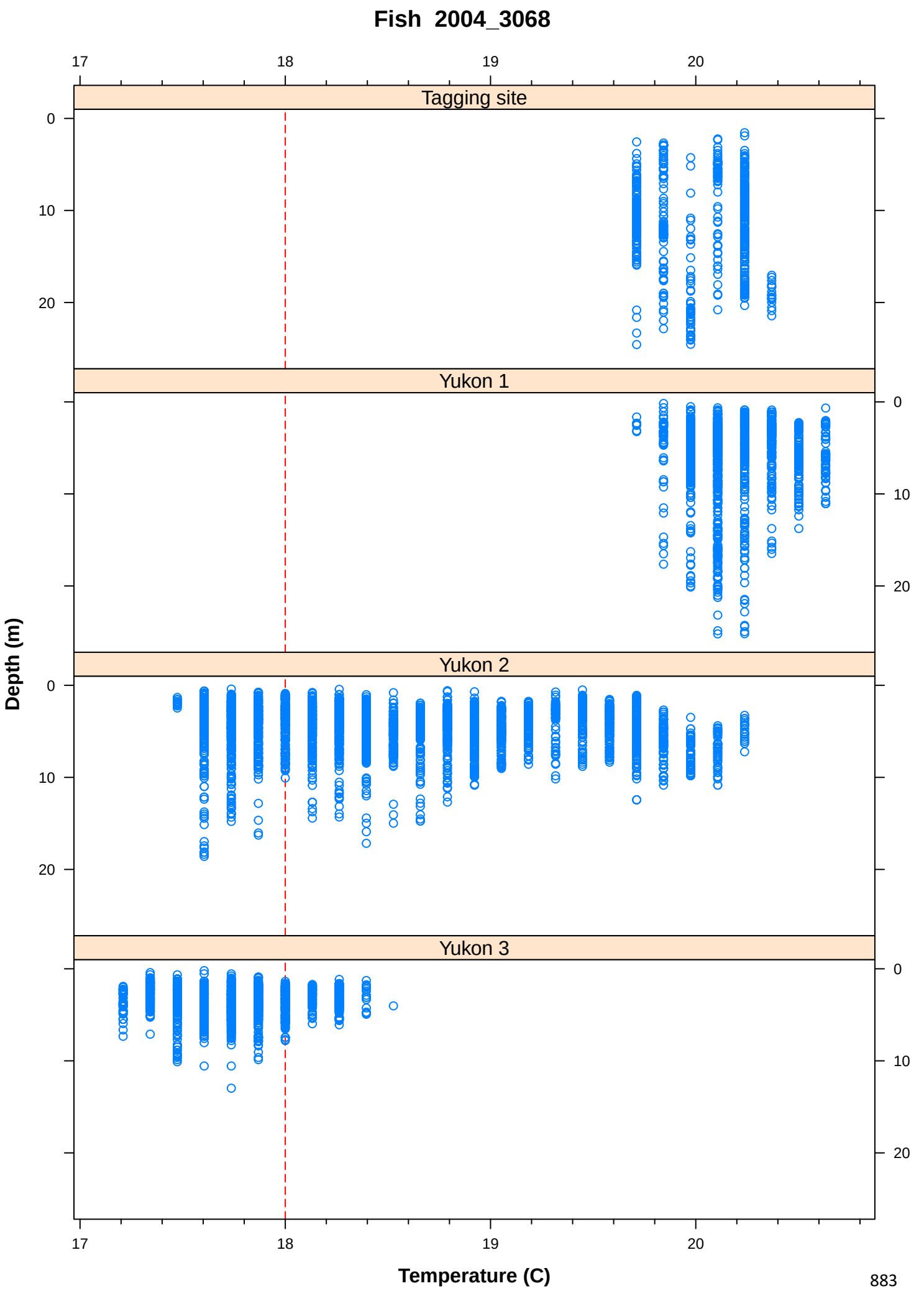

Fish 2004_3068
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
0.2
0.0
0
5
10
15
20
25
Depth (m)
878


Fish 2004_3068
0
100
200
300
400
500
21
20
19
18
17
Temperature (C)
Distance from Paimiut (km)

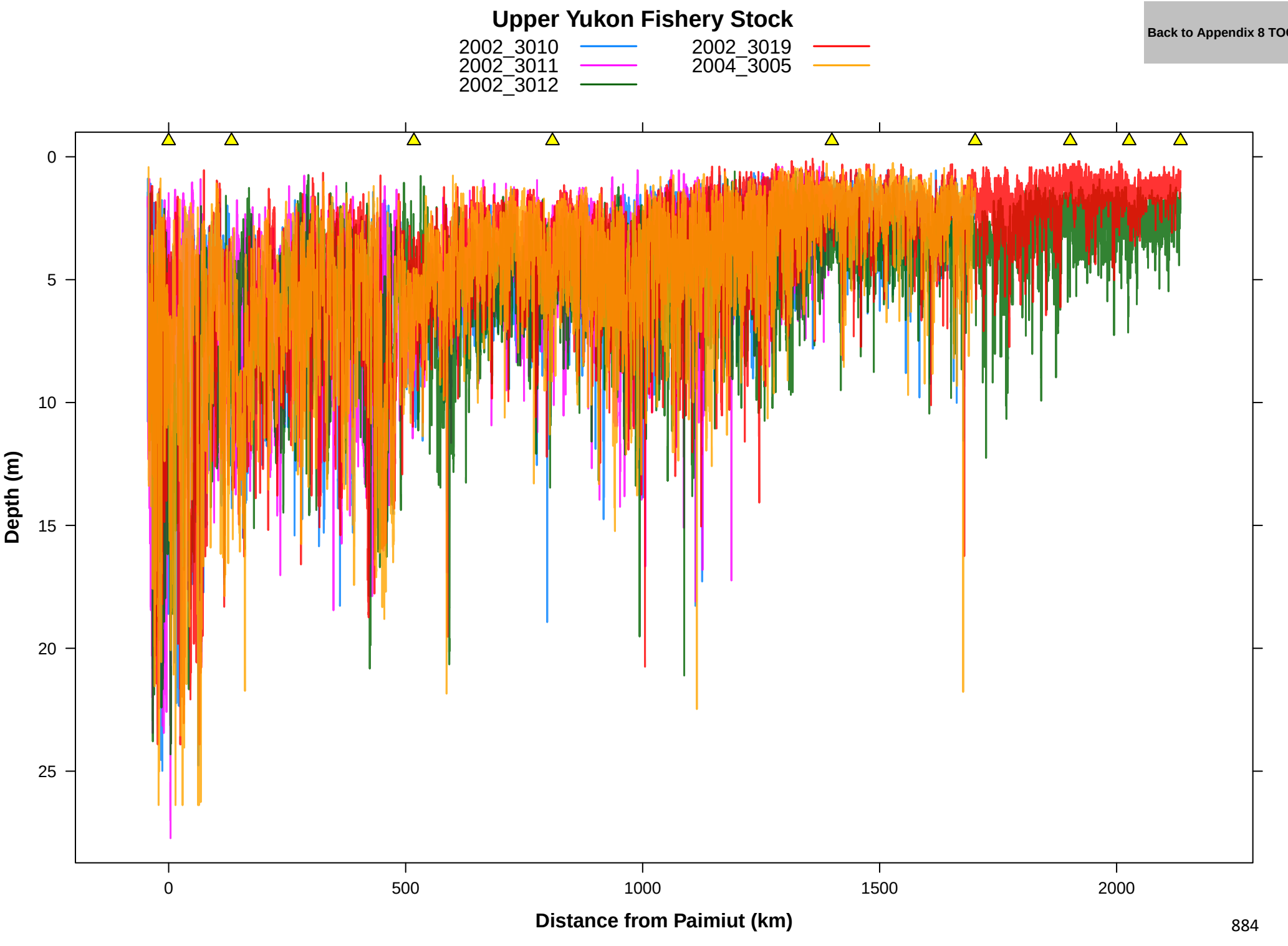

Fish 2004_3068
0
100
200
300
21
20
19
18
17
Temperature (C)
Hours since release
880

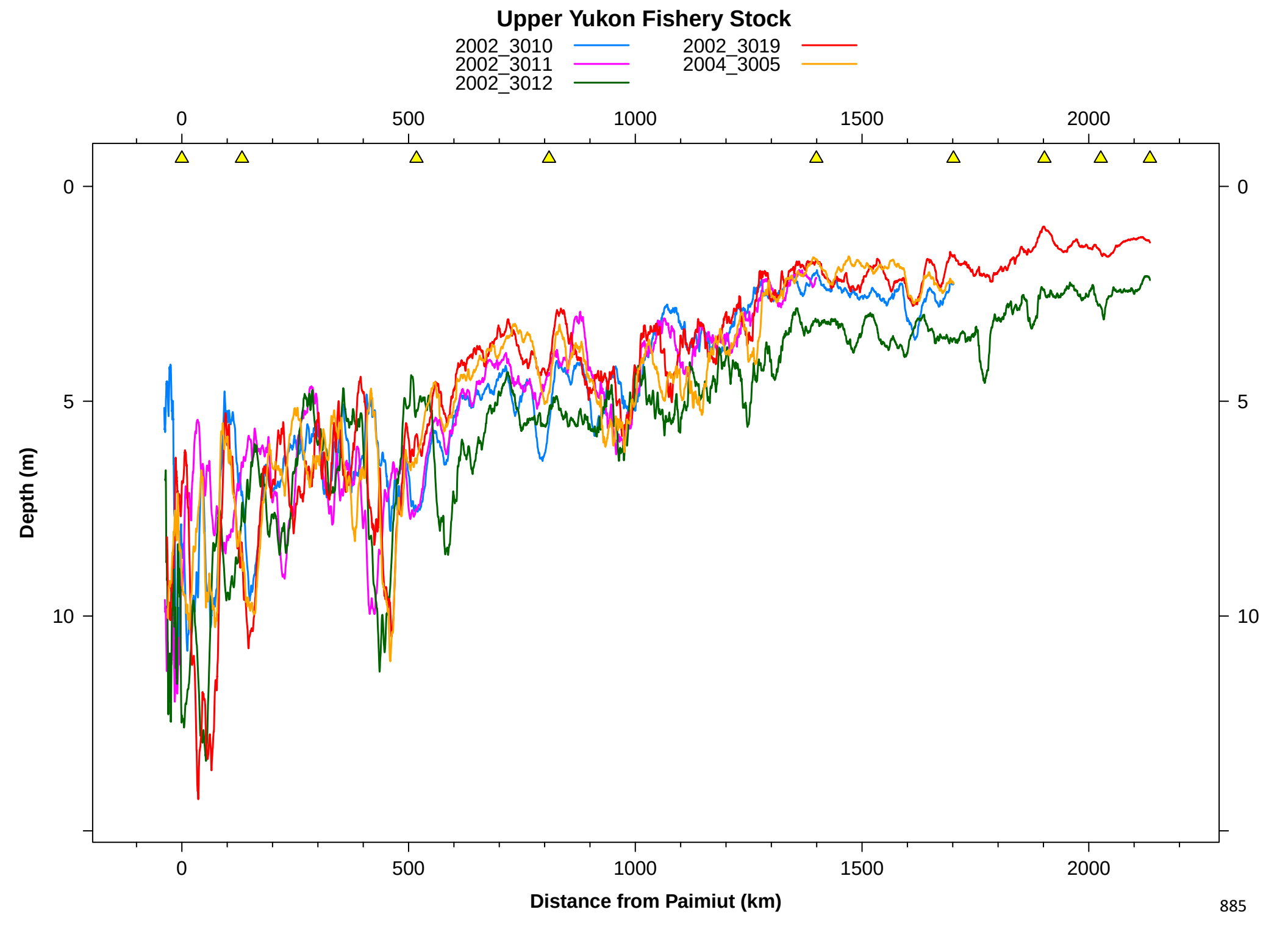

Fish 2004_3068
Temperature (C)
20
19
18
Tagging site
Yukon 1
Yukon 2
Yukon 3
Reach
881

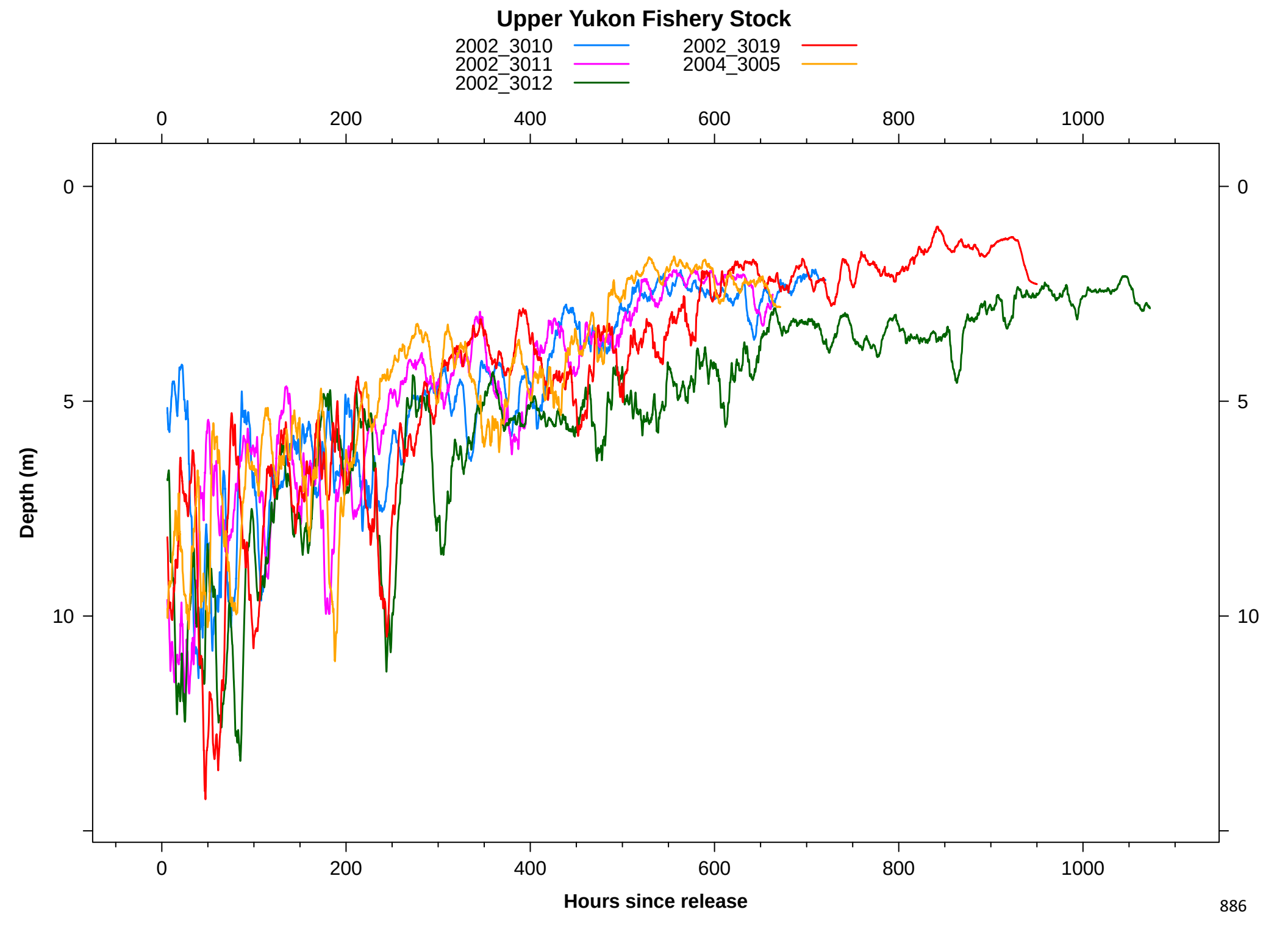

Fish 2004_3068
17.0
17.5
18.0
18.5
19.0
19.5
20.0
20.5
21.0
Tagging site
Yukon 1
Yukon 2
Yukon 3
Density
0
2
Temperature (C)
882

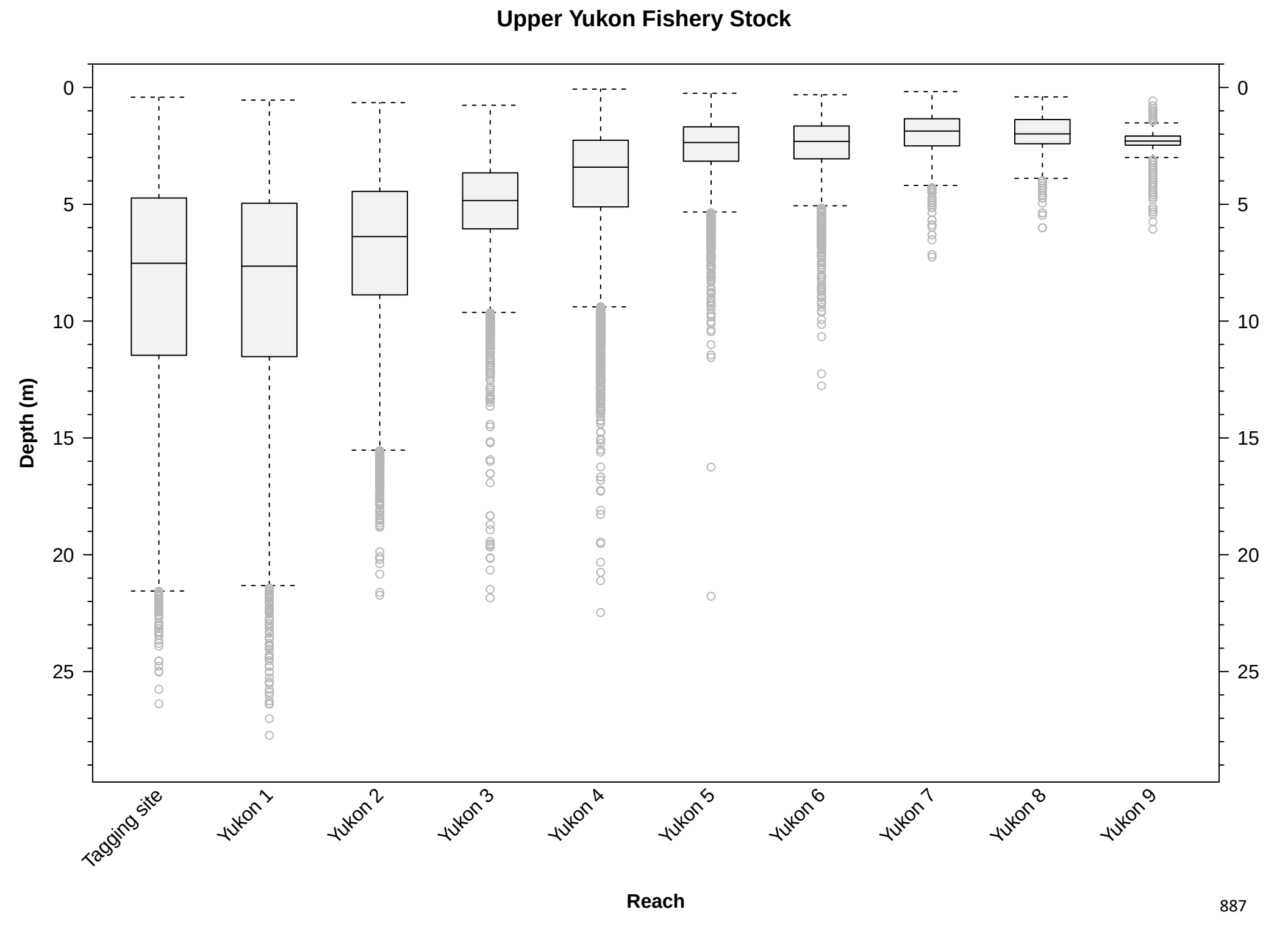

Fish 2004_3068
Tagging site
Yukon 1
Yukon 2
Yukon 3
Depth (m)
Temperature (C)
17
18
19
20
0
10
20

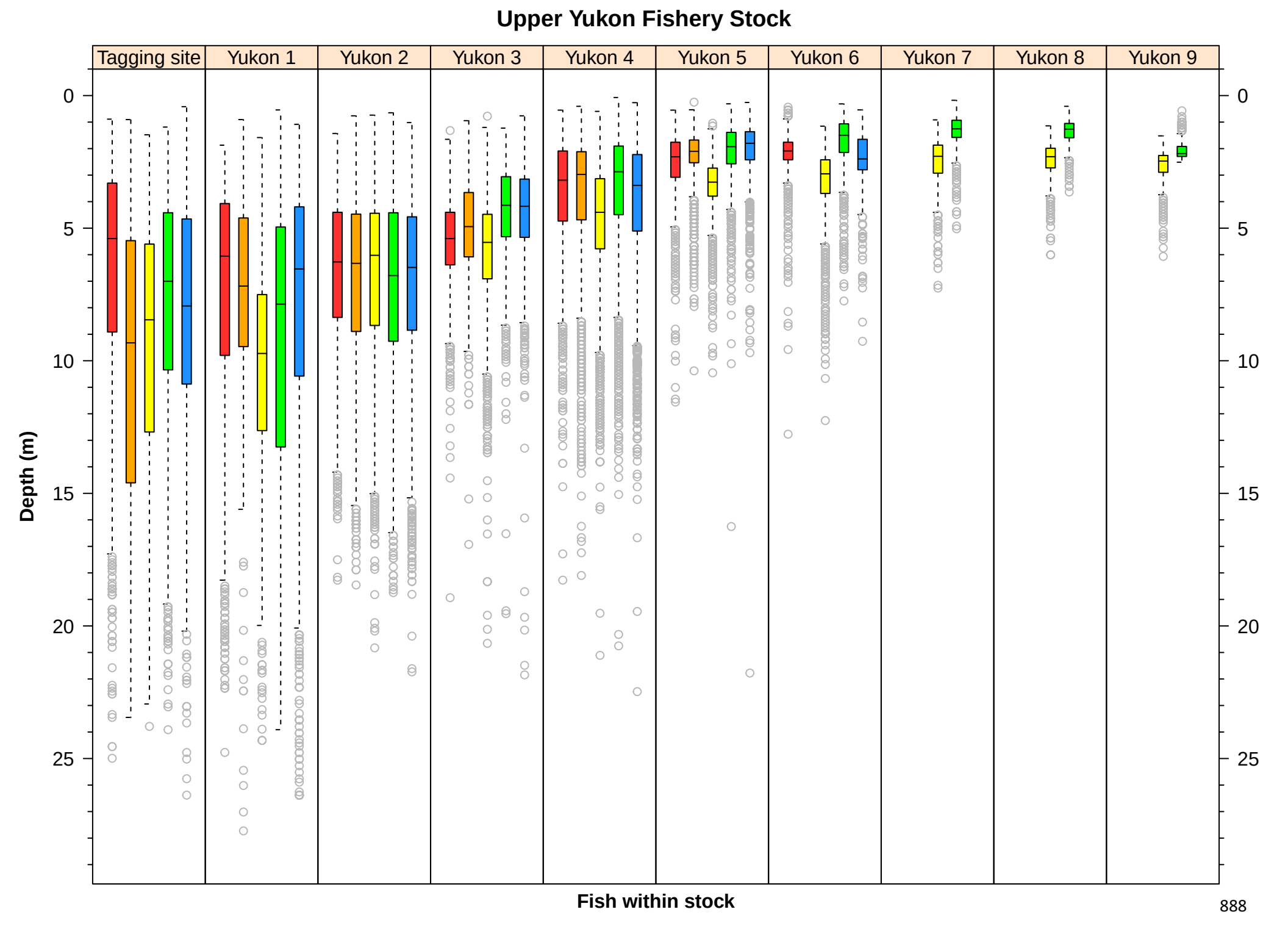
Back to Appendix 8 TOC

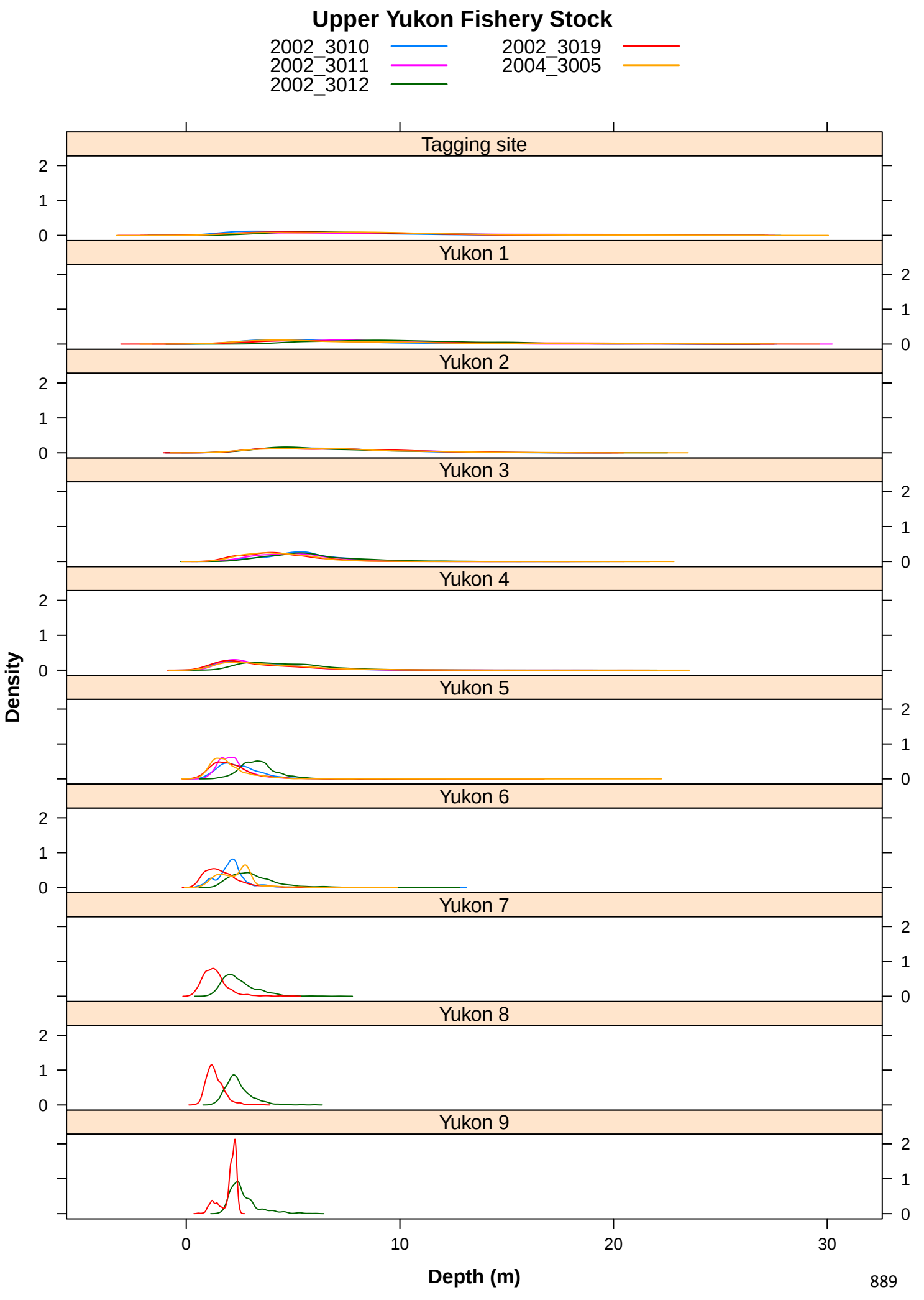


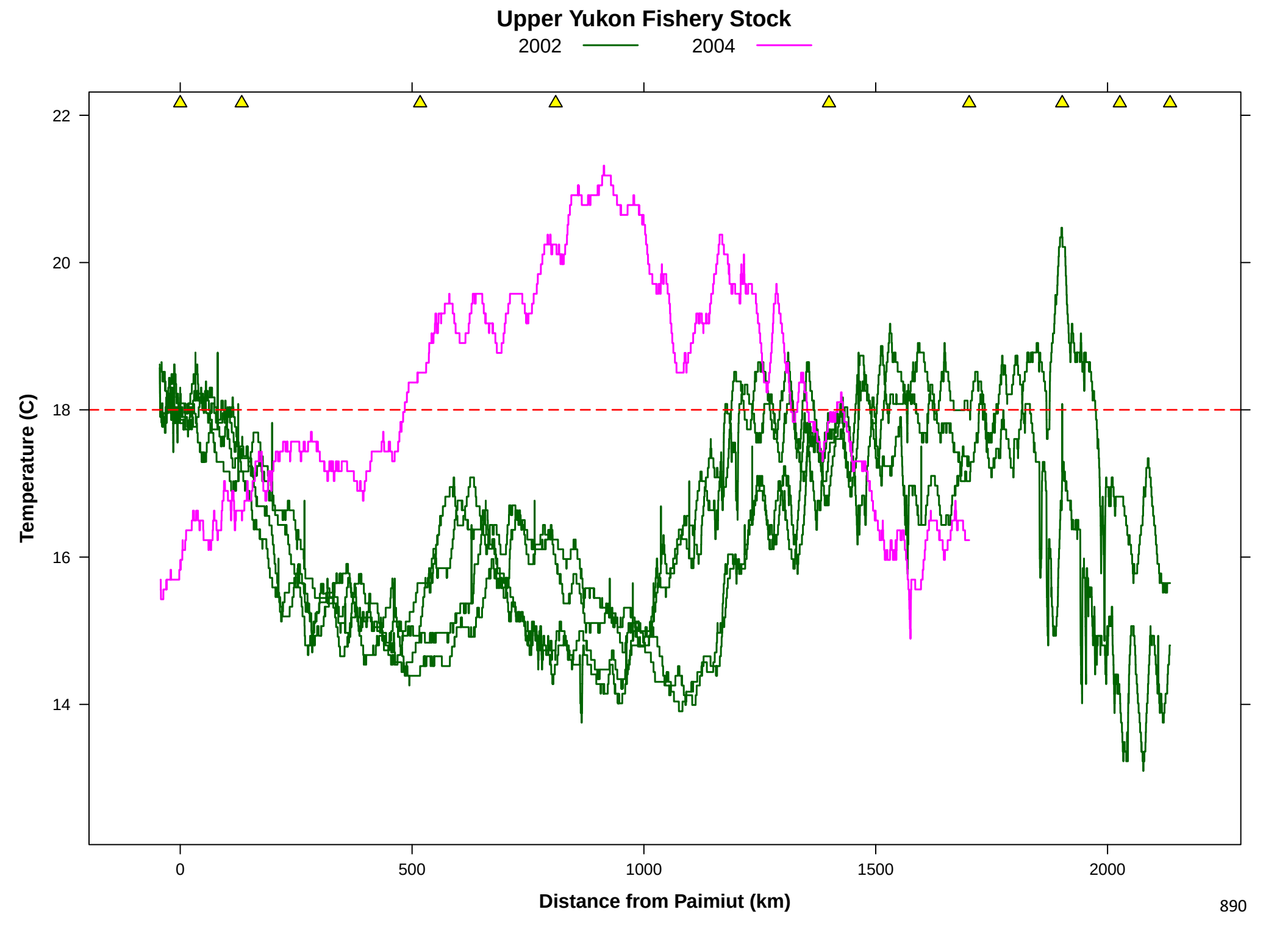

Upper Yukon Fishery Stock
2002_3010
2002_3011
2002_3012
2002_3019
2004_3005
0
500
1000
1500
2000
0
5
10
Depth (m)
Distance from Paimiut (km)

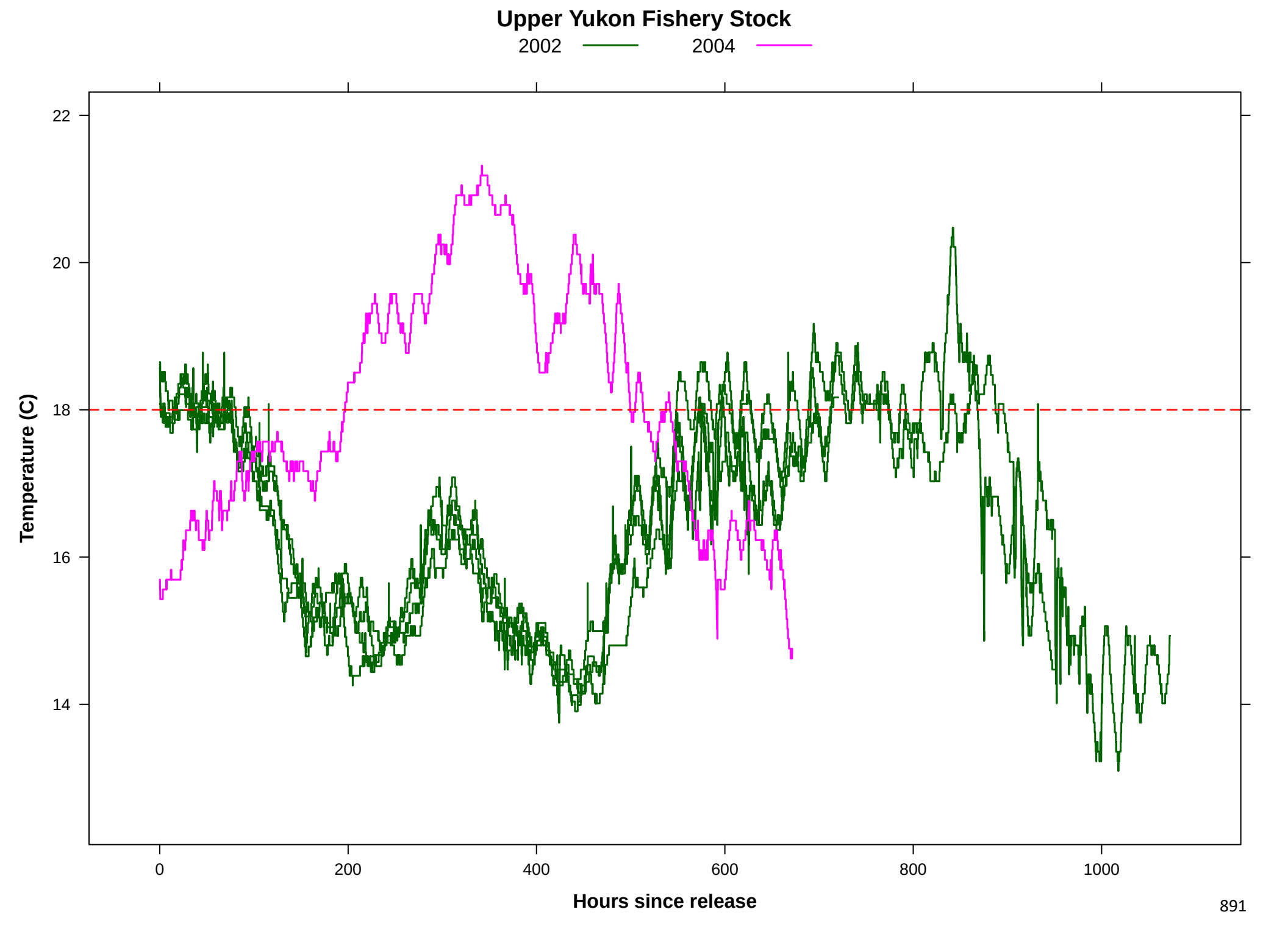

Upper Yukon Fishery Stock
2002_3010
2002_3011
2002_3012
2002_3019
2004_3005
0
200
400
600
800
1000
0
5
10
Depth (m)
Hours since release

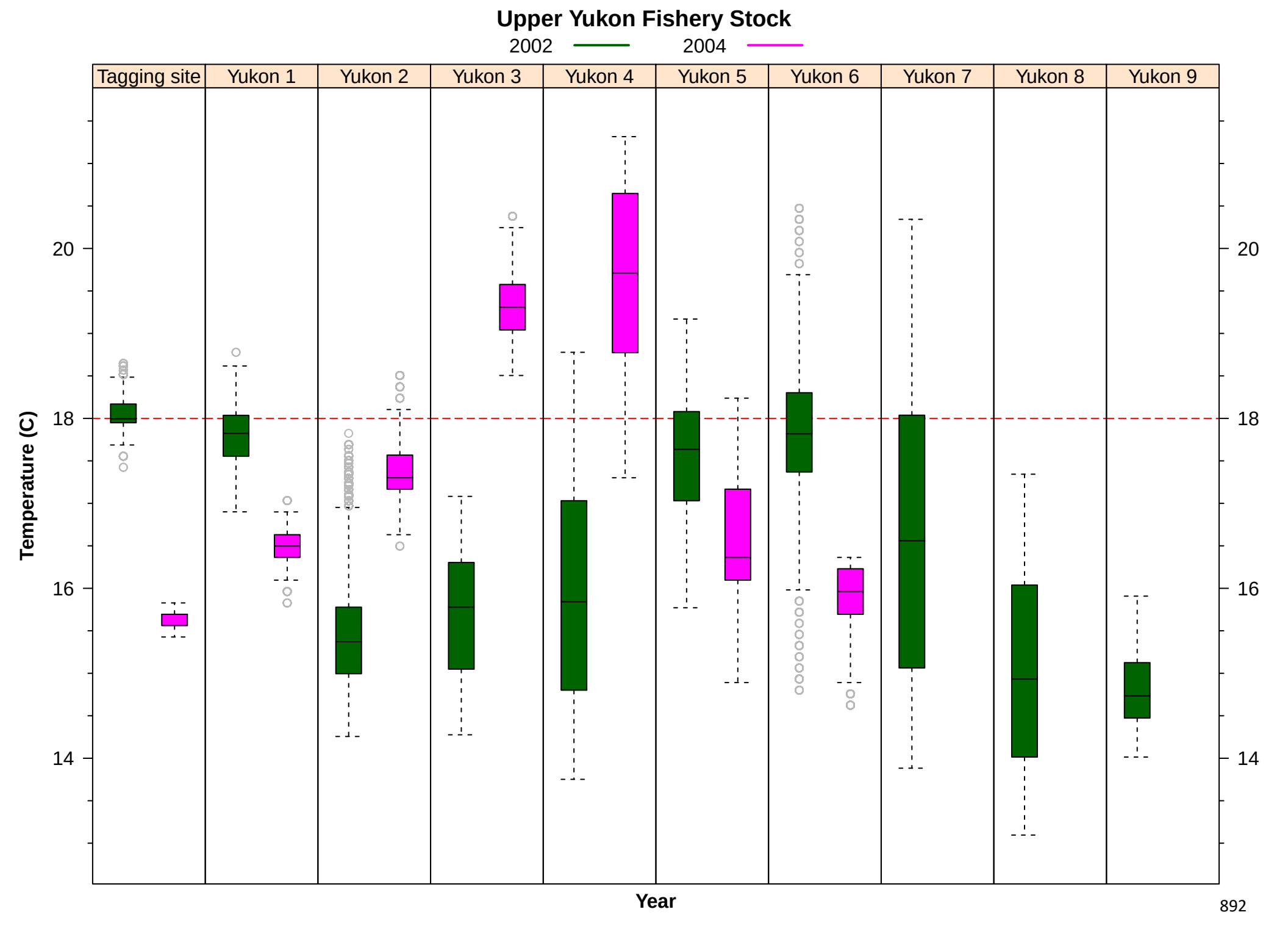

Upper Yukon Fishery Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Reach

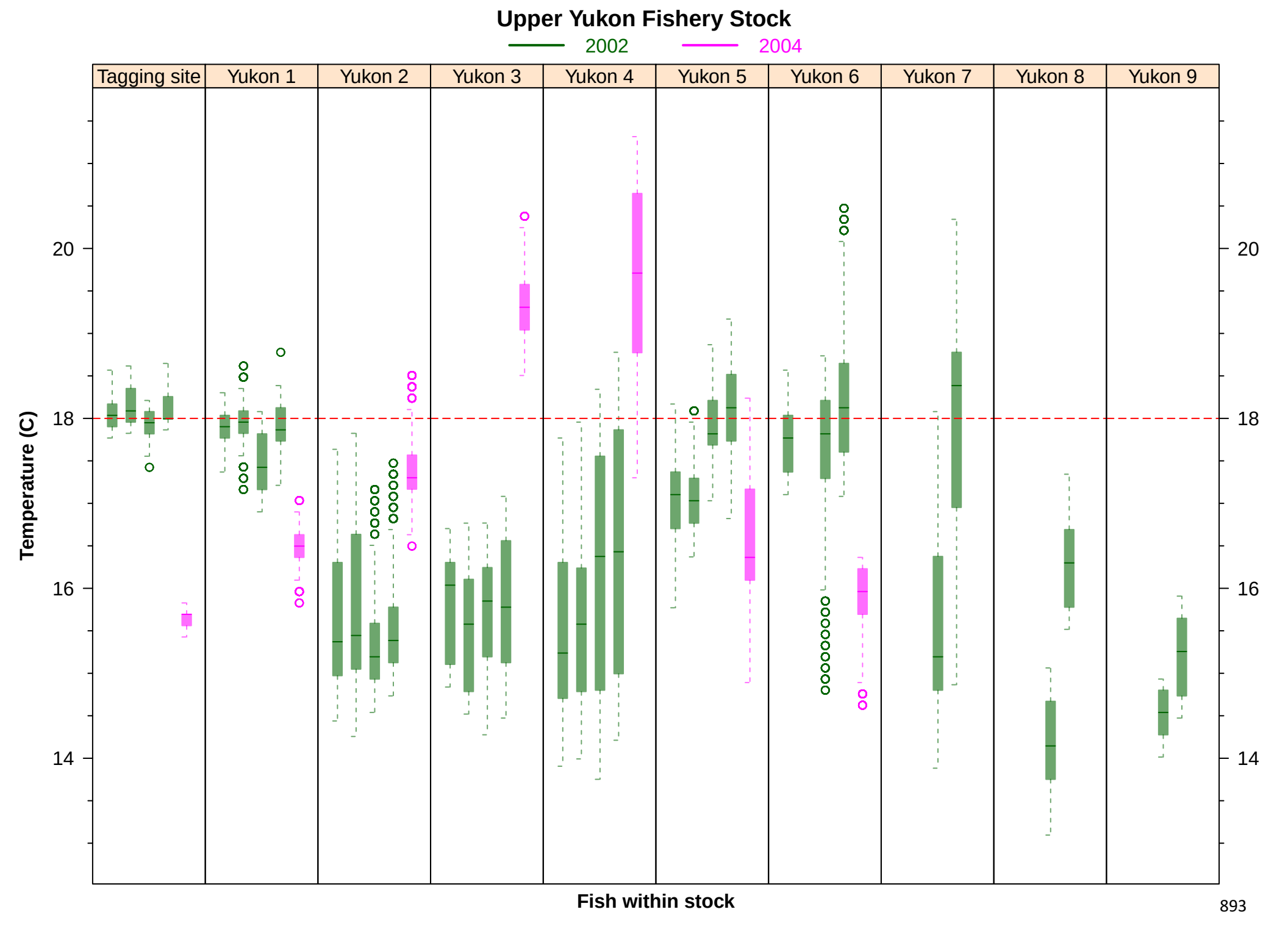

Upper Yukon Fishery Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Depth (m)
0
5
10
15
20
25
Fish within stock
888

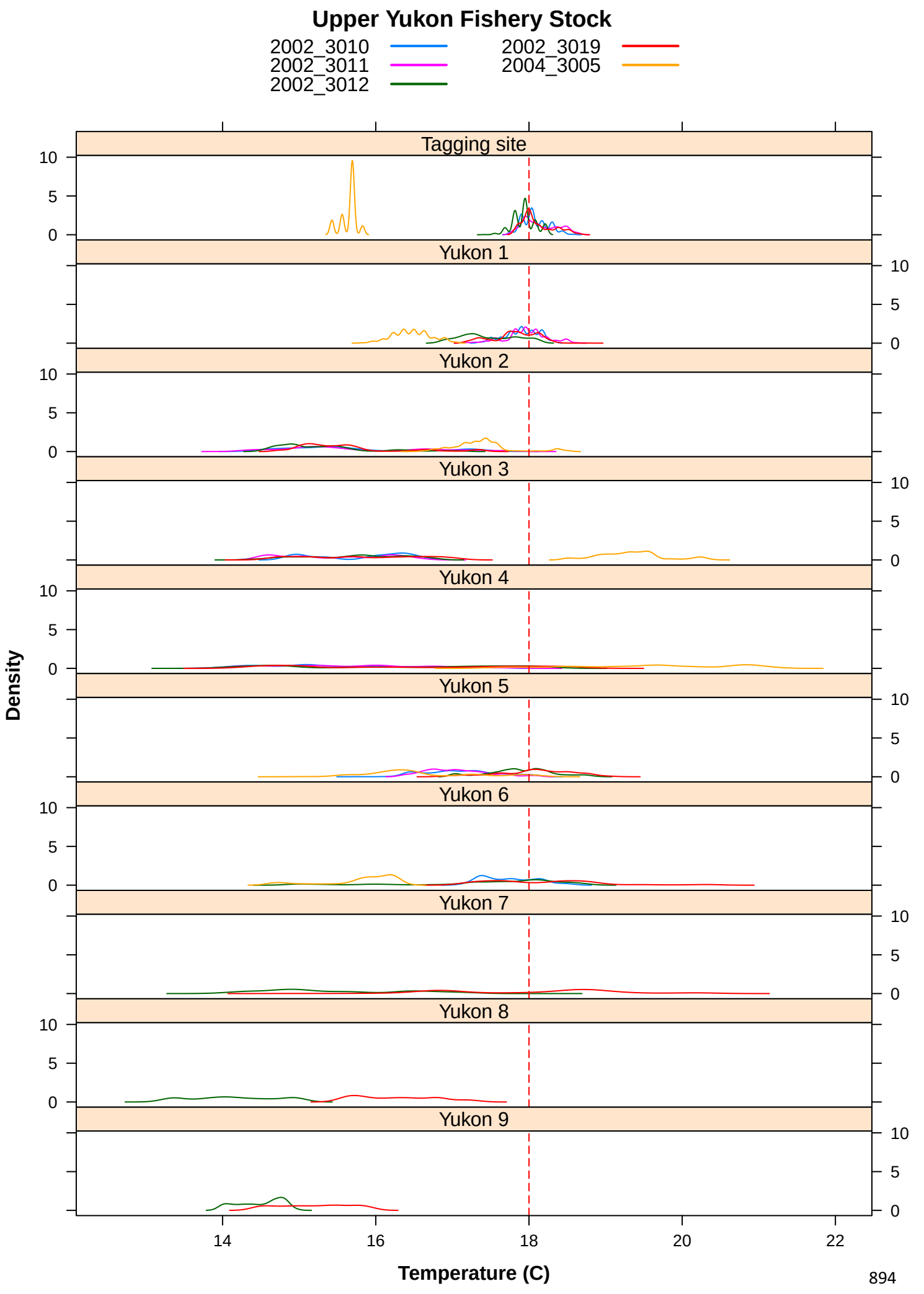

Upper Yukon Fishery Stock
2002_3010
2002_3011
2002_3012
2002_3019
2004_3005
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Density
0
1
2
0
10
20
30
Depth (m)

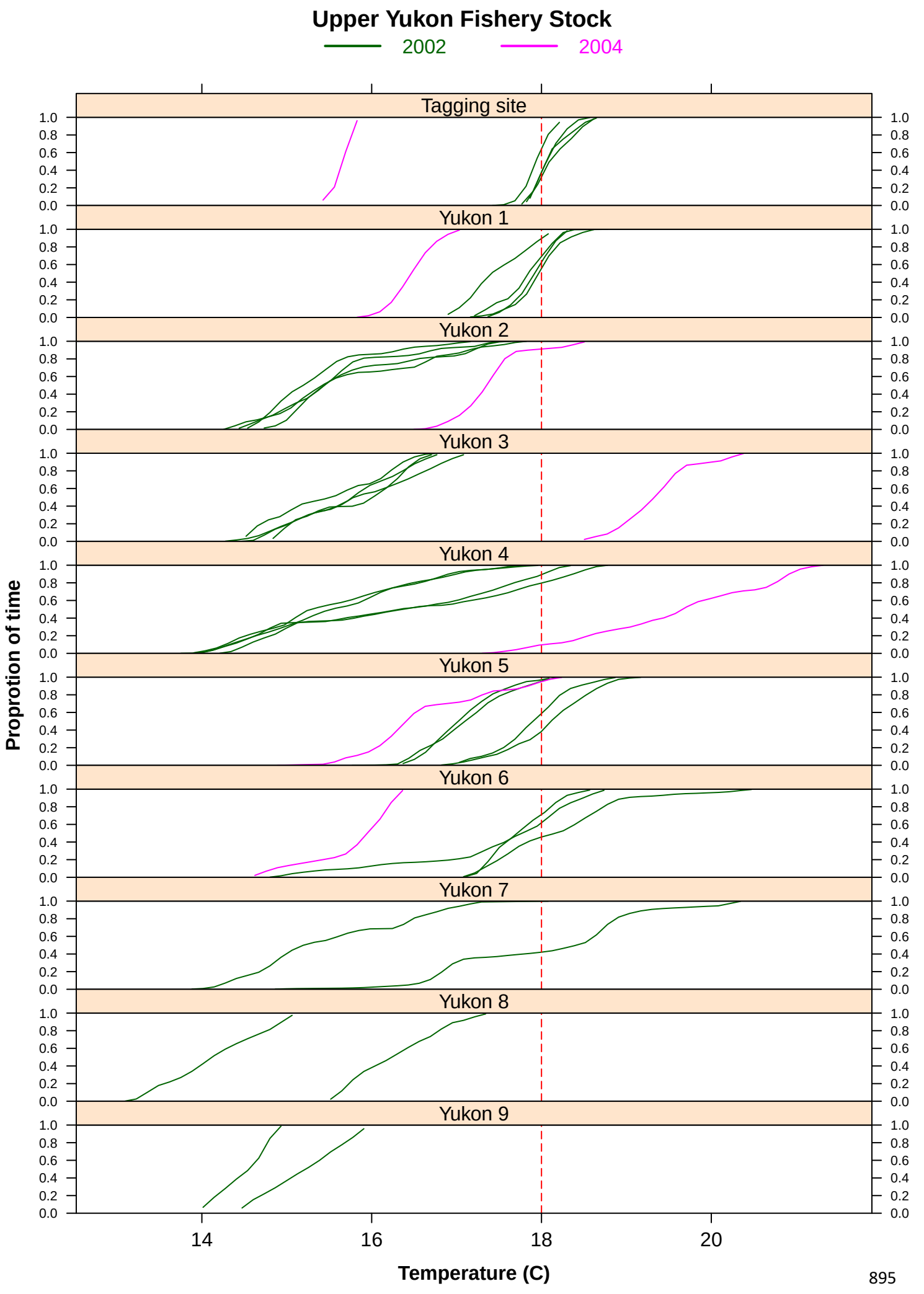

Upper Yukon Fishery Stock
2002
2004
22
20
18
16
14
Temperature (C)
0
500
1000
1500
2000
Distance from Paimiut (km)
890

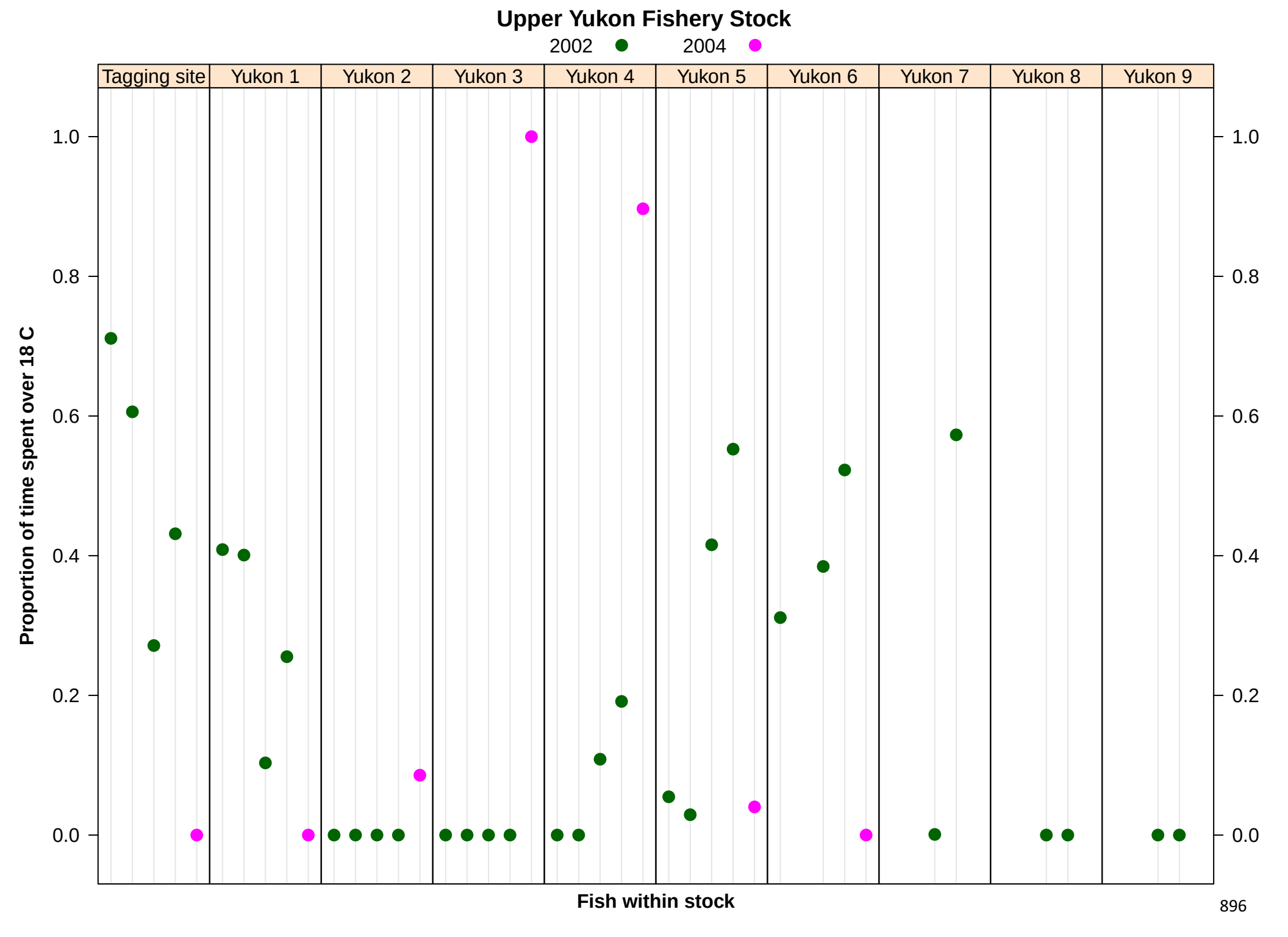

Upper Yukon Fishery Stock
2002
2004
Temperature (C)
22
20
18
16
14
0
200
400
600
800
1000
Hours since release
891

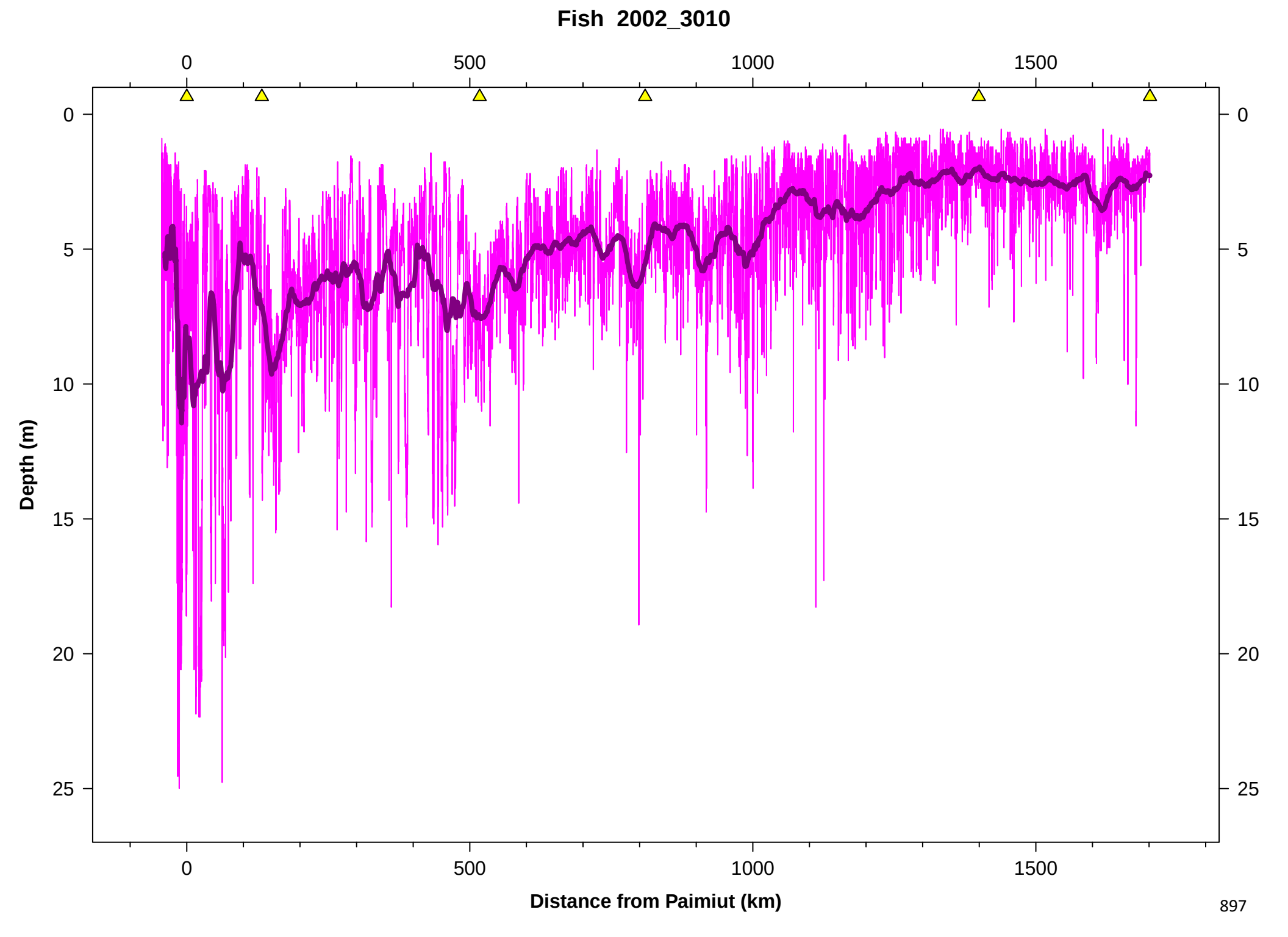

Upper Yukon Fishery Stock
2002
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Temperature (C)
20
18
16
14
Year
892

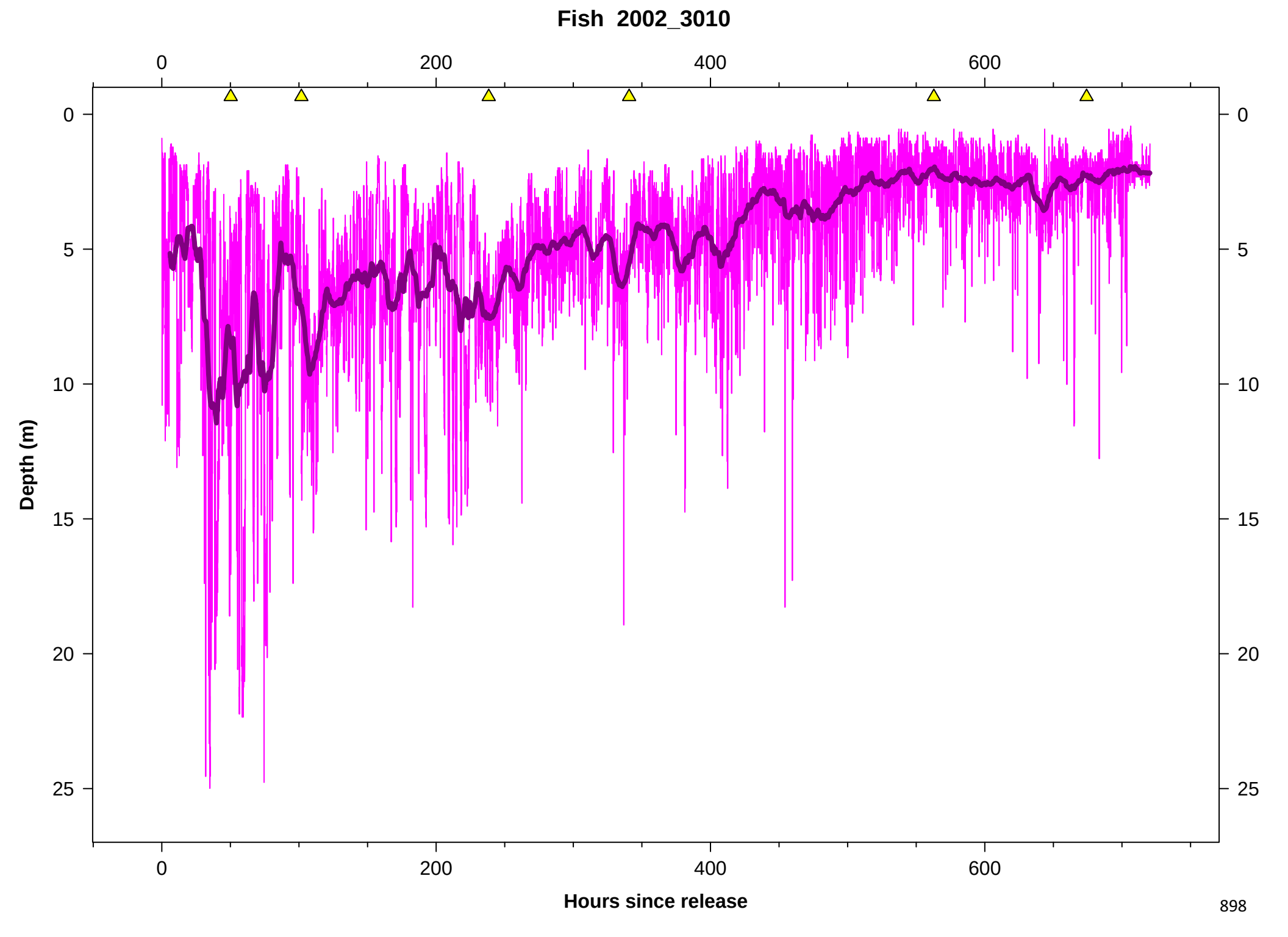

Upper Yukon Fishery Stock
2002
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Temperature (C)
20
18
16
14
Fish within stock
893

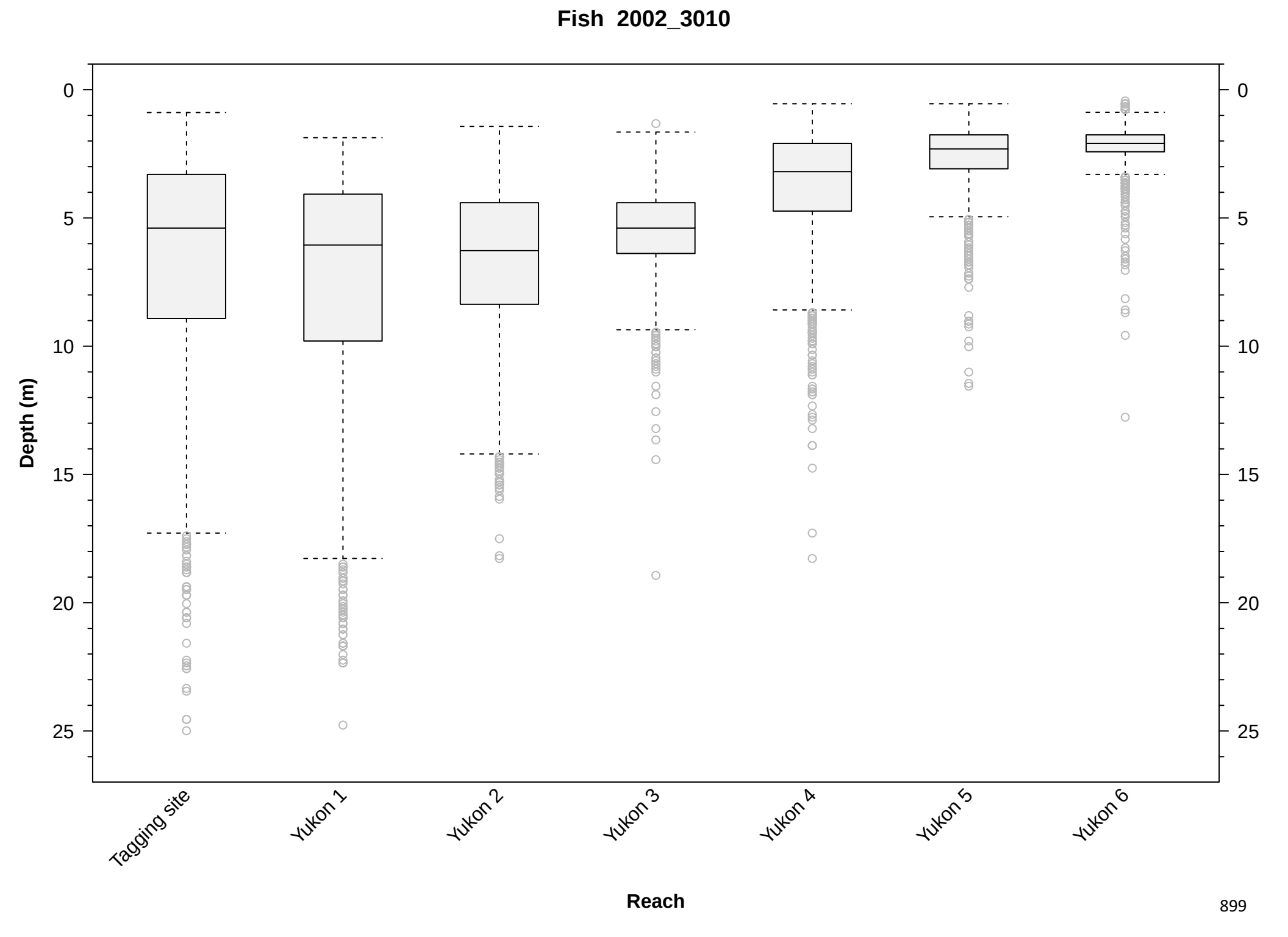

Upper Yukon Fishery Stock
2002_3010
2002_3011
2002_3012
2002_3019
2004_3005
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Density
0
5
10
14
16
18
20
22
Temperature (C)

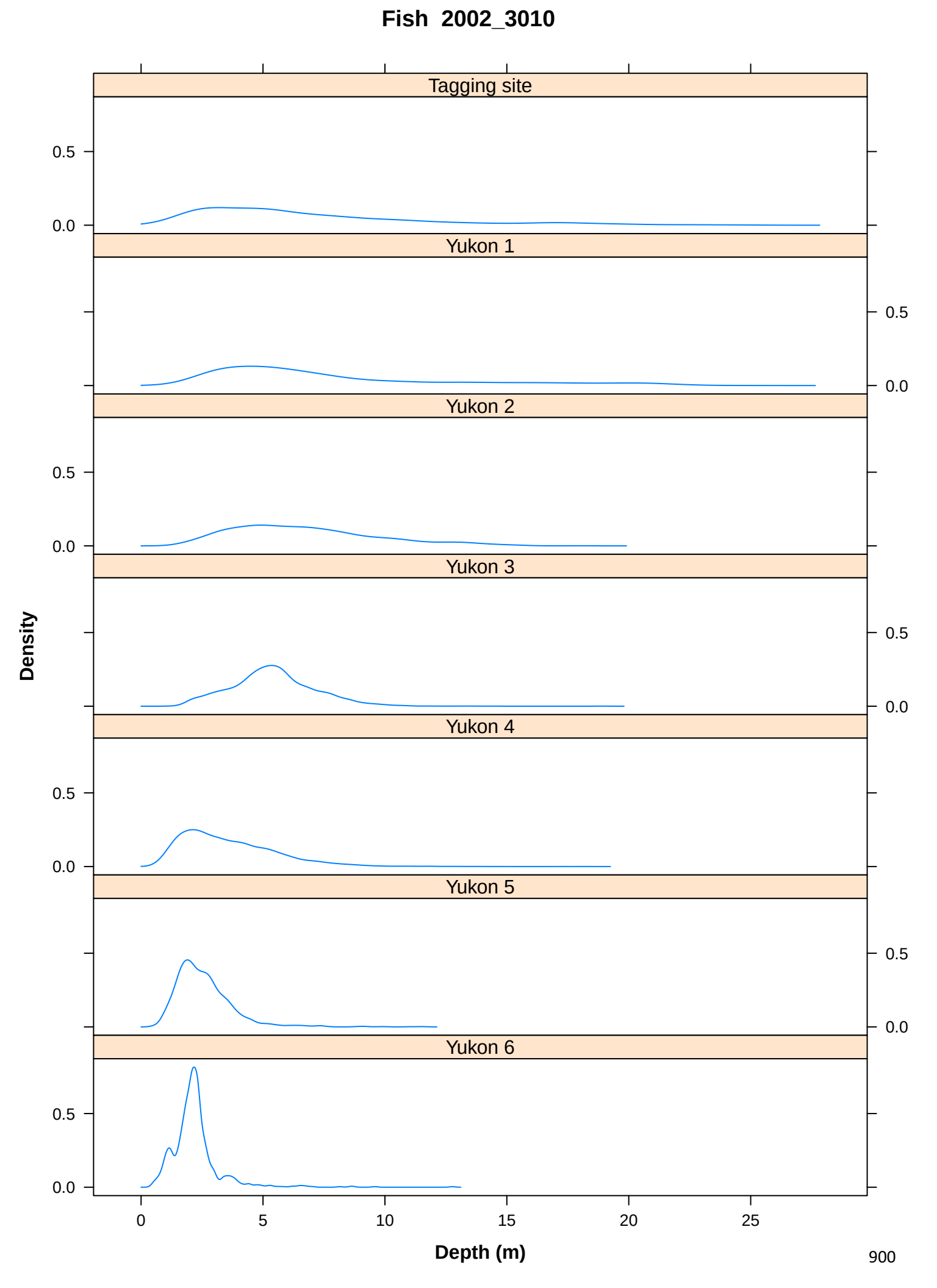

Upper Yukon Fishery Stock
2002
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Proprotion of time
0.0
0.2
0.4
0.6
0.8
1.0
14
16
18
20
Temperature (C)

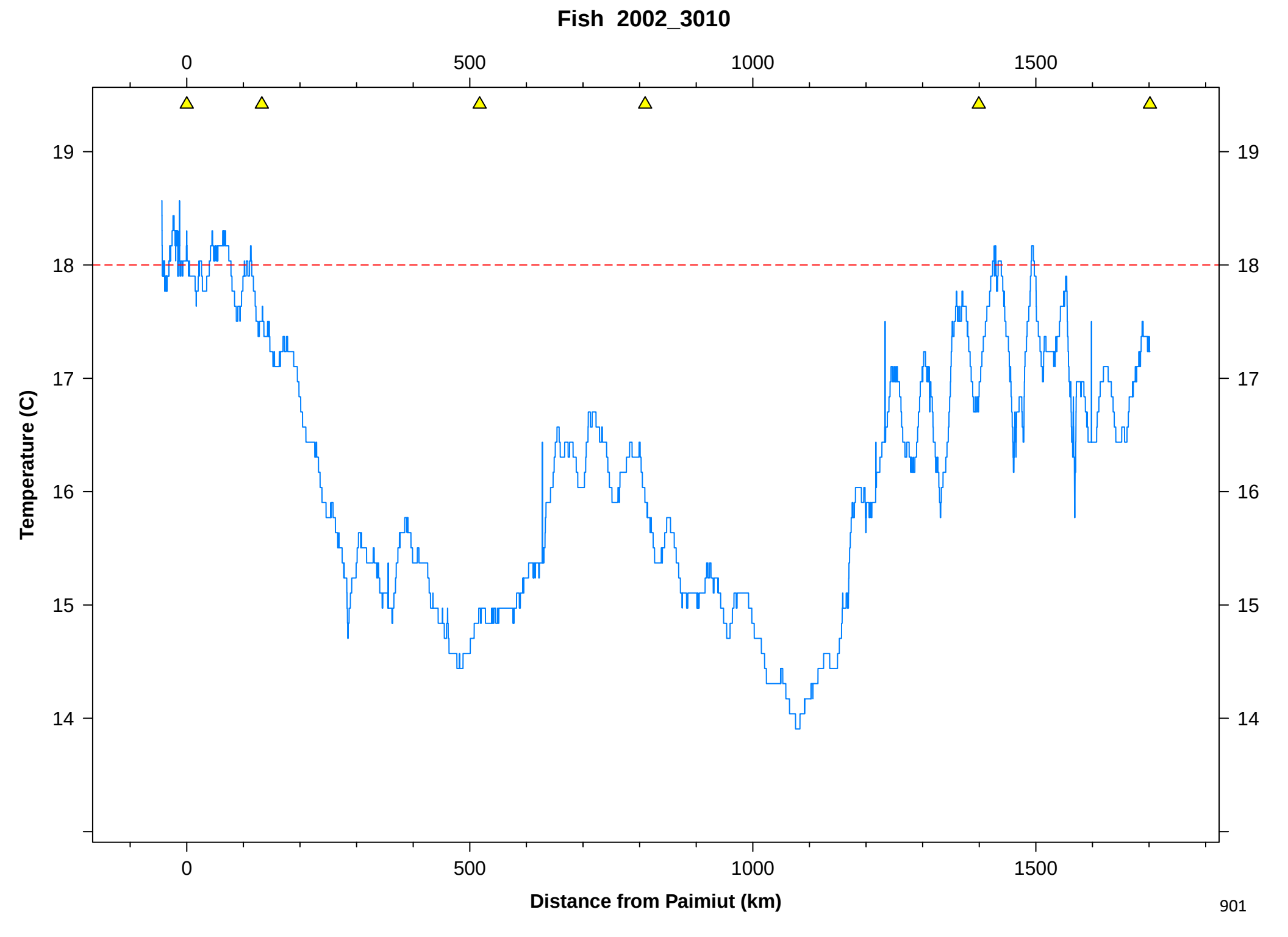

Upper Yukon Fishery Stock
2002
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock
896

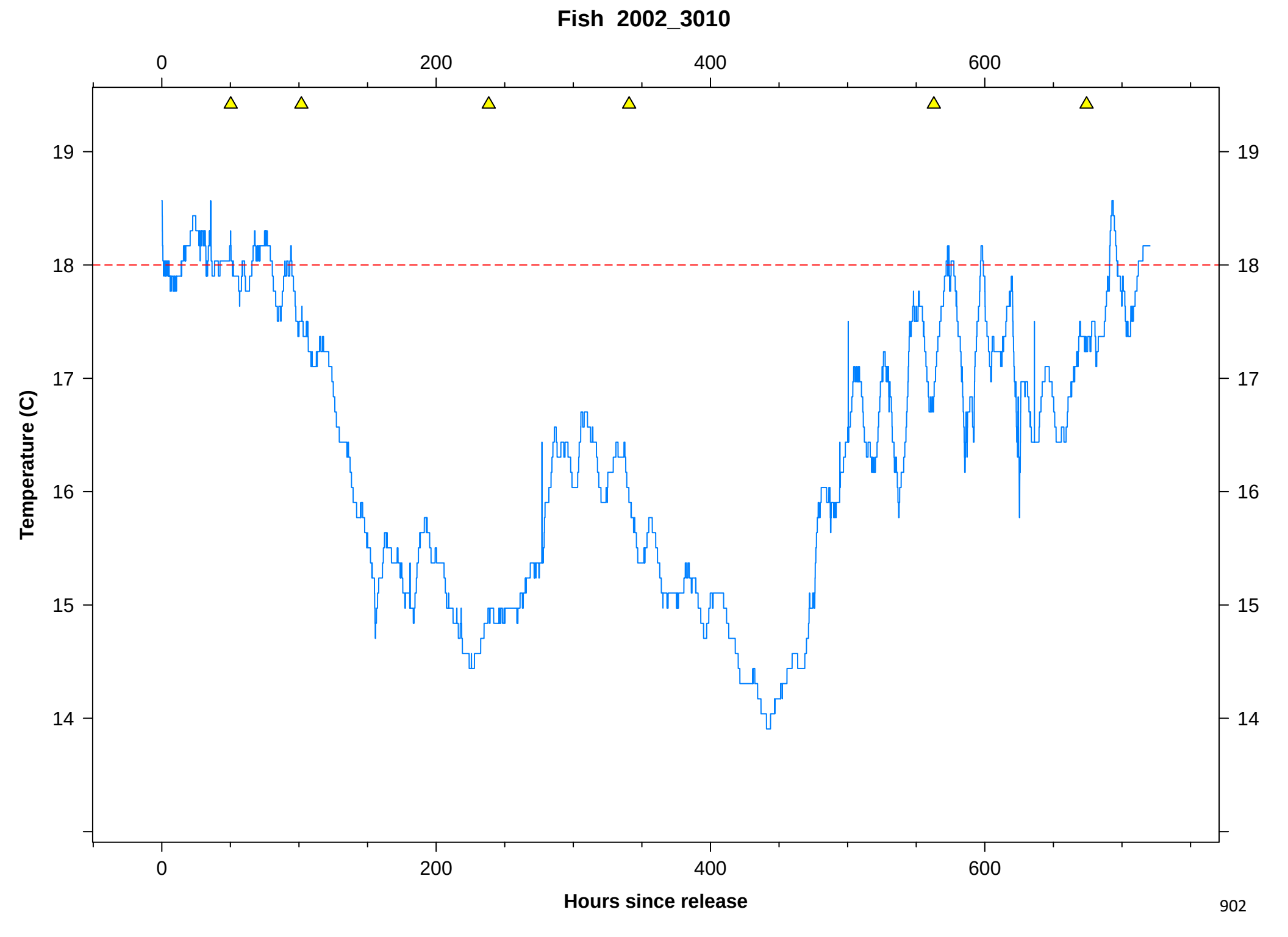

Fish 2002_3010
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

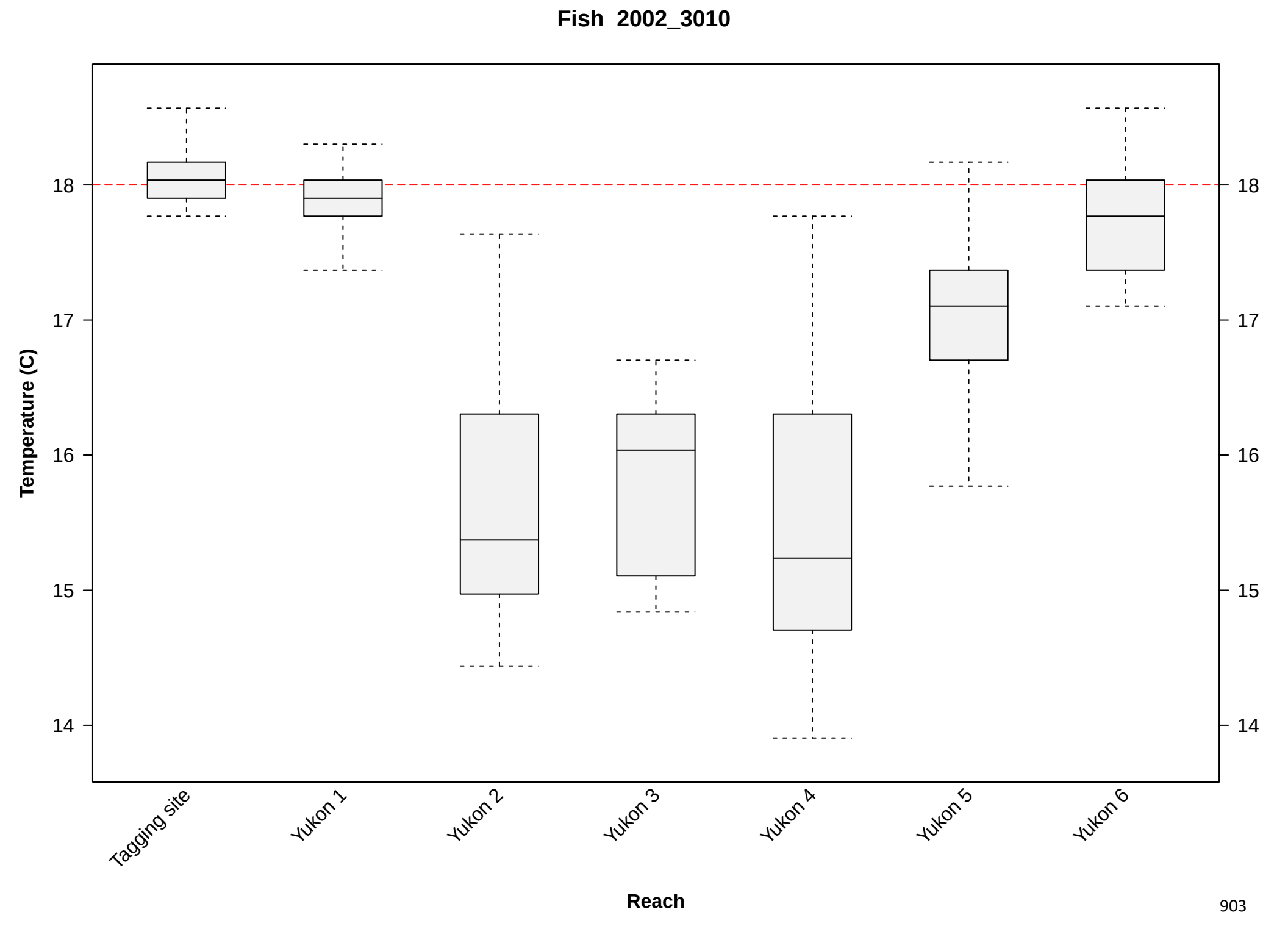

Fish 2002_3010
0
200
400
600
0
5
10
15
20
25
Depth (m)
Hours since release

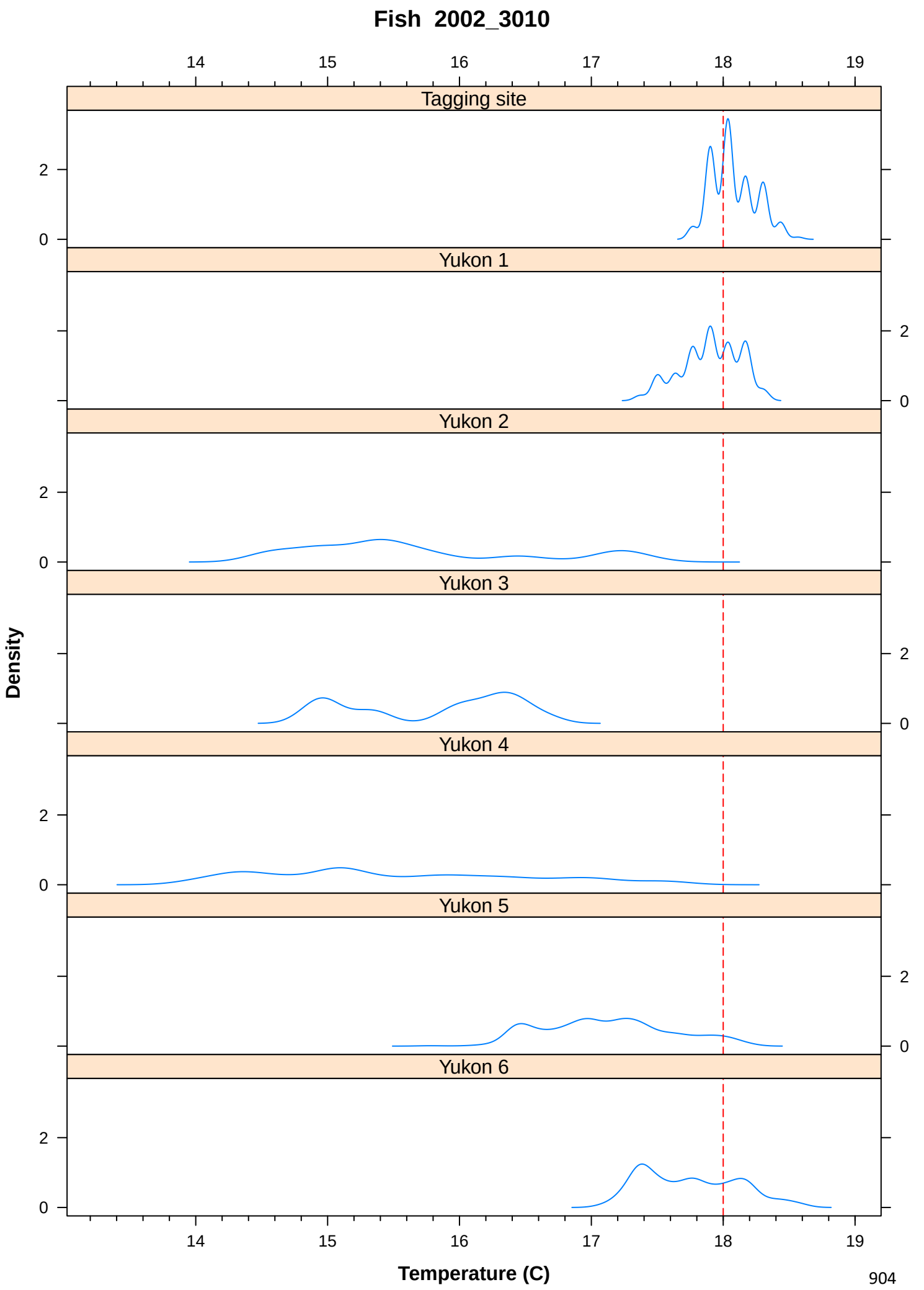

Fish 2002_3010
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Reach
899

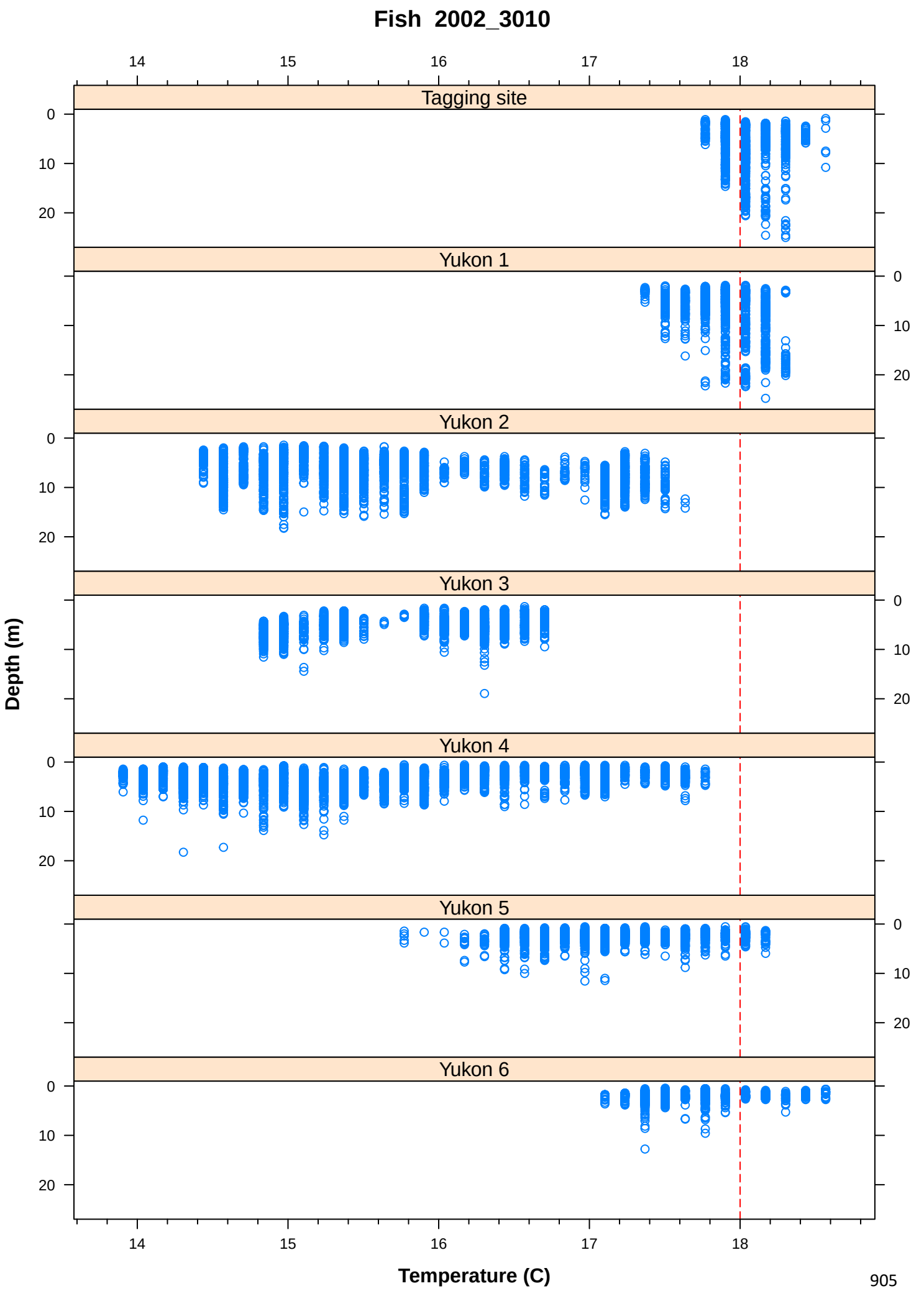

Fish 2002_3010
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Density
0.5
0.0
0
5
10
15
20
25
Depth (m)
900

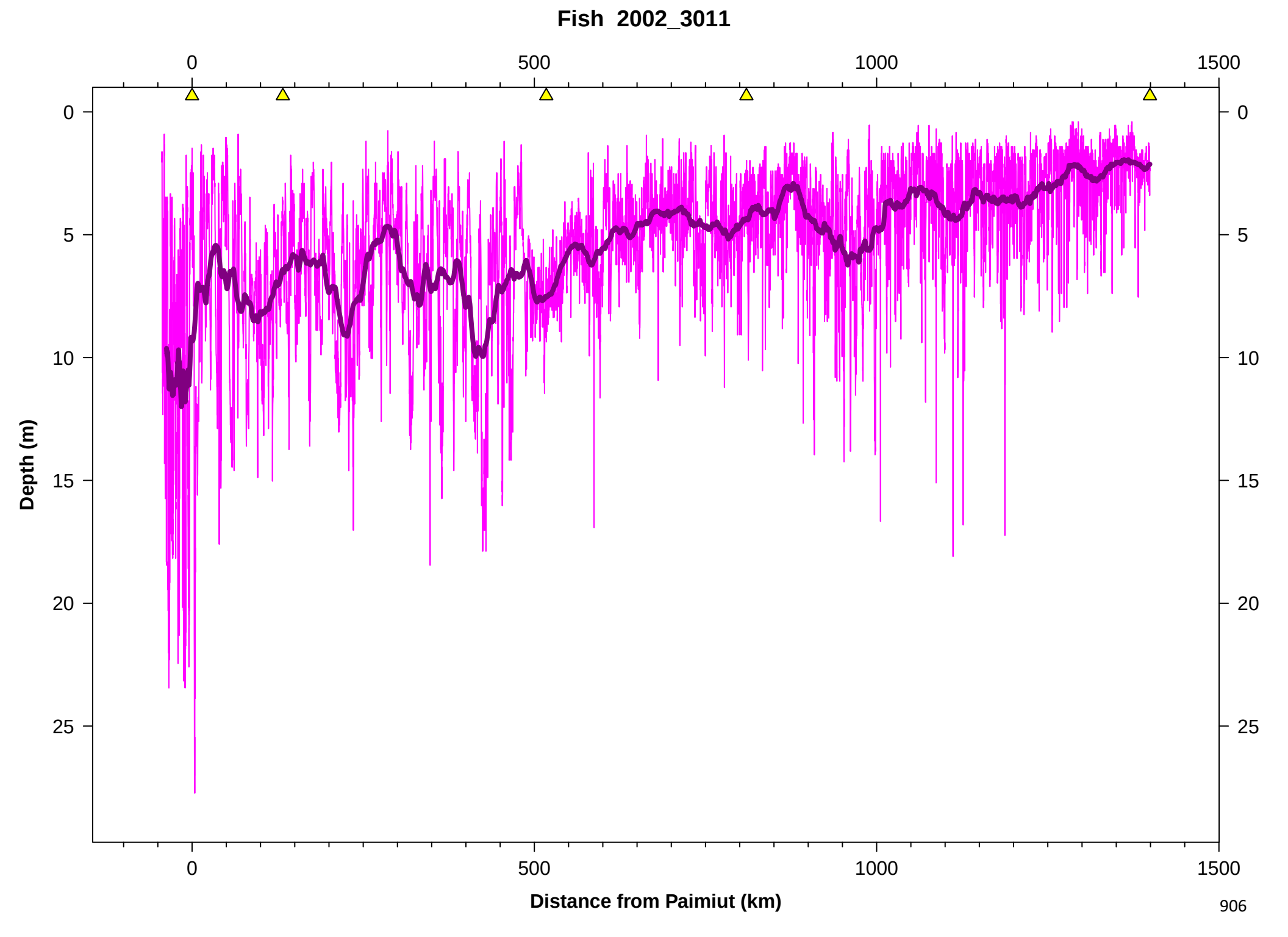

Fish 2002_3010
0
500
1000
1500
19
18
17
16
15
14
Temperature (C)
Distance from Paimiut (km)
901

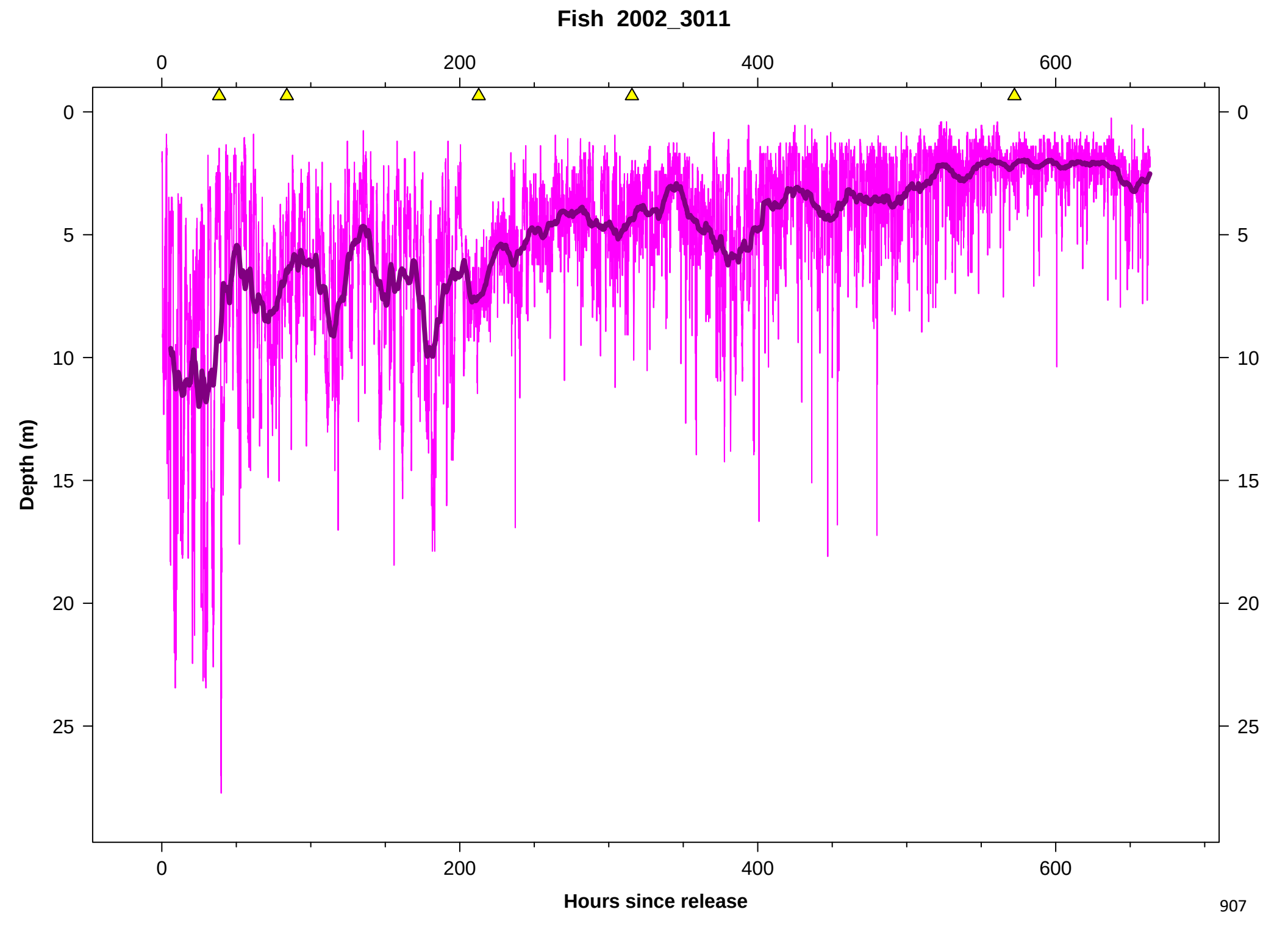

Fish 2002_3010
0
200
400
600
19
18
17
16
15
14
Temperature (C)
Hours since release
902

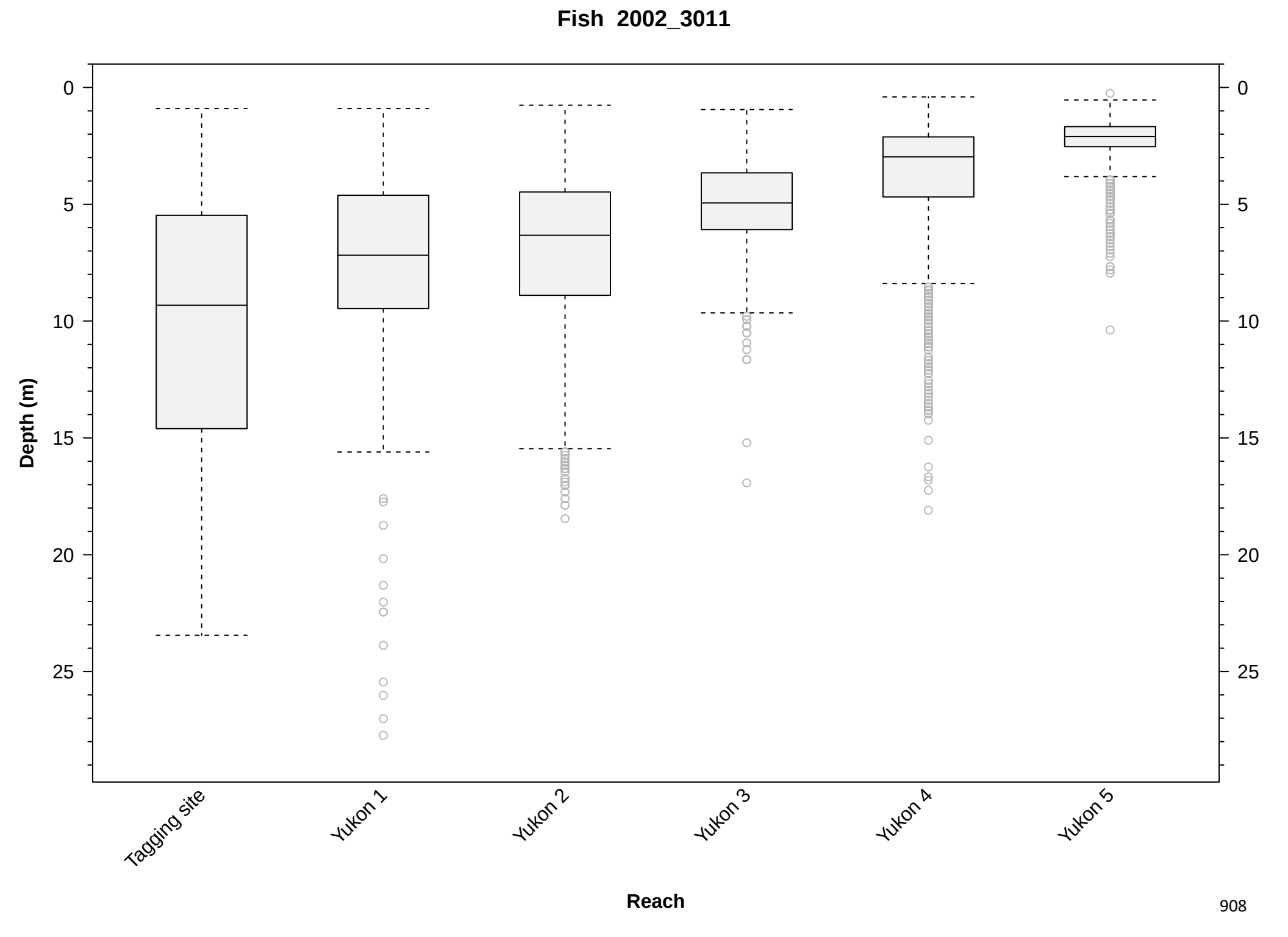

Fish 2002_3010
Temperature (C)
18
17
16
15
14
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Reach
903

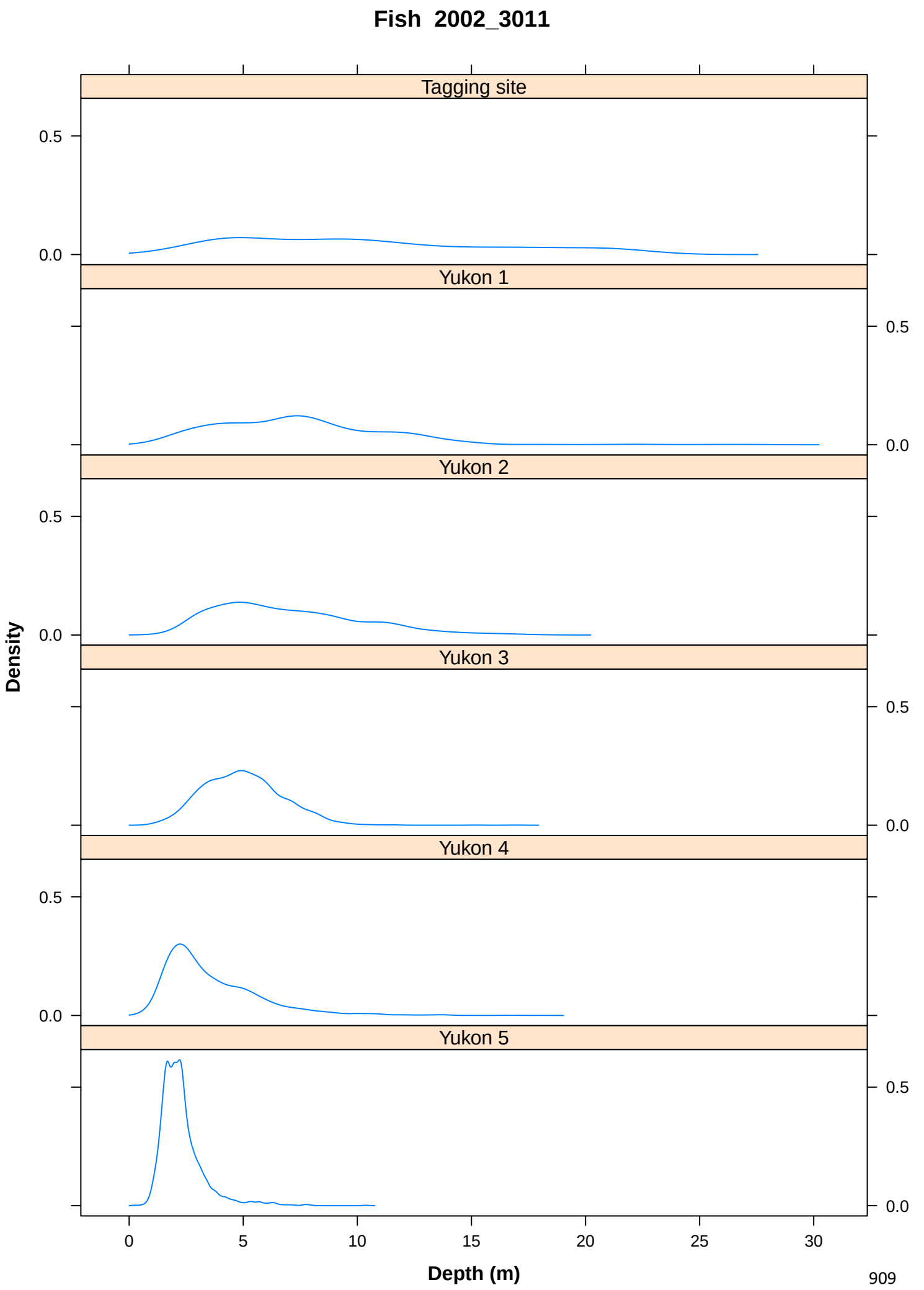

Fish 2002_3010
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Density
Temperature (C)
14
15
16
17
18
19
0
2
904

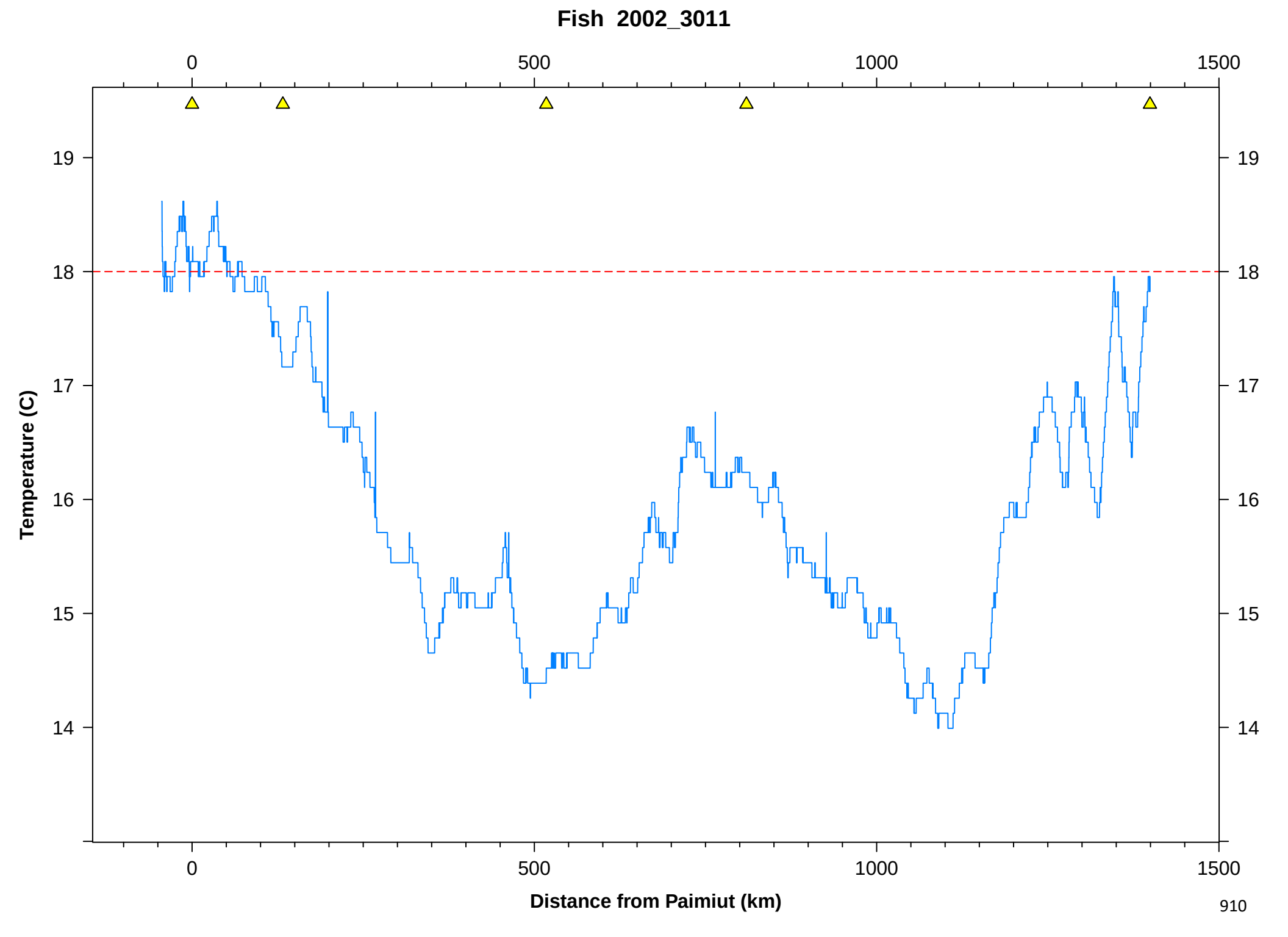

Fish 2002_3010
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Depth (m)
Temperature (C)
14
15
16
17
18
0
10
20

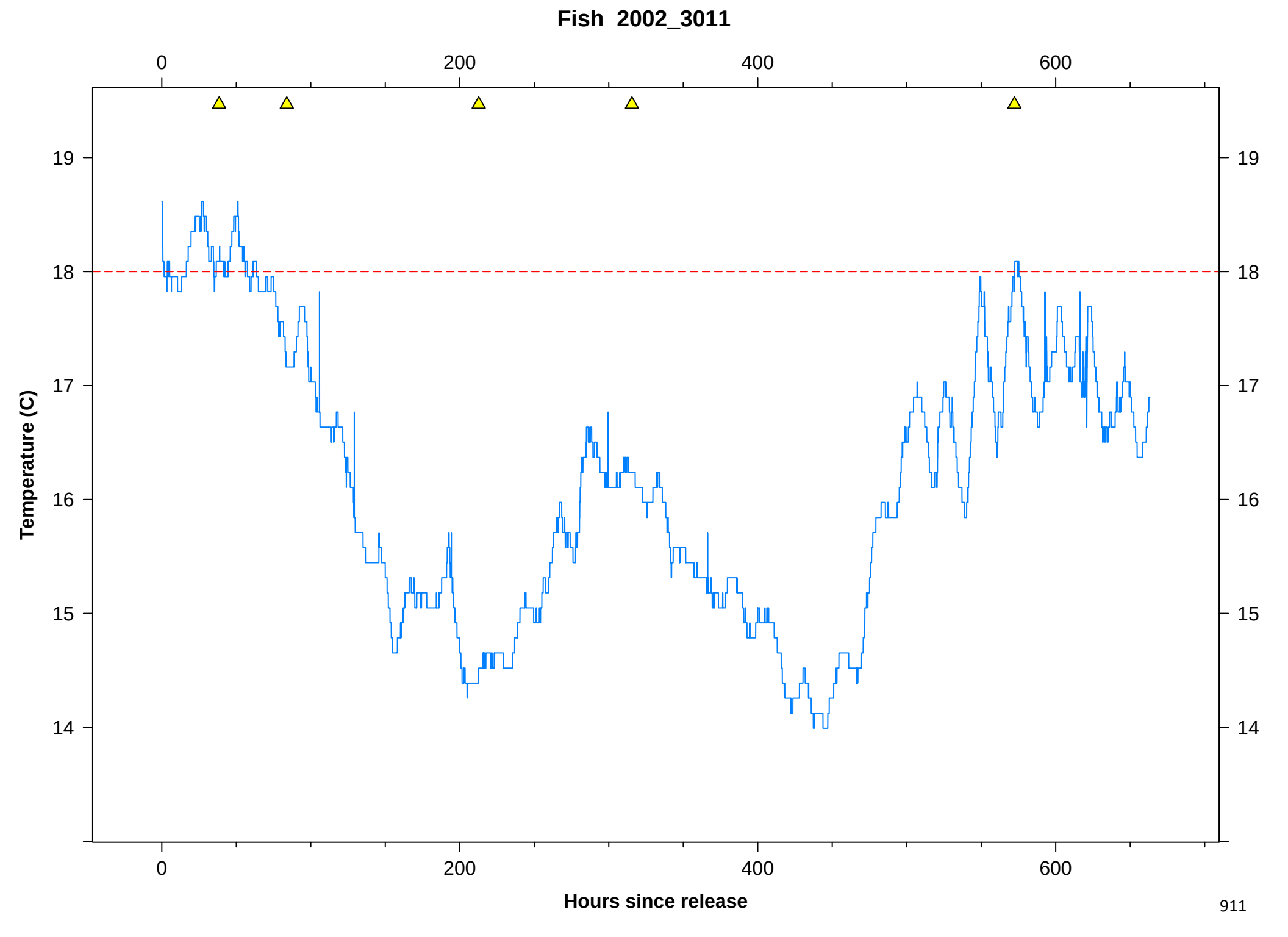

Fish 2002_3011
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
906

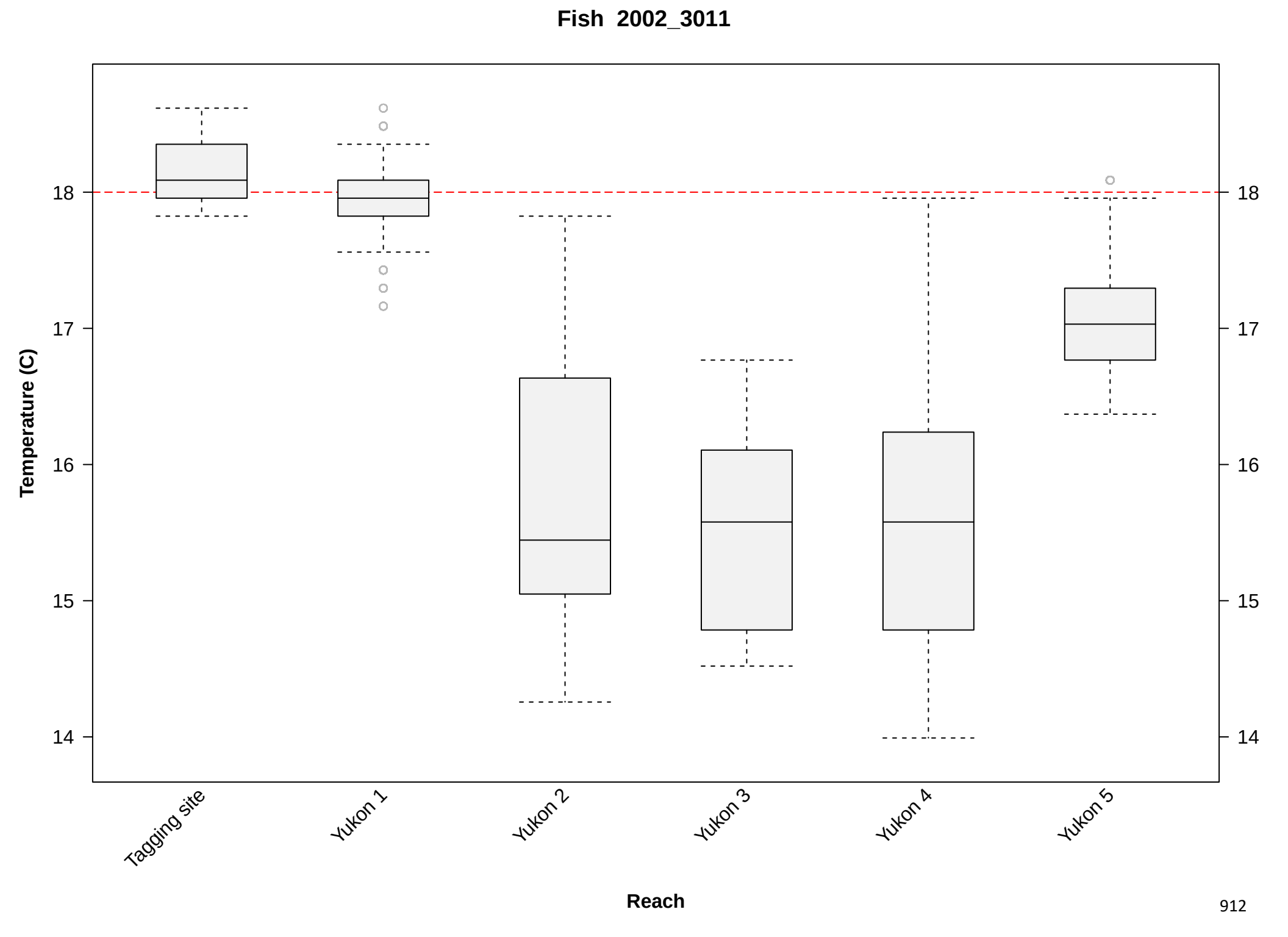

Fish 2002_3011
0
200
400
600
0
5
10
15
20
25
Depth (m)
Hours since release
907

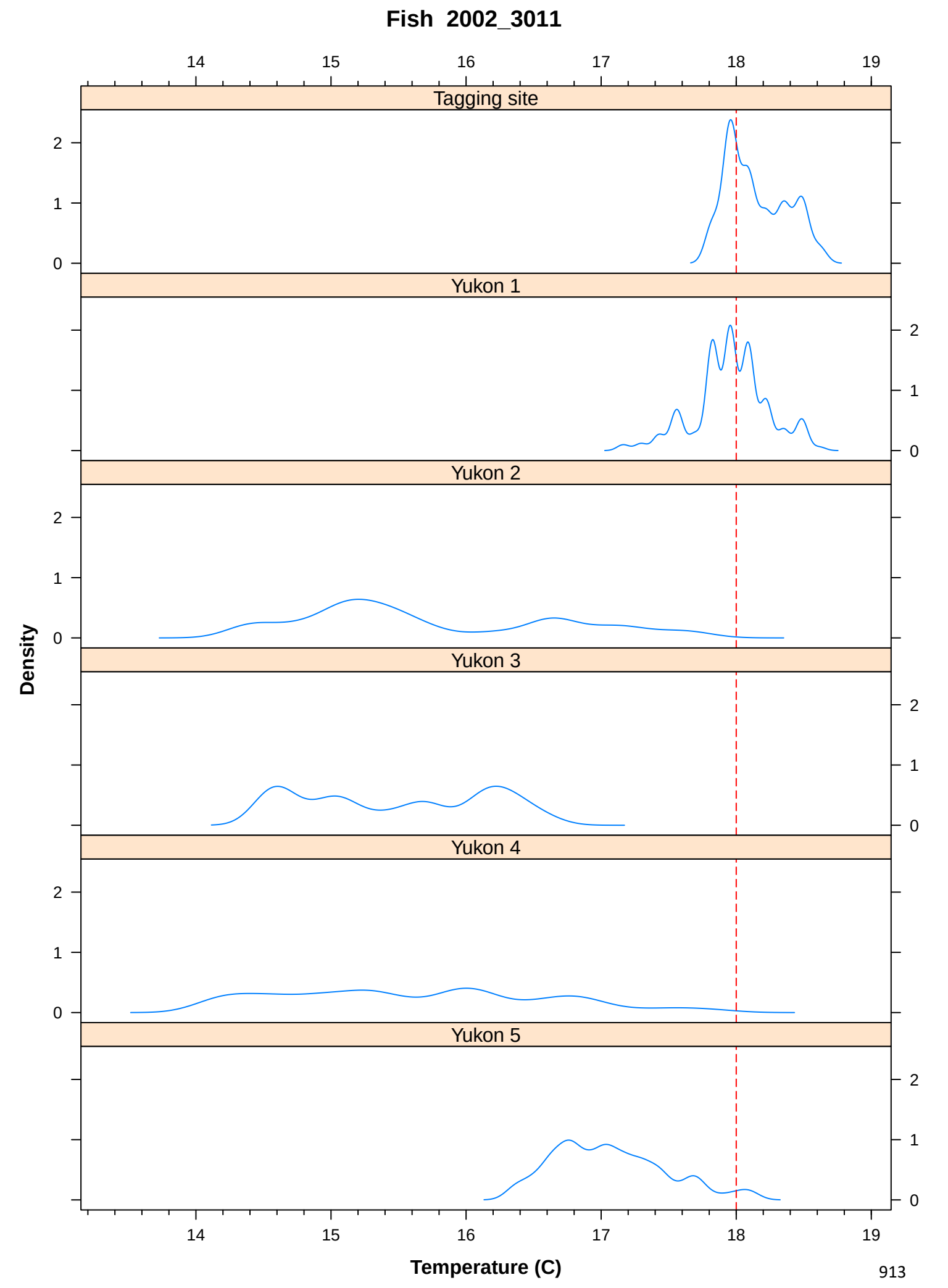

Fish 2002_3011
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Reach
908

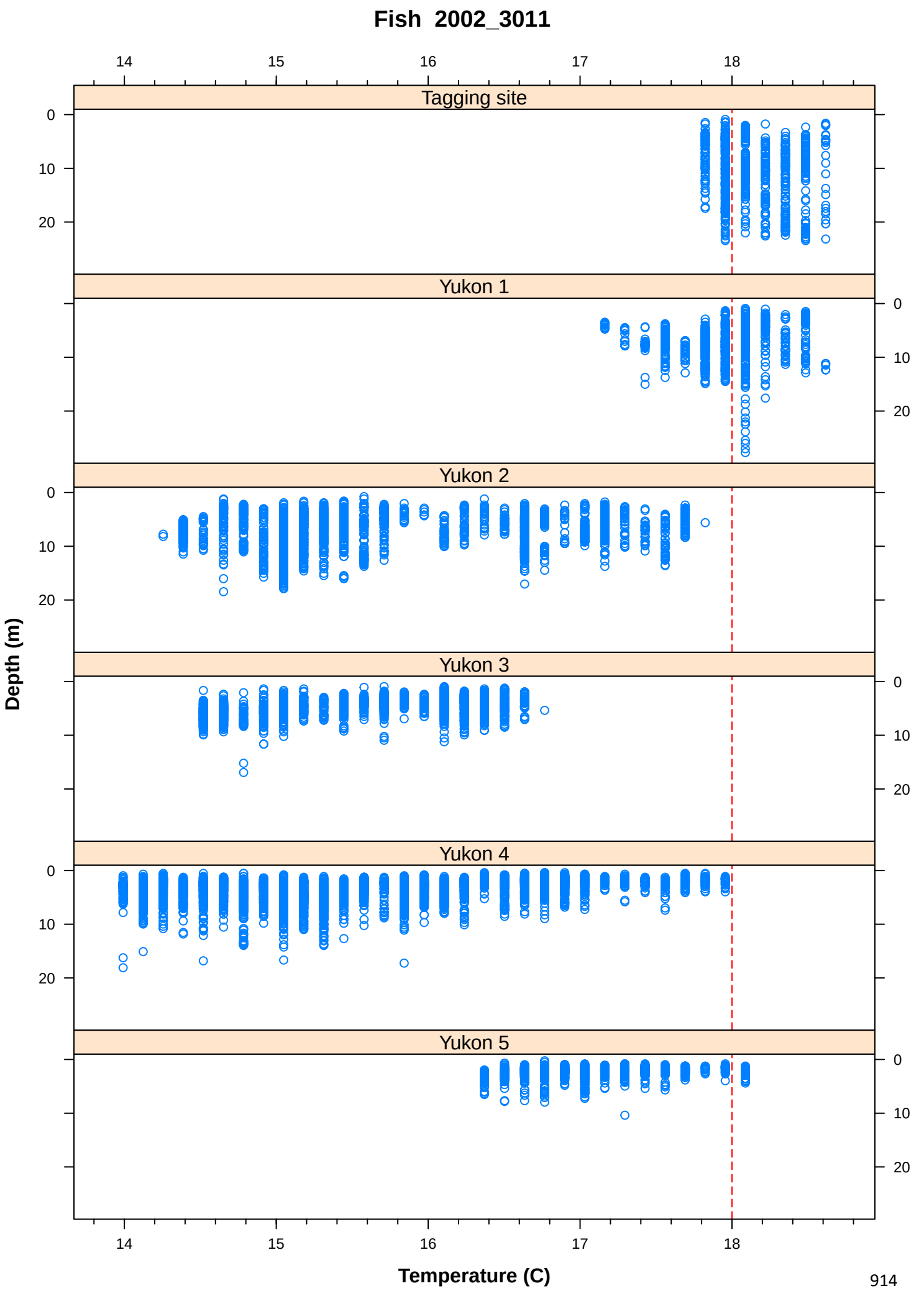

Fish 2002_3011
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Density
0.5
0.0
0
5
10
15
20
25
30
Depth (m)
909

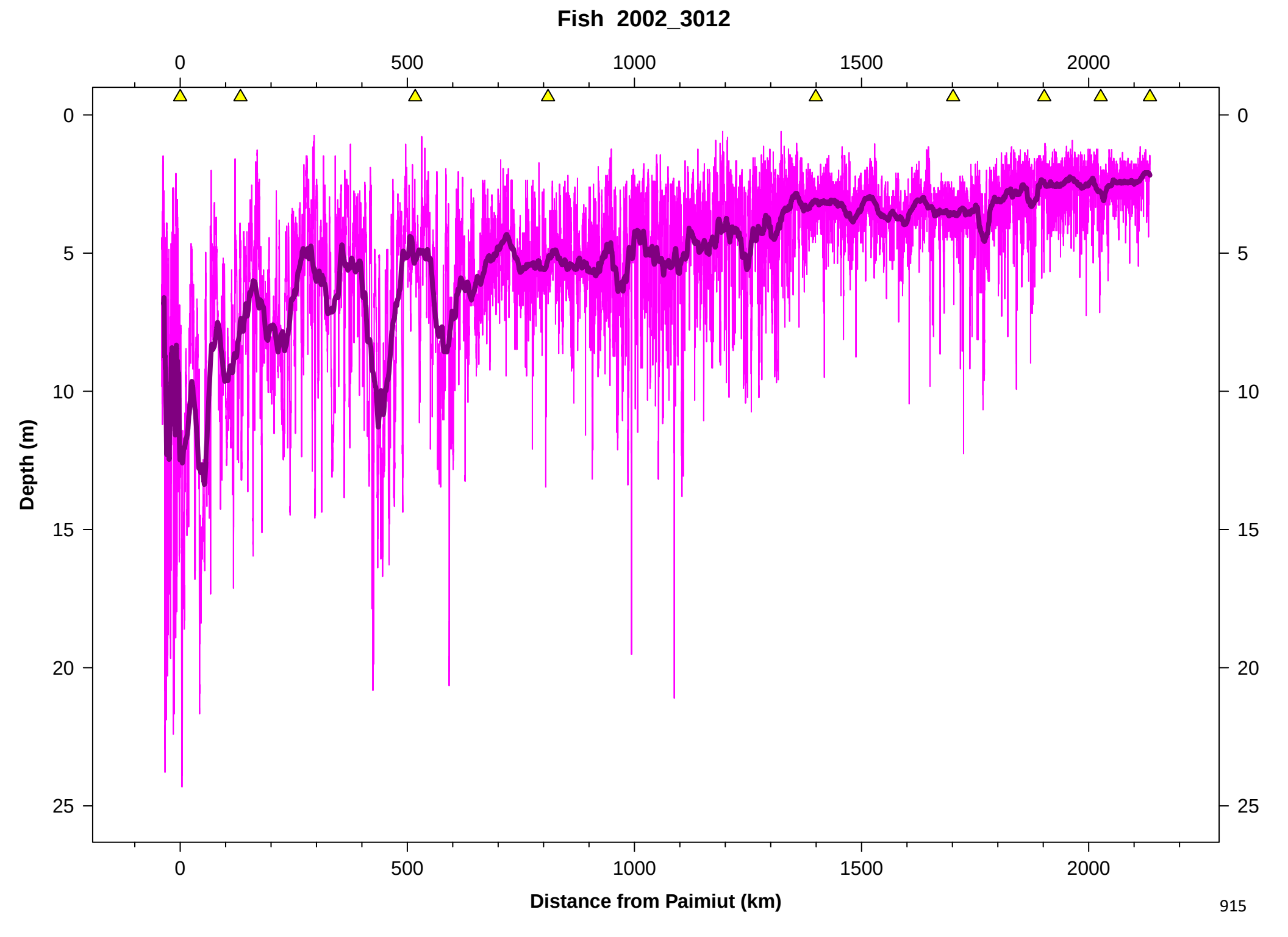

Fish 2002_3011
0
500
1000
1500
19
18
17
16
15
14
Temperature (C)
Distance from Paimiut (km)

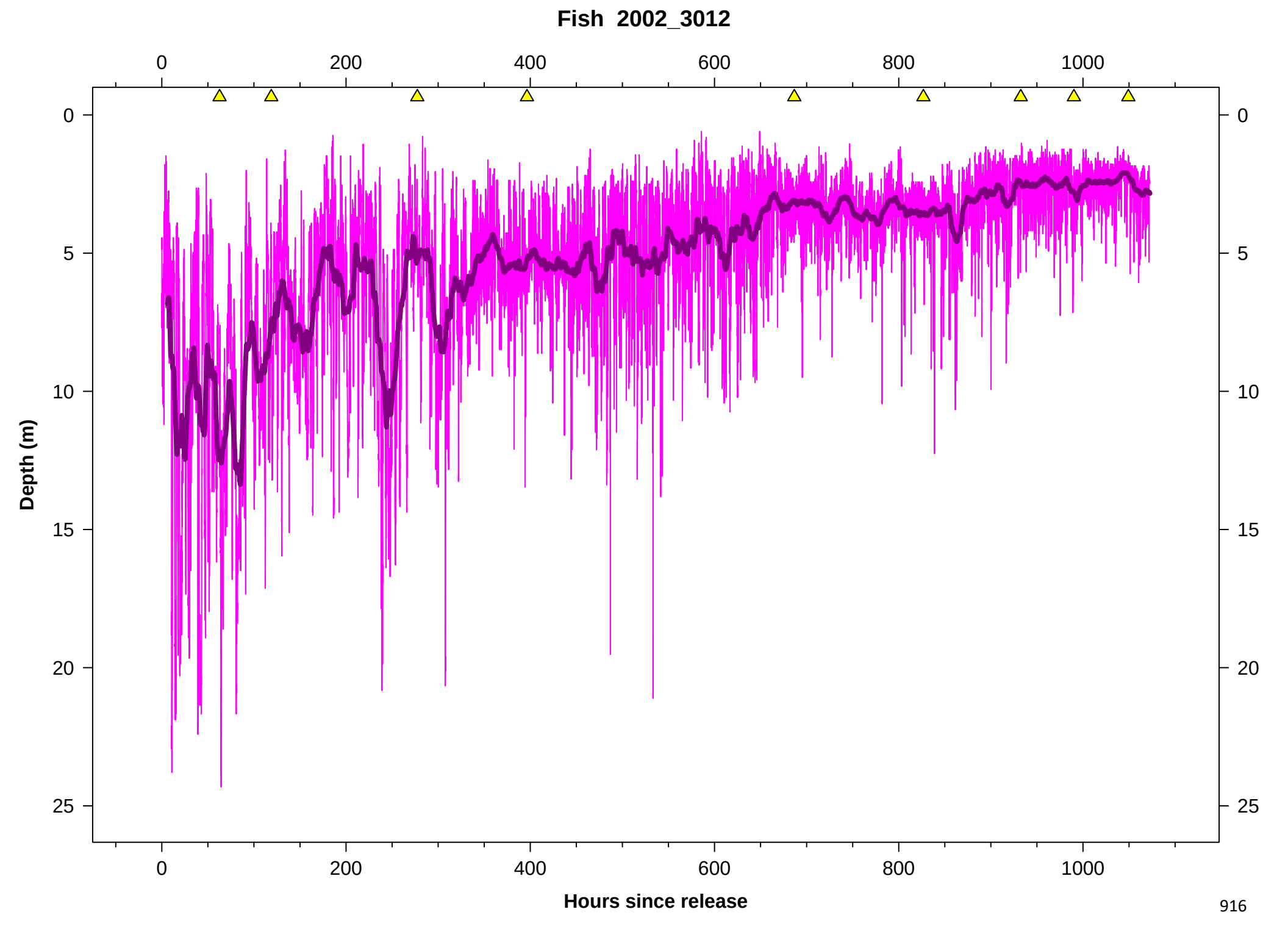

Fish 2002_3011
0
200
400
600
19
18
17
16
15
14
Temperature (C)
Hours since release
911

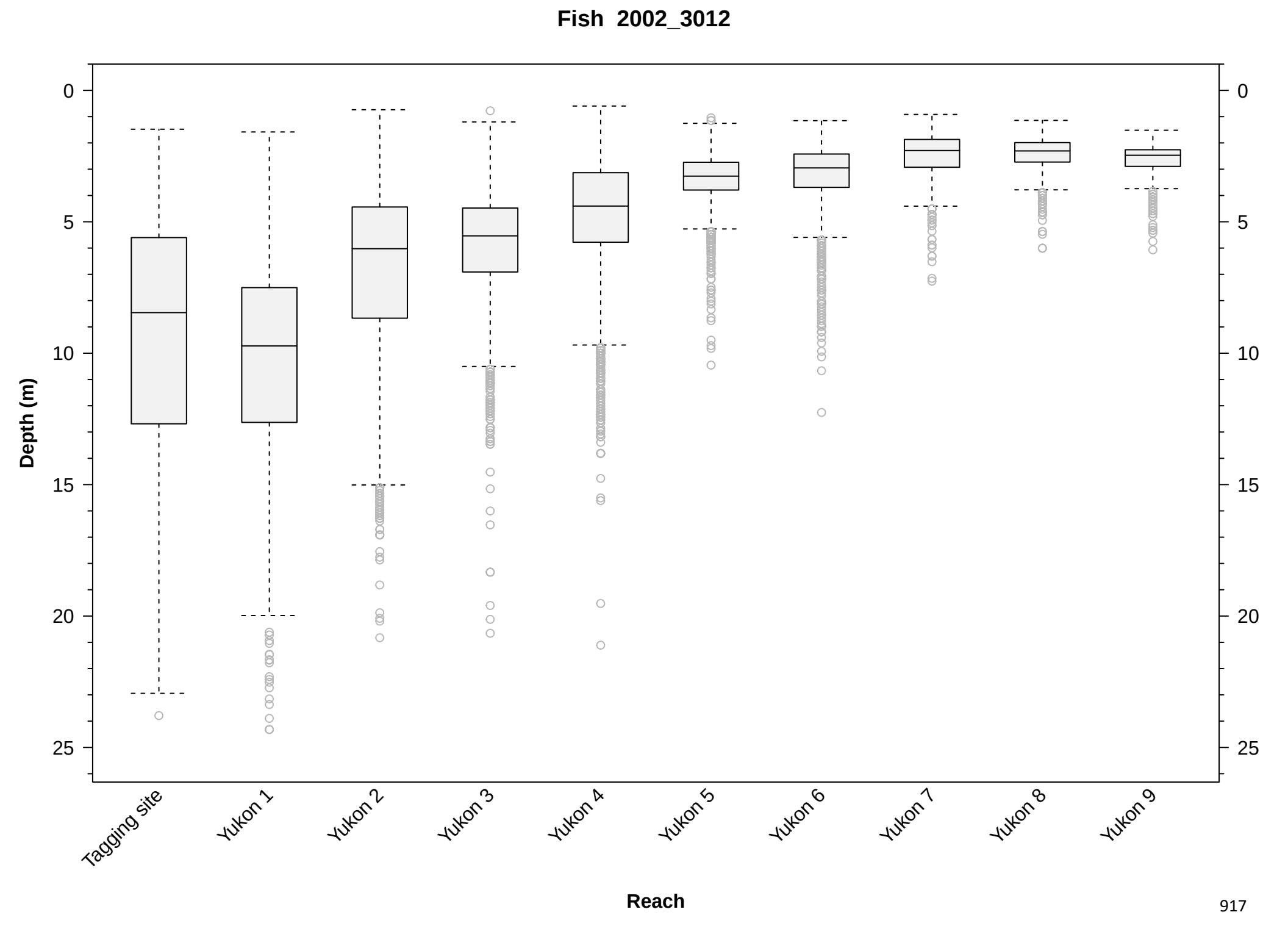

Fish 2002_3011
Temperature (C)
18
17
16
15
14
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Reach
912

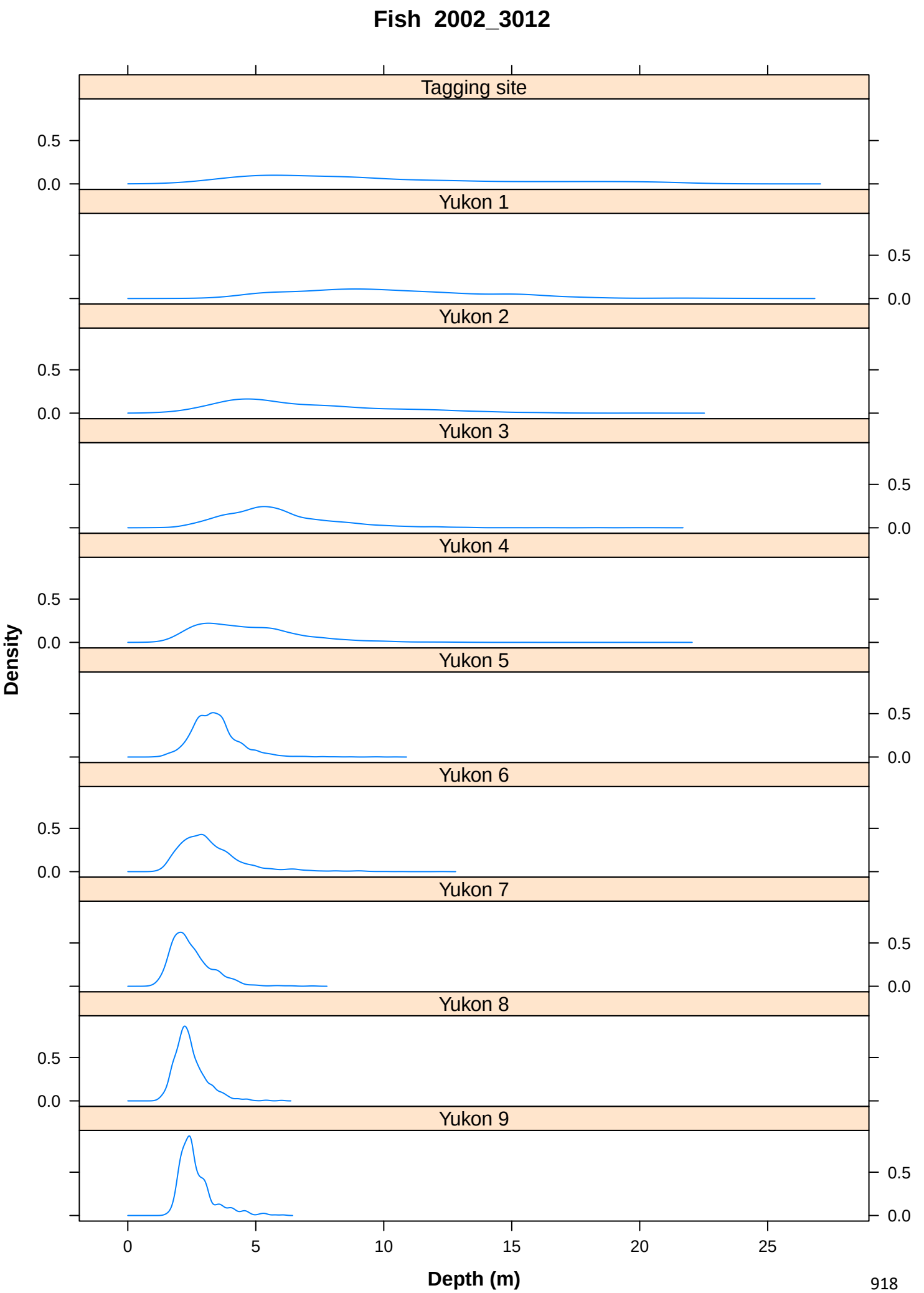

Fish 2002_3011
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Density
Temperature (C)
14
15
16
17
18
19
0
1
2
913

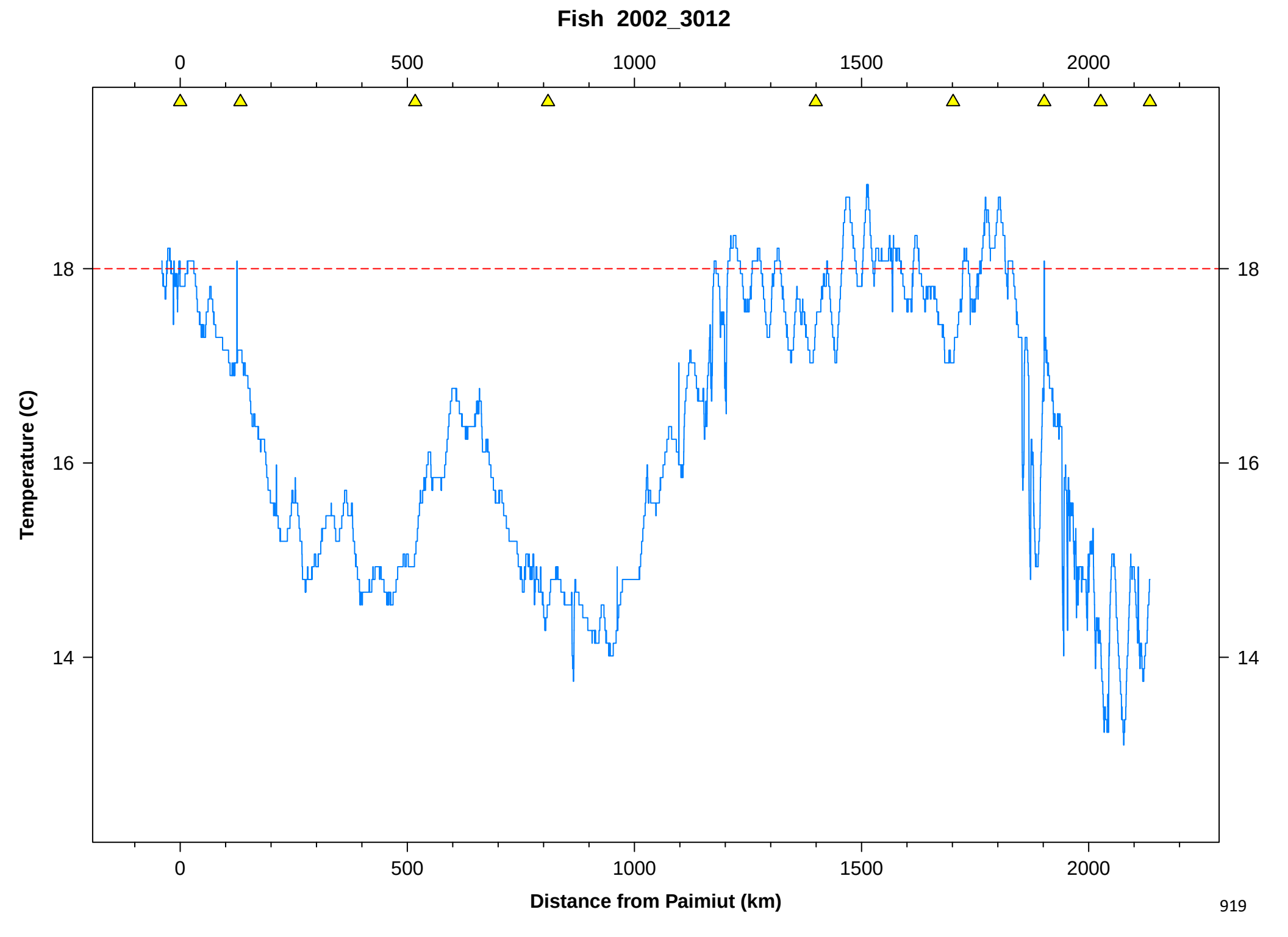

Fish 2002_3011
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Depth (m)
Temperature (C)
14
15
16
17
18
0
10
20

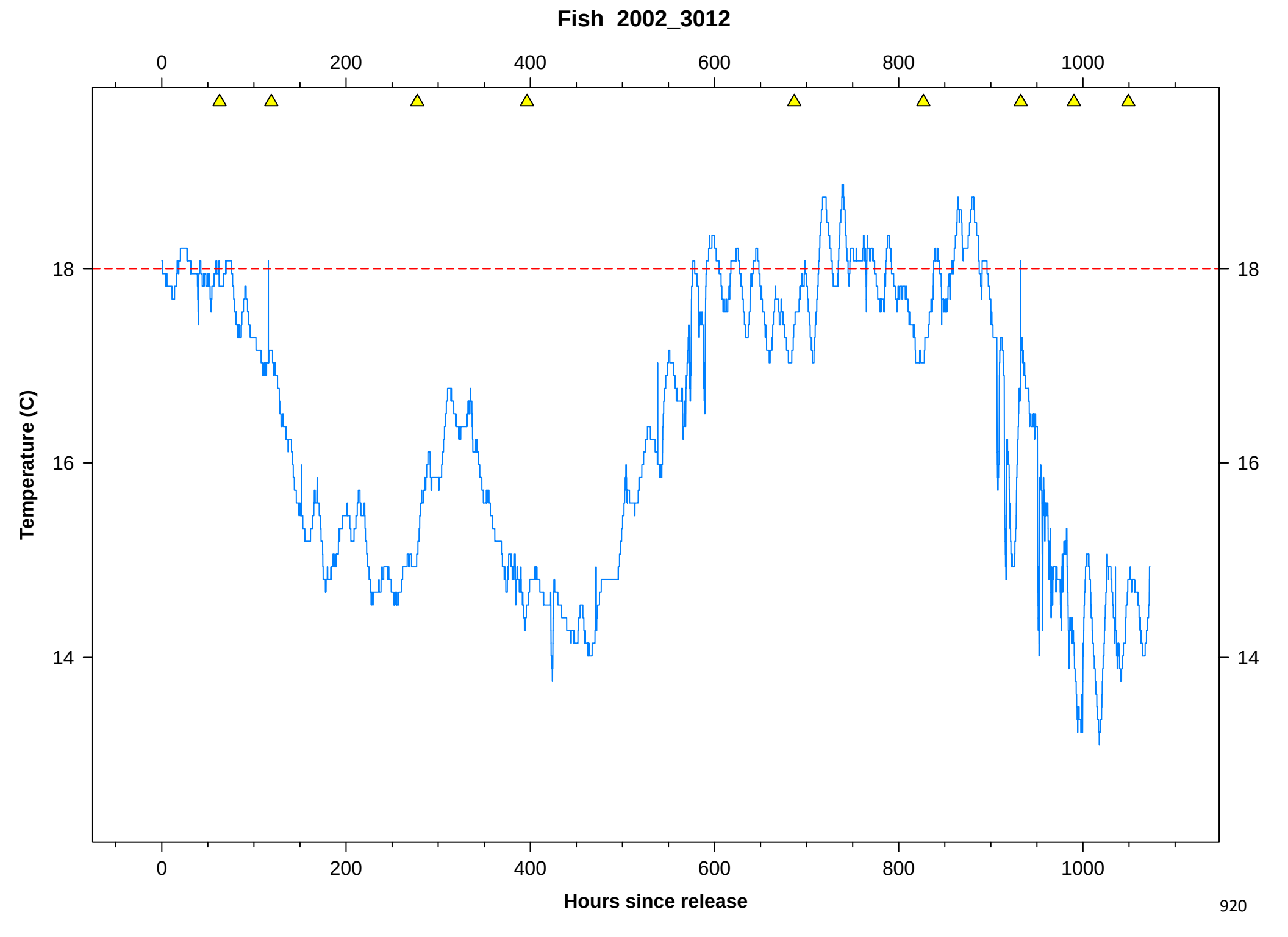

Fish 2002_3012
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
915

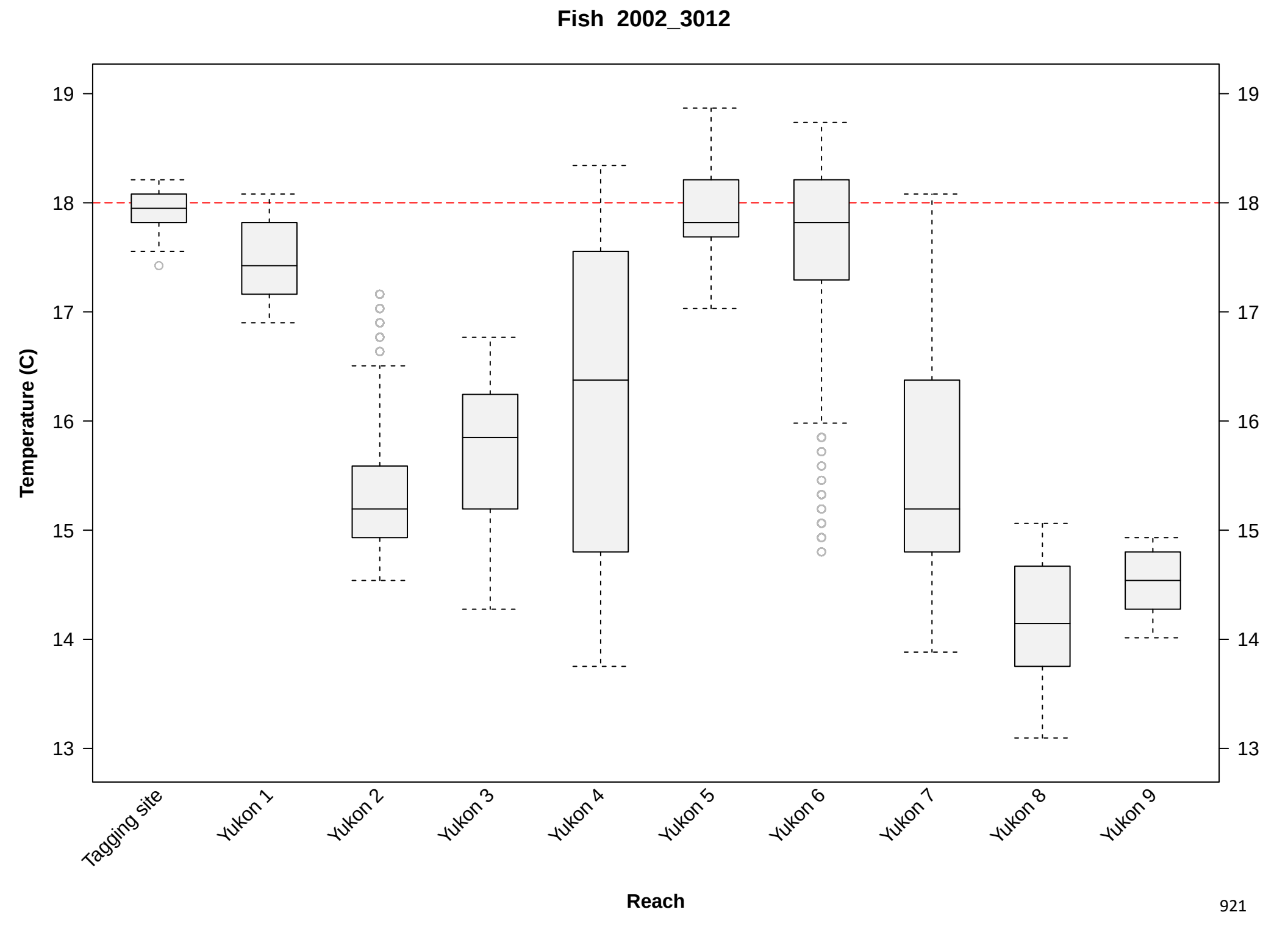

Fish 2002_3012
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release
916

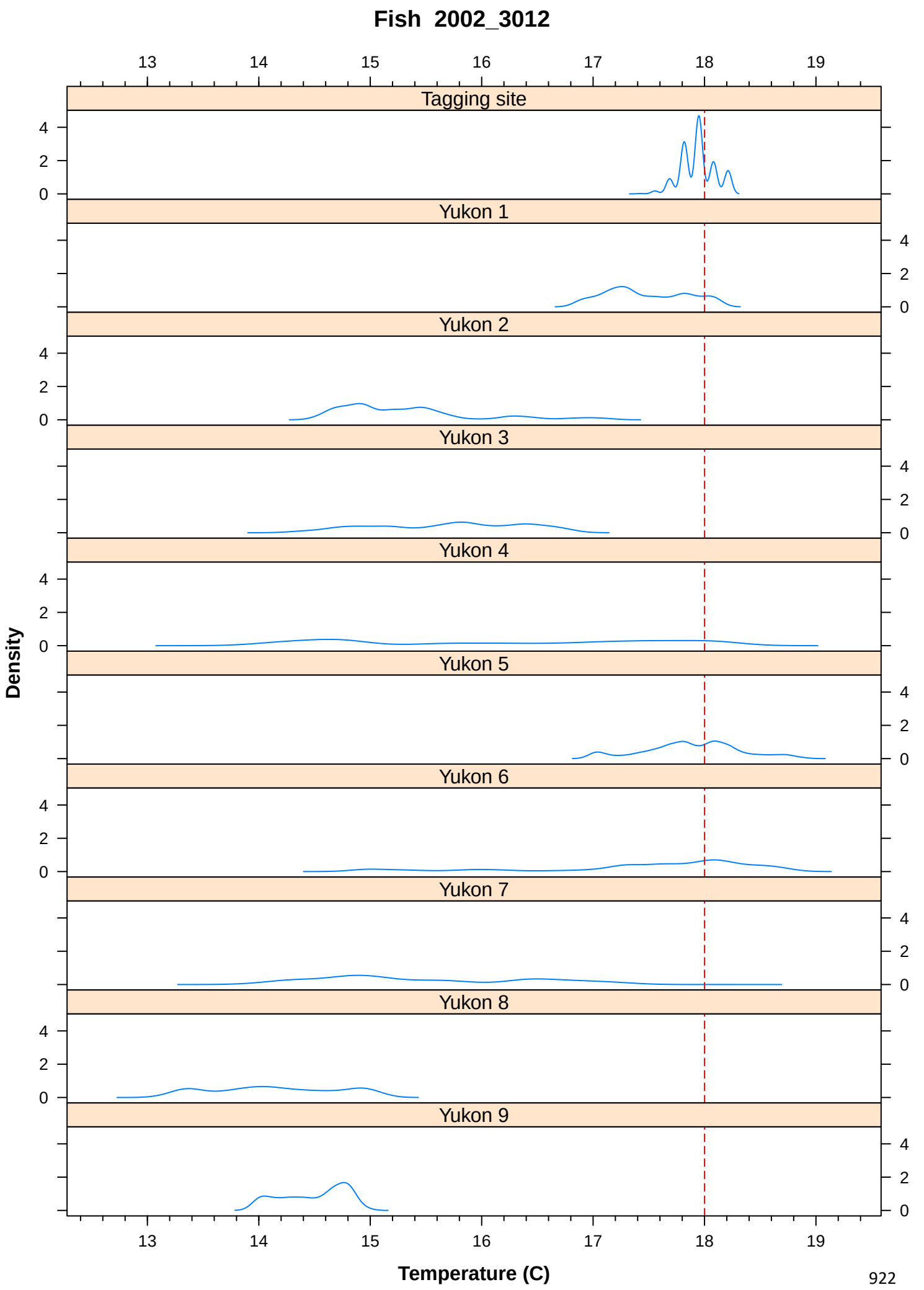

Fish 2002_3012
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Reach
917

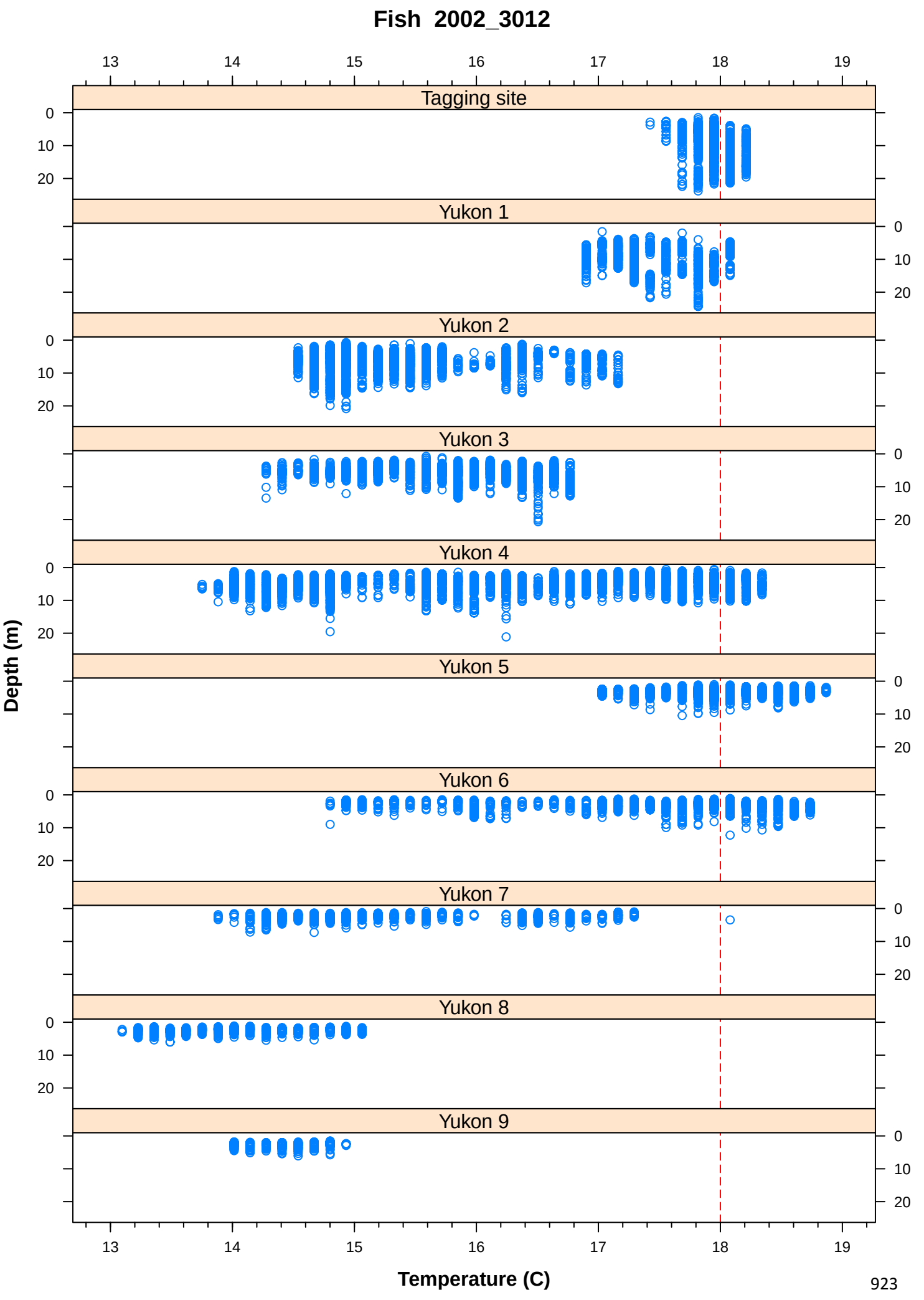

Fish 2002_3012
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Density
0.5
0.0
0
5
10
15
20
25
Depth (m)
918

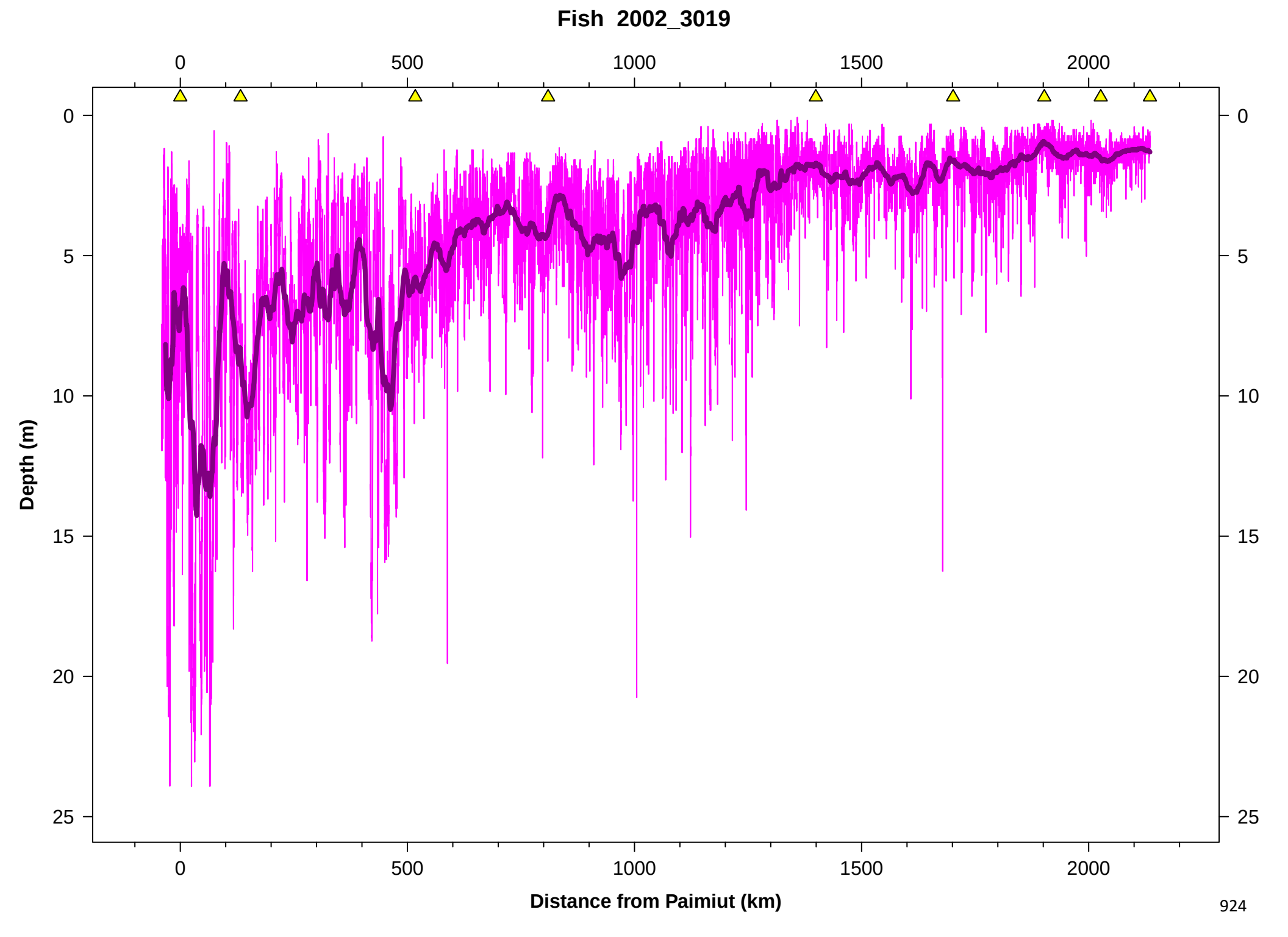

Fish 2002_3012
0
500
1000
1500
2000
18
16
14
Temperature (C)
Distance from Paimiut (km)

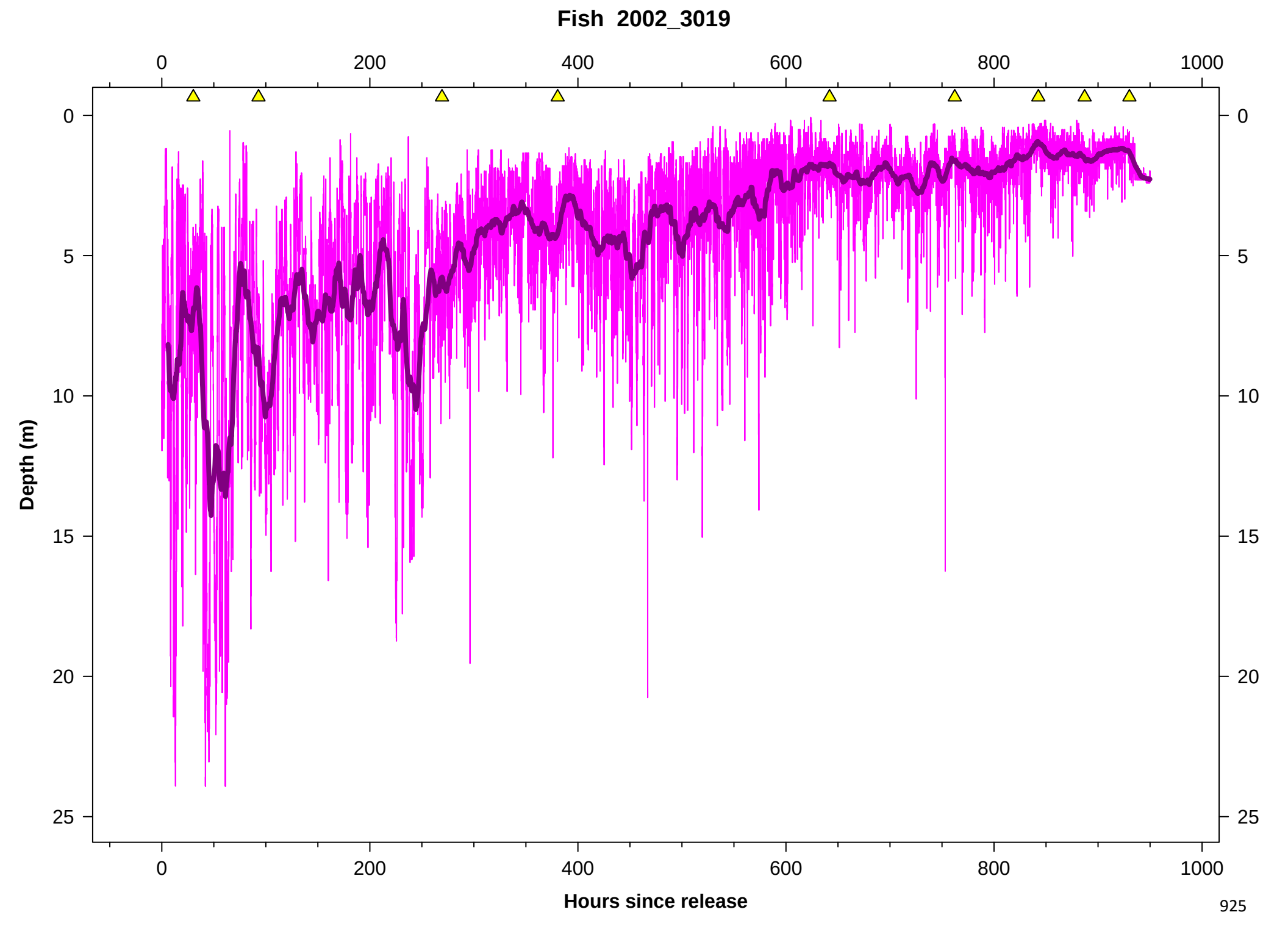

Fish 2002_3012
0
200
400
600
800
1000
18
16
14
Temperature (C)
Hours since release
920

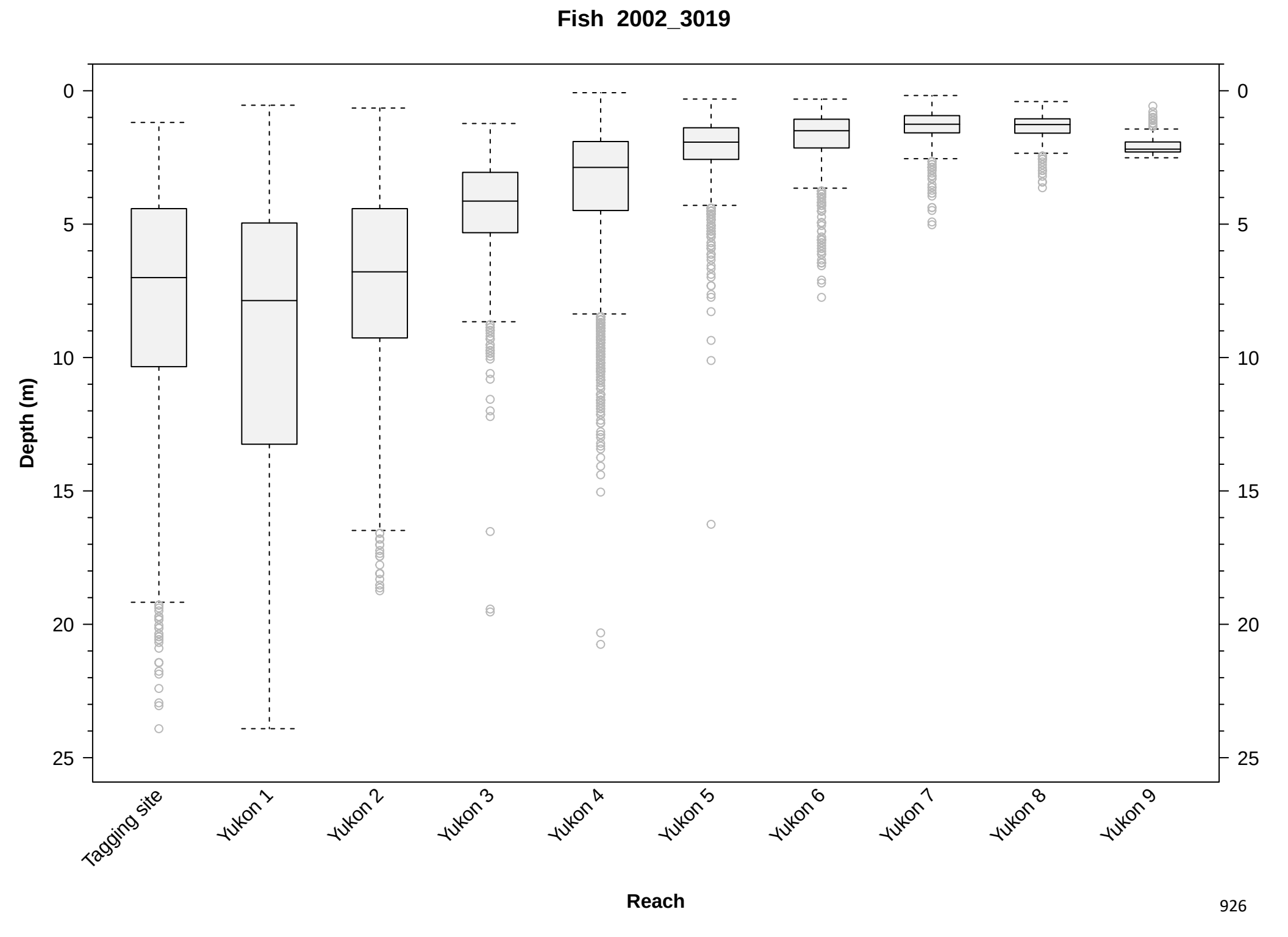

Fish 2002_3012
Temperature (C)
19
18
17
16
15
14
13
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Reach
921

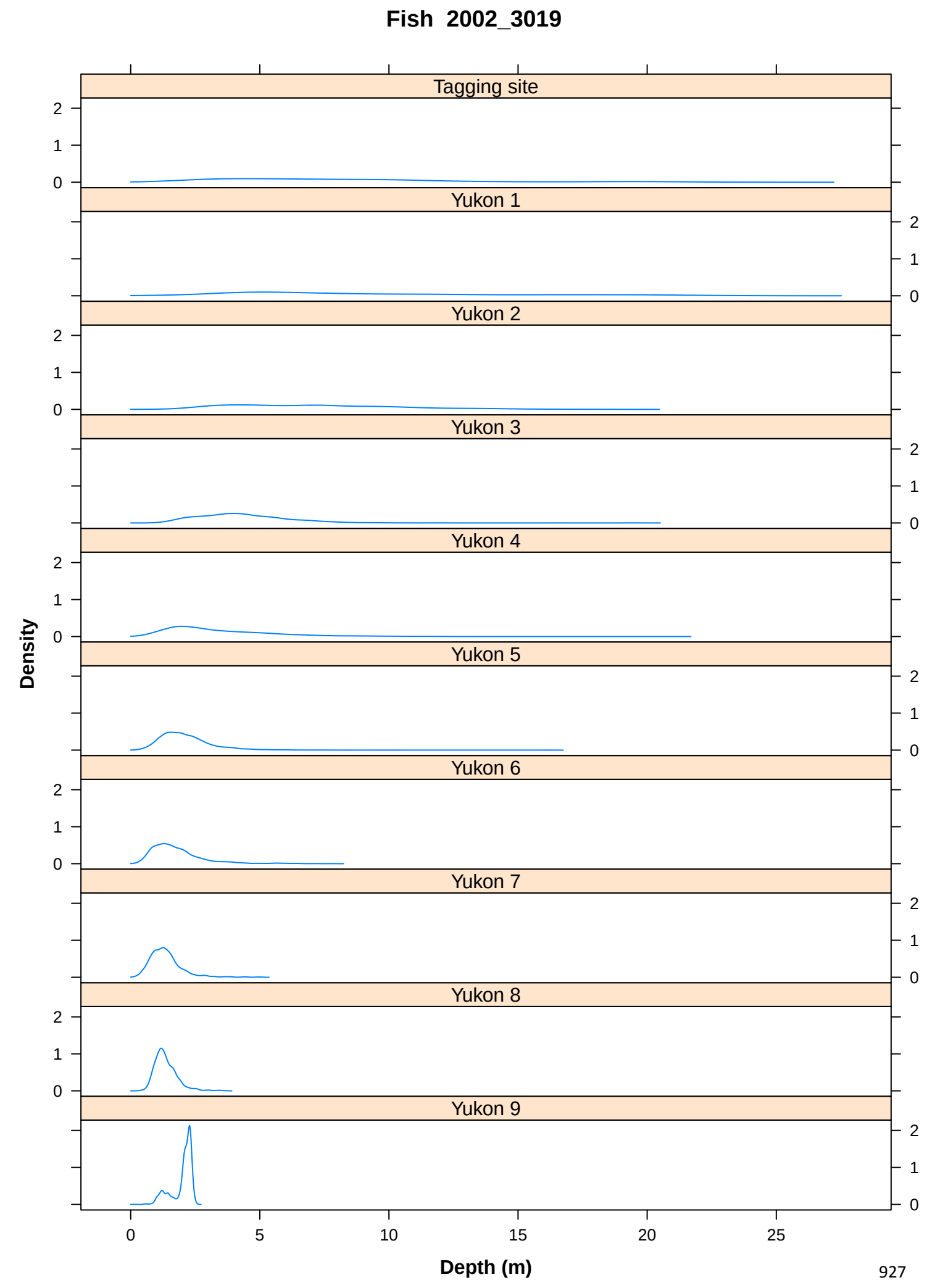

Fish 2002_3012
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Density
Temperature (C)
13
14
15
16
17
18
19
0
2
4

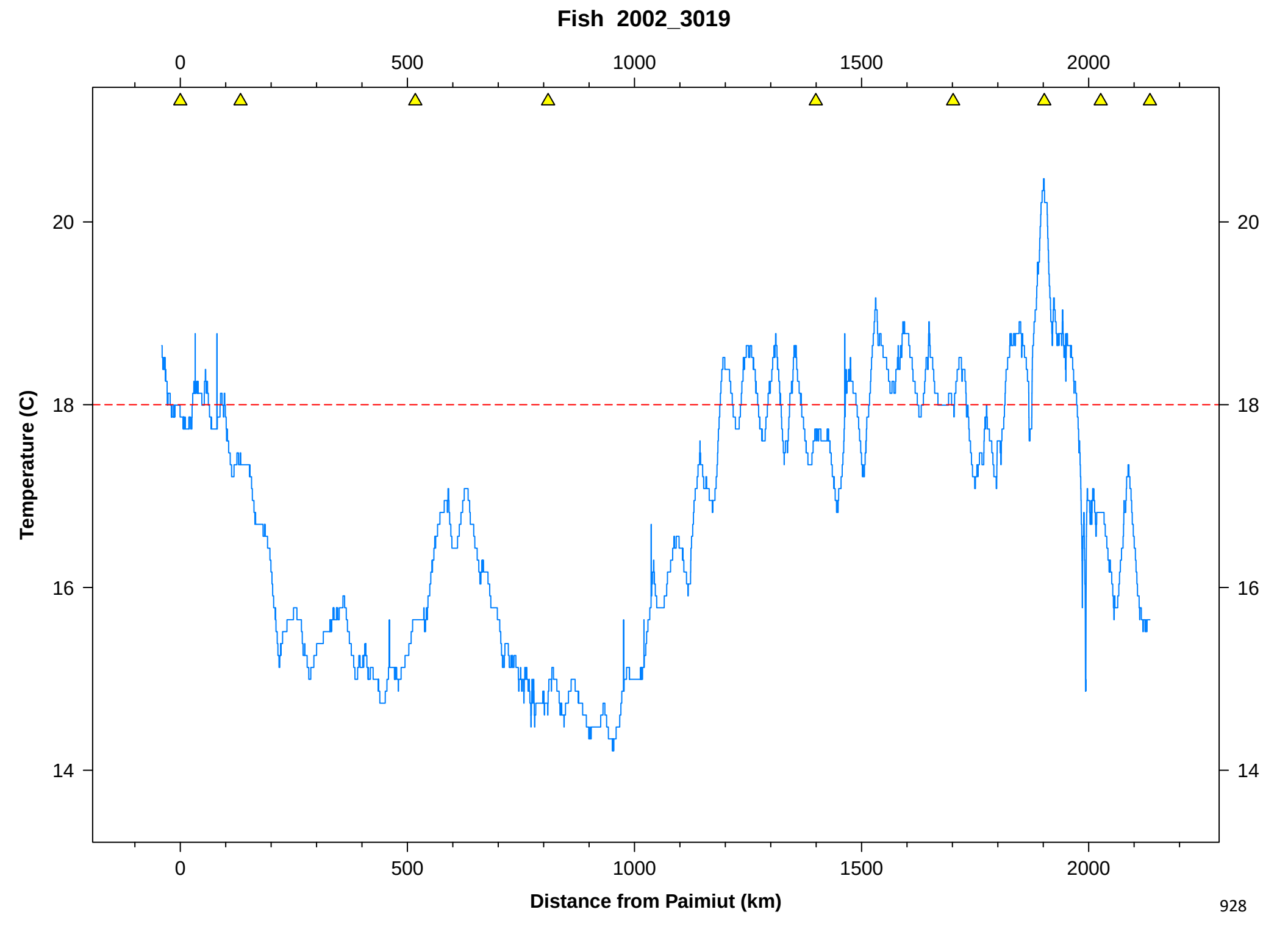

Fish 2002_3012
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Depth (m)
Temperature (C)
13
14
15
16
17
18
19
0
10
20

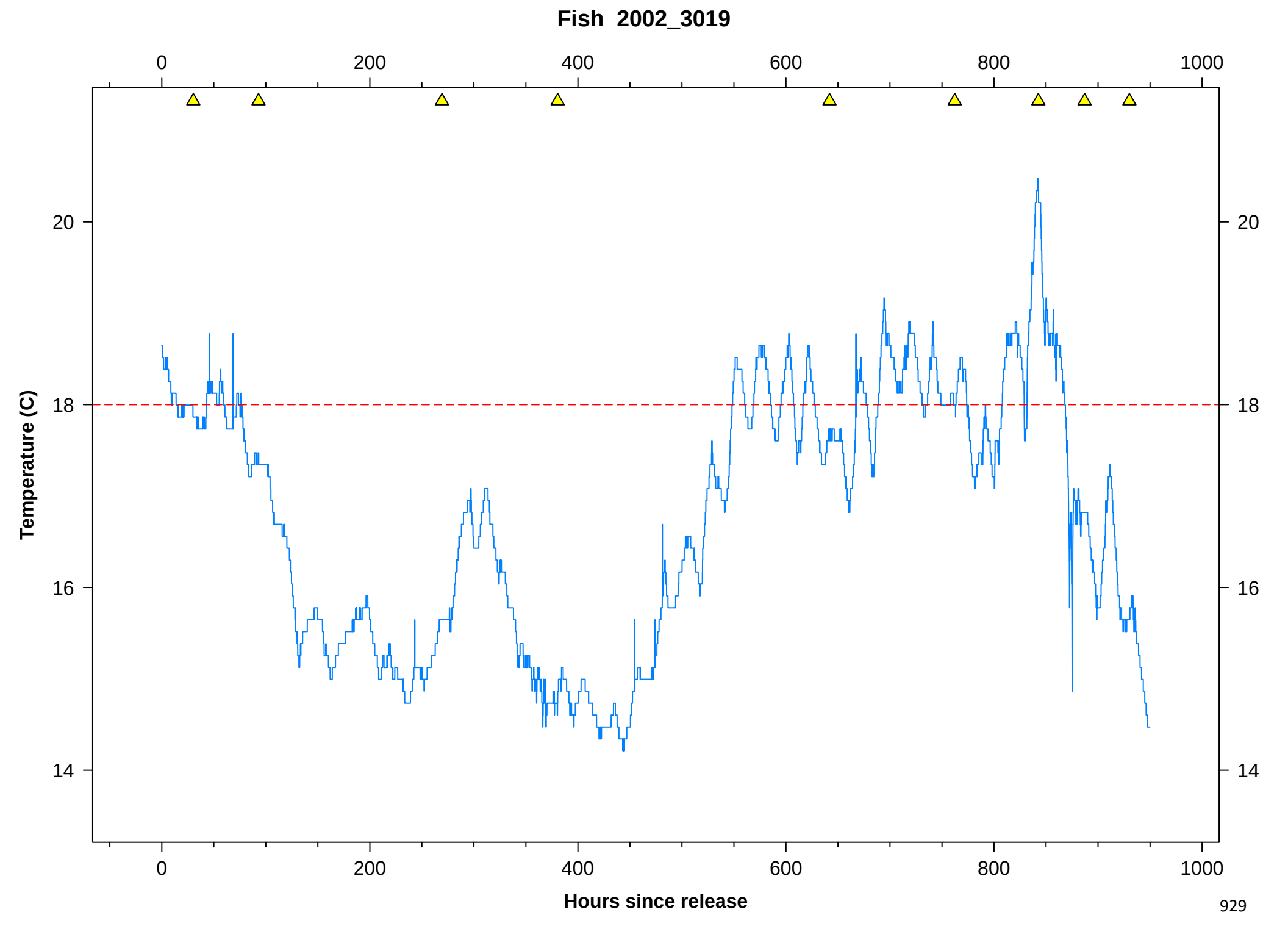

Fish 2002_3019
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

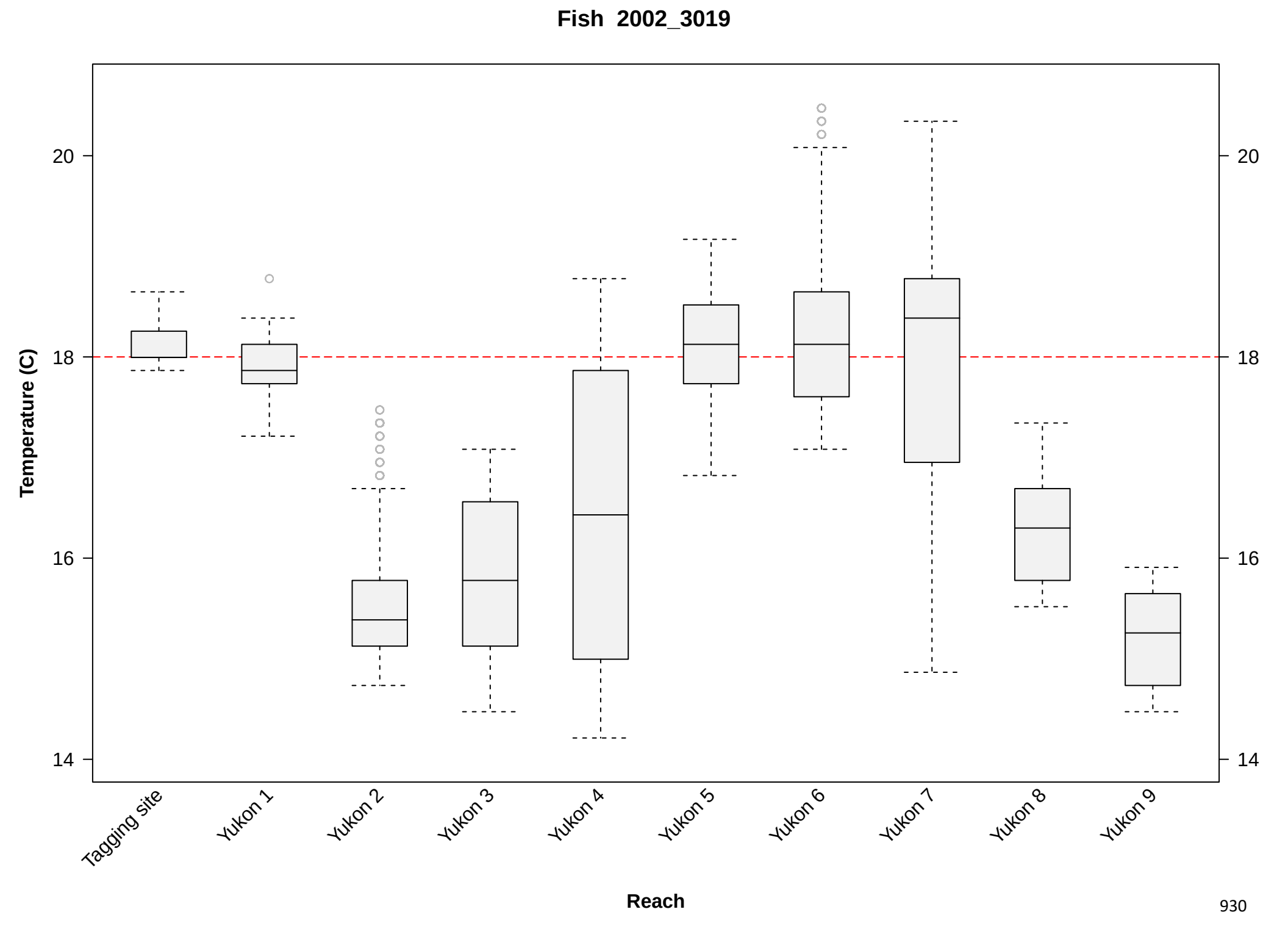

Fish 2002_3019
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release
925

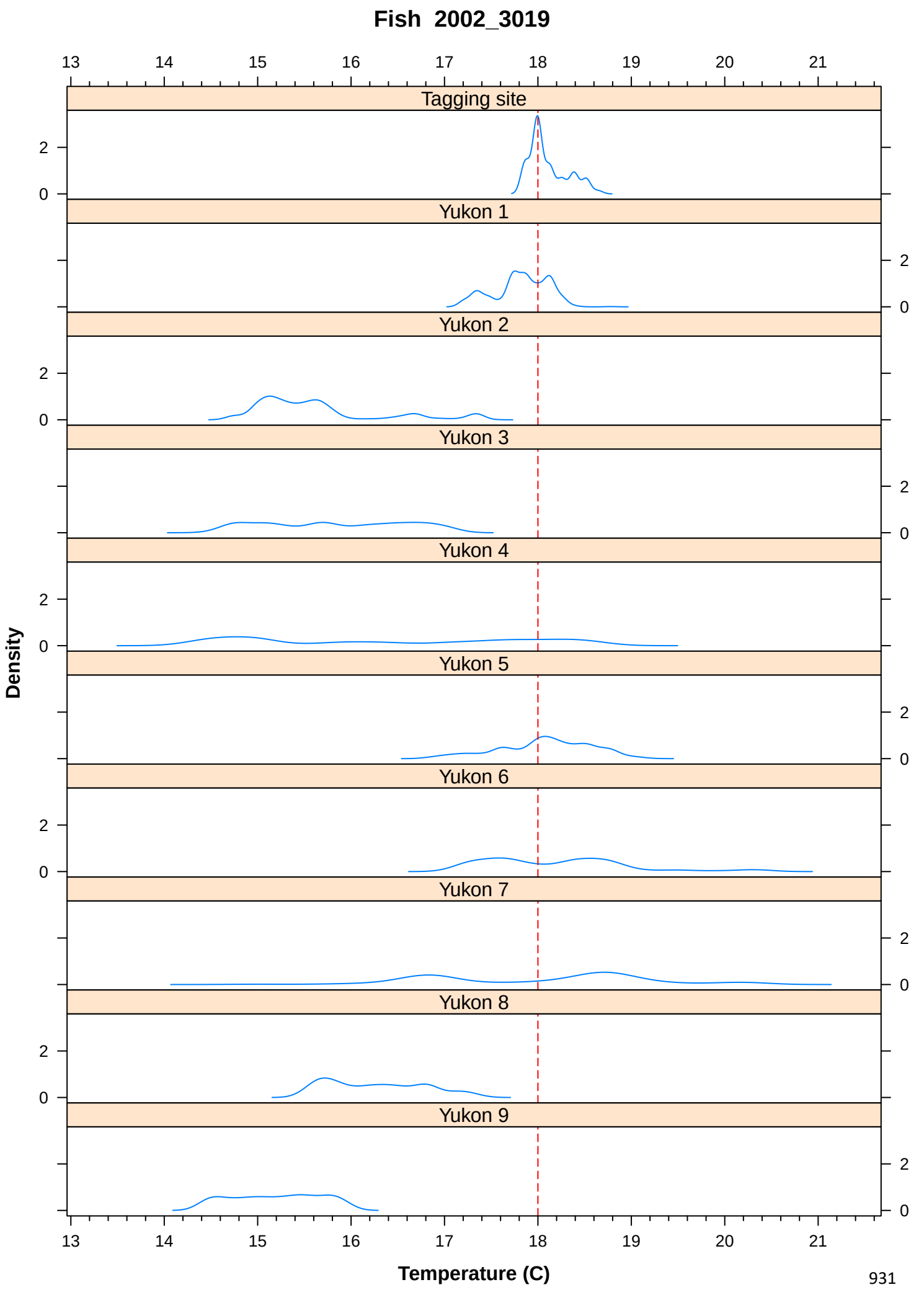

Fish 2002_3019
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Reach

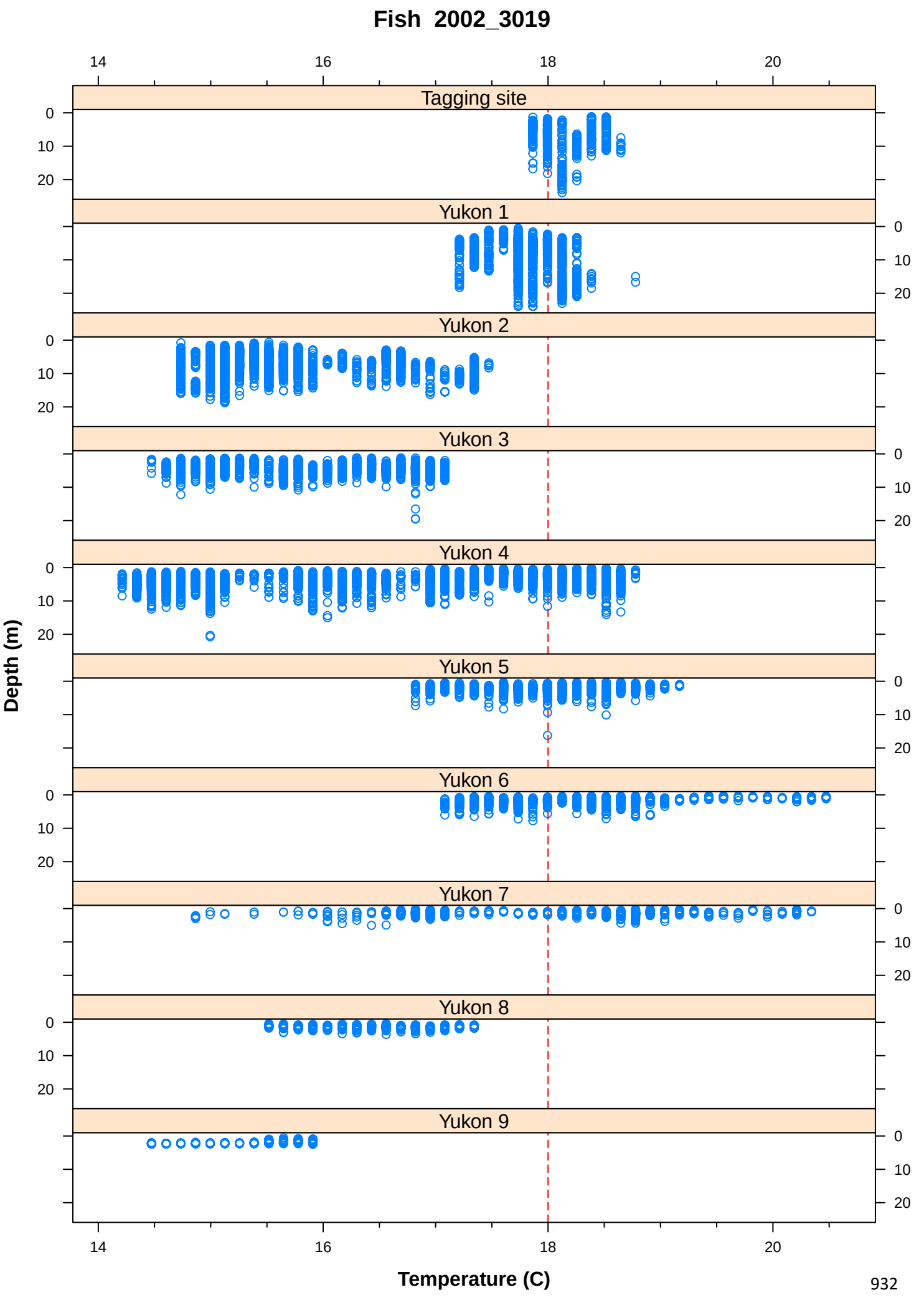

Fish 2002_3019
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Density
0
1
2
0
5
10
15
20
25
Depth (m)

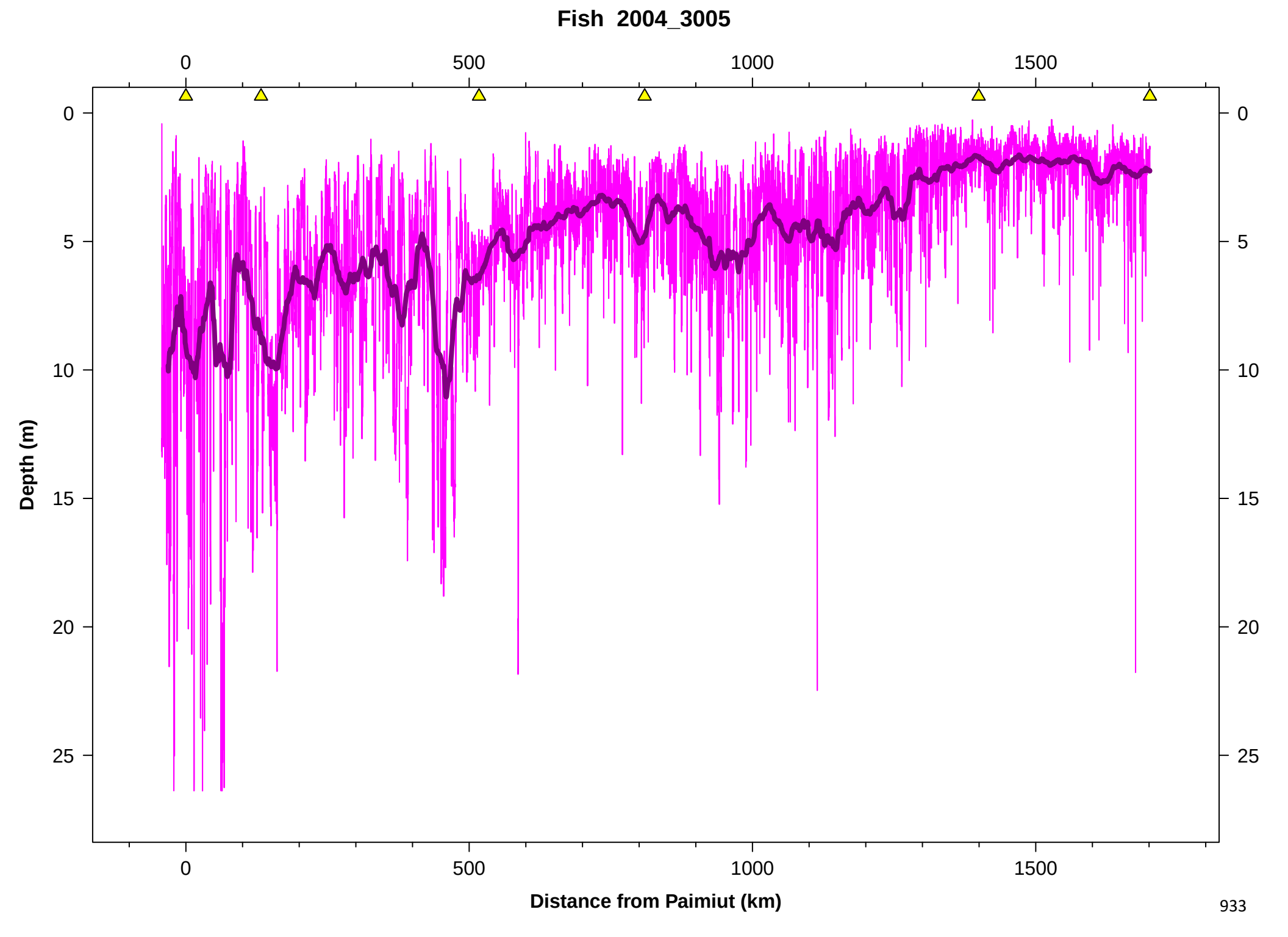

Fish 2002_3019
0
500
1000
1500
2000
20
18
16
14
Temperature (C)
Distance from Paimiut (km)

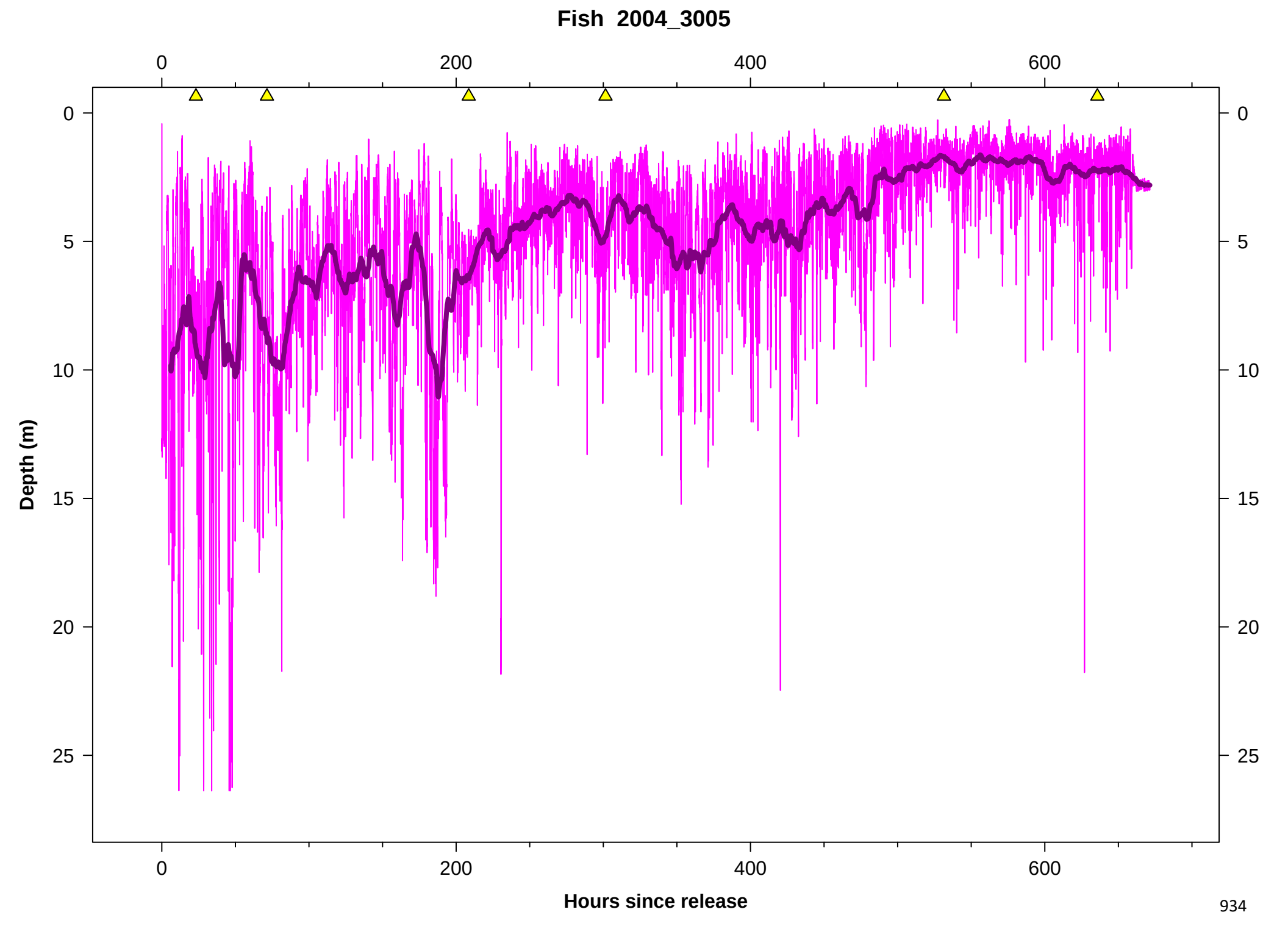

Fish 2002_3019
0
200
400
600
800
1000
20
18
16
14
Temperature (C)
Hours since release
929

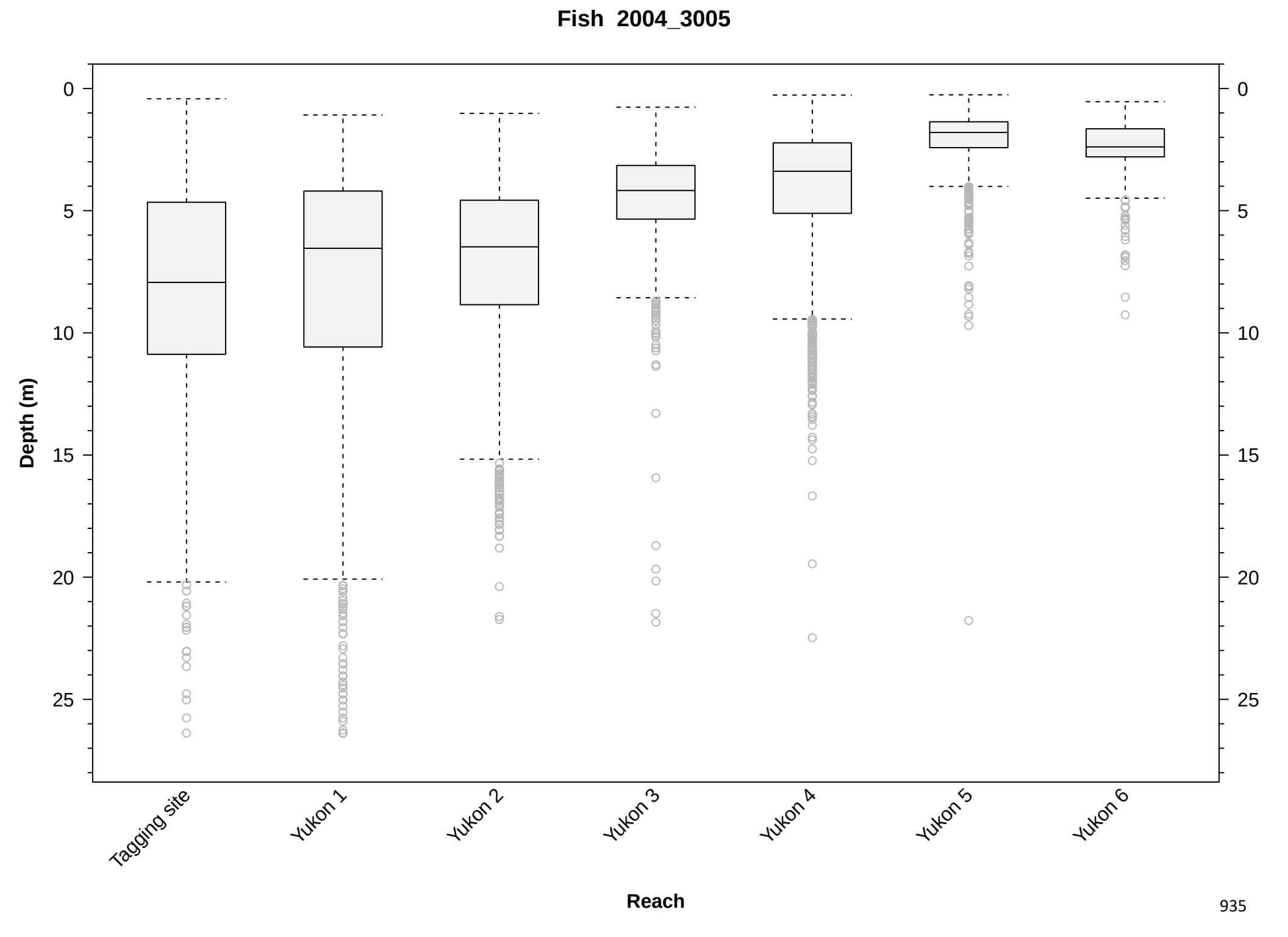

Fish 2002_3019
Temperature (C)
20
18
16
14
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Reach
930

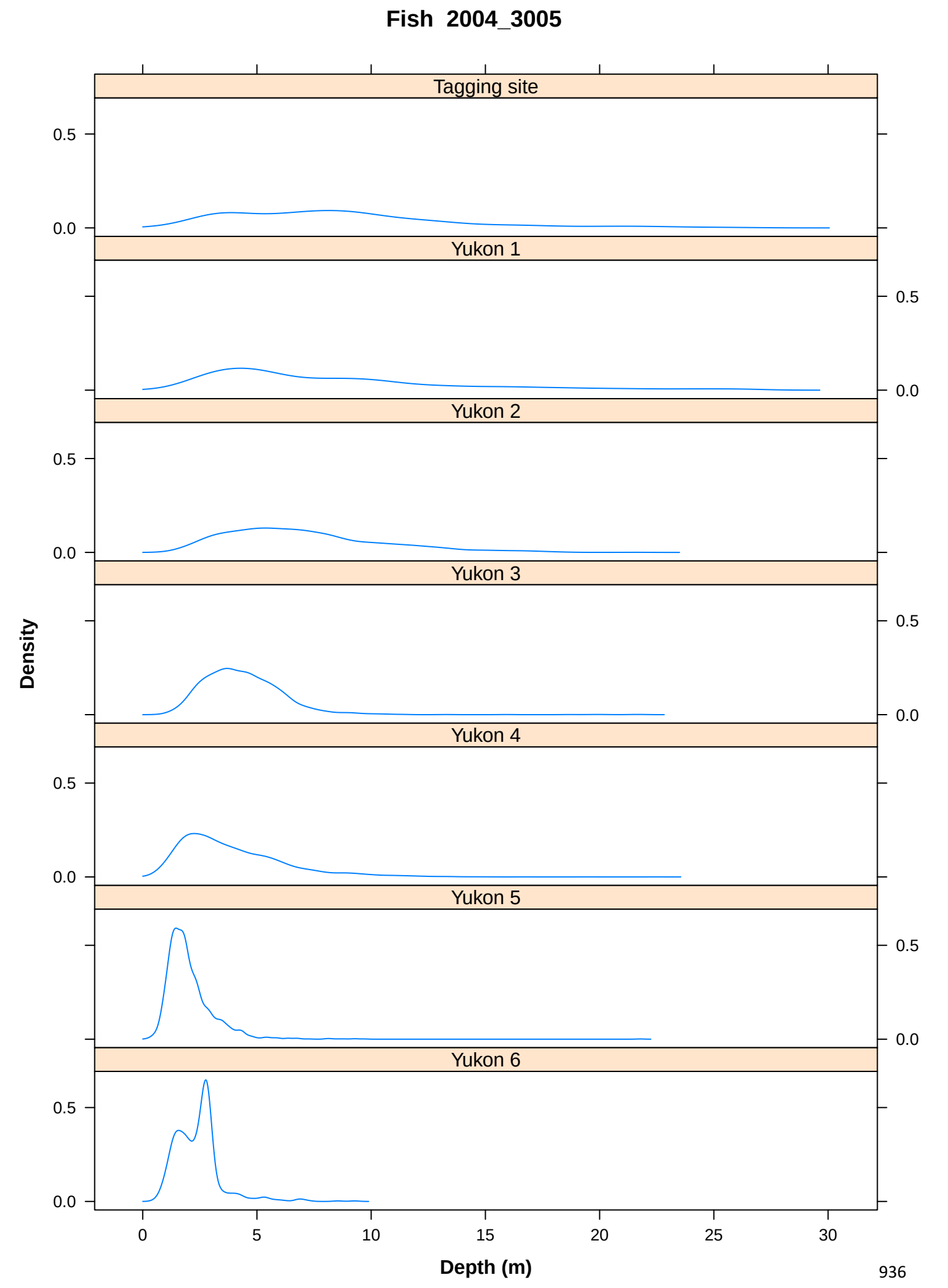

Fish 2002_3019
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Density
Temperature (C)
13
14
15
16
17
18
19
20
21
0
2

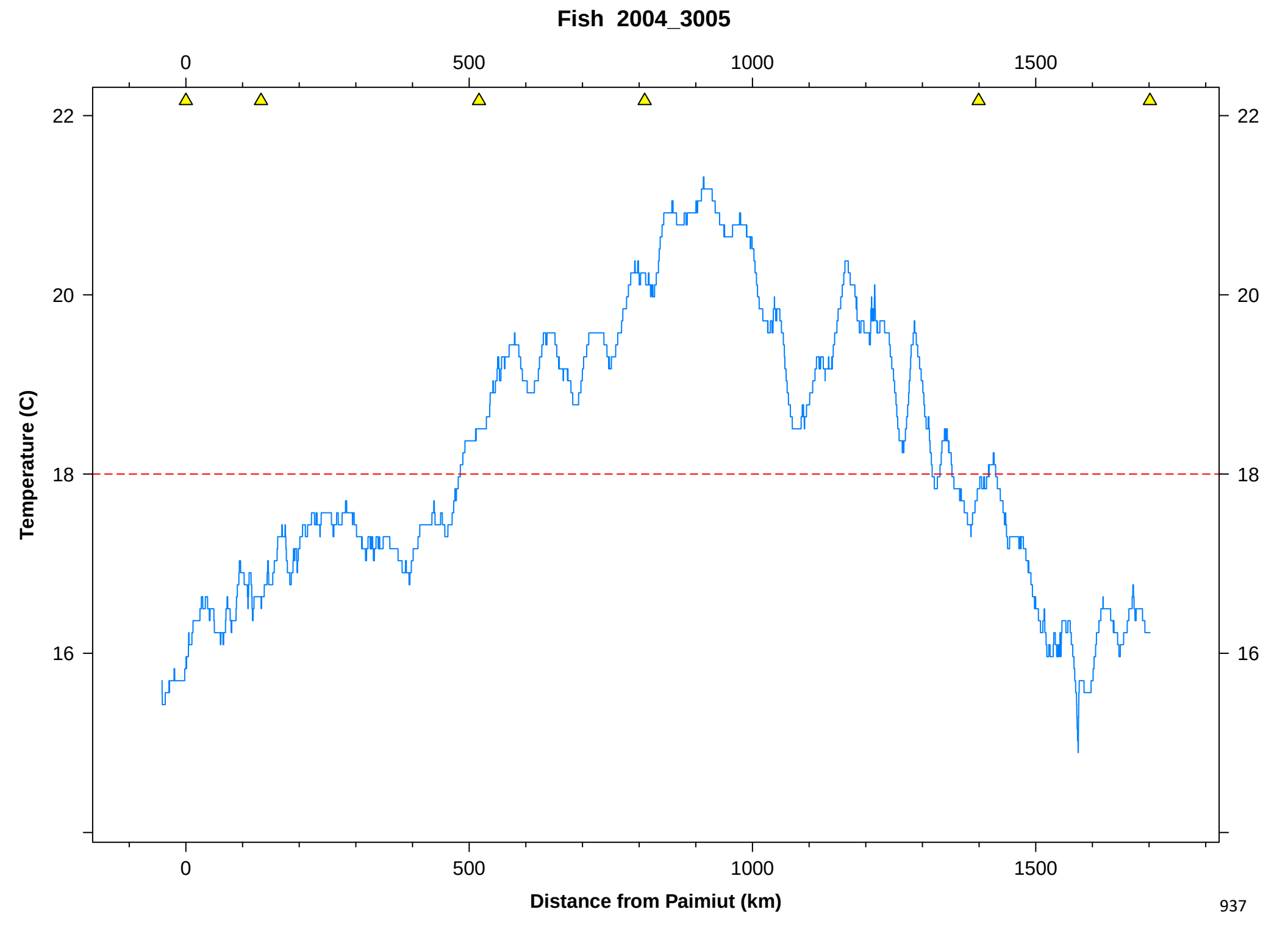

Fish 2002_3019
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Depth (m)
Temperature (C)
14
16
18
20
0
10
20

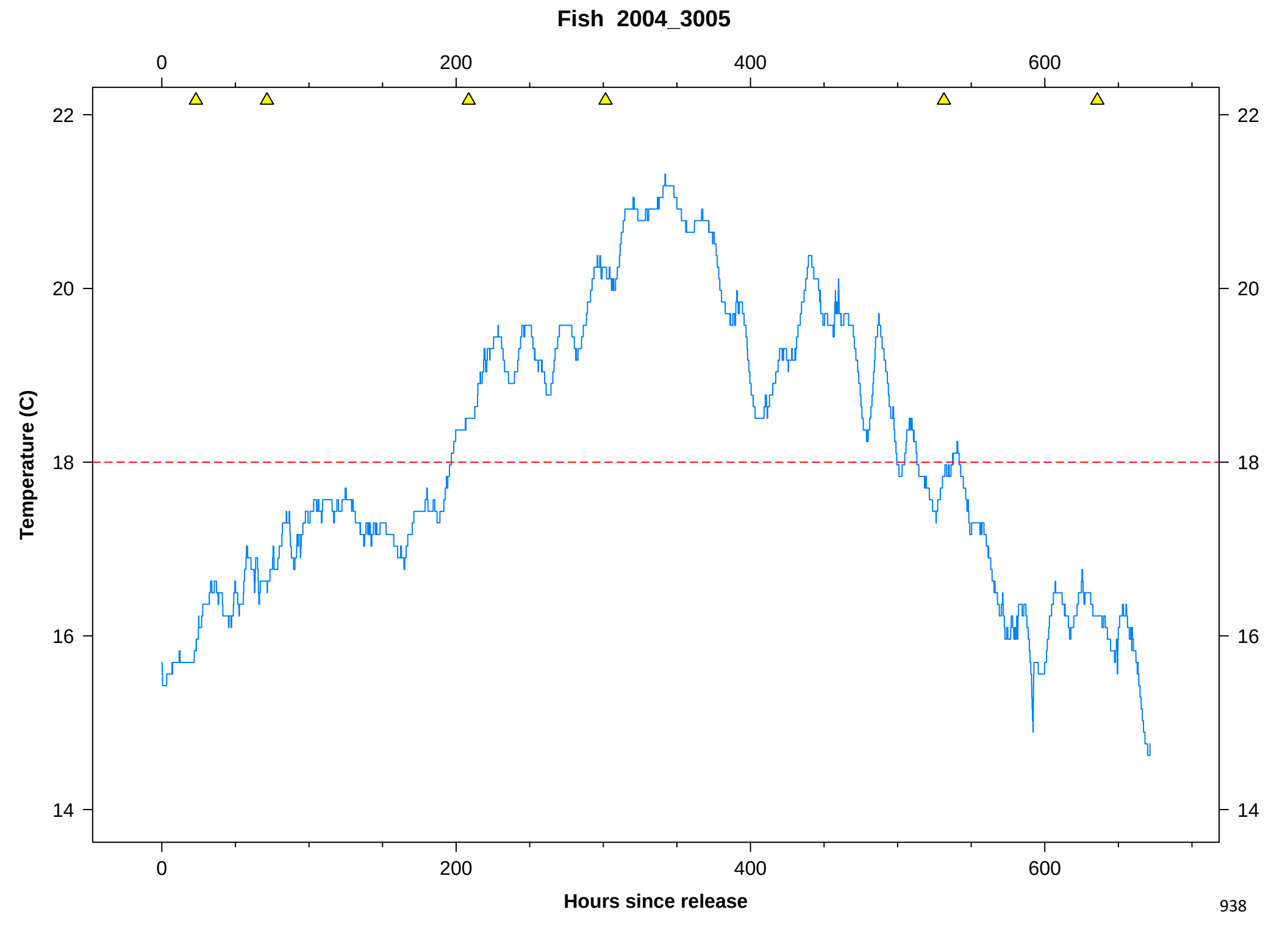

Fish 2004_3005
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

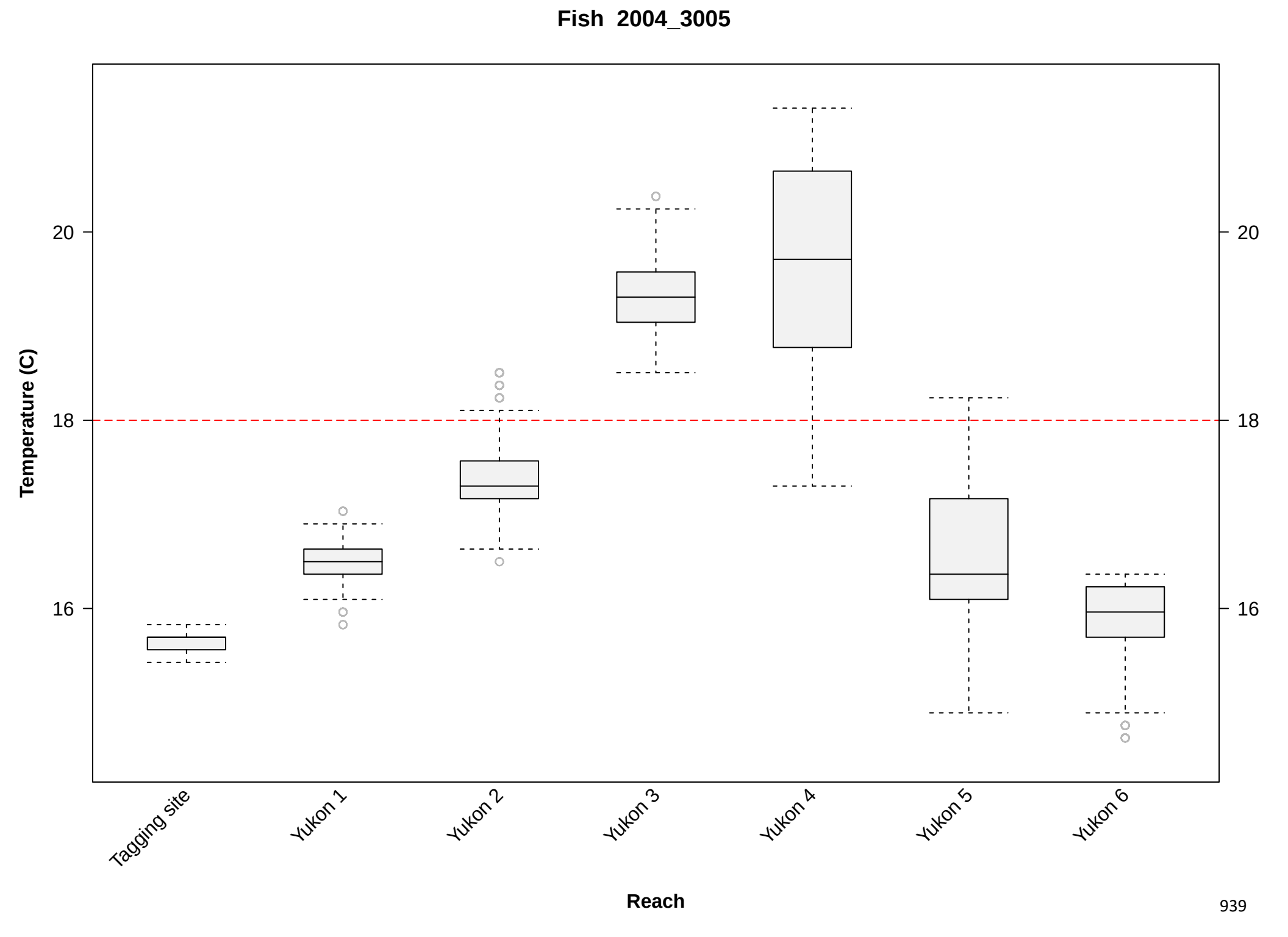

Fish 2004_3005
0
200
400
600
0
5
10
15
20
25
Depth (m)
Hours since release

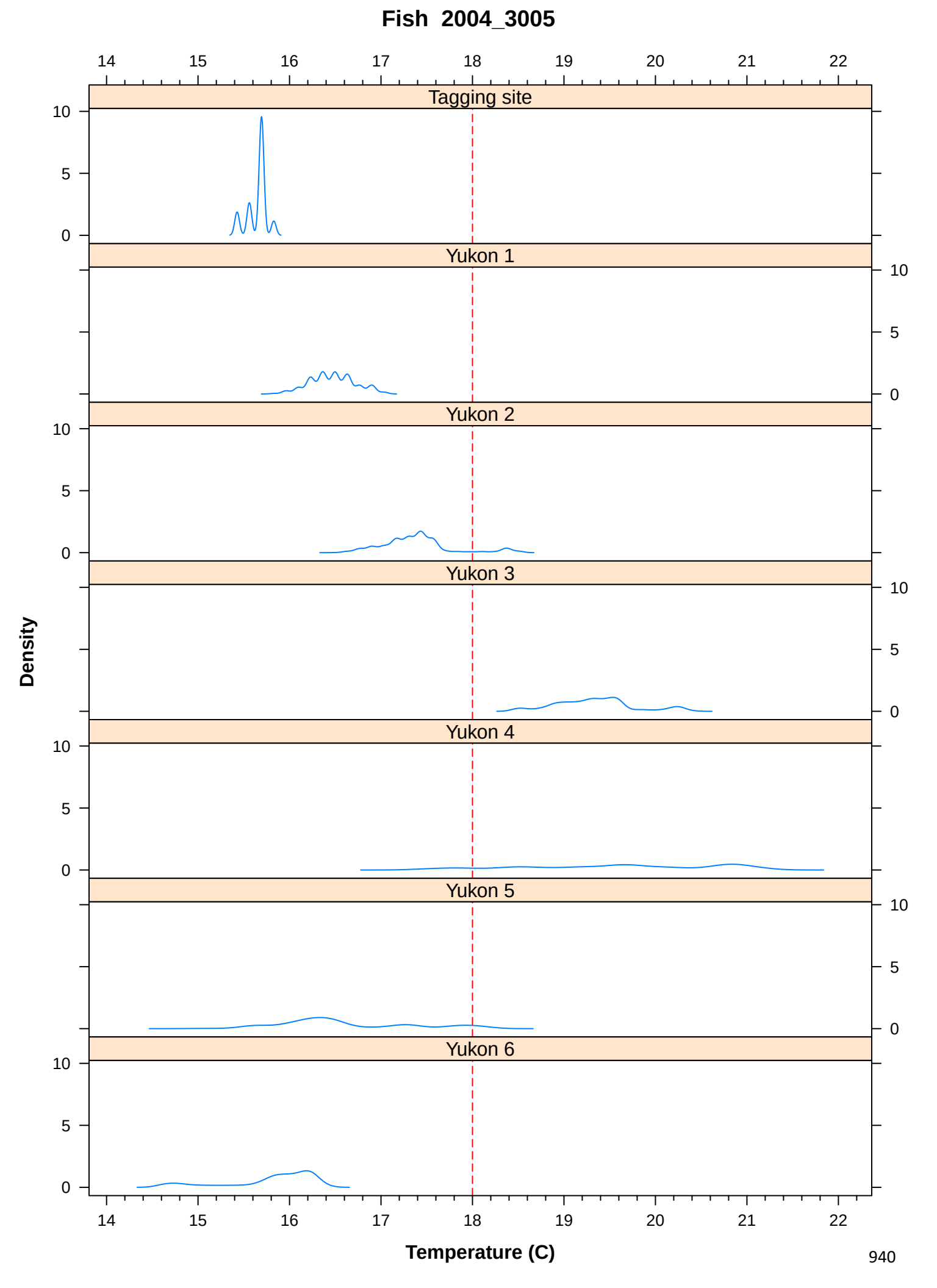

Fish 2004_3005
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Reach

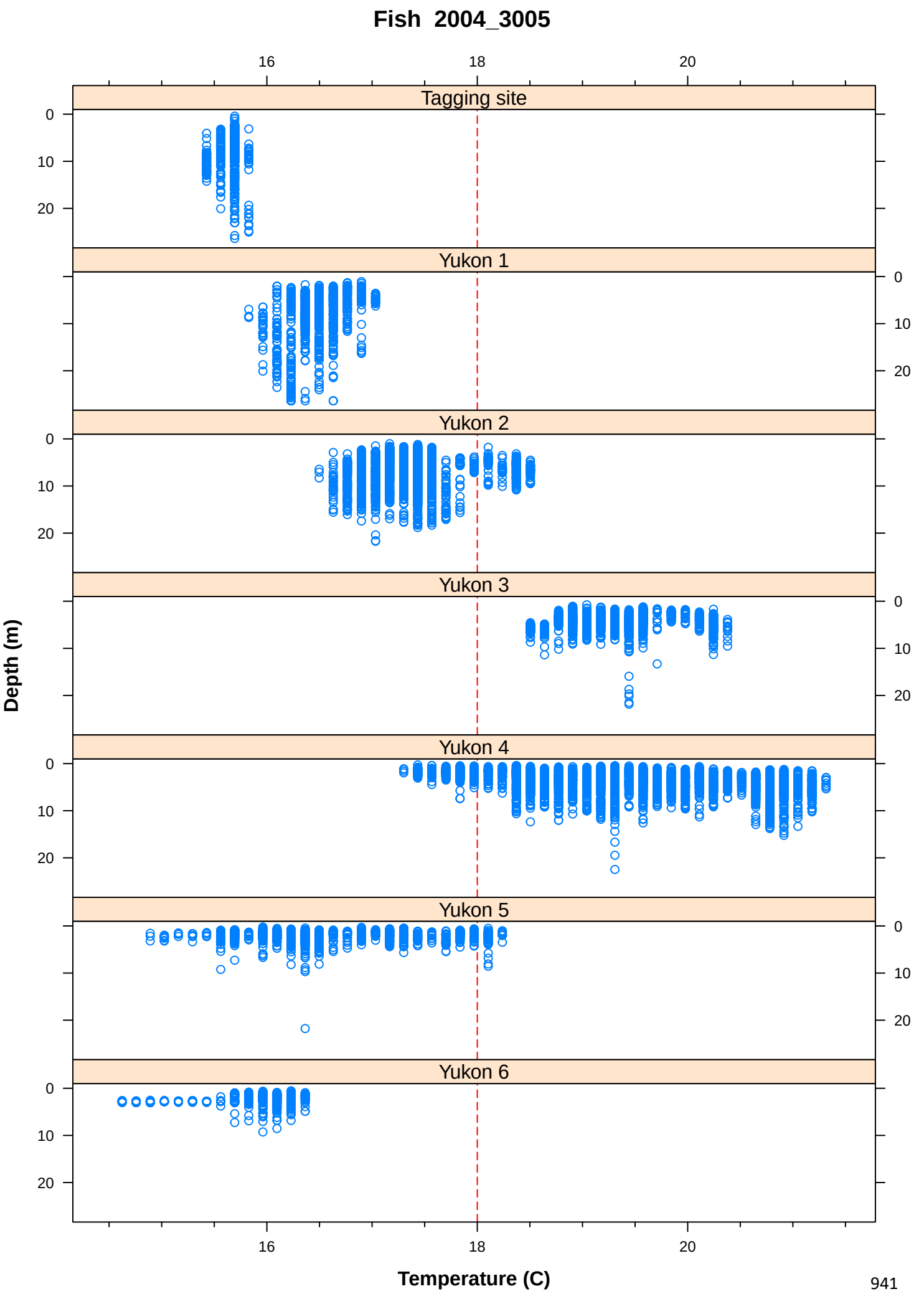

Fish 2004_3005
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Density
0.0
0.5
0
5
10
15
20
25
30
Depth (m)


Fish 2004_3005
0
500
1000
1500
22
20
18
16
Temperature (C)
Distance from Paimiut (km)
937


Fish 2004_3005
0
200
400
600
22
20
18
16
14
Temperature (C)
Hours since release
938


Fish 2004_3005
Temperature (C)
20
18
16
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Reach
939


Fish 2004_3005
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Density
Temperature (C)
14
15
16
17
18
19
20
21
22
0
5
10


Fish 2004_3005
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Depth (m)
Temperature (C)
16
18
20
0
10
20
941

Appendix 9. -- Swimming depths and thermal conditions encountered during the spawning migration by Yukon River Chinook salmon stocks returning to the Upper Yukon in 2002-2004.

Charley 945

Klondike 956

Stewart 996

White 1007

Pelly 1016

Tatchun 1083

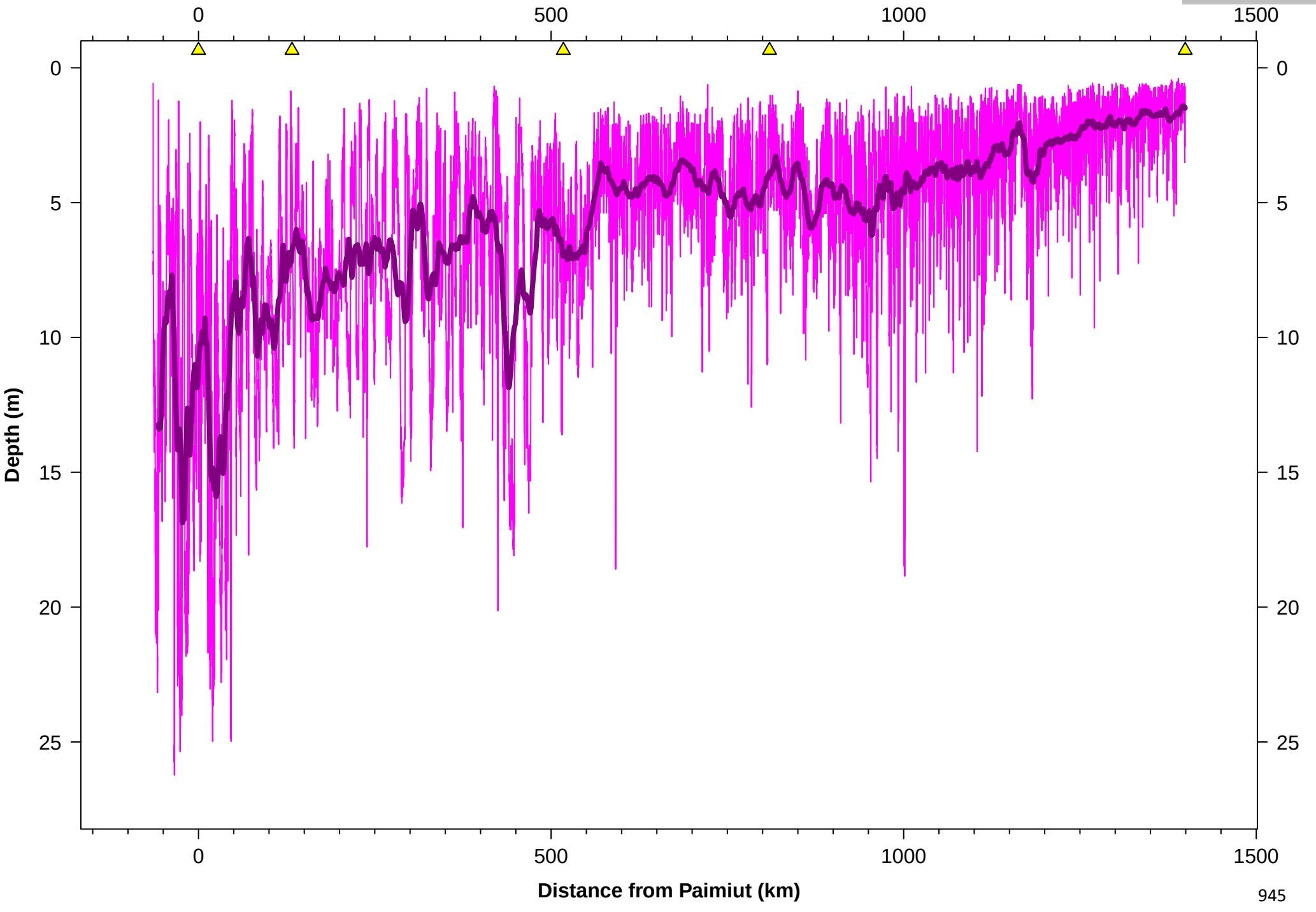
Big Salmon 1092

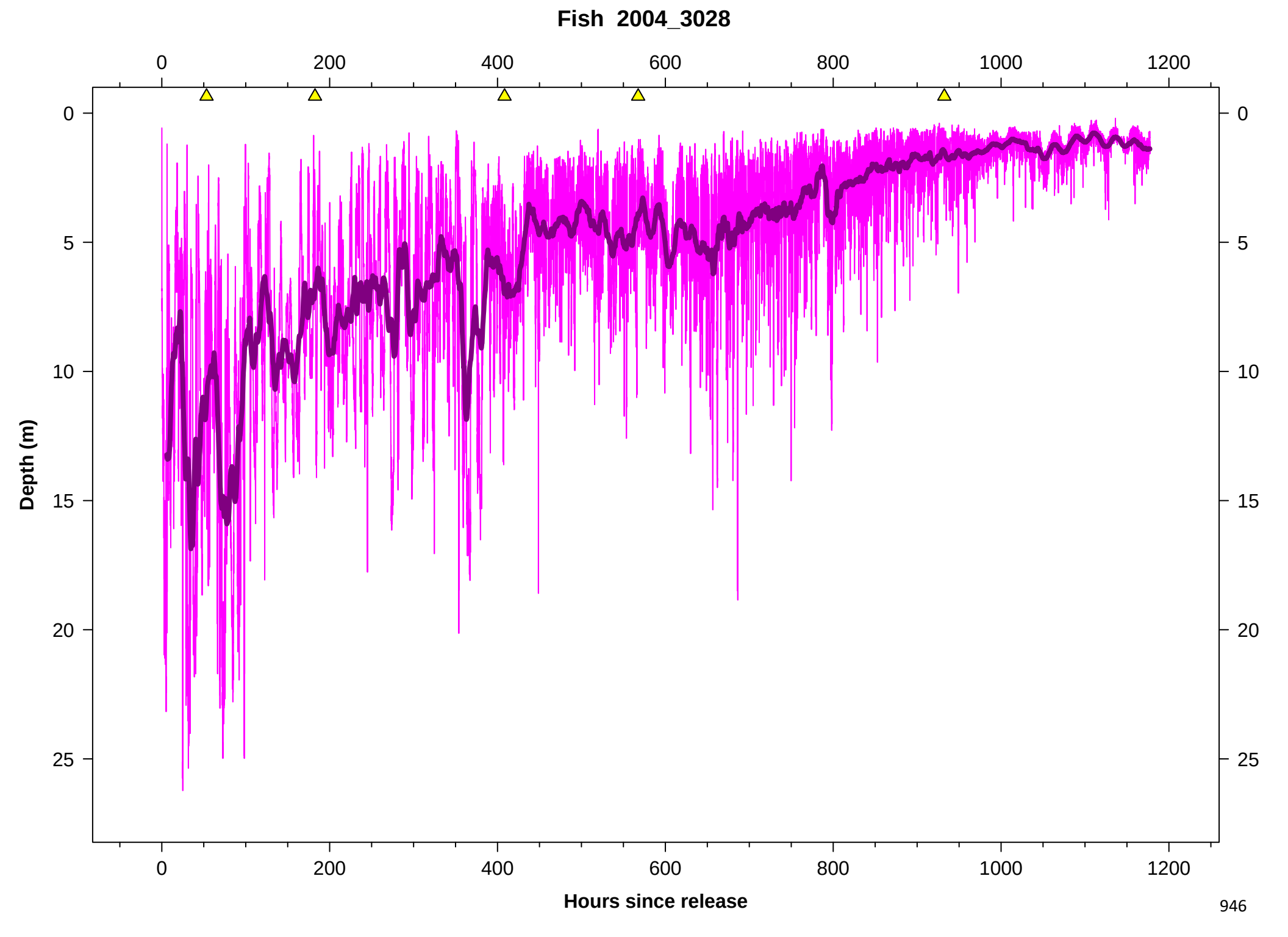
Teslin 1132

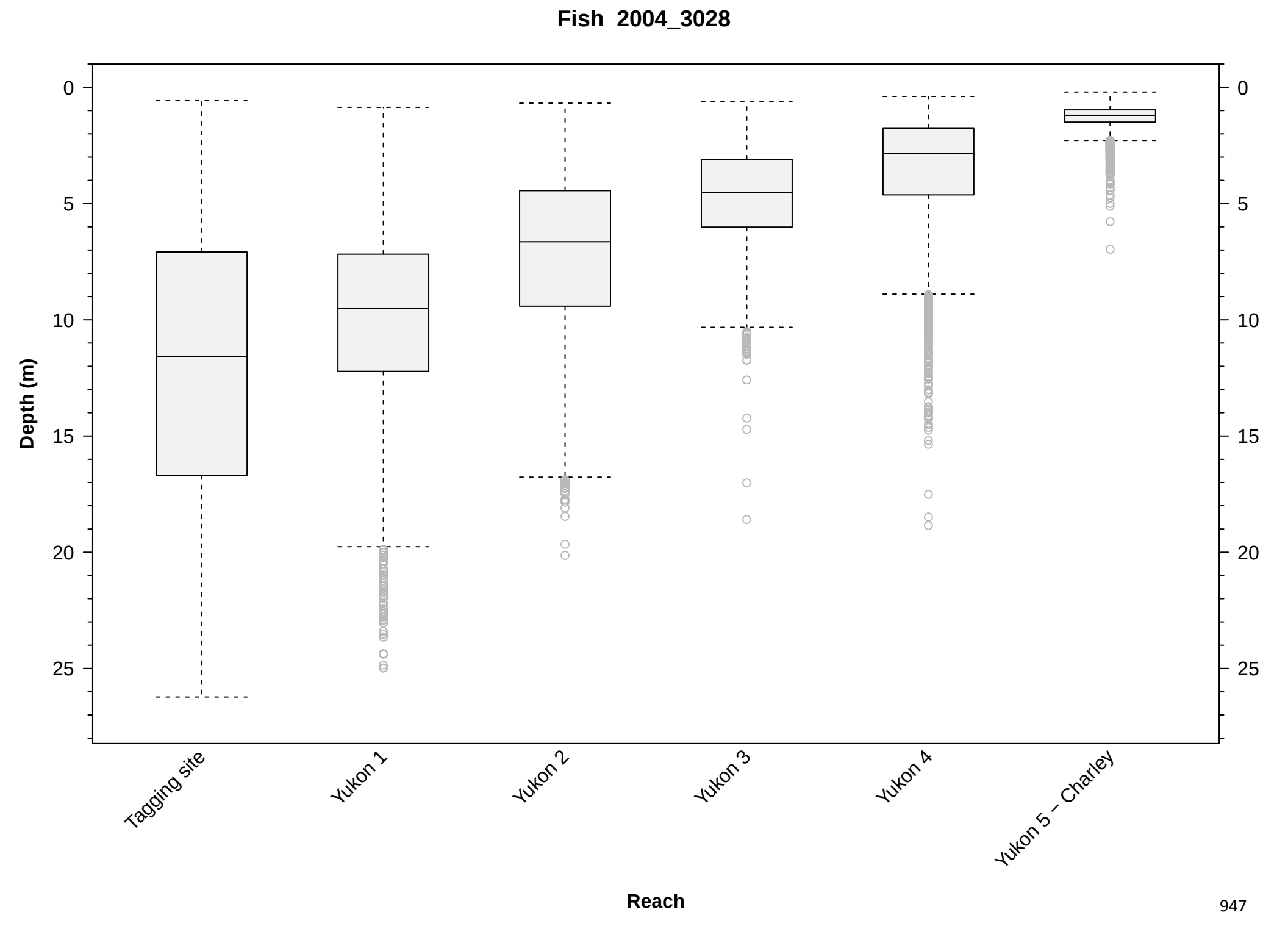
Whitehorse 1190

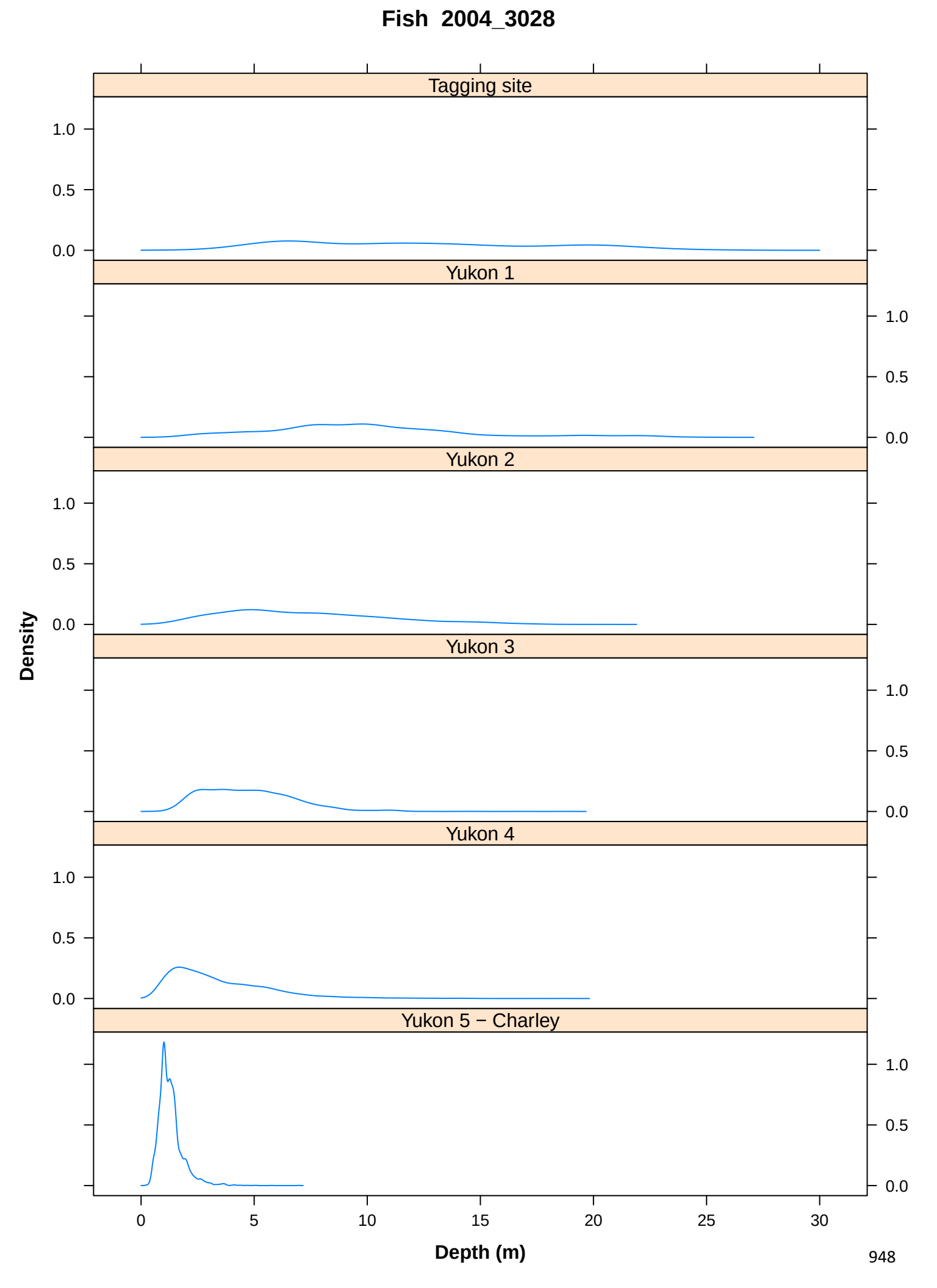
Back to Appendix 9 TOC

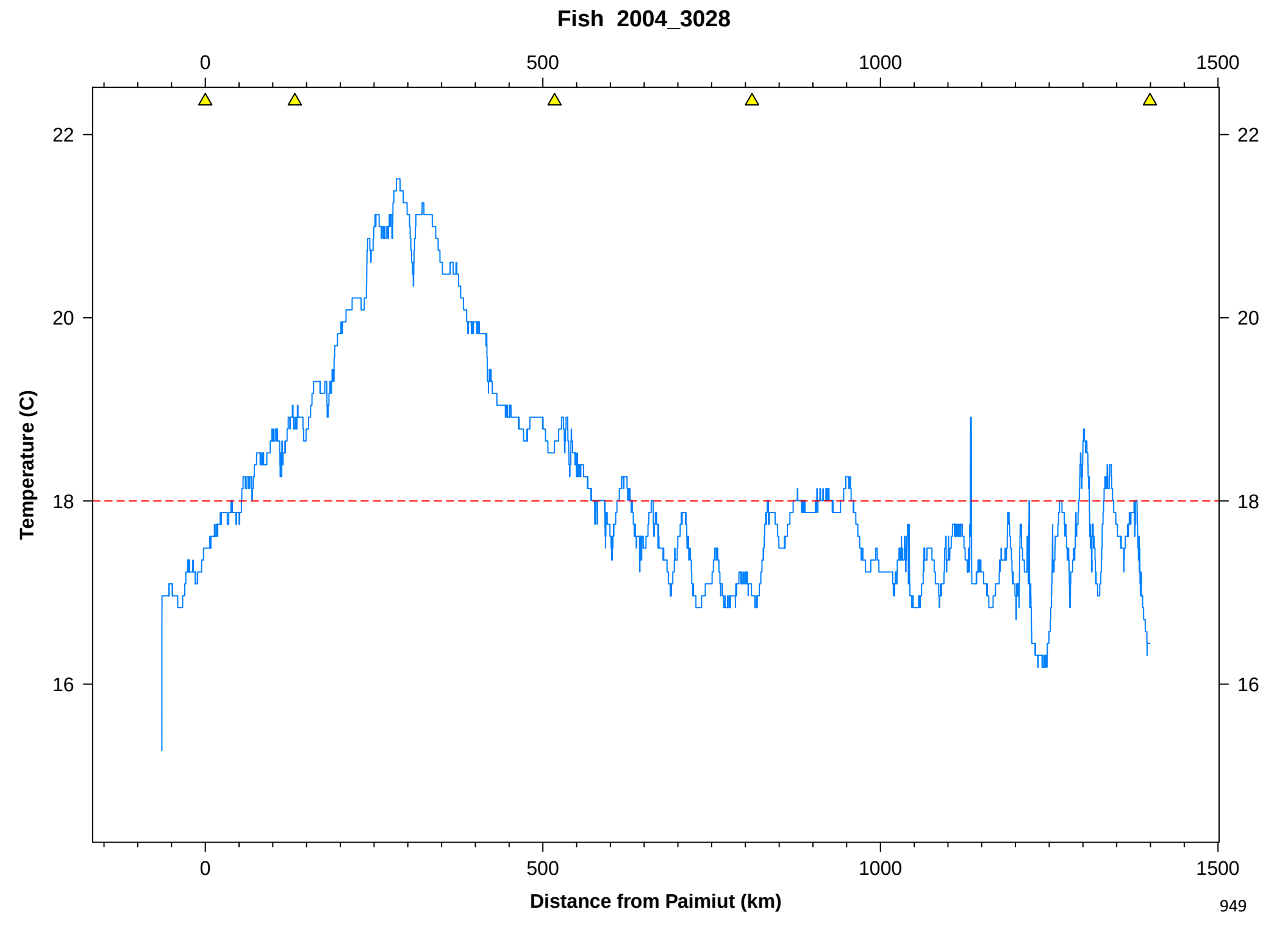
Charley Fish 2004_3028

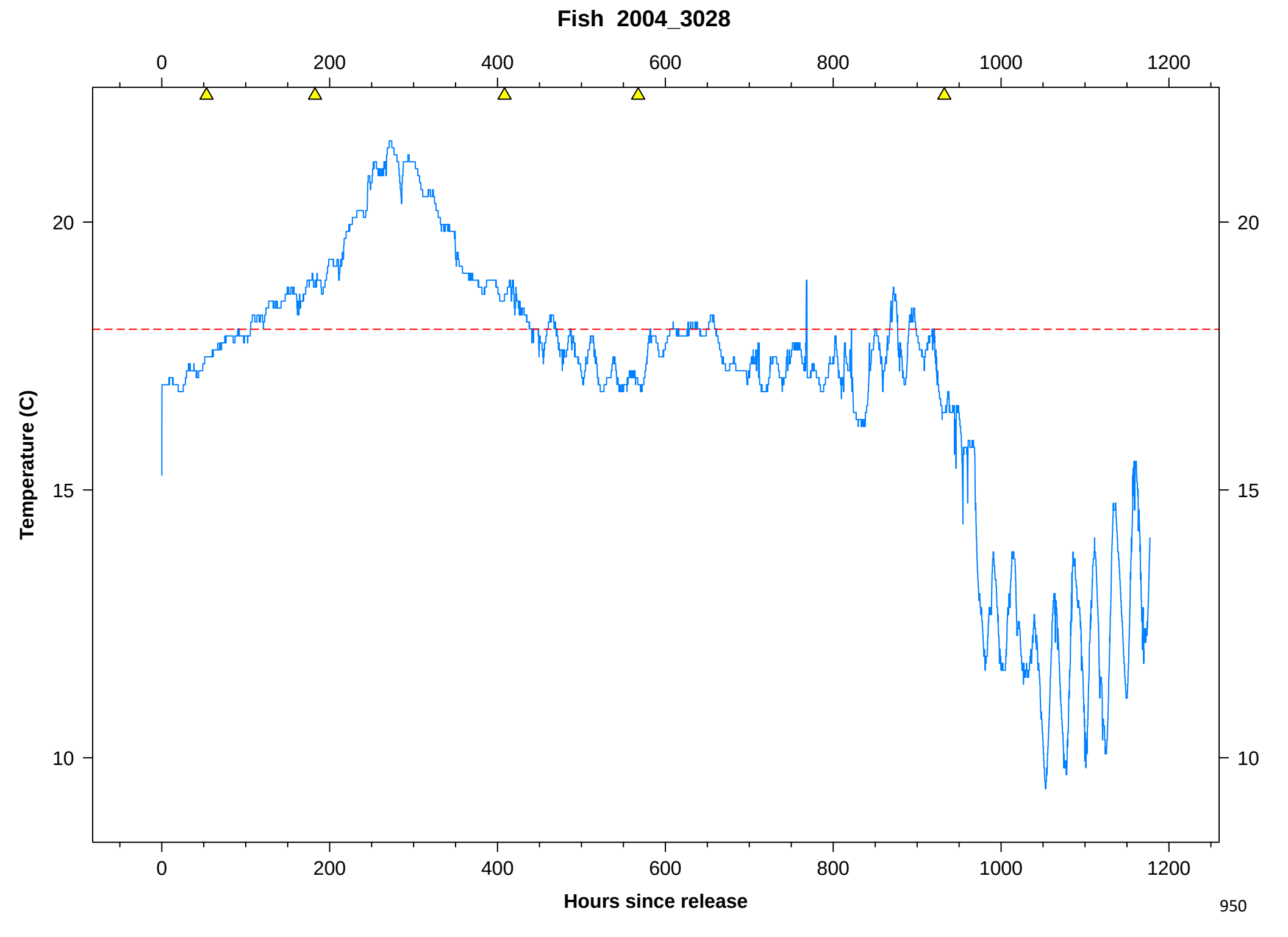


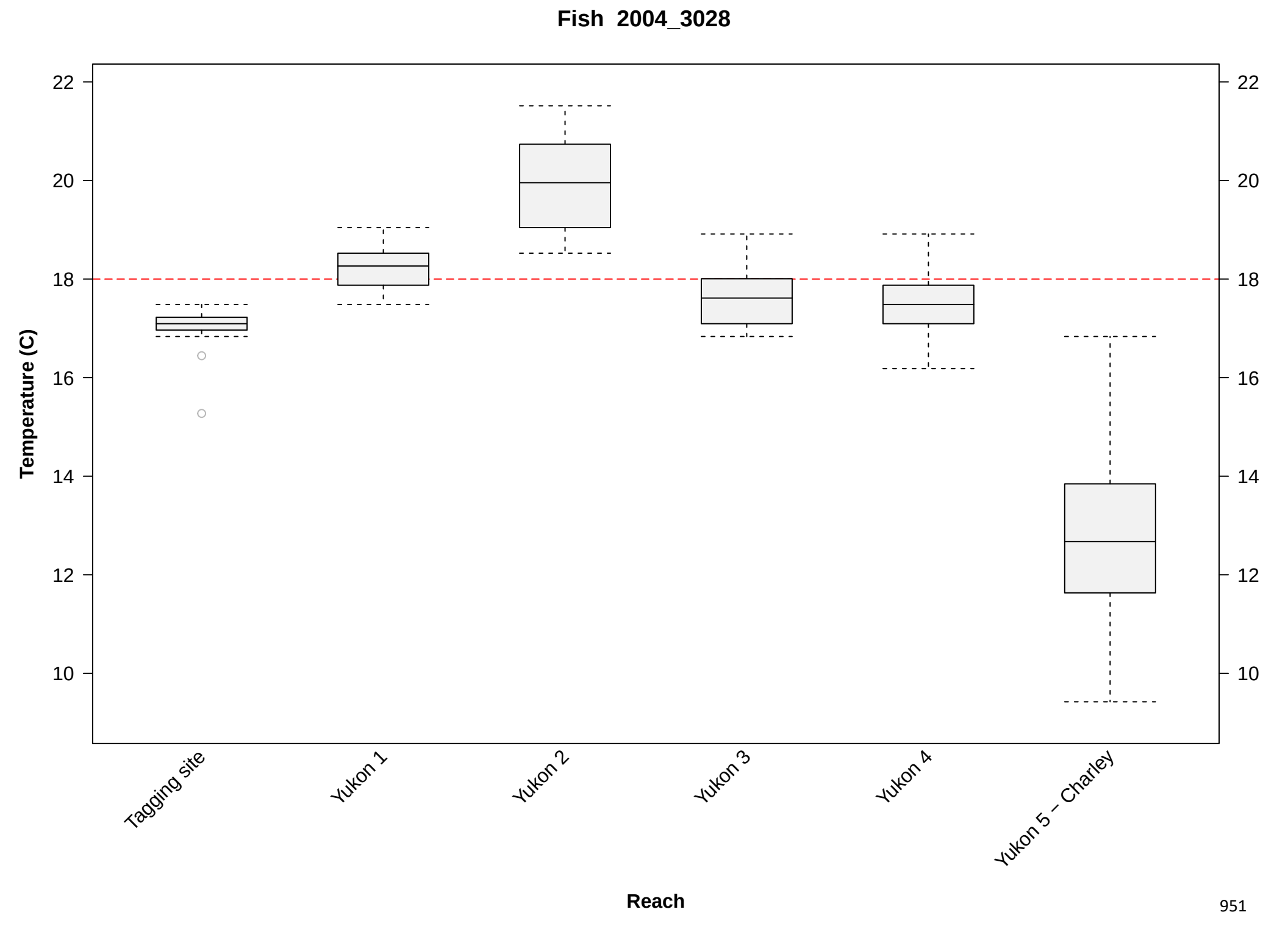

Fish 2004_3028
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Hours since release

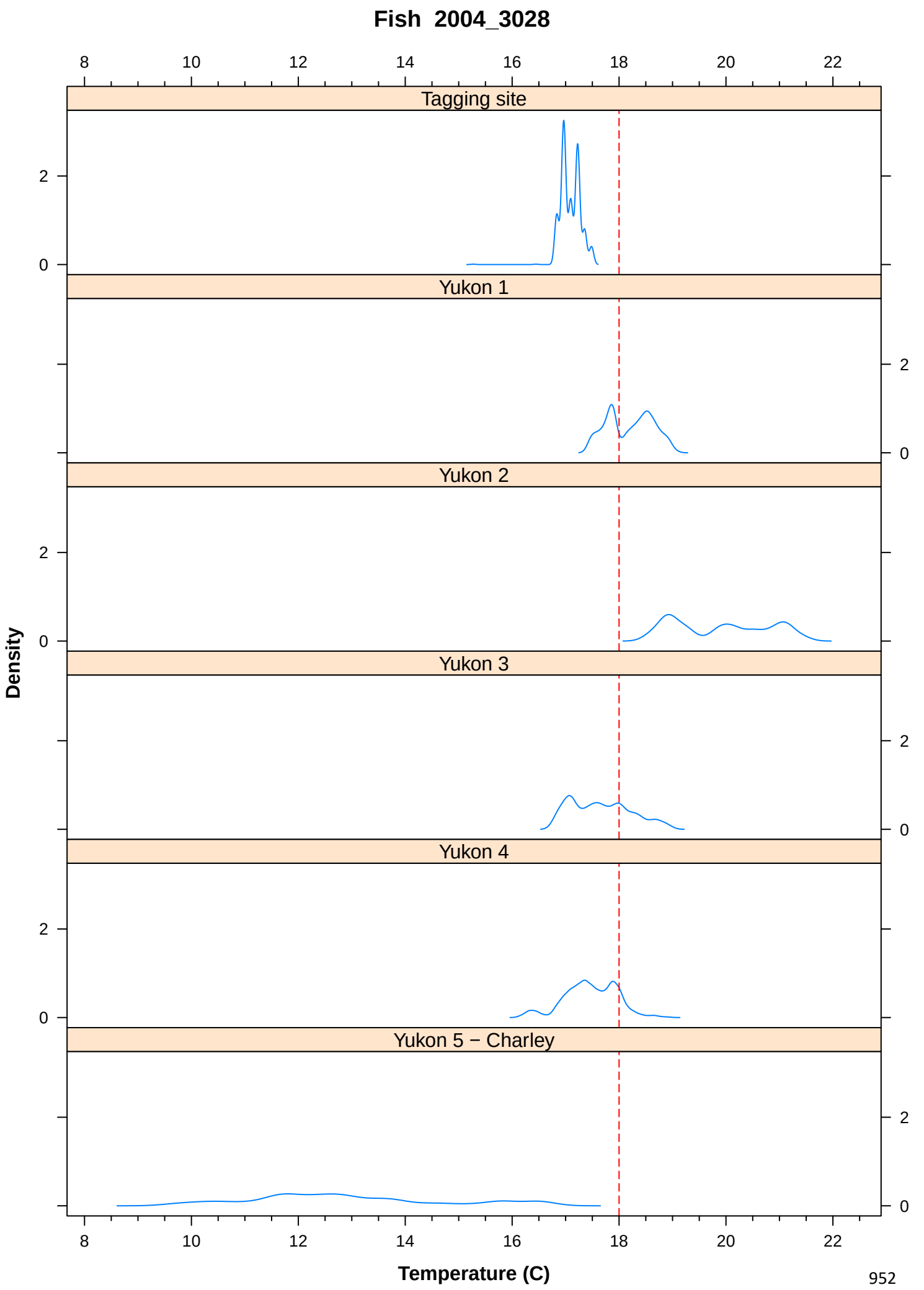

Fish 2004_3028
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5 – Charley
Reach
947

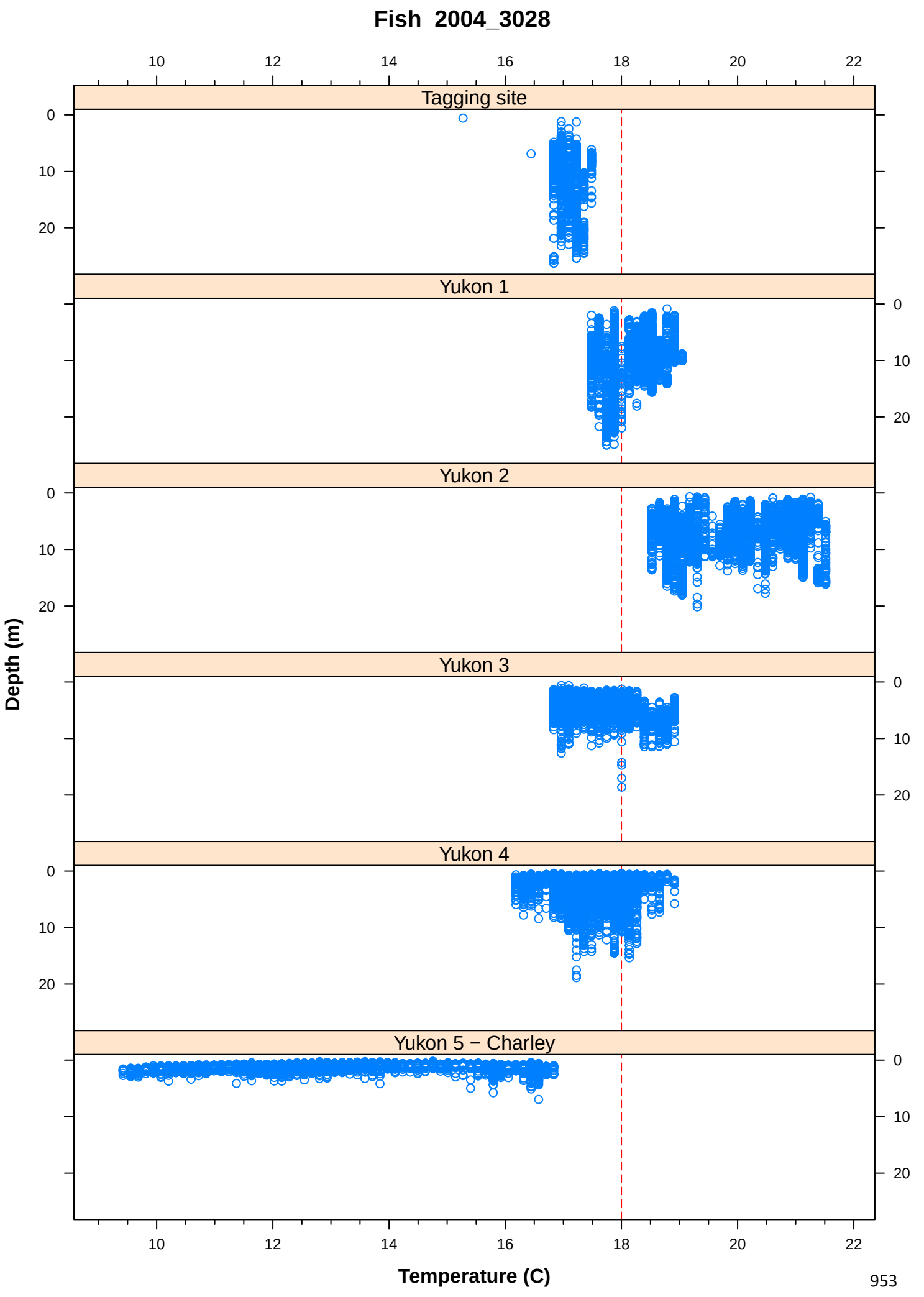

Fish 2004_3028
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5 − Charley
Density
Depth (m)
0.0
0.5
1.0
0
5
10
15
20
25
30
948

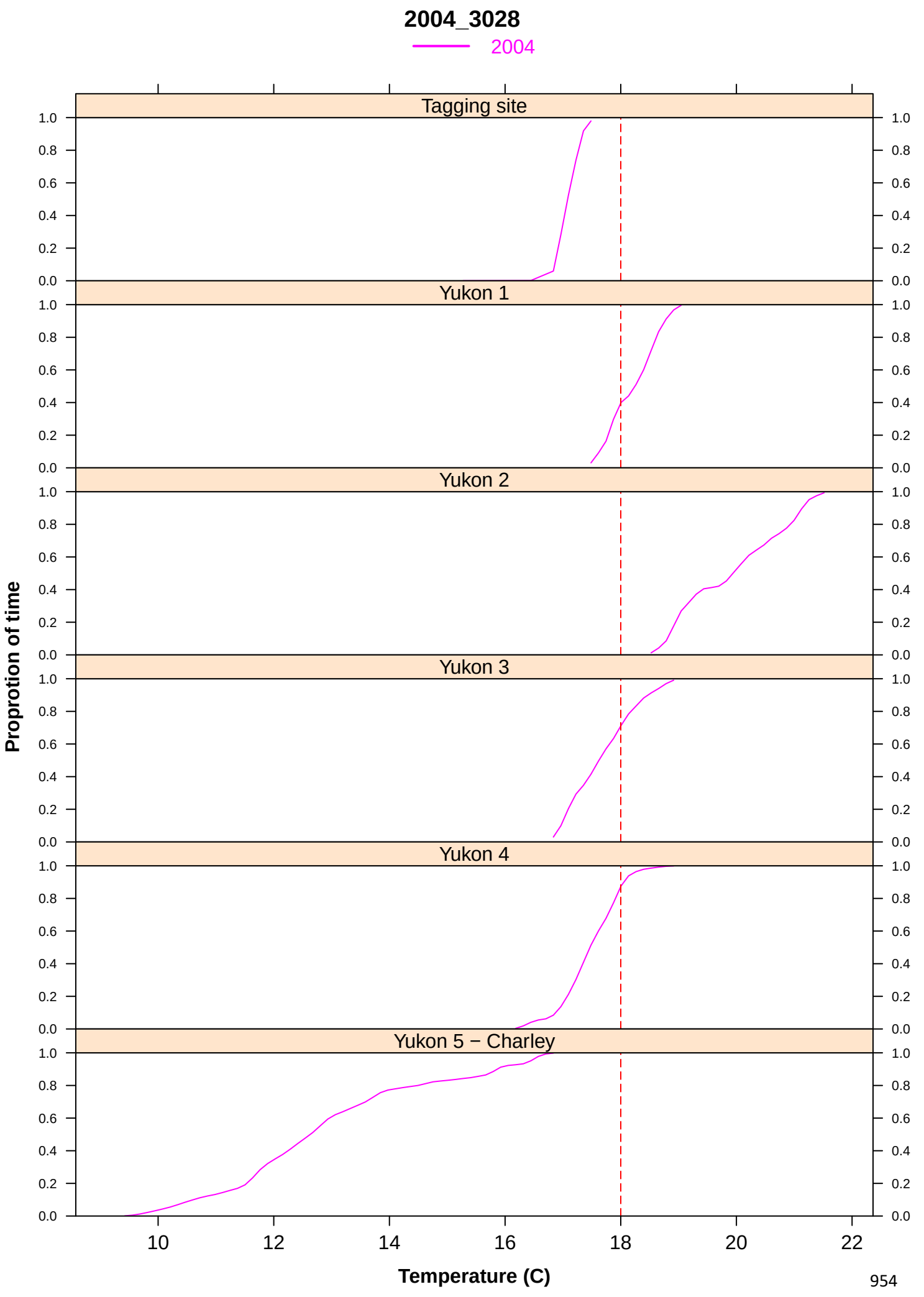

Fish 2004_3028
0
500
1000
1500
22
20
18
16
Temperature (C)
Distance from Paimiut (km)

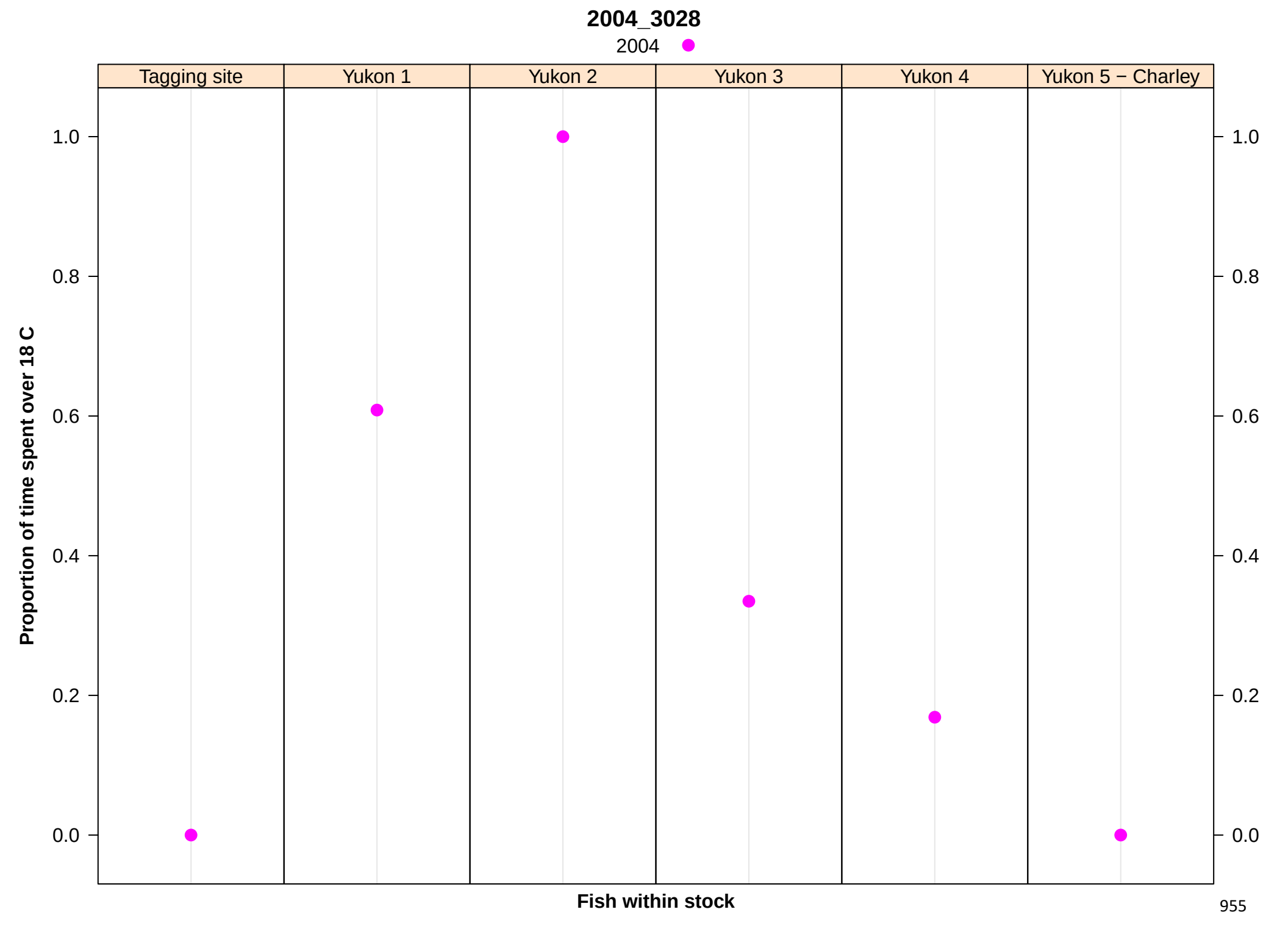

Fish 2004_3028
0
200
400
600
800
1000
1200
20
15
10
Temperature (C)
Hours since release


Fish 2004_3028
Temperature (C)
22
20
18
16
14
12
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5 – Charley
Reach
951

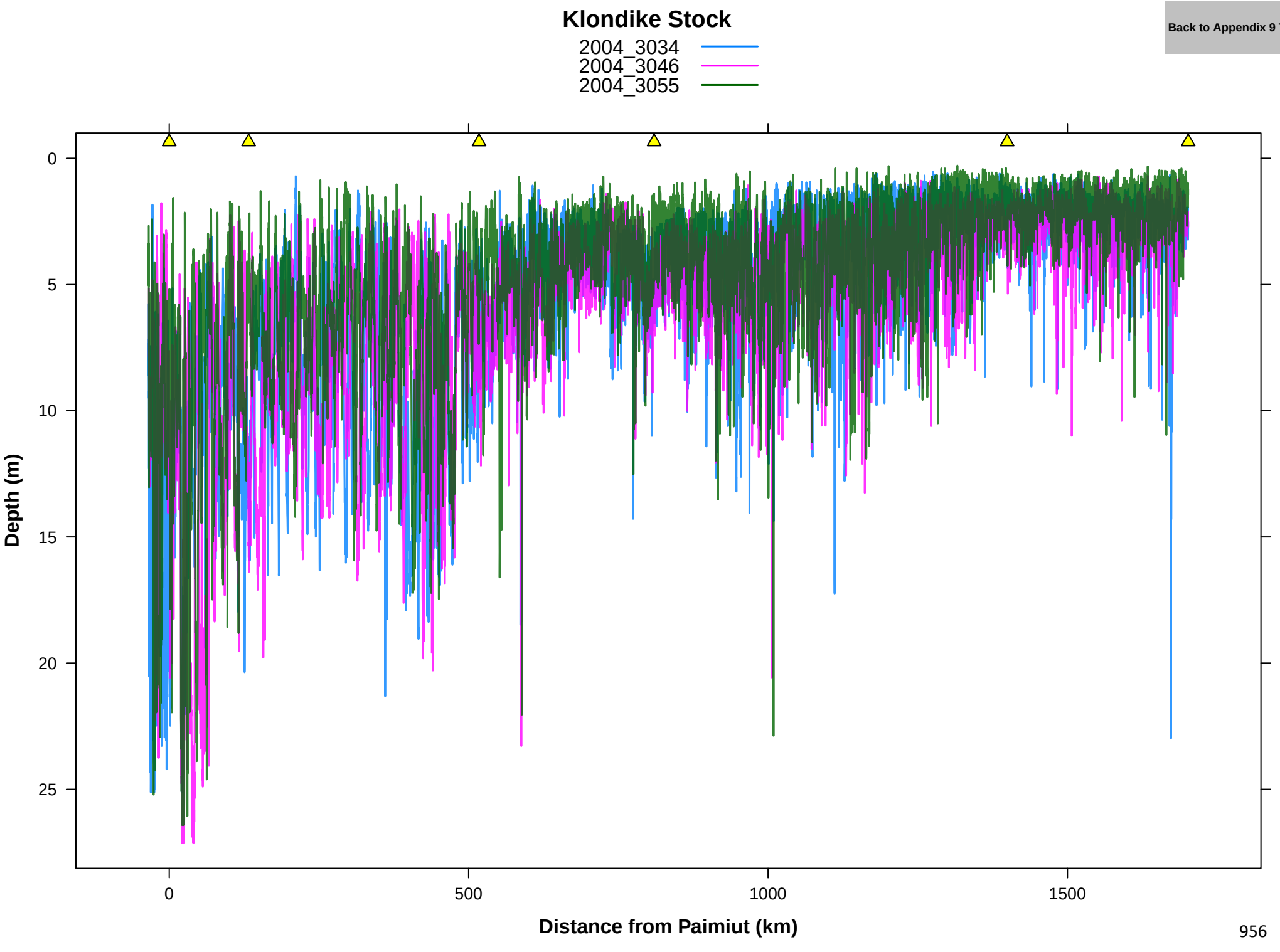

Fish 2004_3028
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5 − Charley
Density
Temperature (C)
8
10
12
14
16
18
20
22
0
2

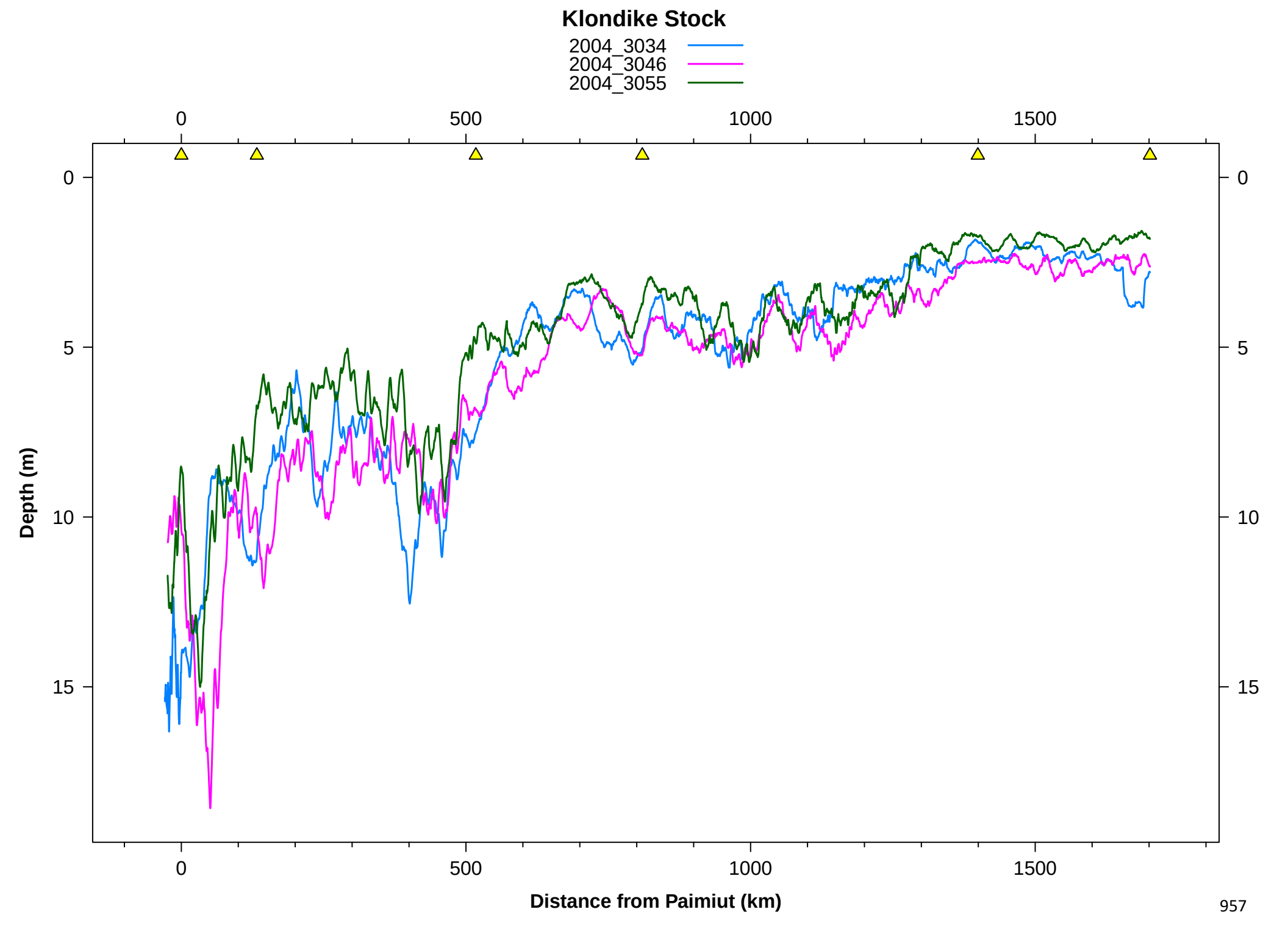

Fish 2004_3028
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5 − Charley
Depth (m)
Temperature (C)
10
12
14
16
18
20
22
0
10
20

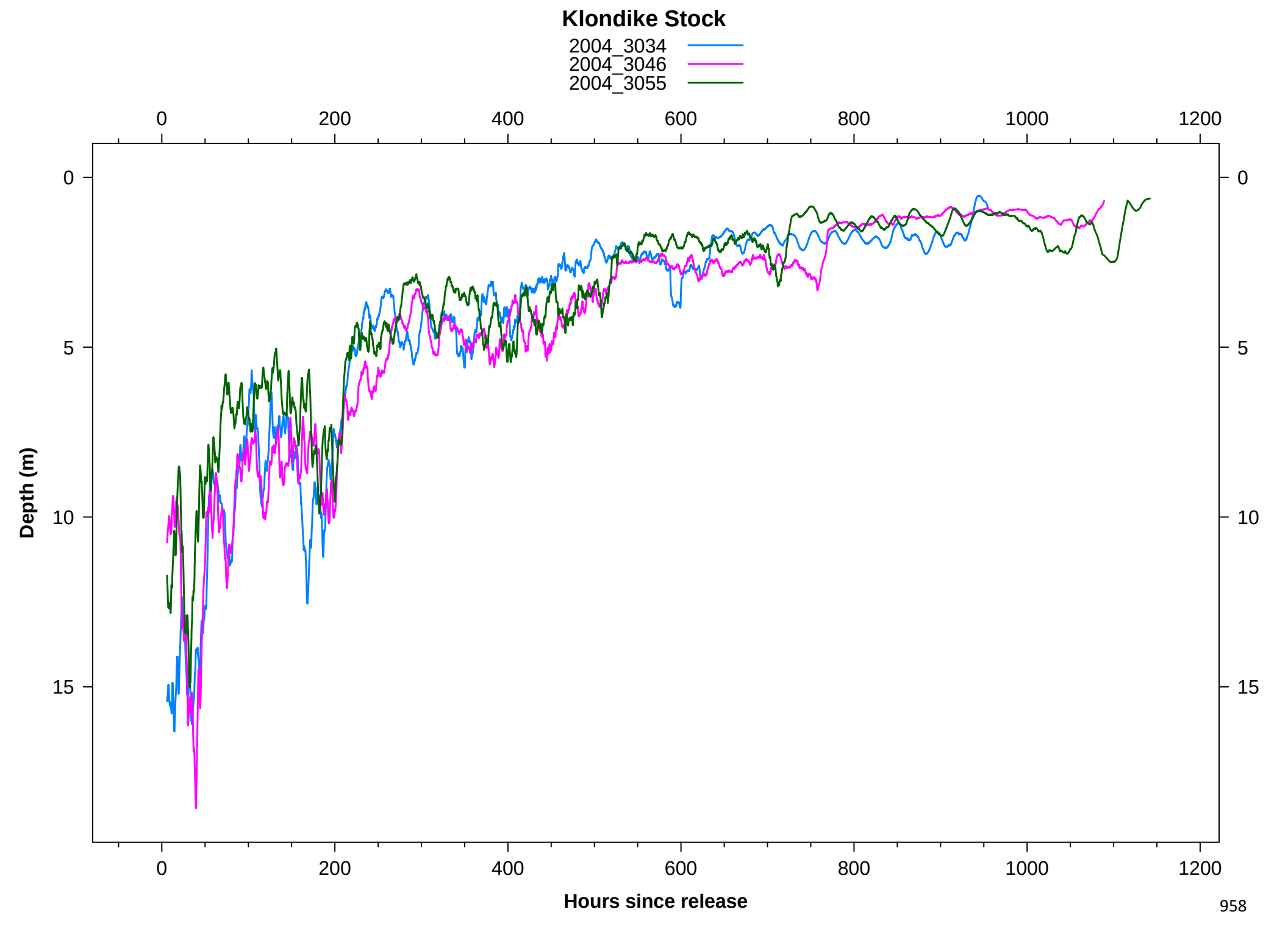

2004_3028
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5 − Charley
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
10
12
14
16
18
20
22

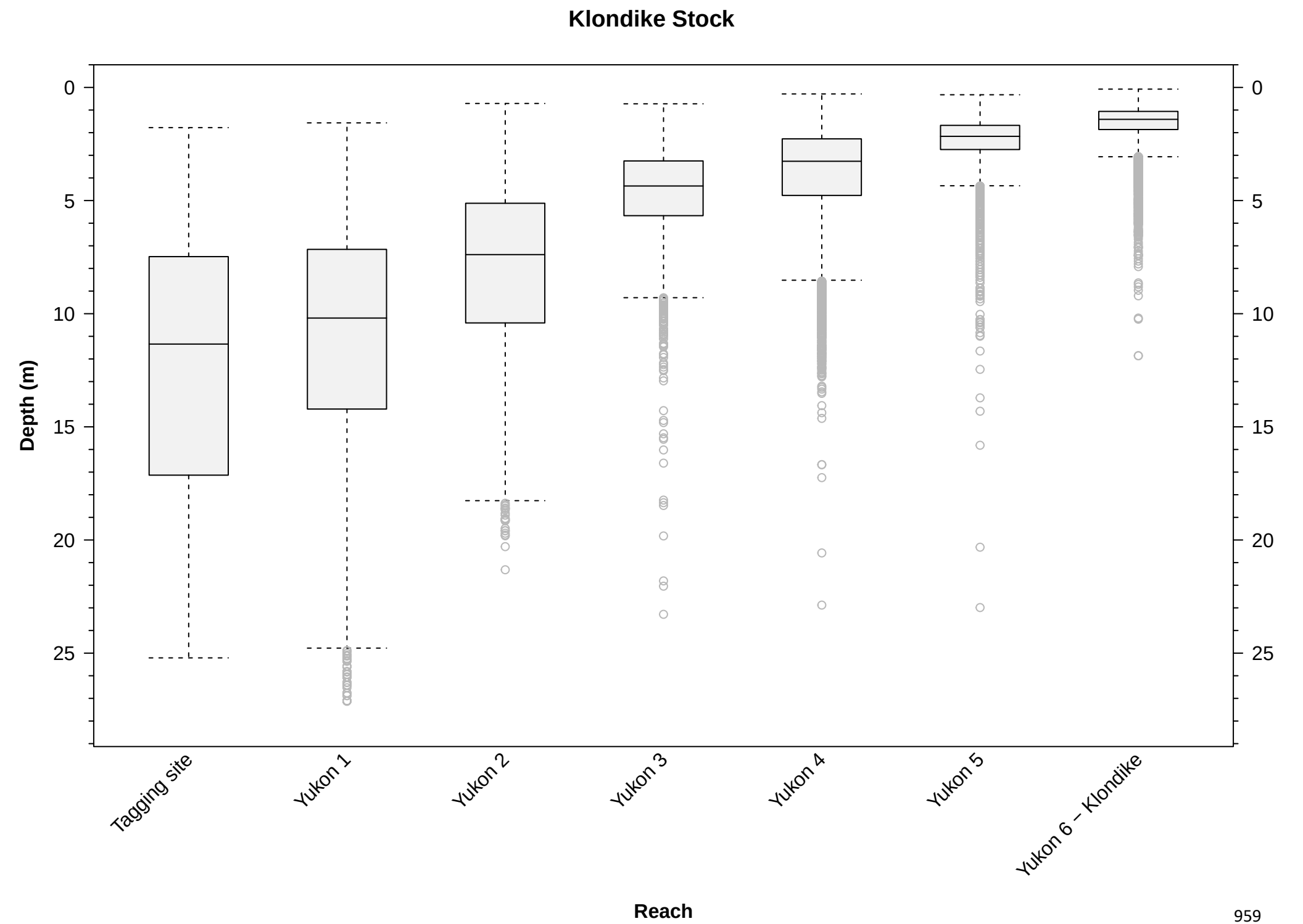

2004_3028
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5 − Charley
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock

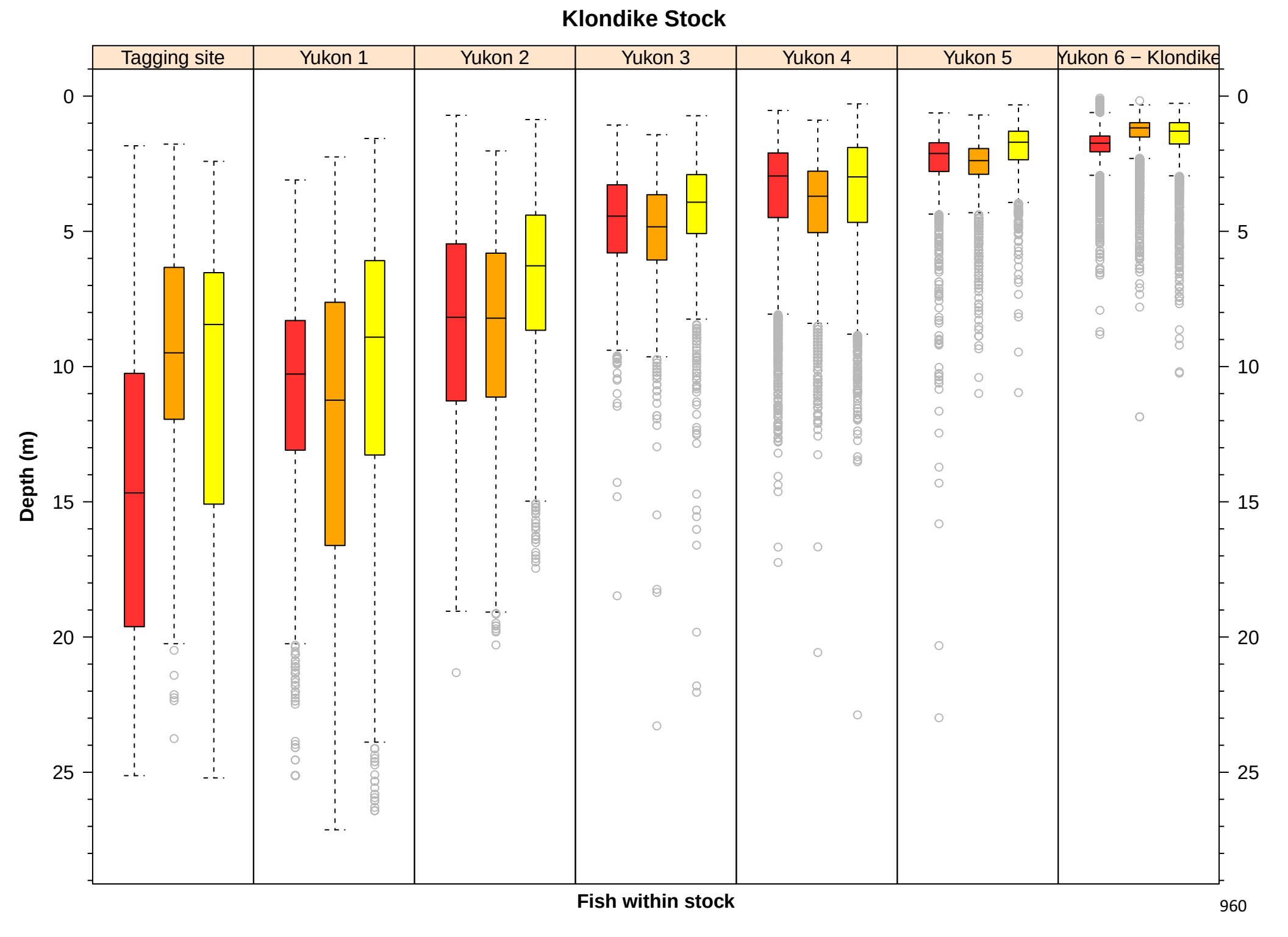
Back to Appendix 9 TOC

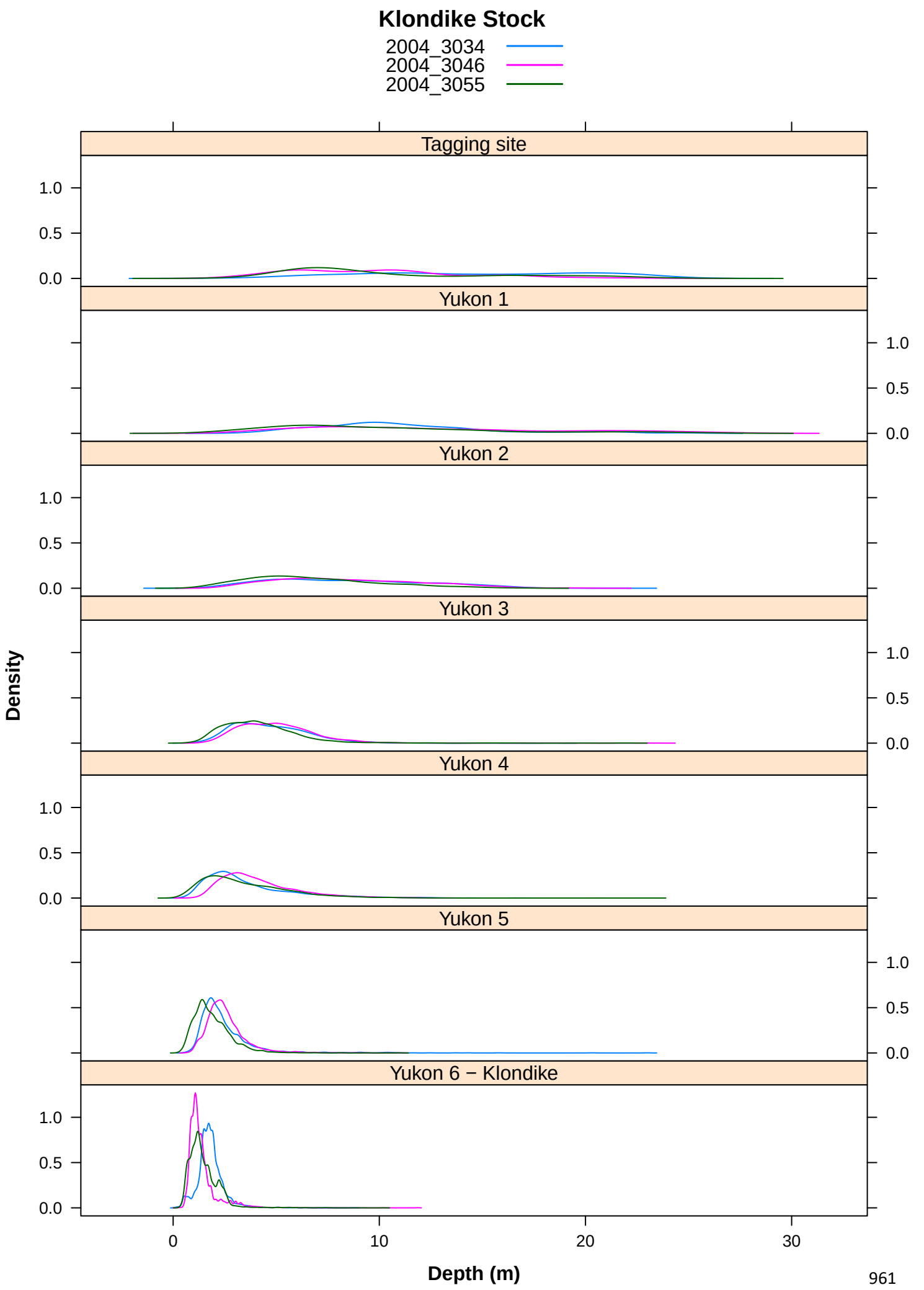


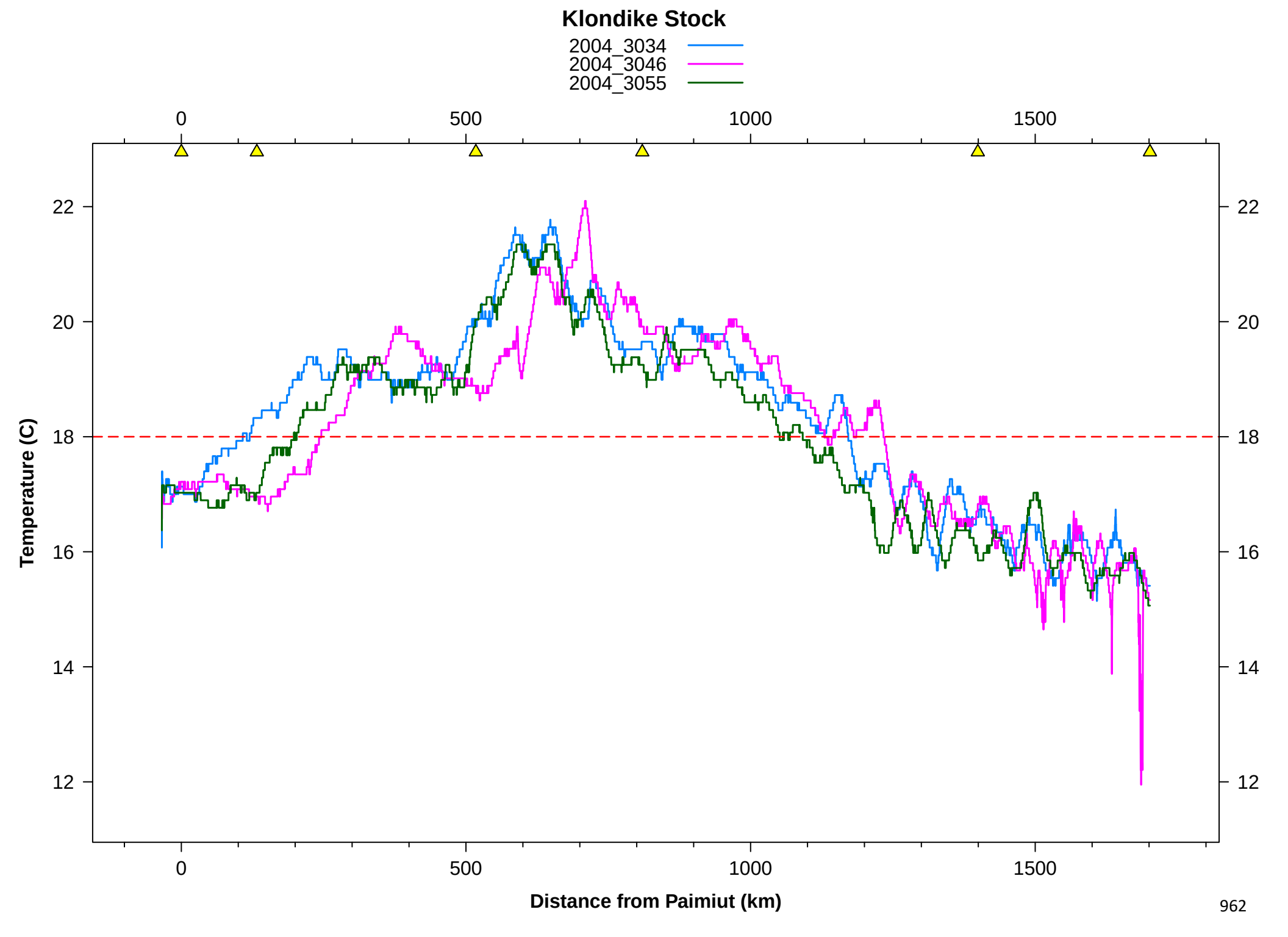

Klondike Stock
2004_3034
2004_3046
2004_3055
0
500
1000
1500
0
5
10
15
Depth (m)
Distance from Paimiut (km)

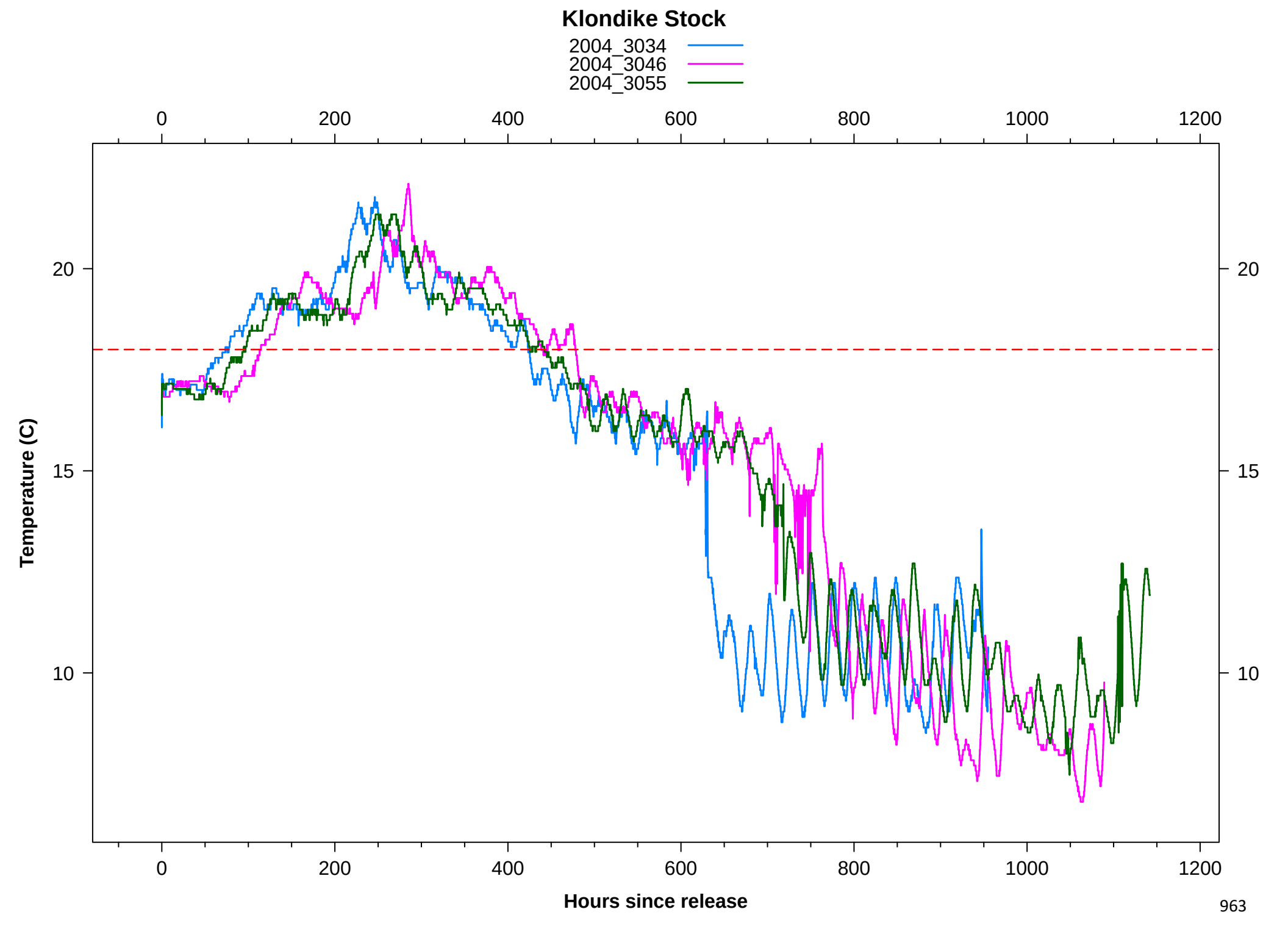

Klondike Stock
2004_3034
2004_3046
2004_3055
0
200
400
600
800
1000
1200
0
5
10
15
Depth (m)
Hours since release

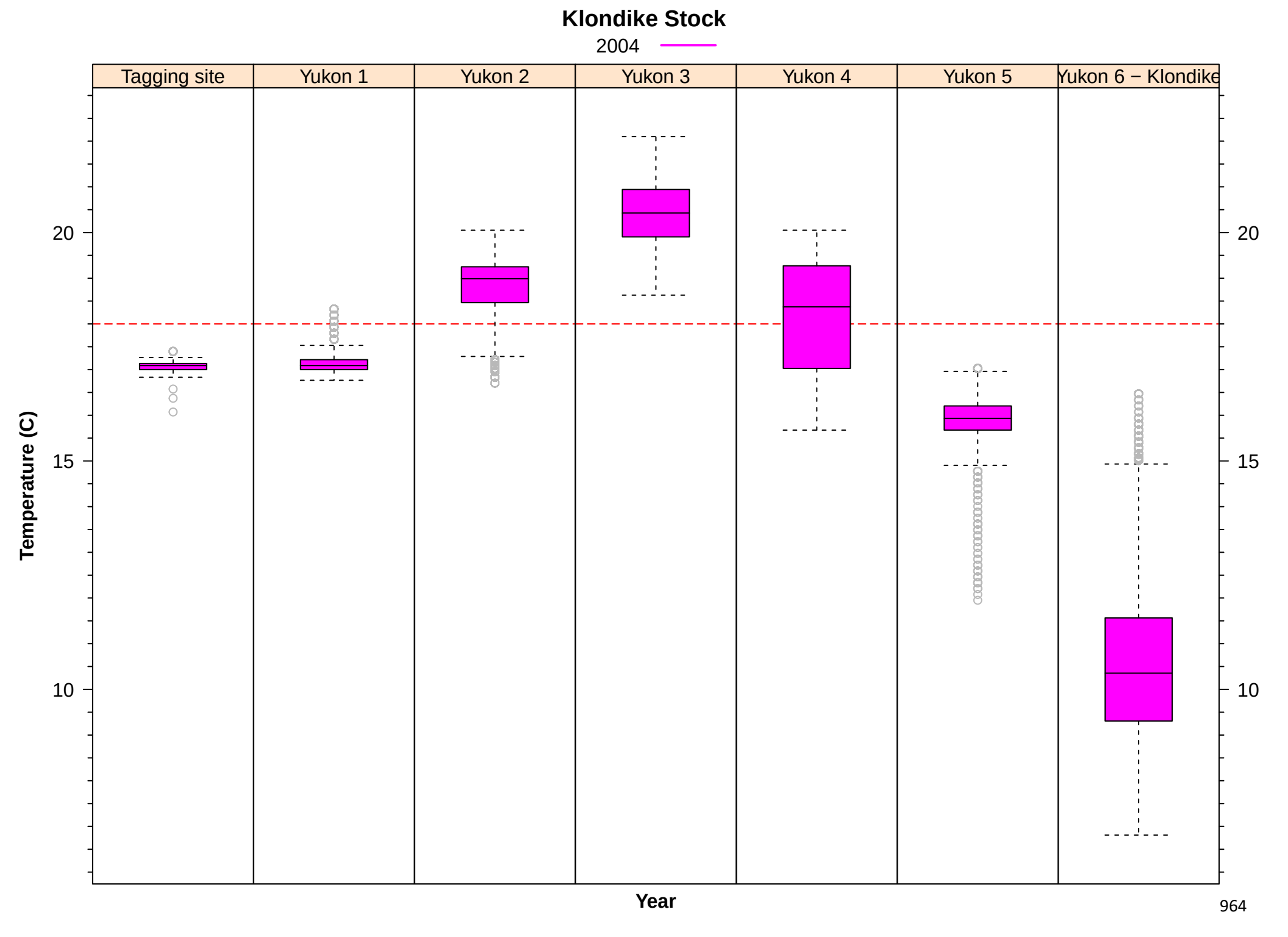

Klondike Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 – Klondike
Reach

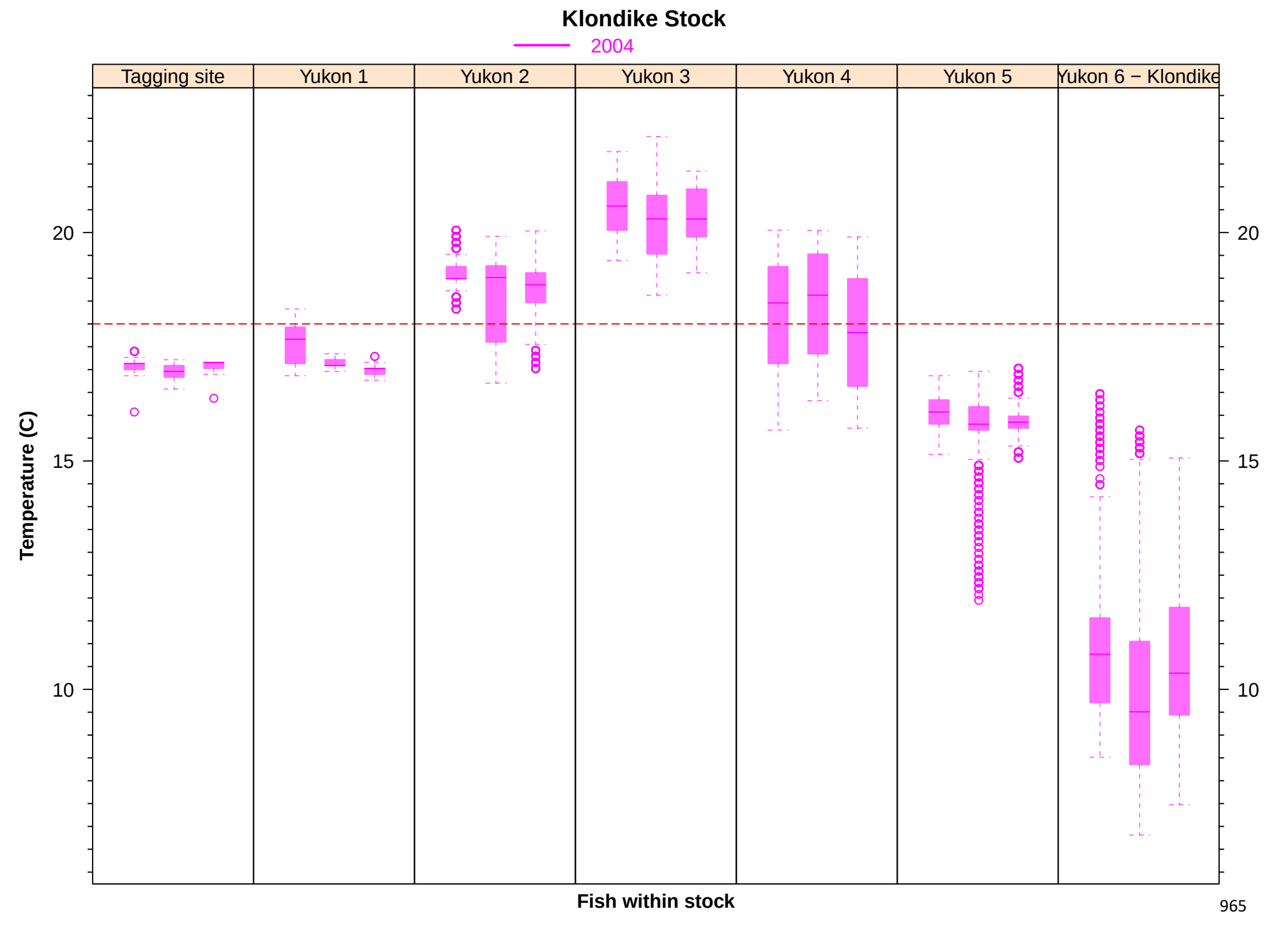

Klondike Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Depth (m)
0
5
10
15
20
25
Fish within stock
960

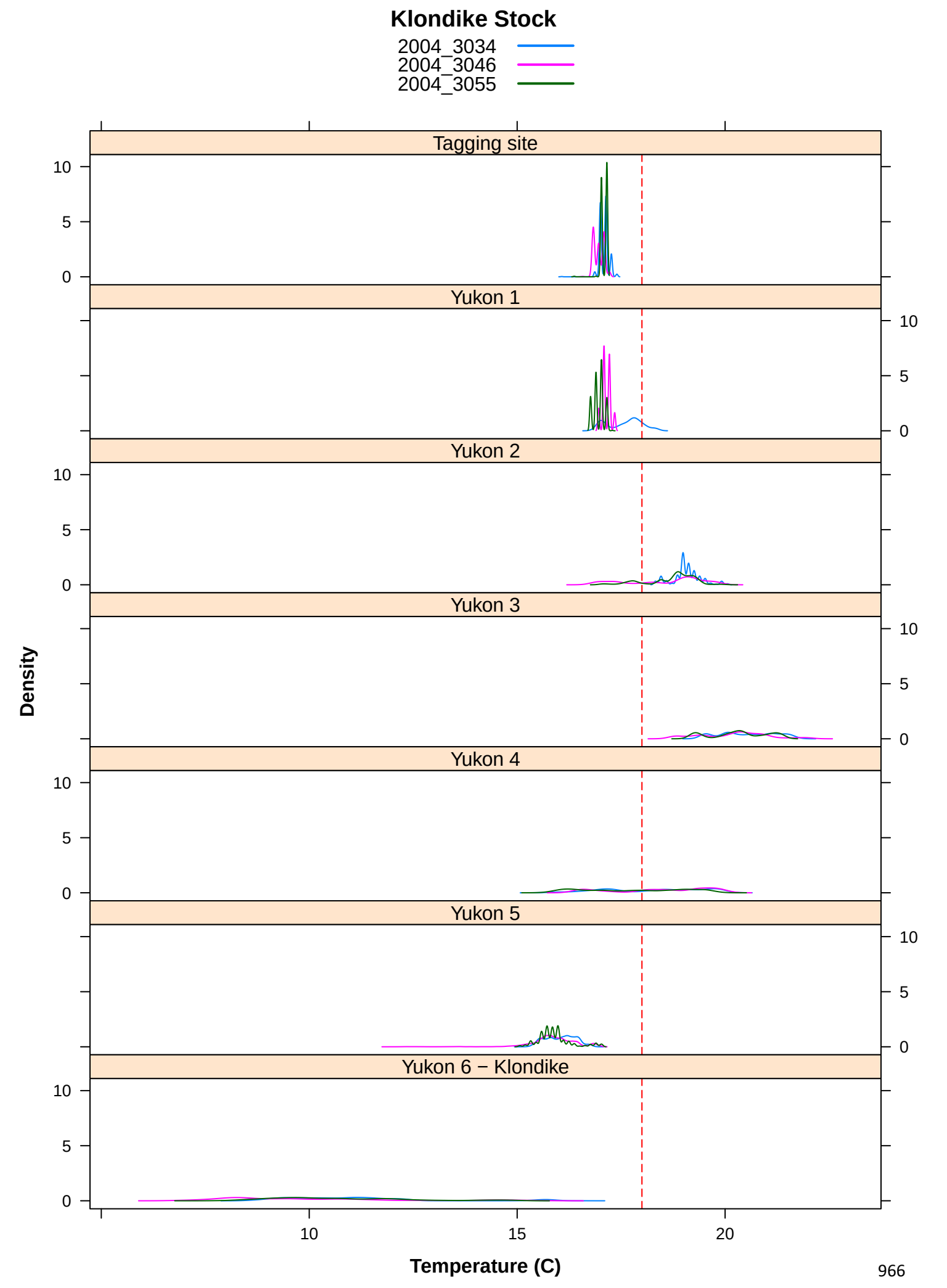

Klondike Stock
2004_3034
2004_3046
2004_3055
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Density
1.0
0.5
0.0
0
10
20
30
Depth (m)

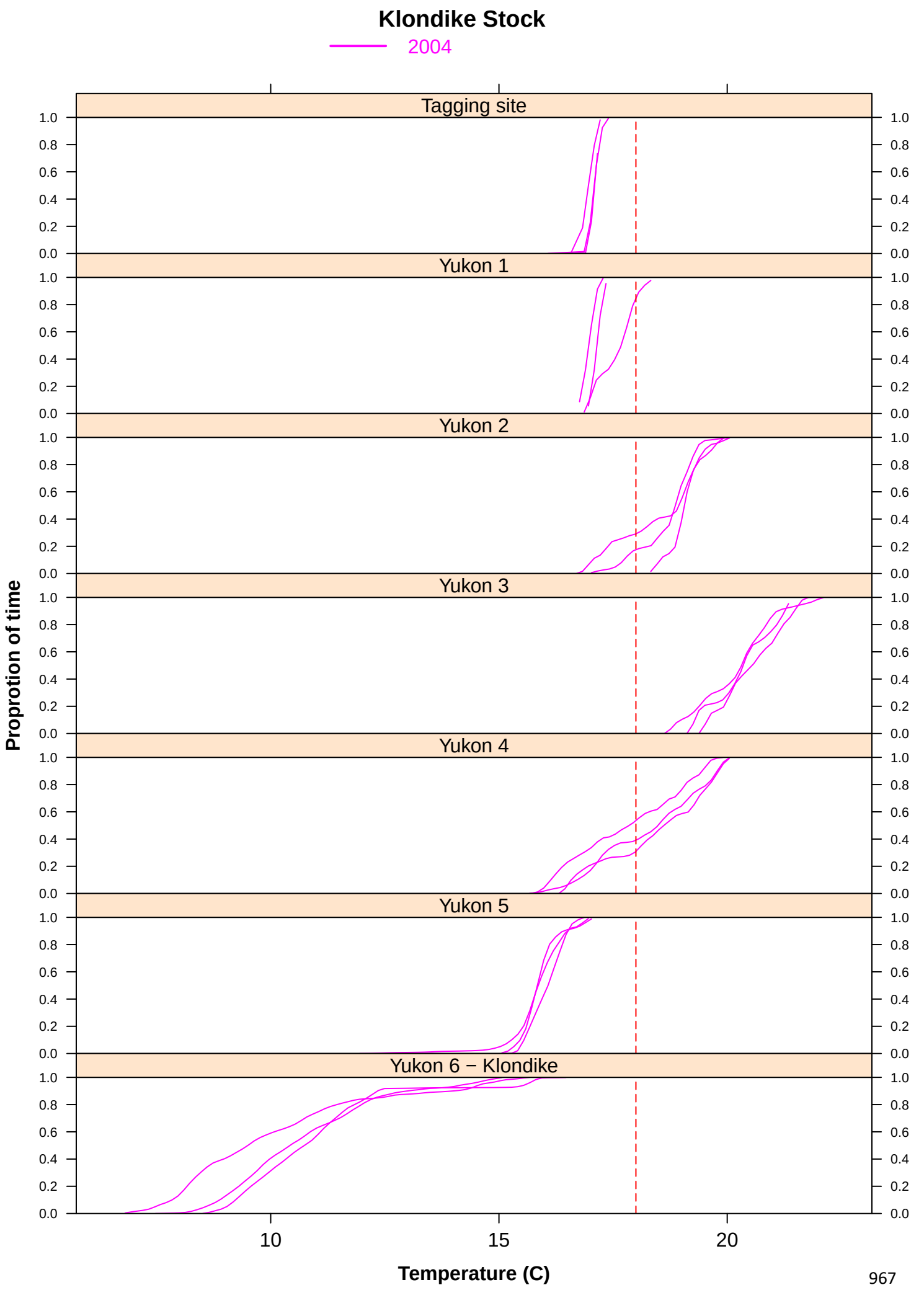

Klondike Stock
2004_3034
2004_3046
2004_3055
0
500
1000
1500
22
20
18
16
14
12
Temperature (C)
Distance from Paimiut (km)

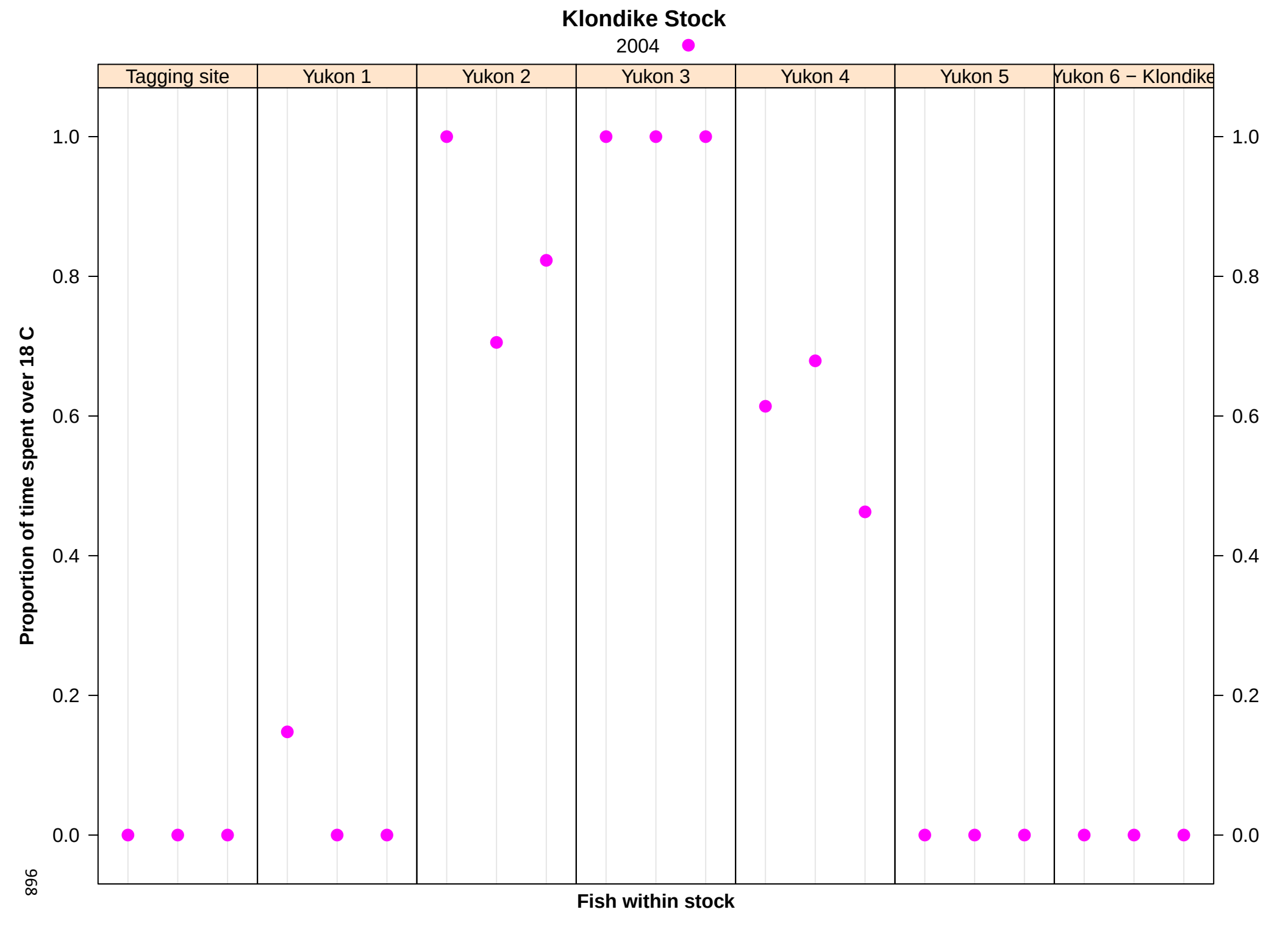

Klondike Stock
2004_3034
2004_3046
2004_3055
0
200
400
600
800
1000
1200
20
15
10
Temperature (C)
Hours since release

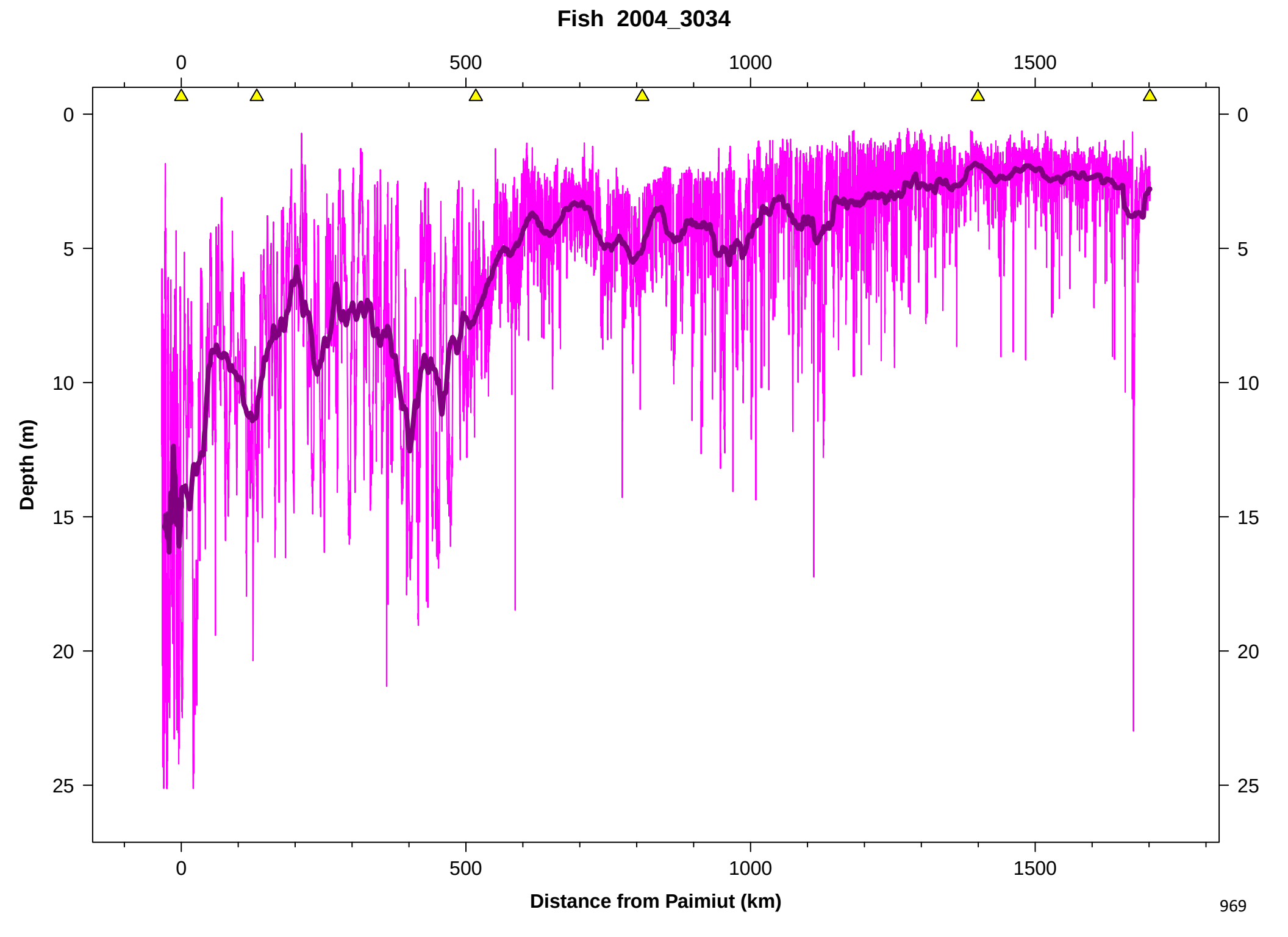

Klondike Stock
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Temperature (C)
20
15
10
Year
964

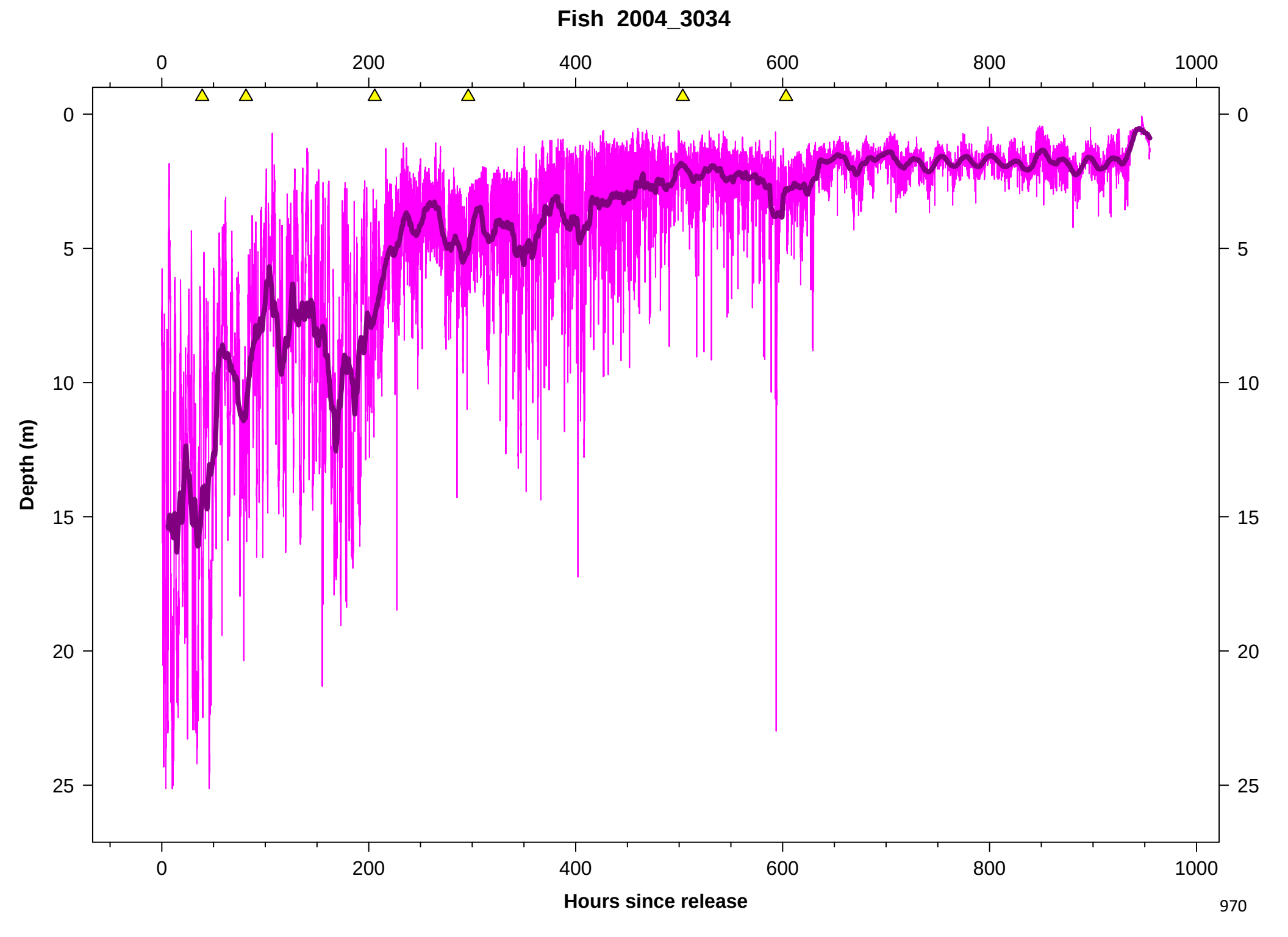

Klondike Stock
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Temperature (C)
20
15
10
Fish within stock
965

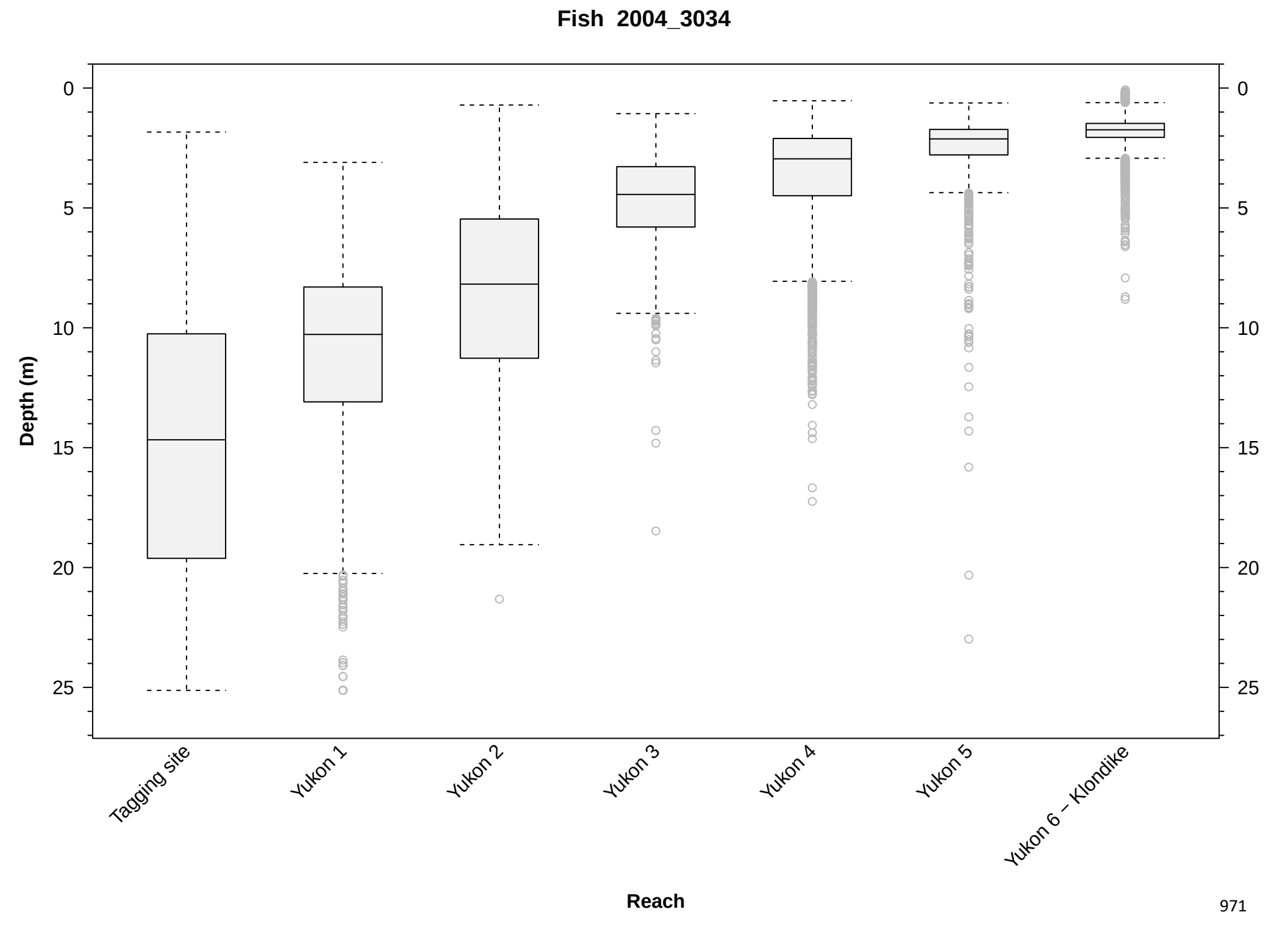

Klondike Stock
2004_3034
2004_3046
2004_3055
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Density
Temperature (C)
0
5
10
15
20

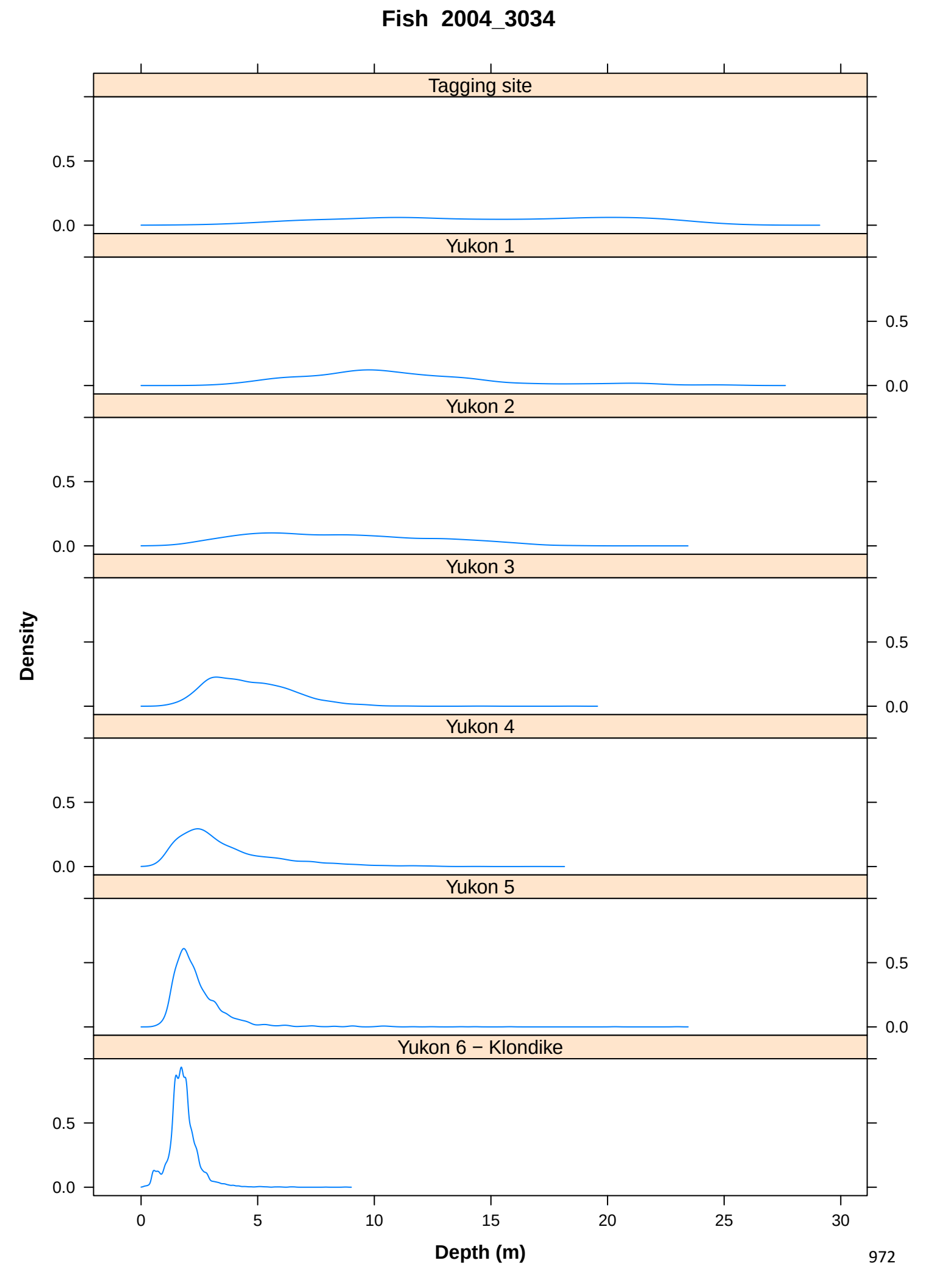

Klondike Stock
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
10
15
20

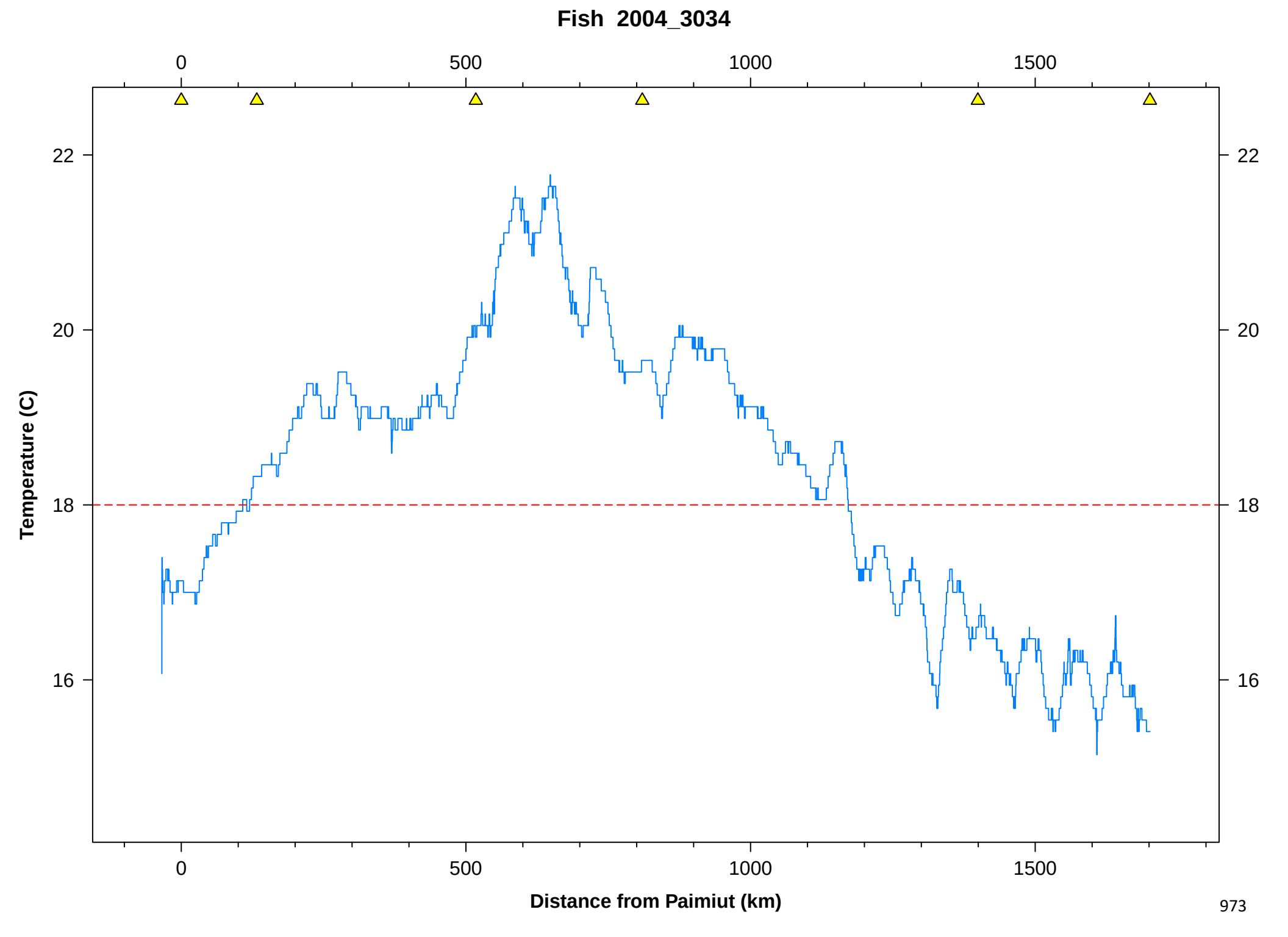

Klondike Stock
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Proportion of time spent over 18 C
1.0
0.8
0.6
0.4
0.2
0.0
Fish within stock
896

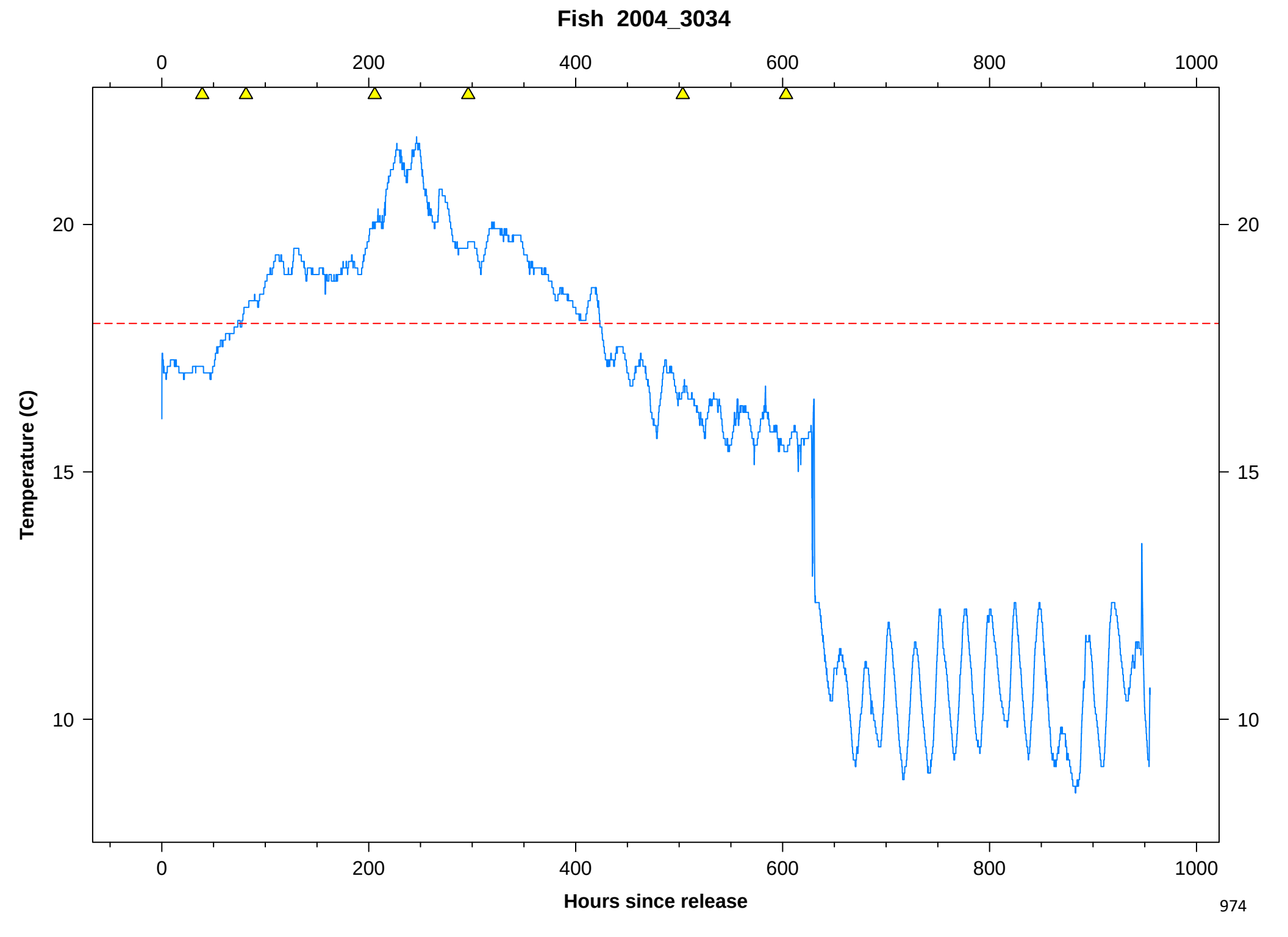

Fish 2004_3034
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

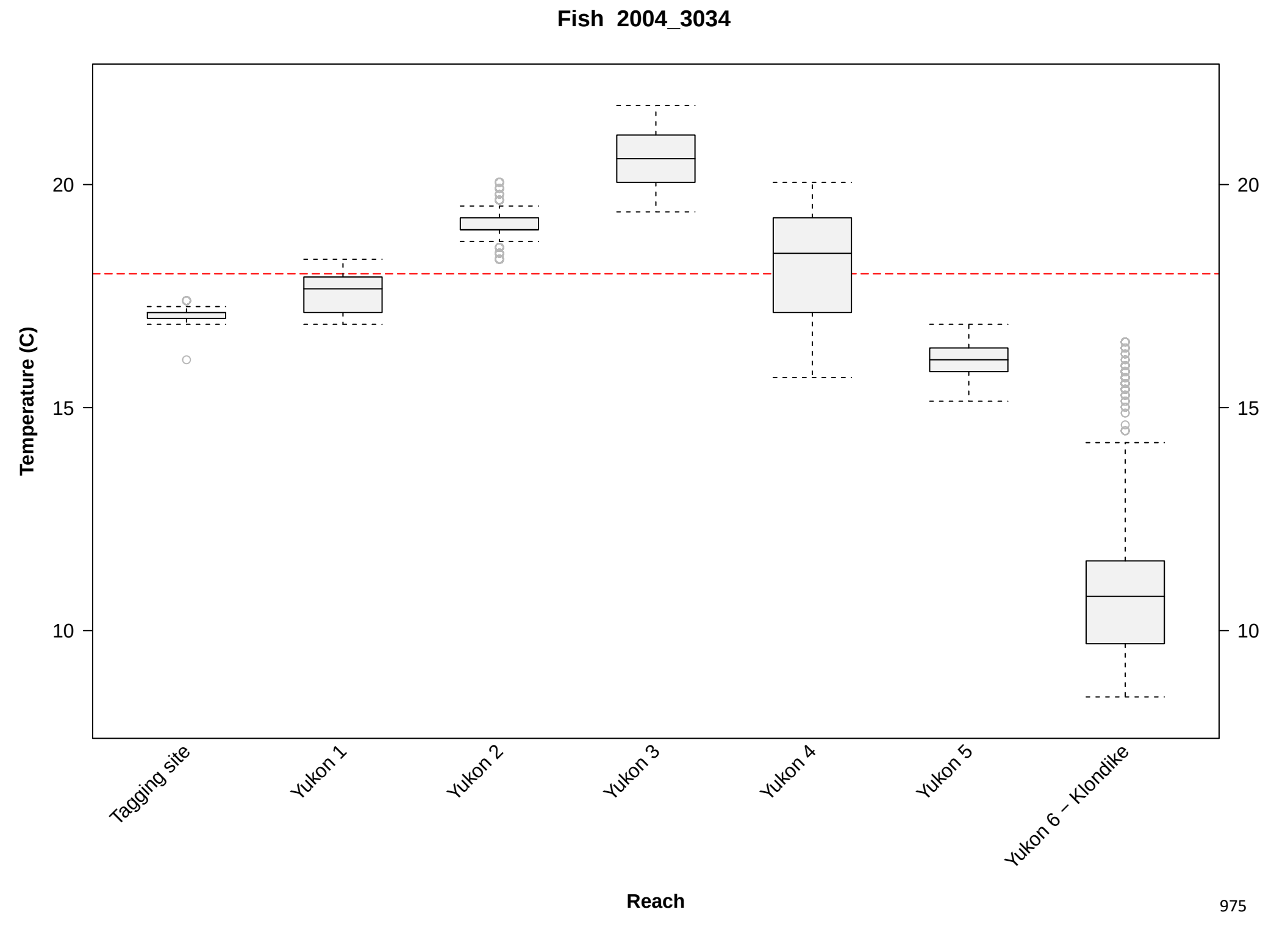

Fish 2004_3034
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release
970

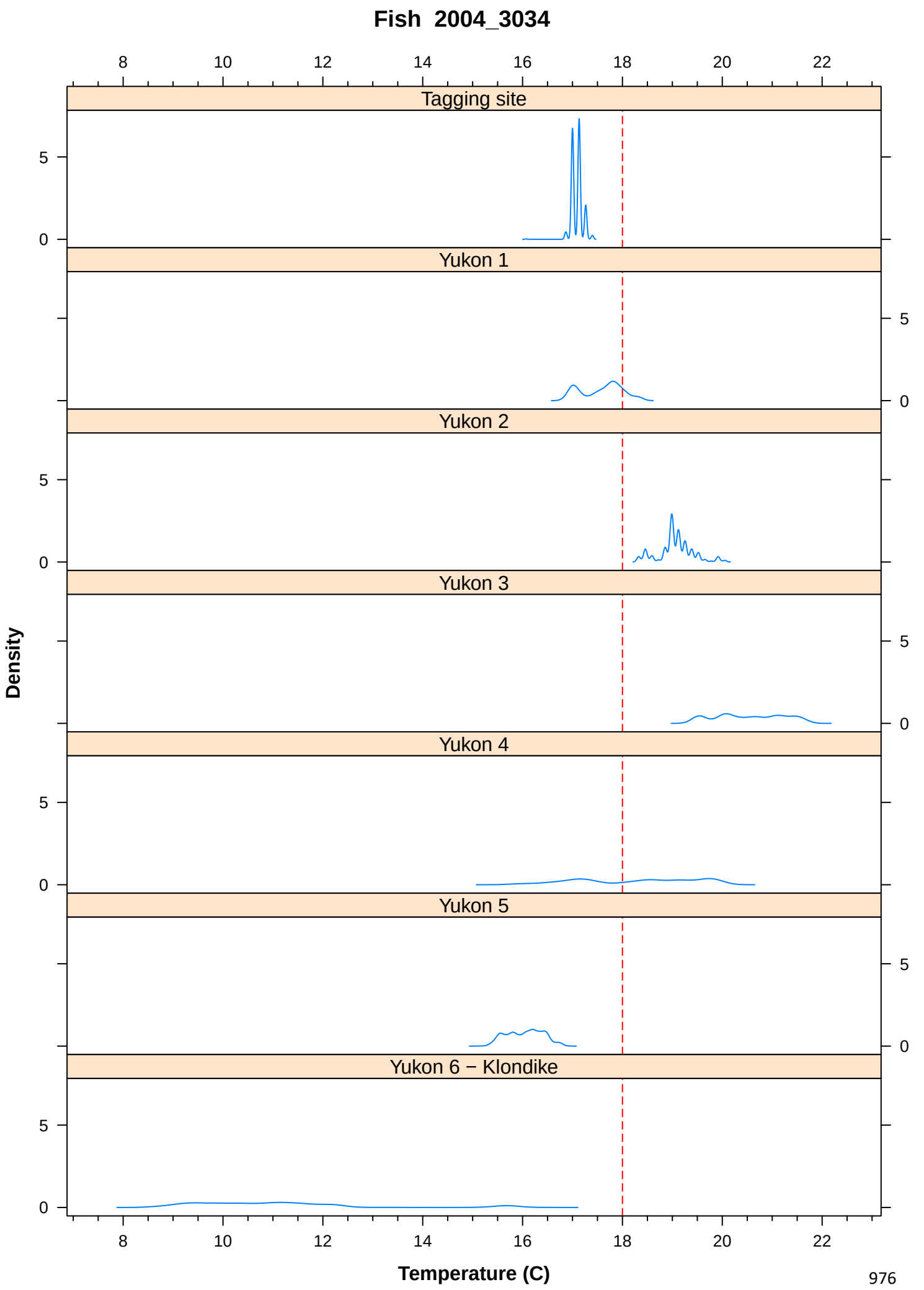

Fish 2004_3034
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 – Klondike
Reach
971

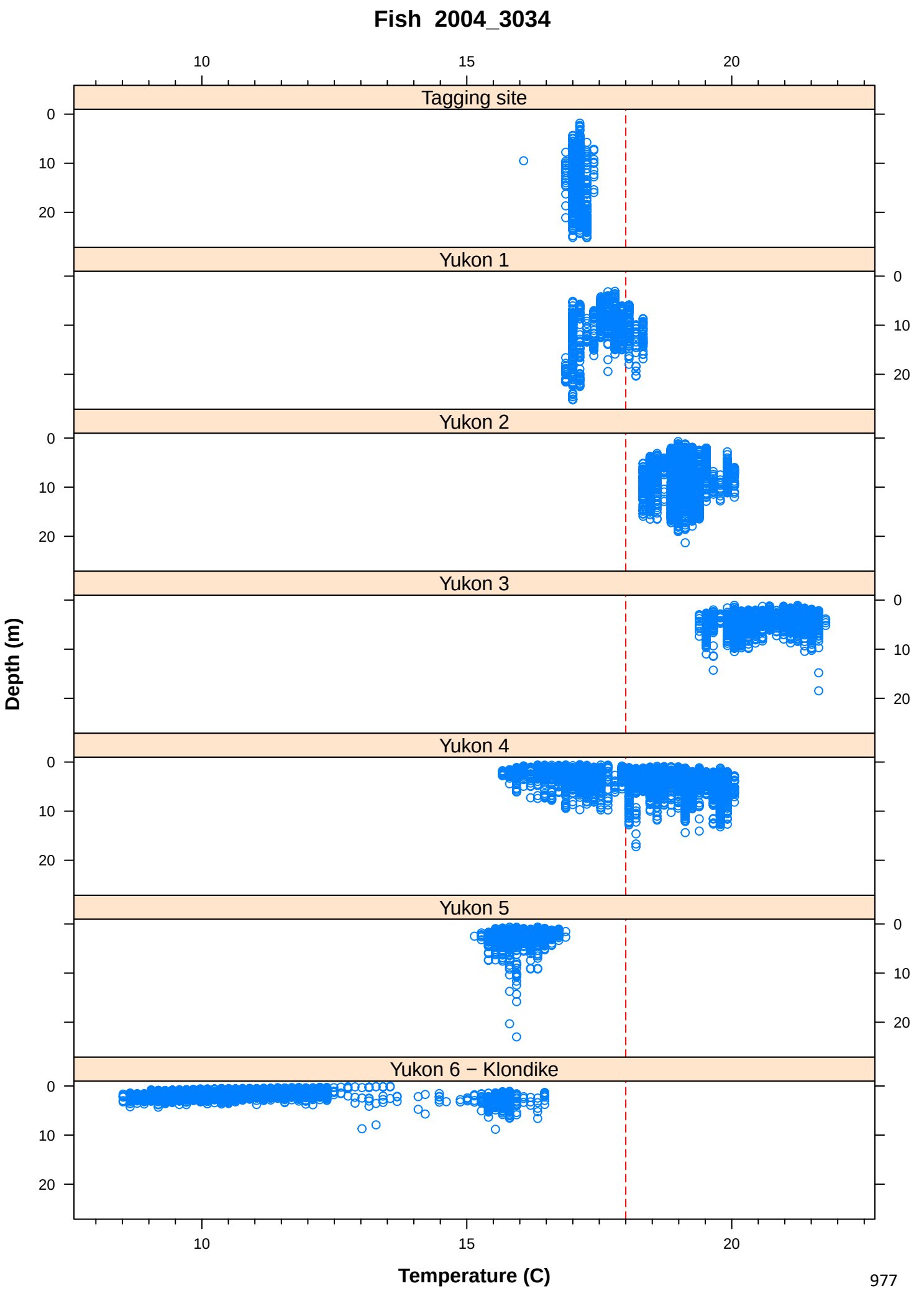

Fish 2004_3034
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Density
0.5
0.0
0
5
10
15
20
25
30
Depth (m)
972

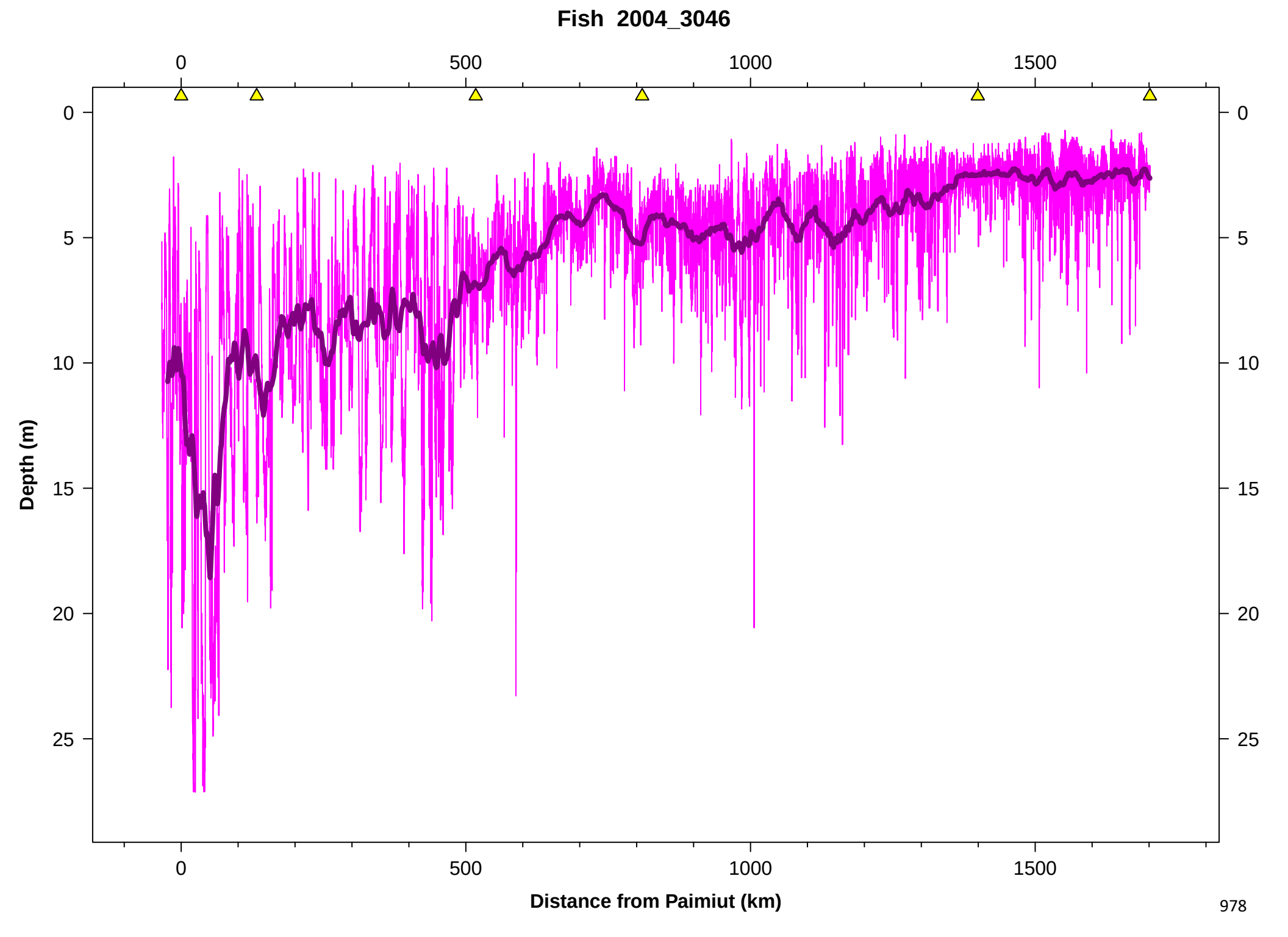

Fish 2004_3034
0
500
1000
1500
22
20
18
16
Temperature (C)
Distance from Paimiut (km)
973

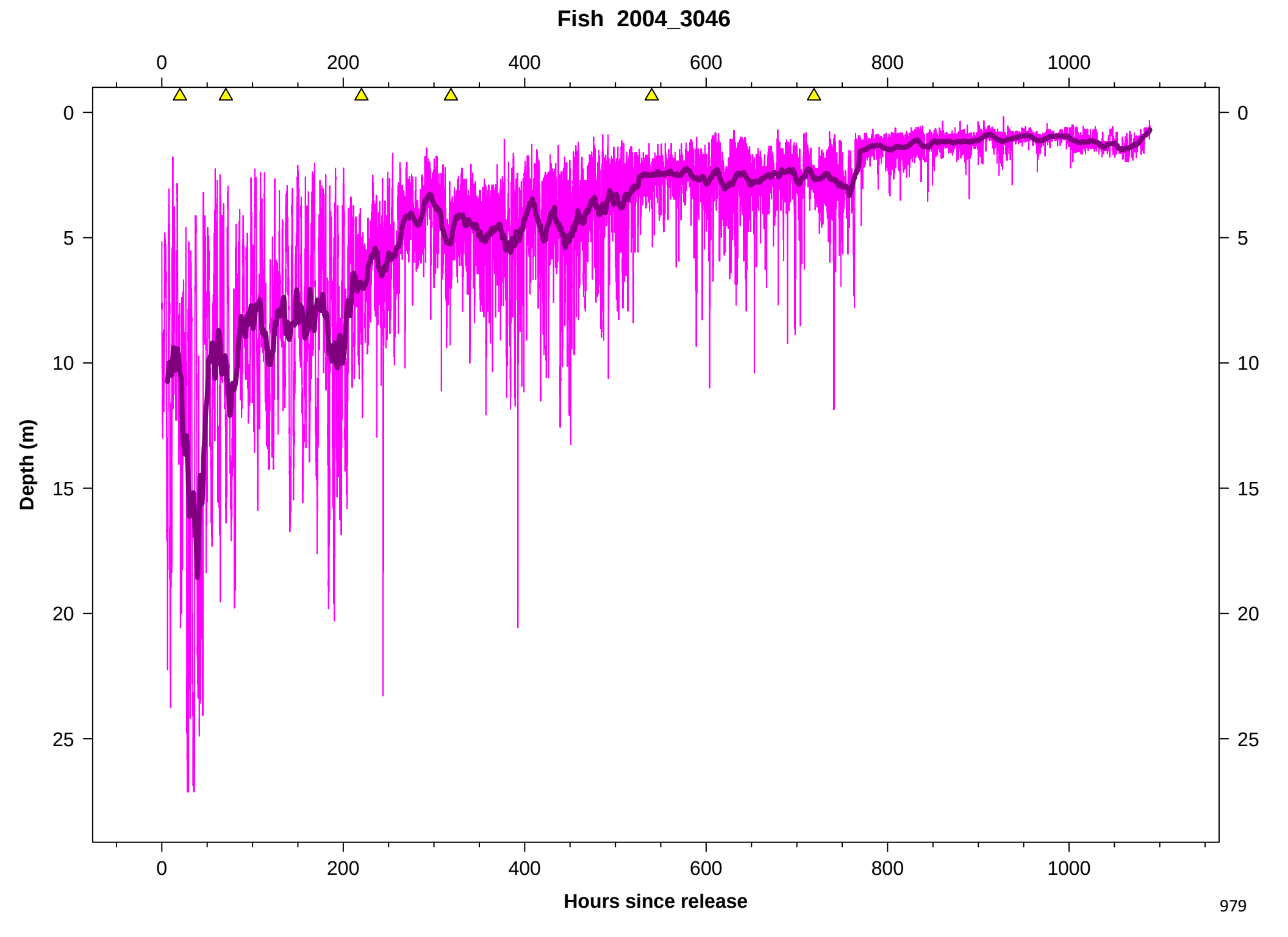

Fish 2004_3034
0
200
400
600
800
1000
20
15
10
Temperature (C)
Hours since release
974

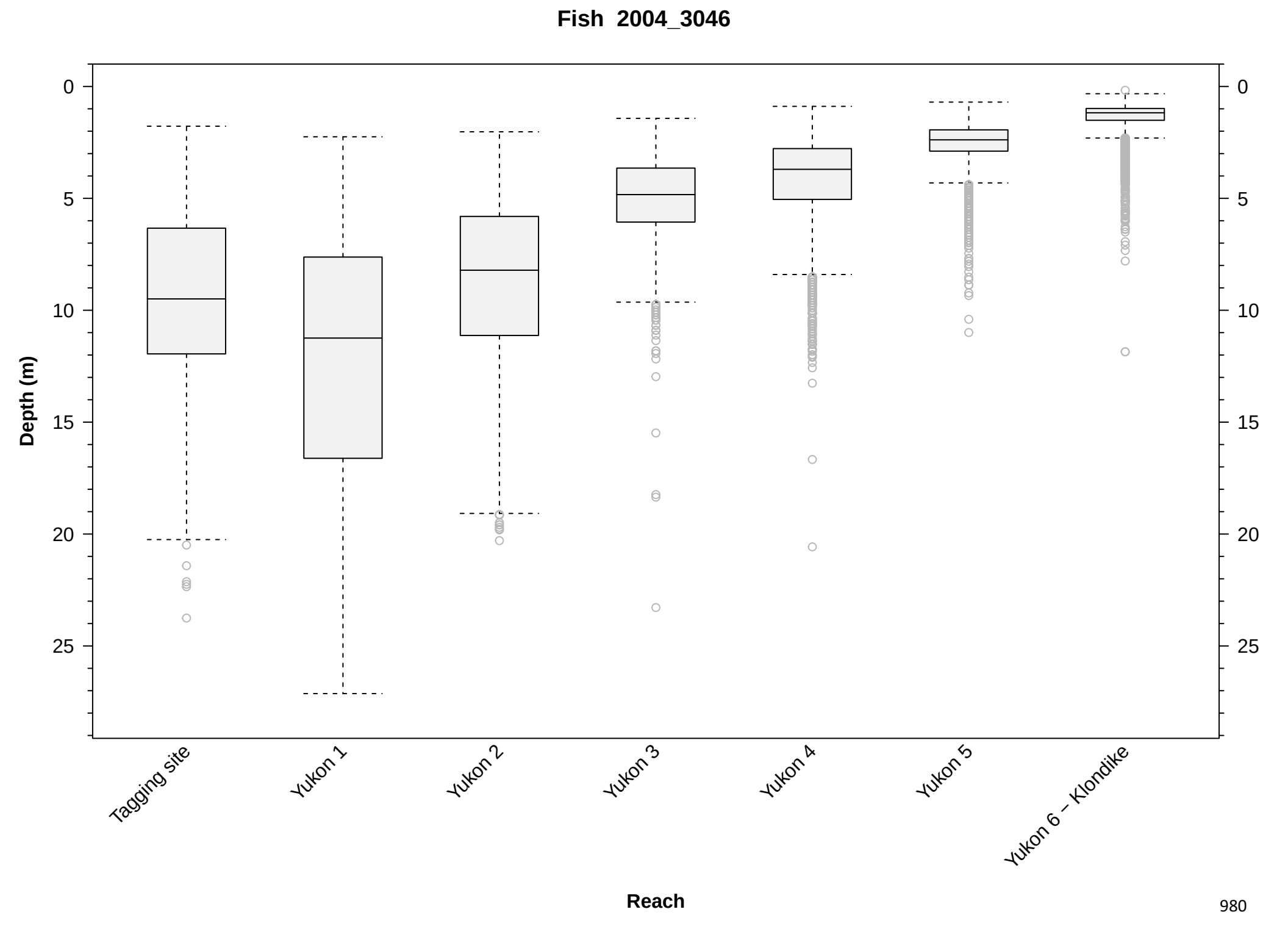

Fish 2004_3034
Temperature (C)
20
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 – Klondike
Reach
975

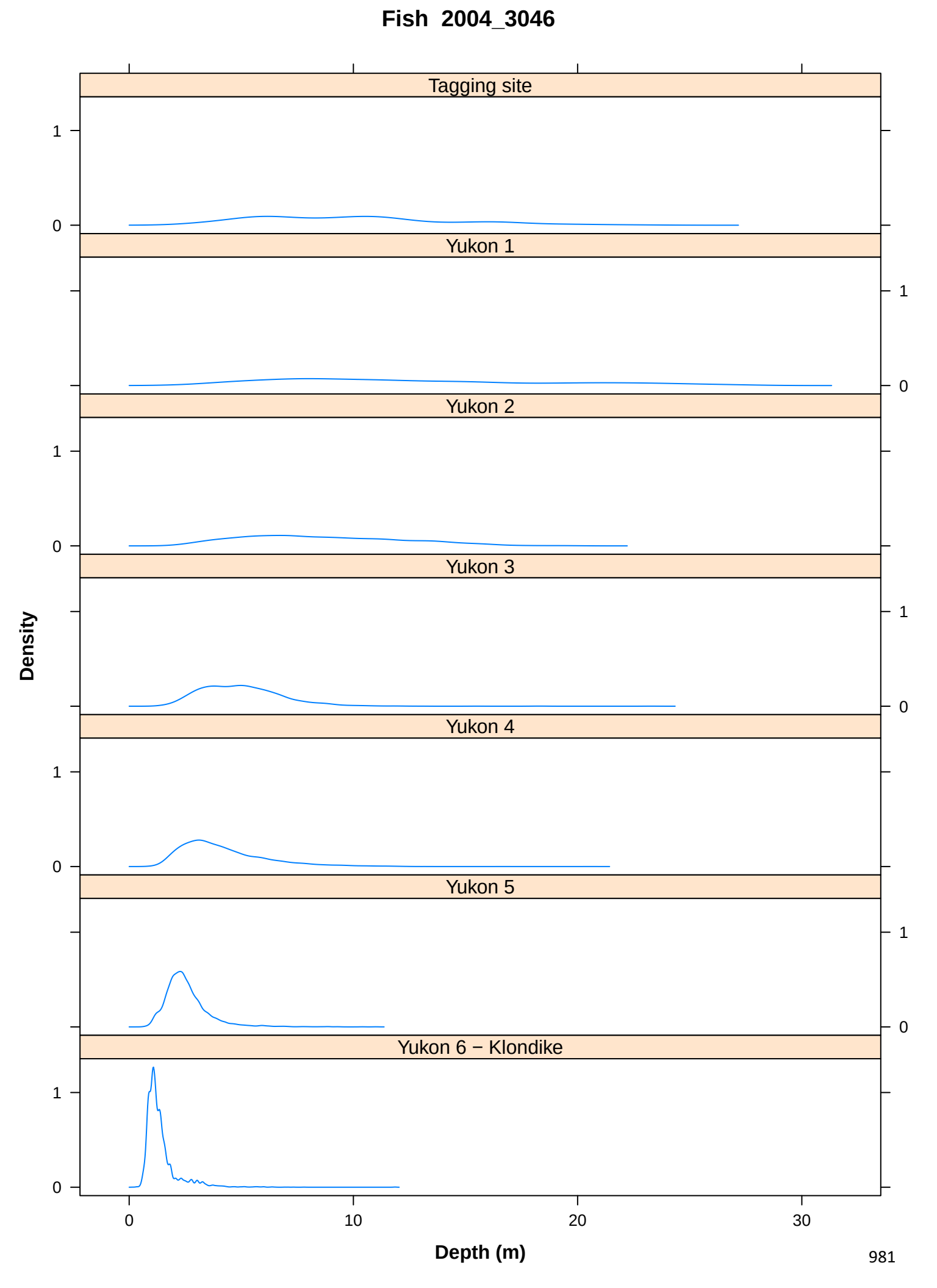

Fish 2004_3034
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Density
Temperature (C)
8
10
12
14
16
18
20
22
0
5

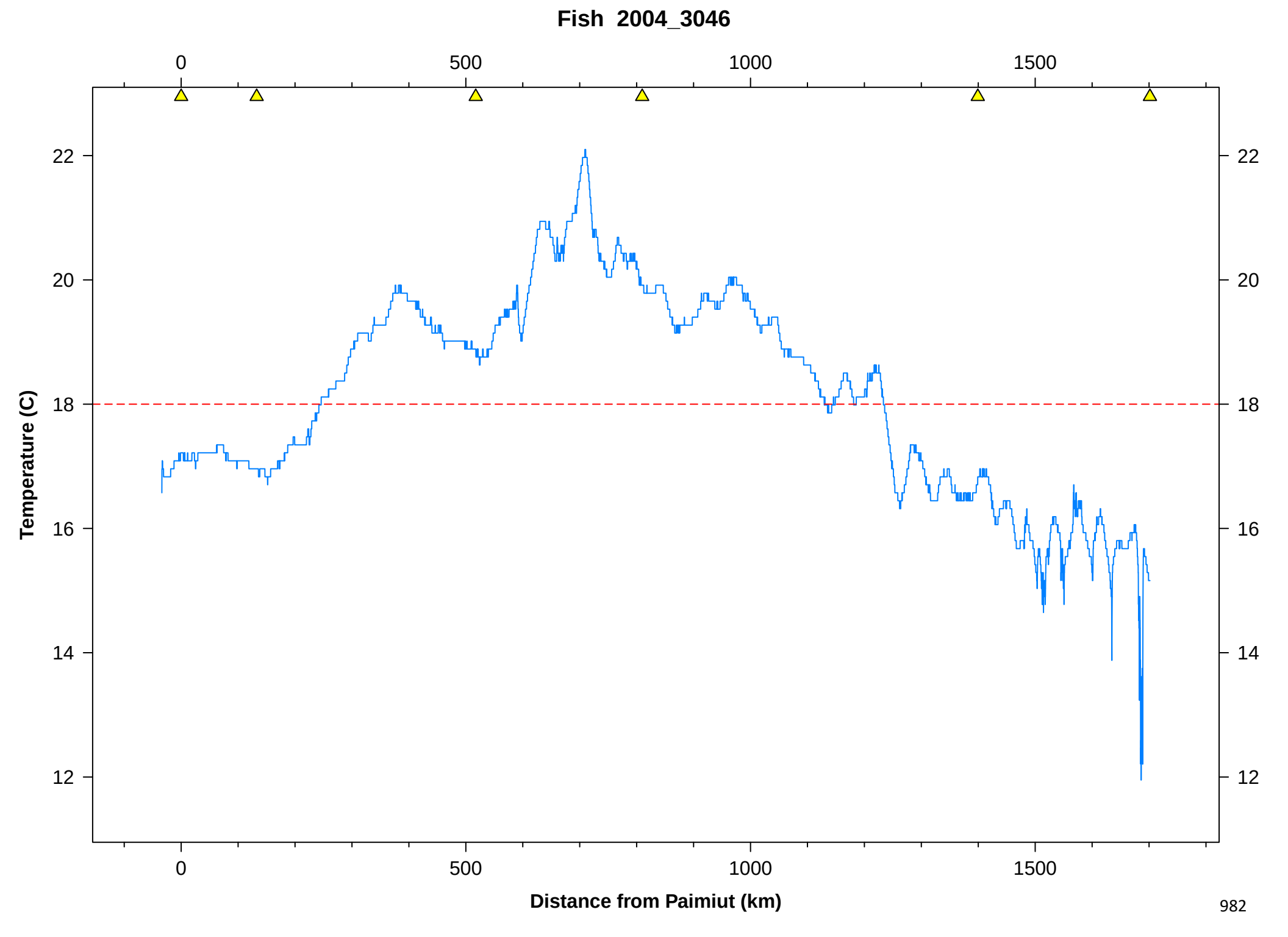

Fish 2004_3034
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Depth (m)
Temperature (C)
10
15
20
0
10
20

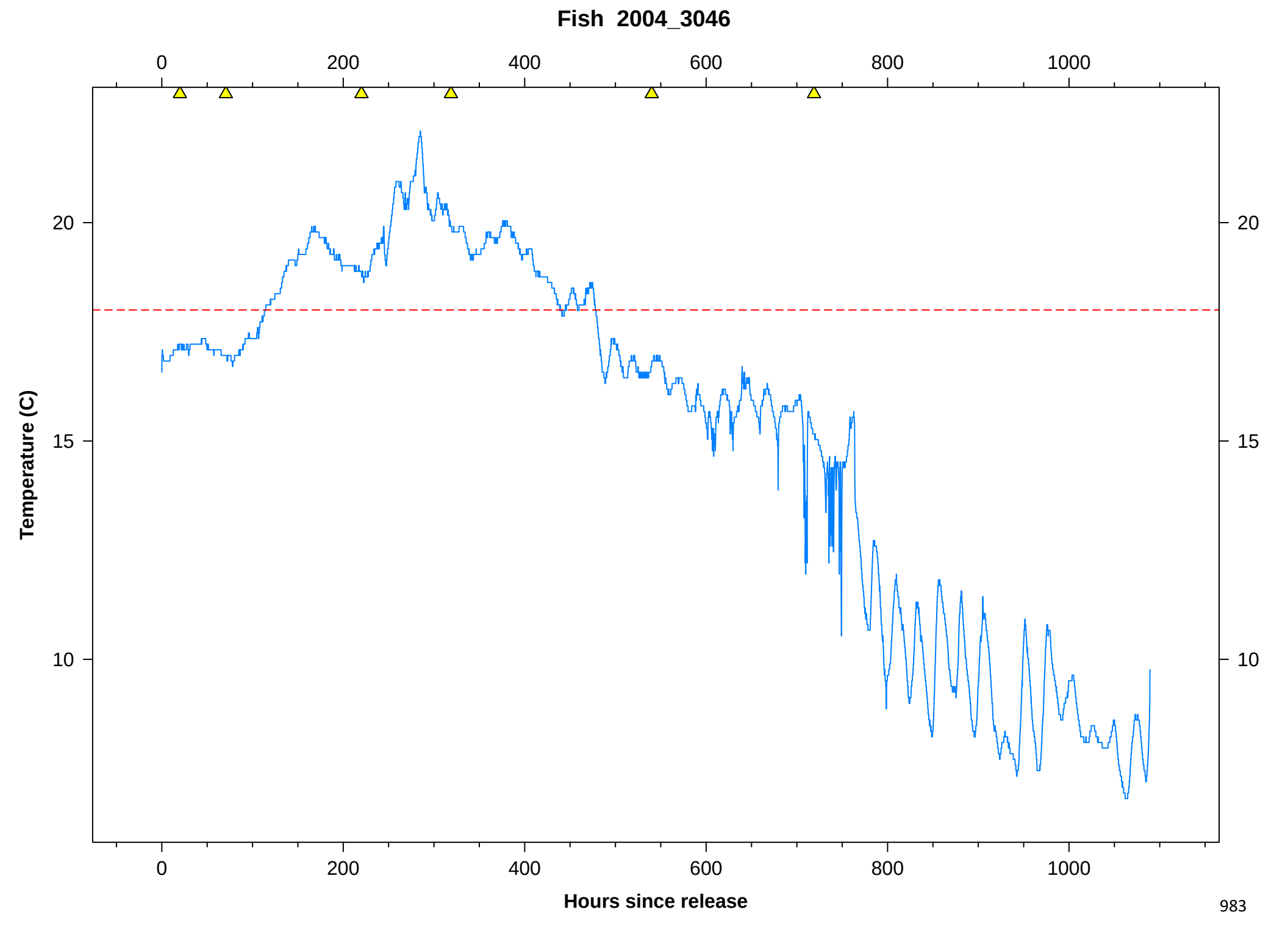

Fish 2004_3046
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

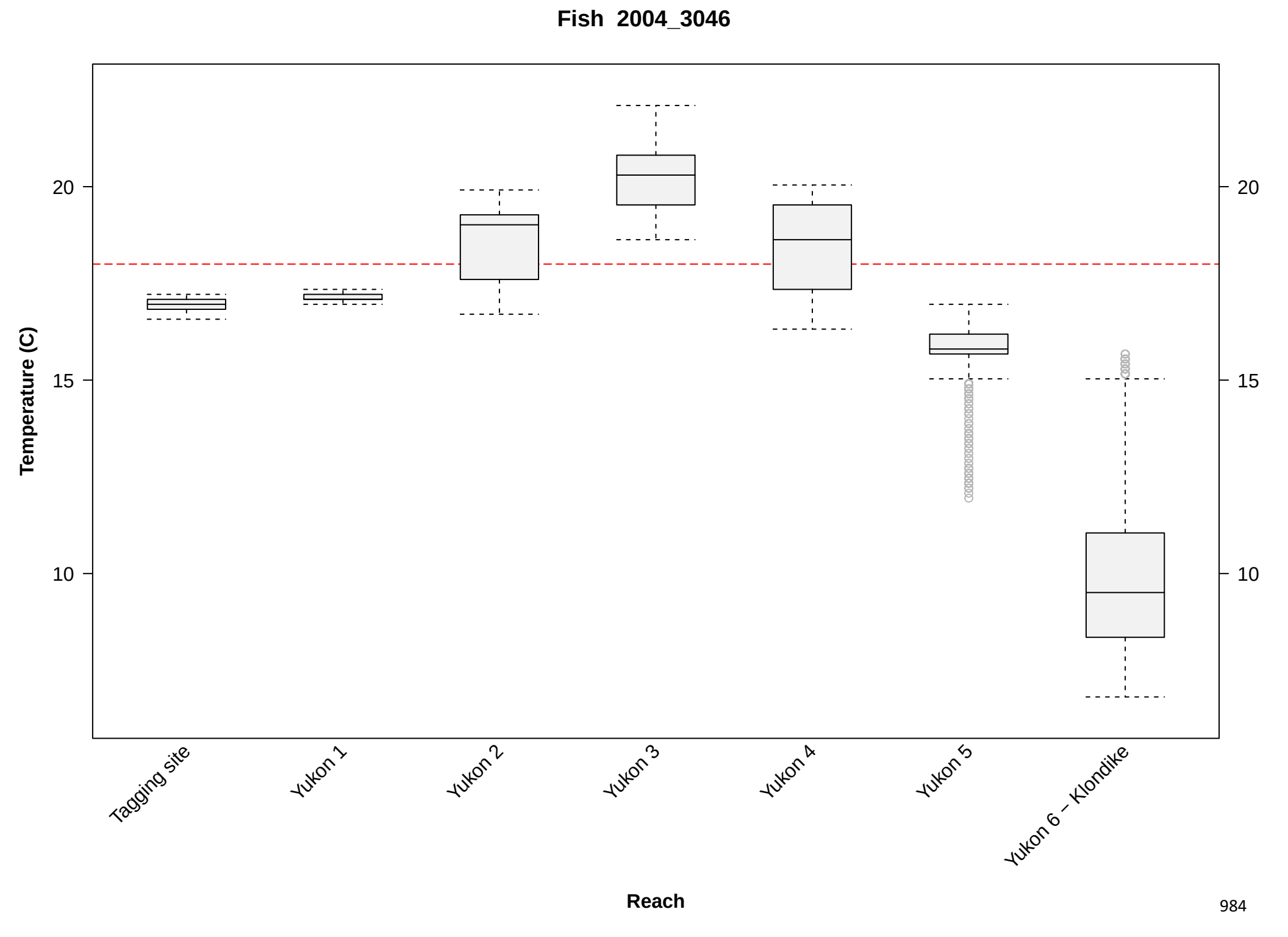

Fish 2004_3046
0
200
400
600
800
1000
0
5
10
15
20
25
Depth (m)
Hours since release
979

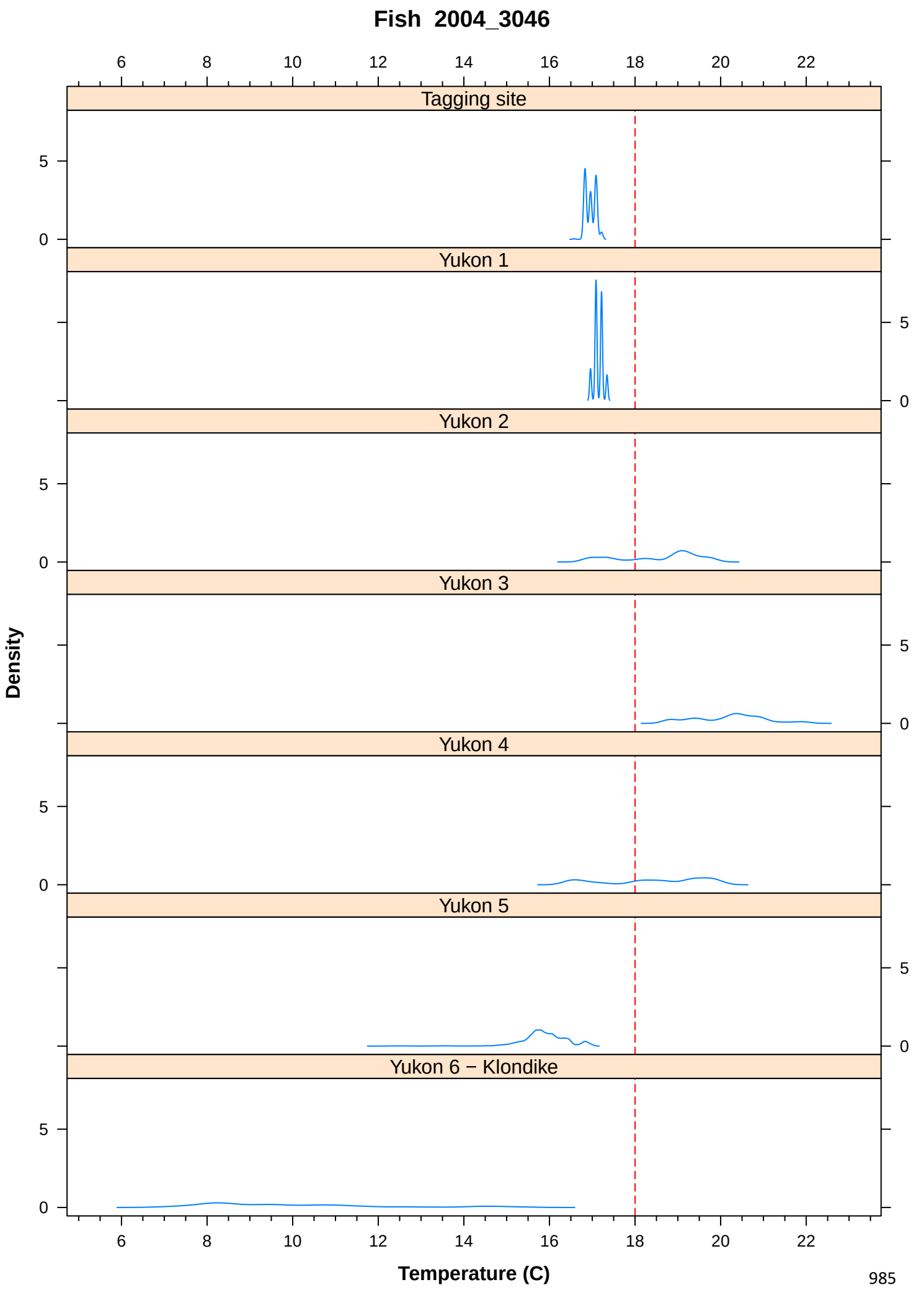

Fish 2004_3046
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 – Klondike
Reach

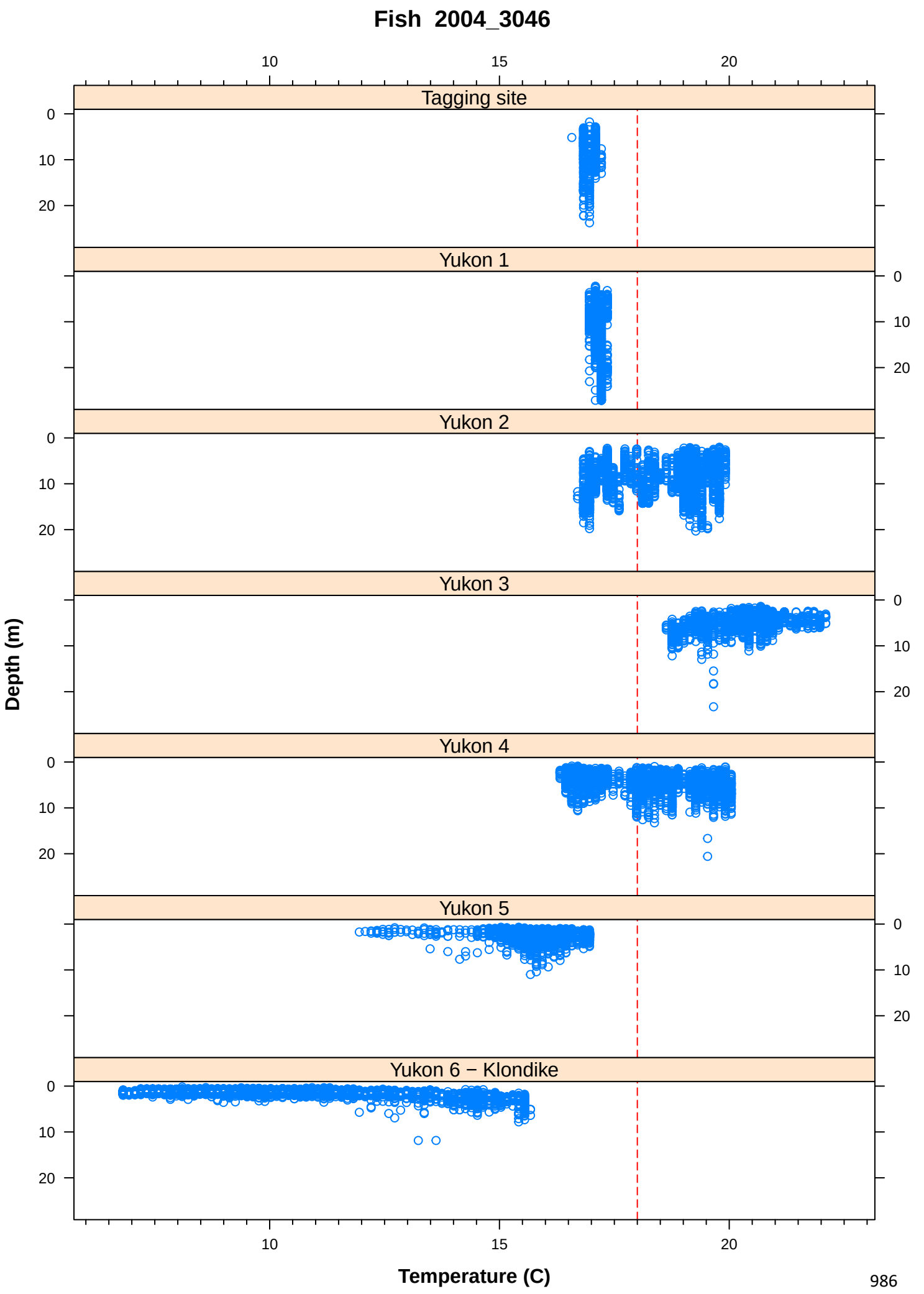

Fish 2004_3046
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Density
Depth (m)
0
10
20
30
1
0
981

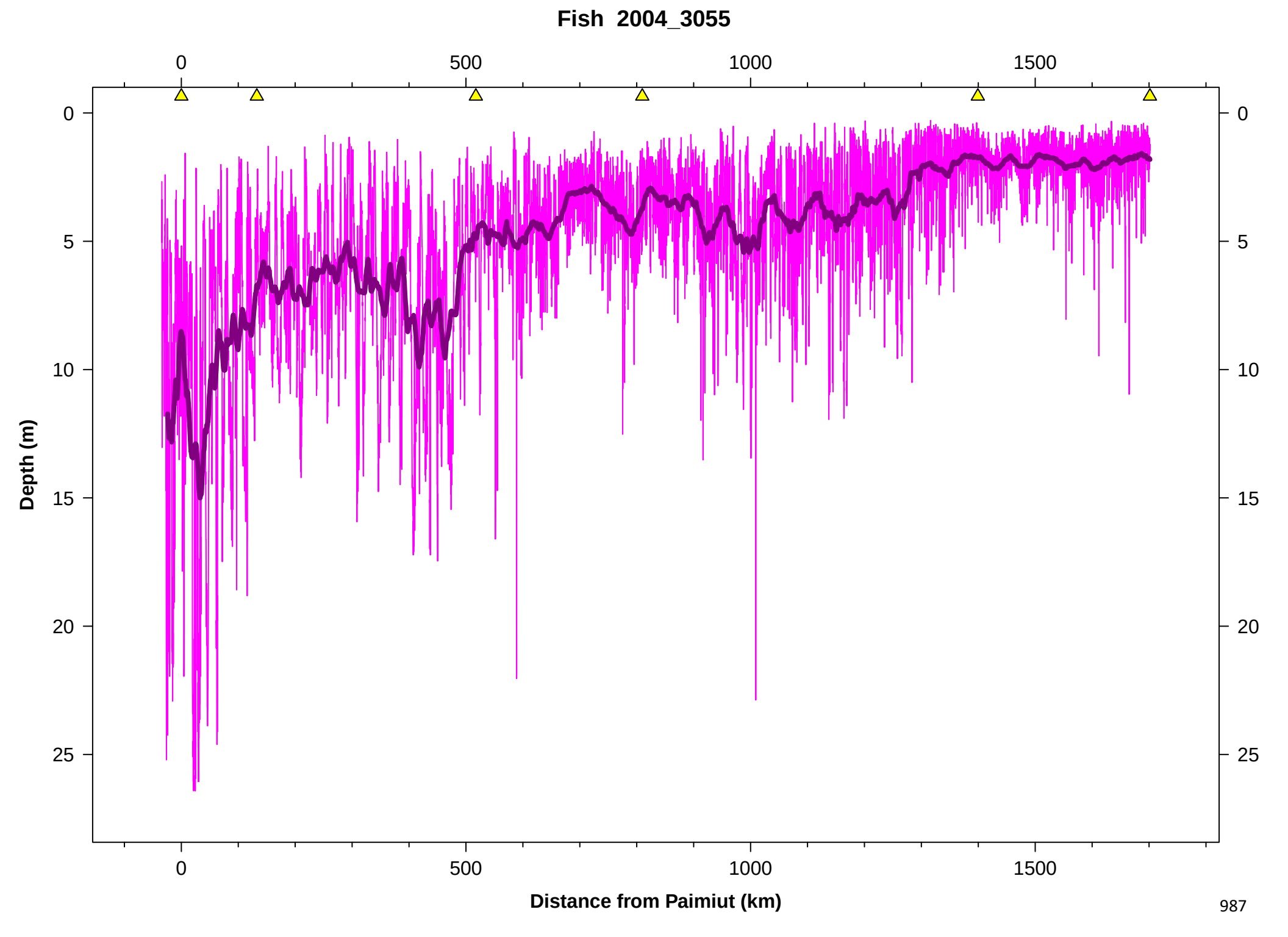

Fish 2004_3046
0
500
1000
1500
22
20
18
16
14
12
Temperature (C)
Distance from Paimiut (km)

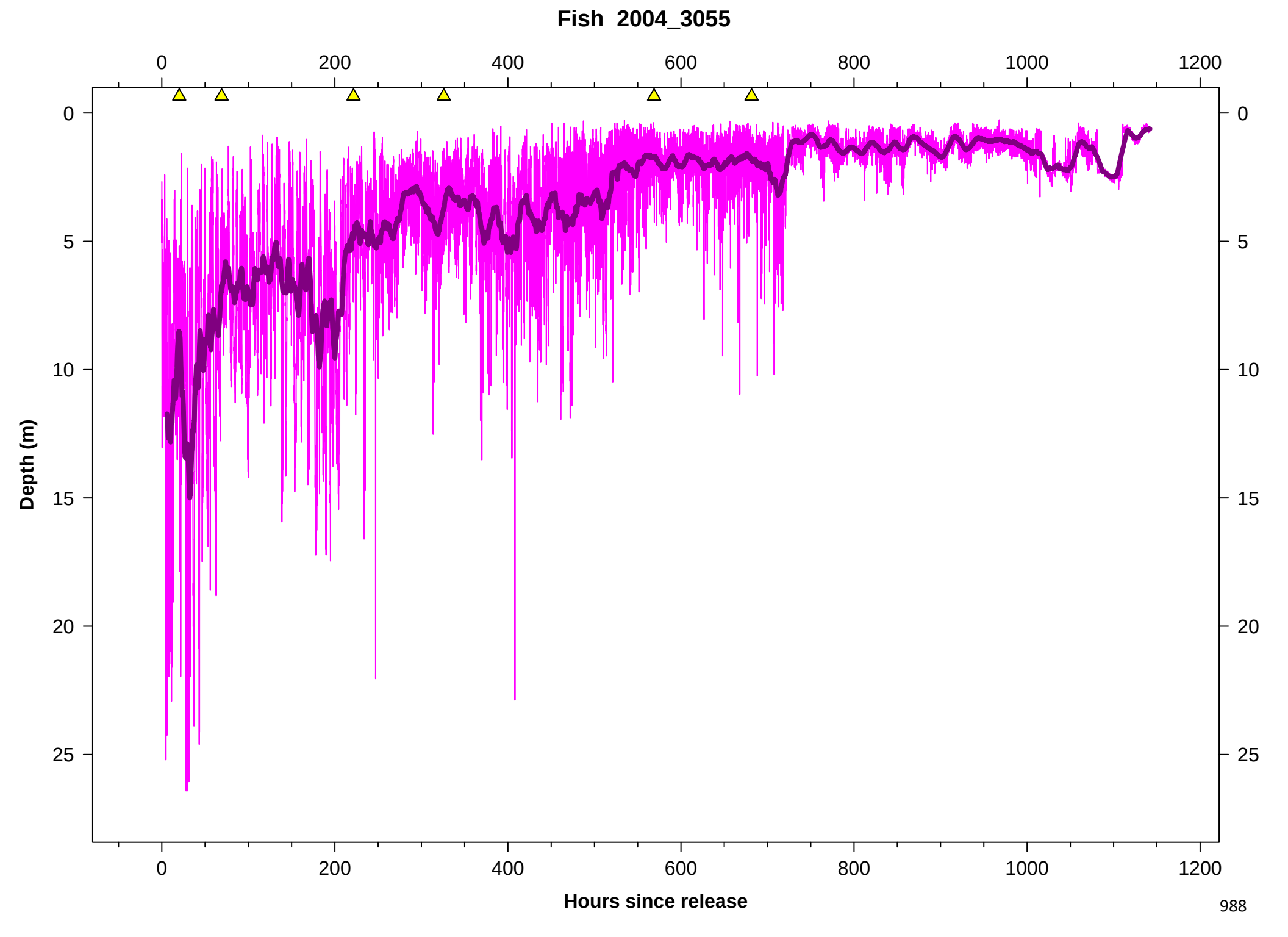

Fish 2004_3046
0
200
400
600
800
1000
20
15
10
Temperature (C)
Hours since release

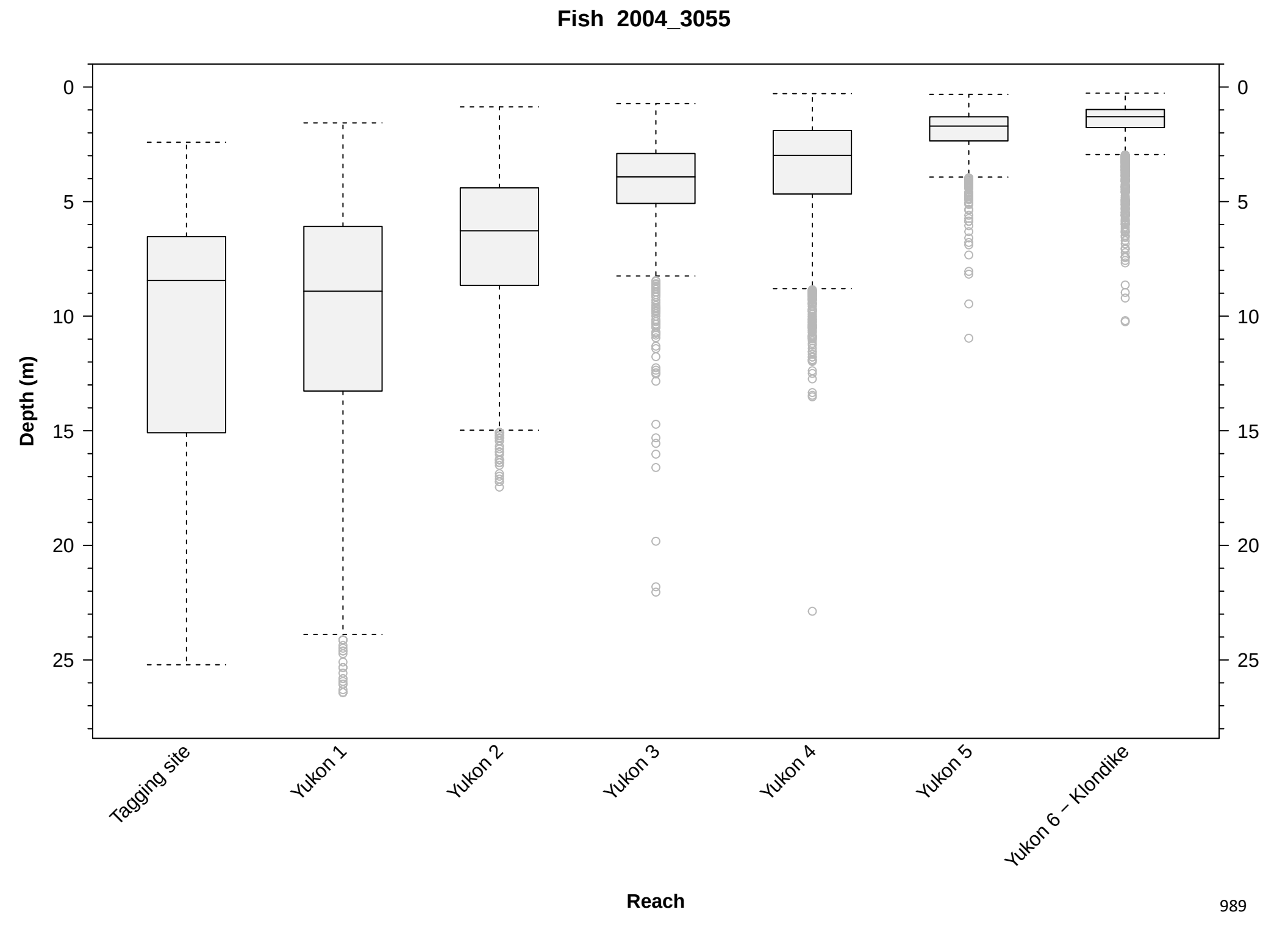

Fish 2004_3046
Temperature (C)
20
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 – Klondike
Reach
984

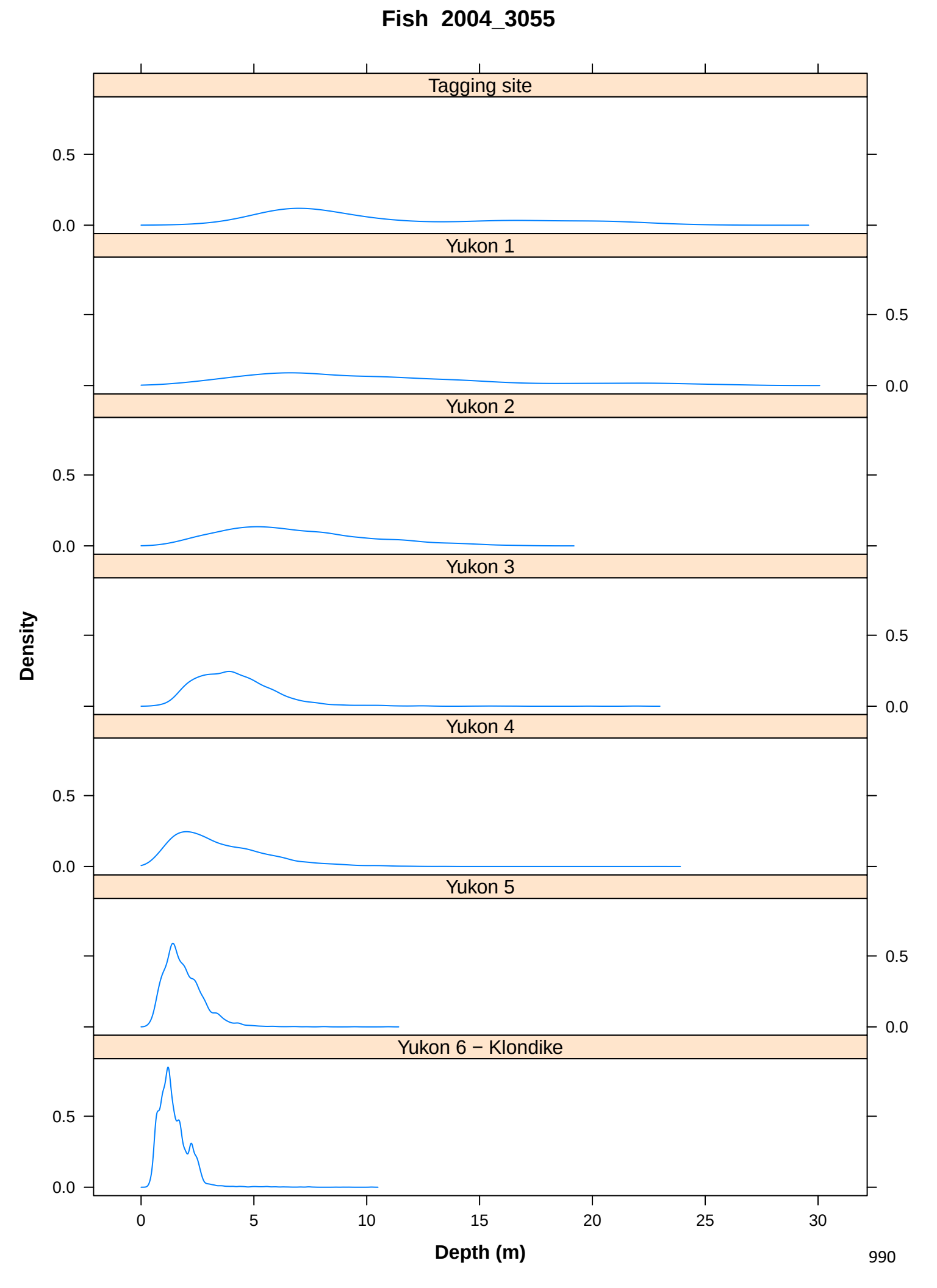

Fish 2004_3046
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Density
Temperature (C)
6
8
10
12
14
16
18
20
22
0
5

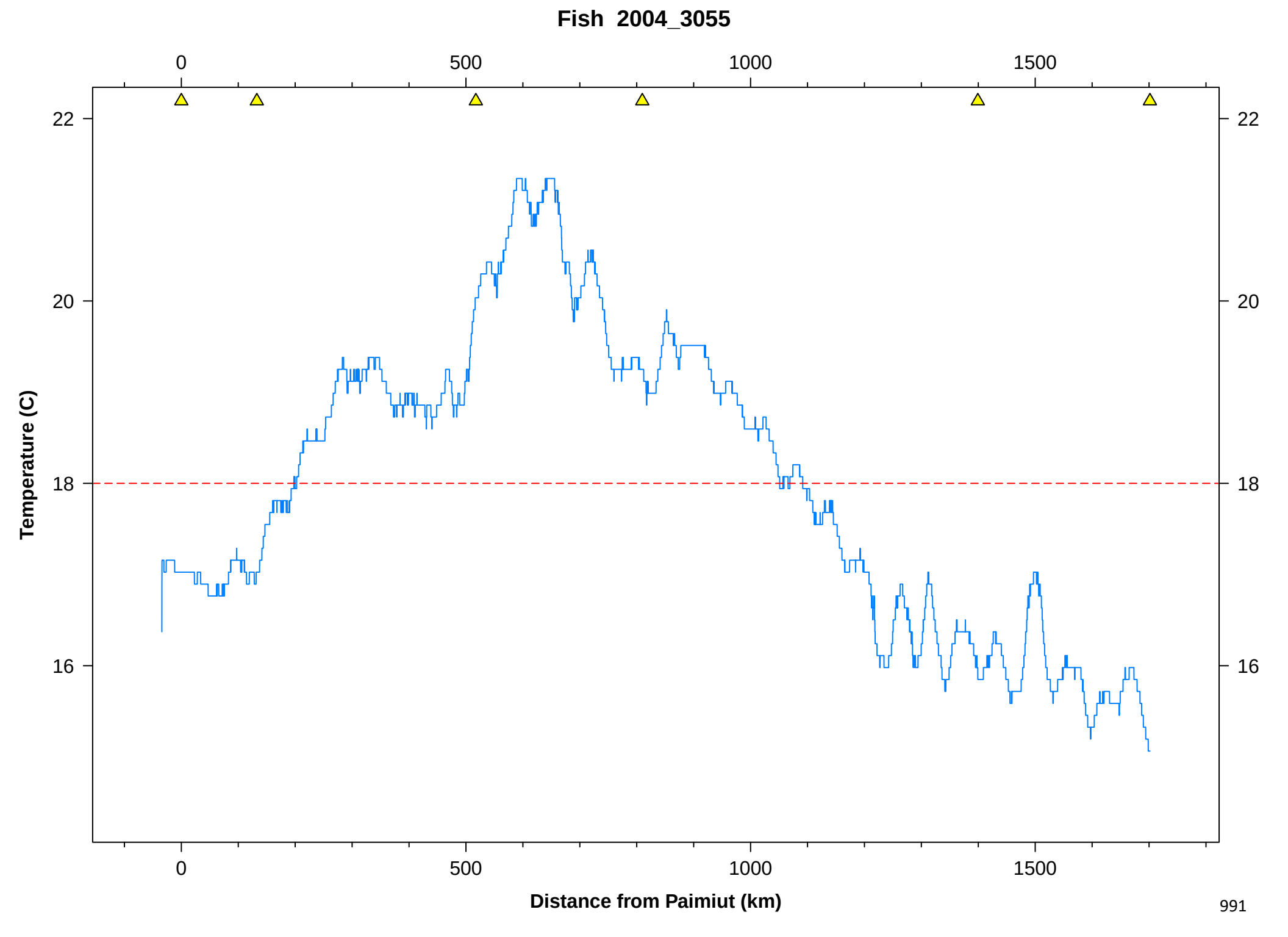

Fish 2004_3046
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Depth (m)
Temperature (C)
10
15
20
0
10
20
986

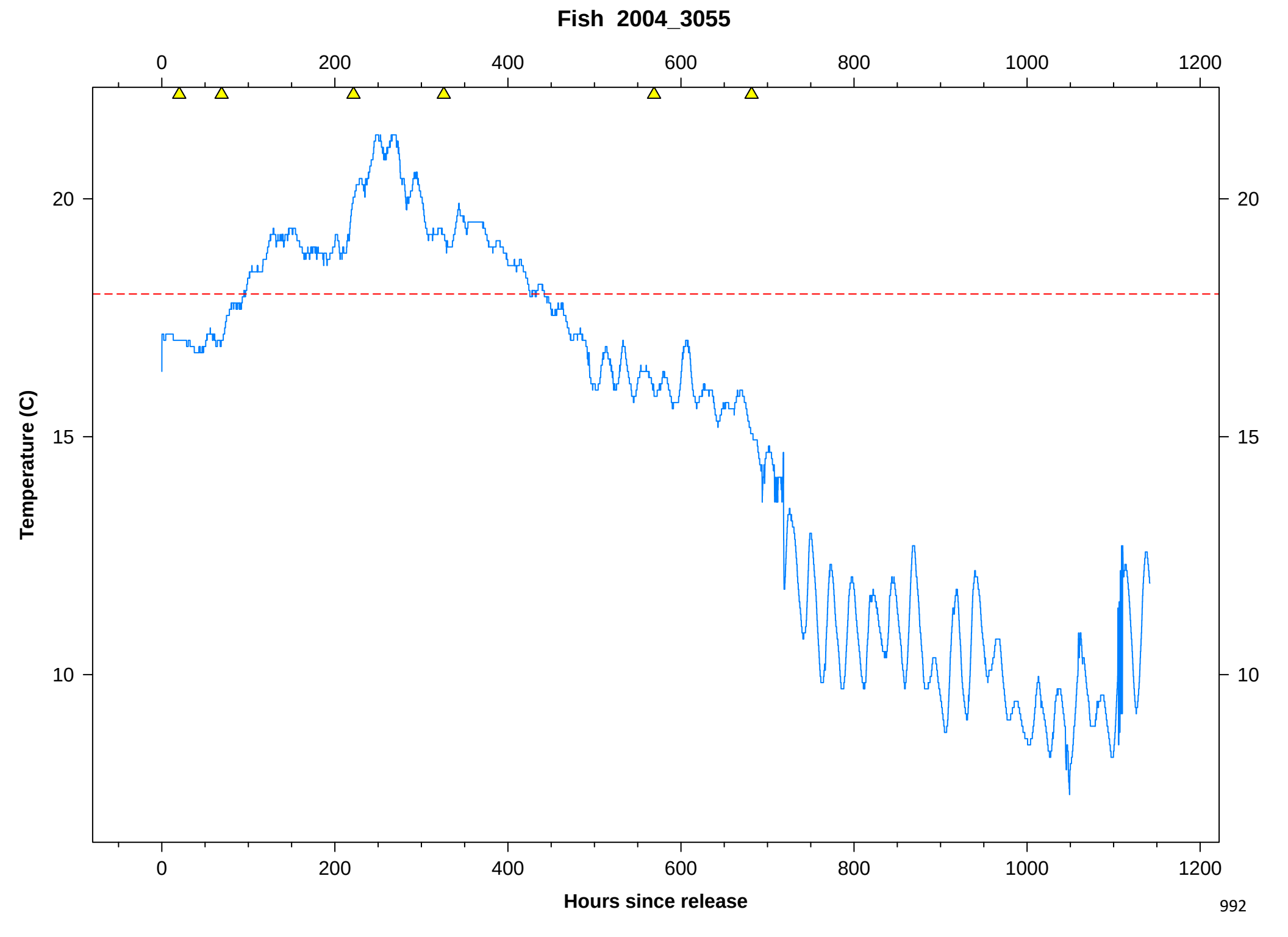

Fish 2004_3055
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

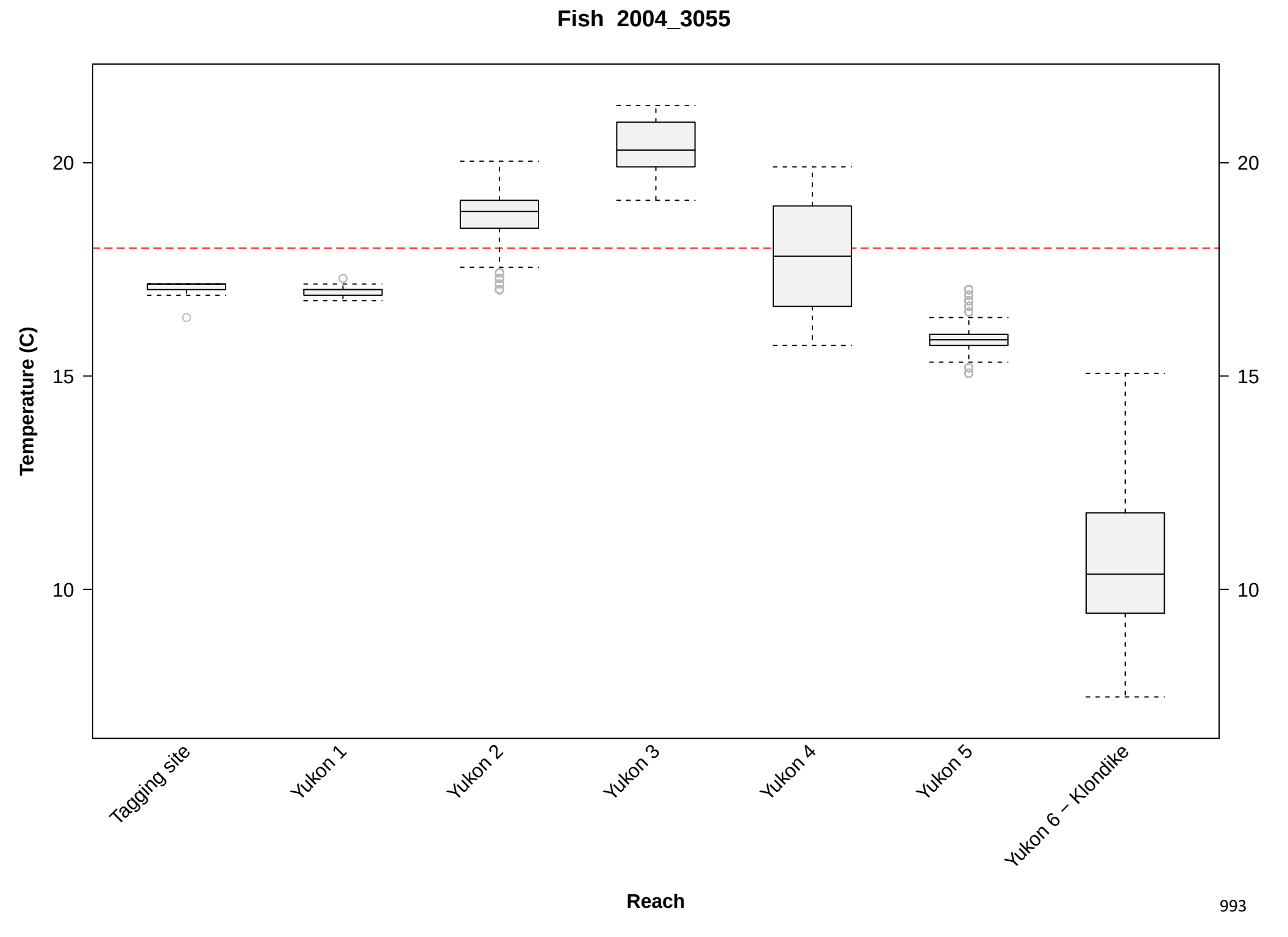

Fish 2004_3055
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Hours since release
988

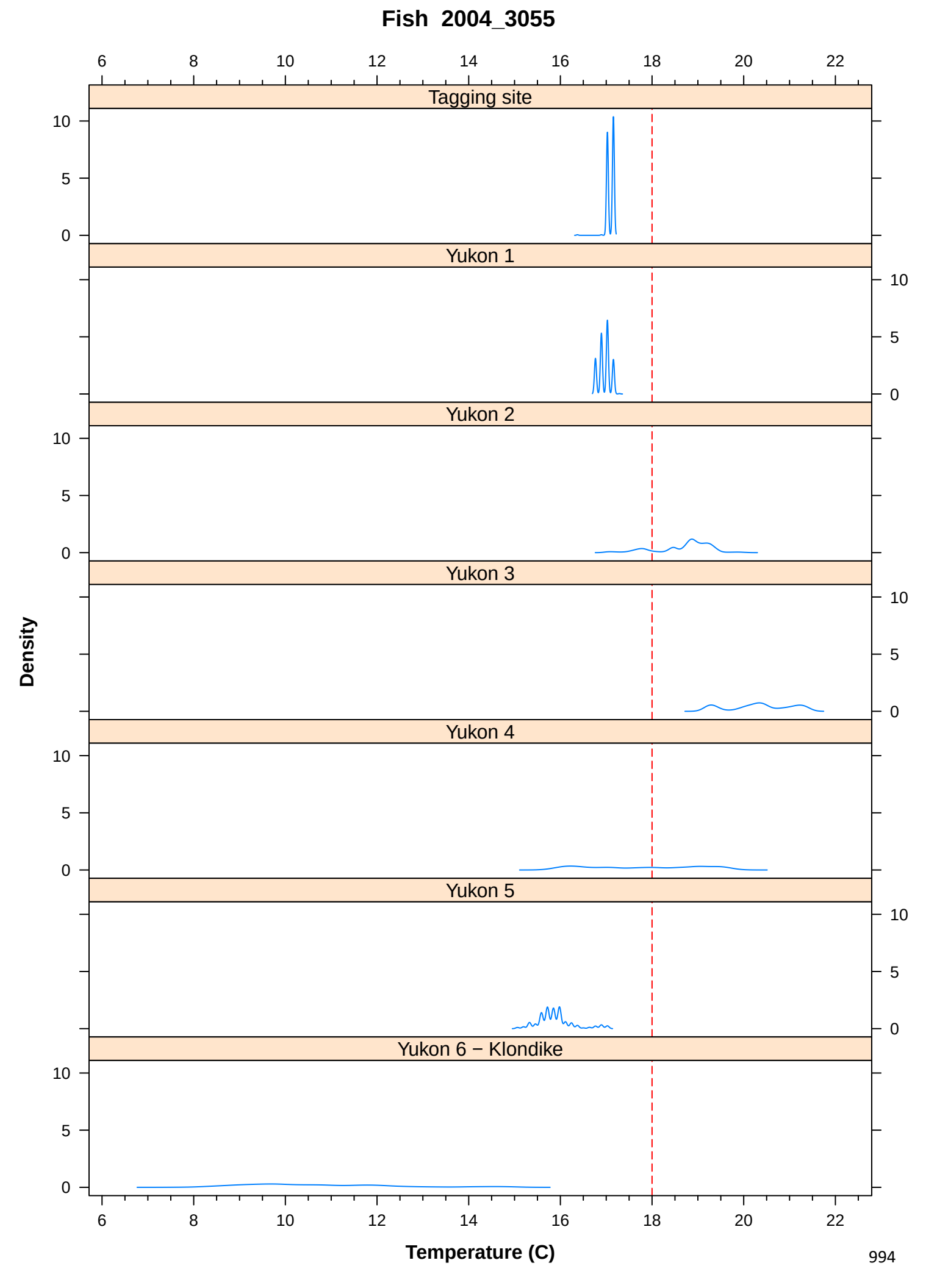

Fish 2004_3055
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 – Klondike
Reach
989

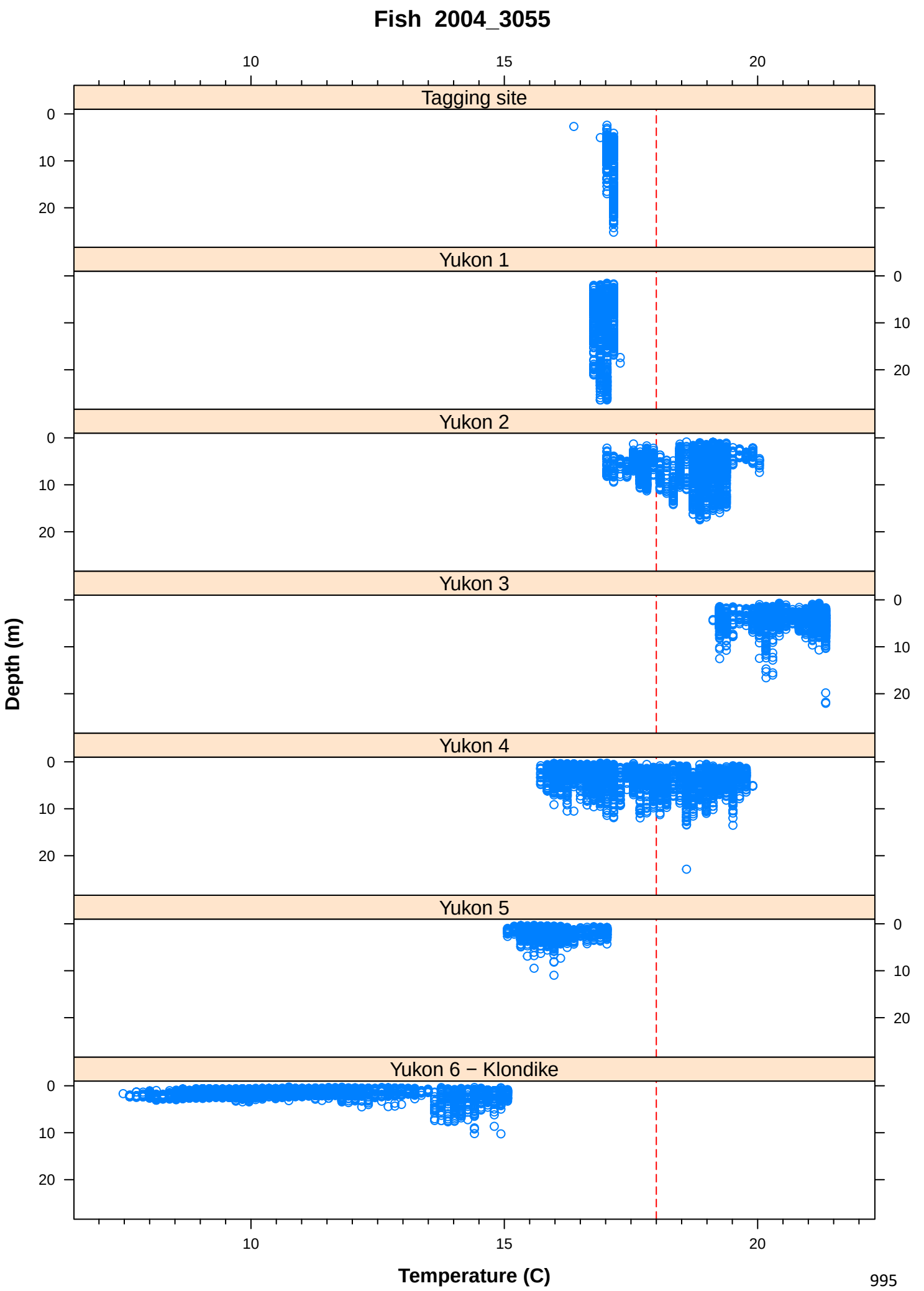

Fish 2004_3055
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Density
0.5
0.0
0
5
10
15
20
25
30
Depth (m)
990


Fish 2004_3055
0
500
1000
1500
22
20
18
16
Temperature (C)
Distance from Paimiut (km)
991

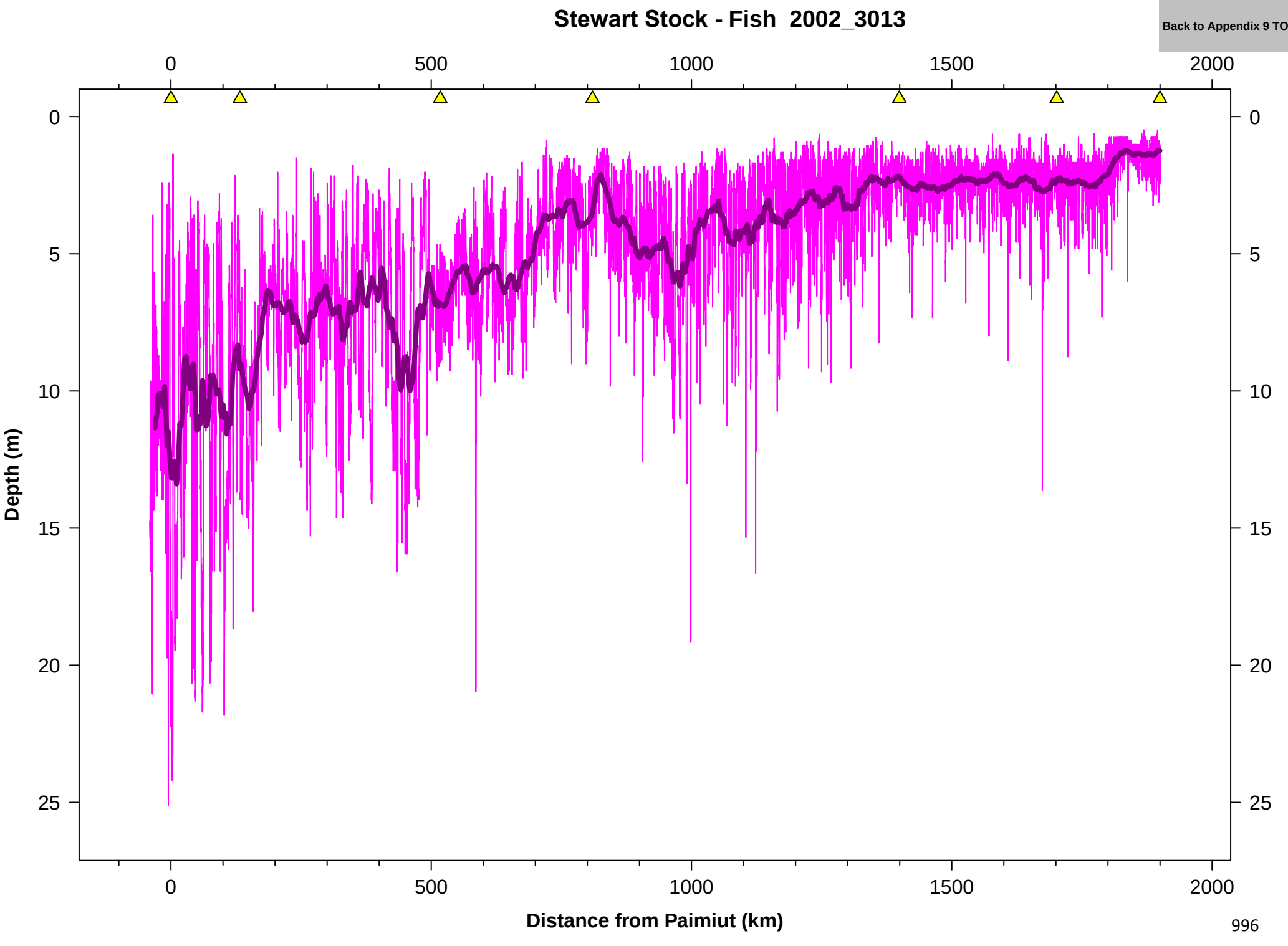

Fish 2004_3055
0
200
400
600
800
1000
1200
20
15
10
Temperature (C)
Hours since release

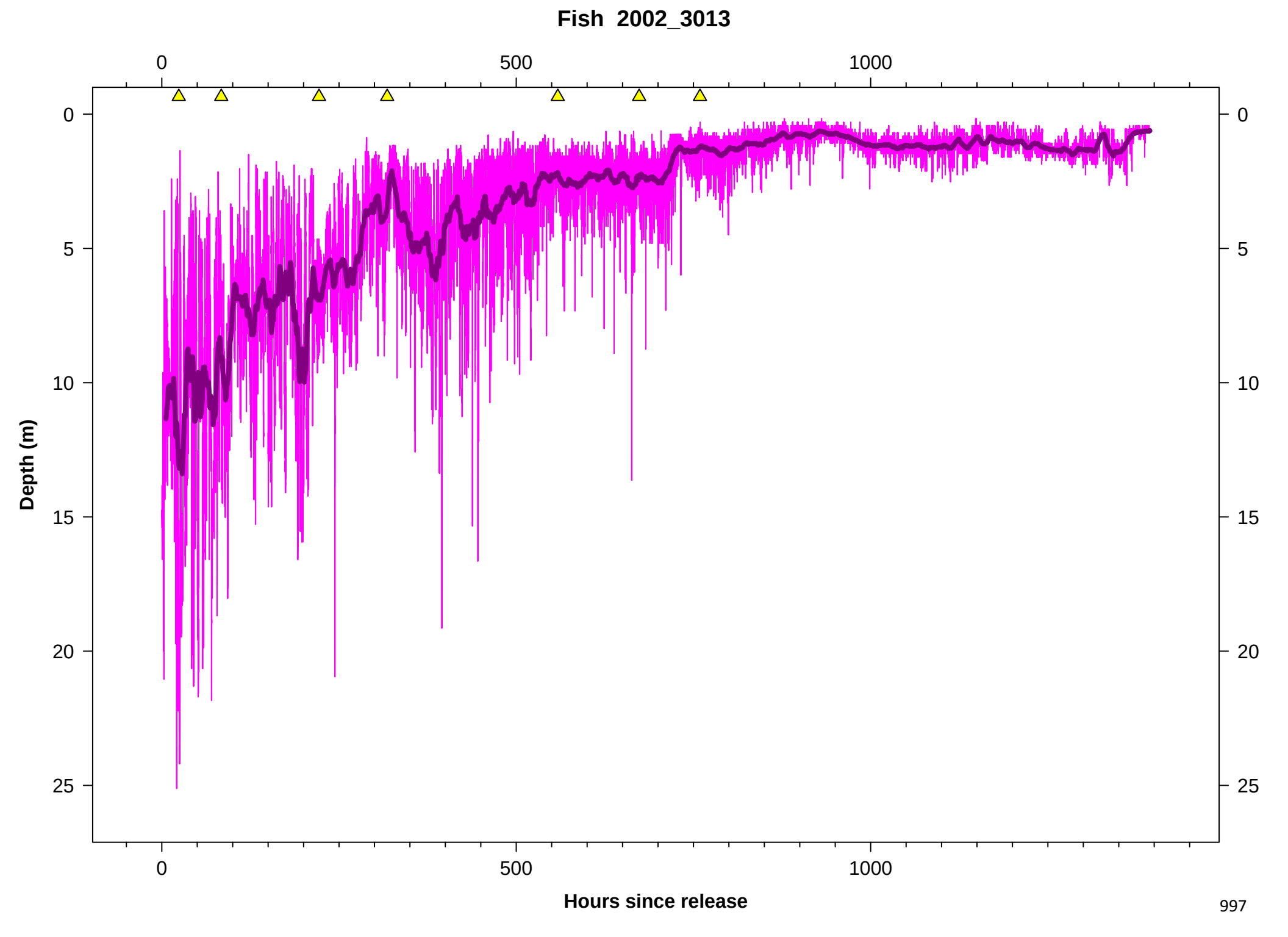

Fish 2004_3055
Temperature (C)
20
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 – Klondike
Reach

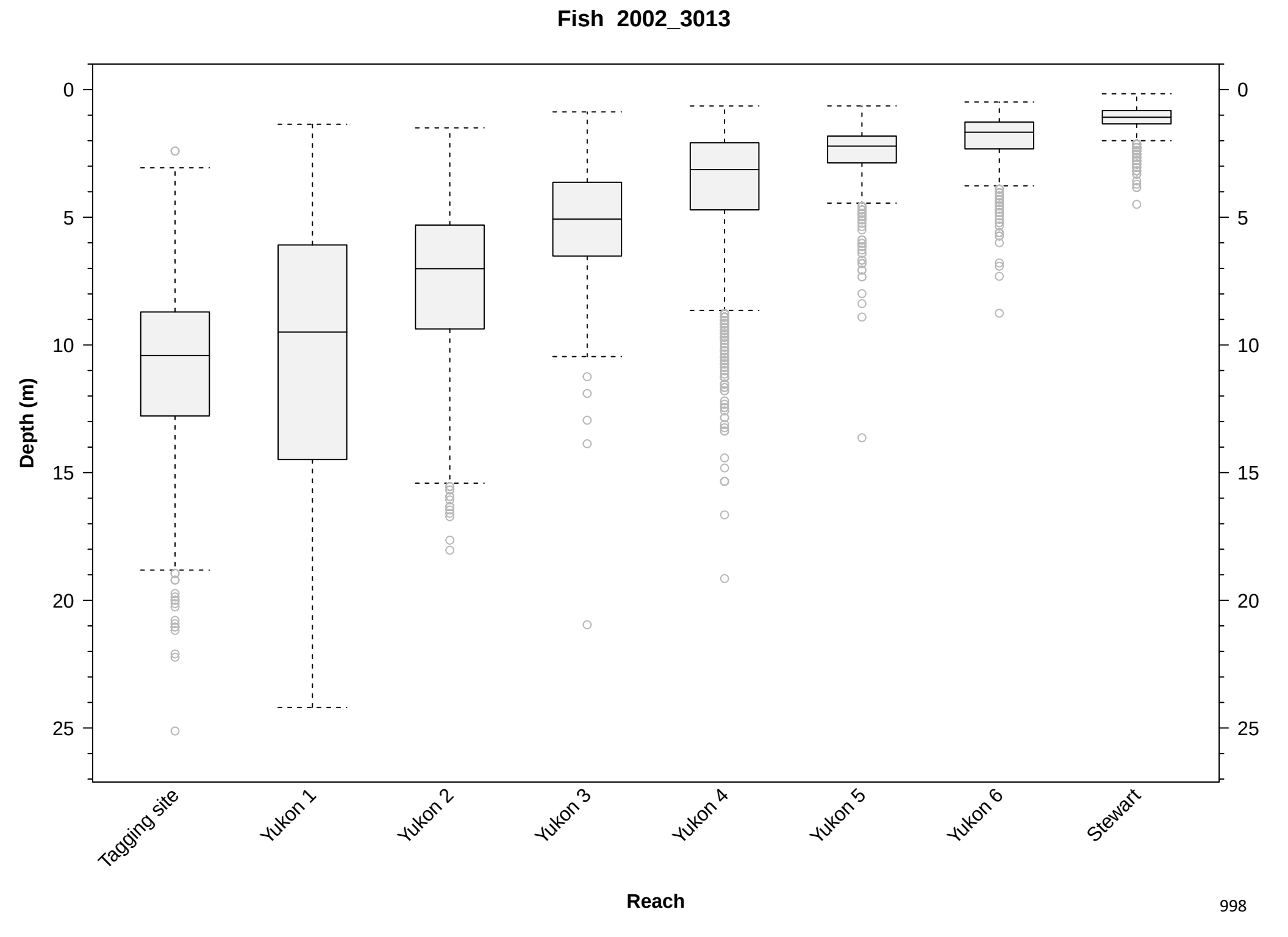

Fish 2004_3055
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Density
Temperature (C)
6
8
10
12
14
16
18
20
22
0
5
10

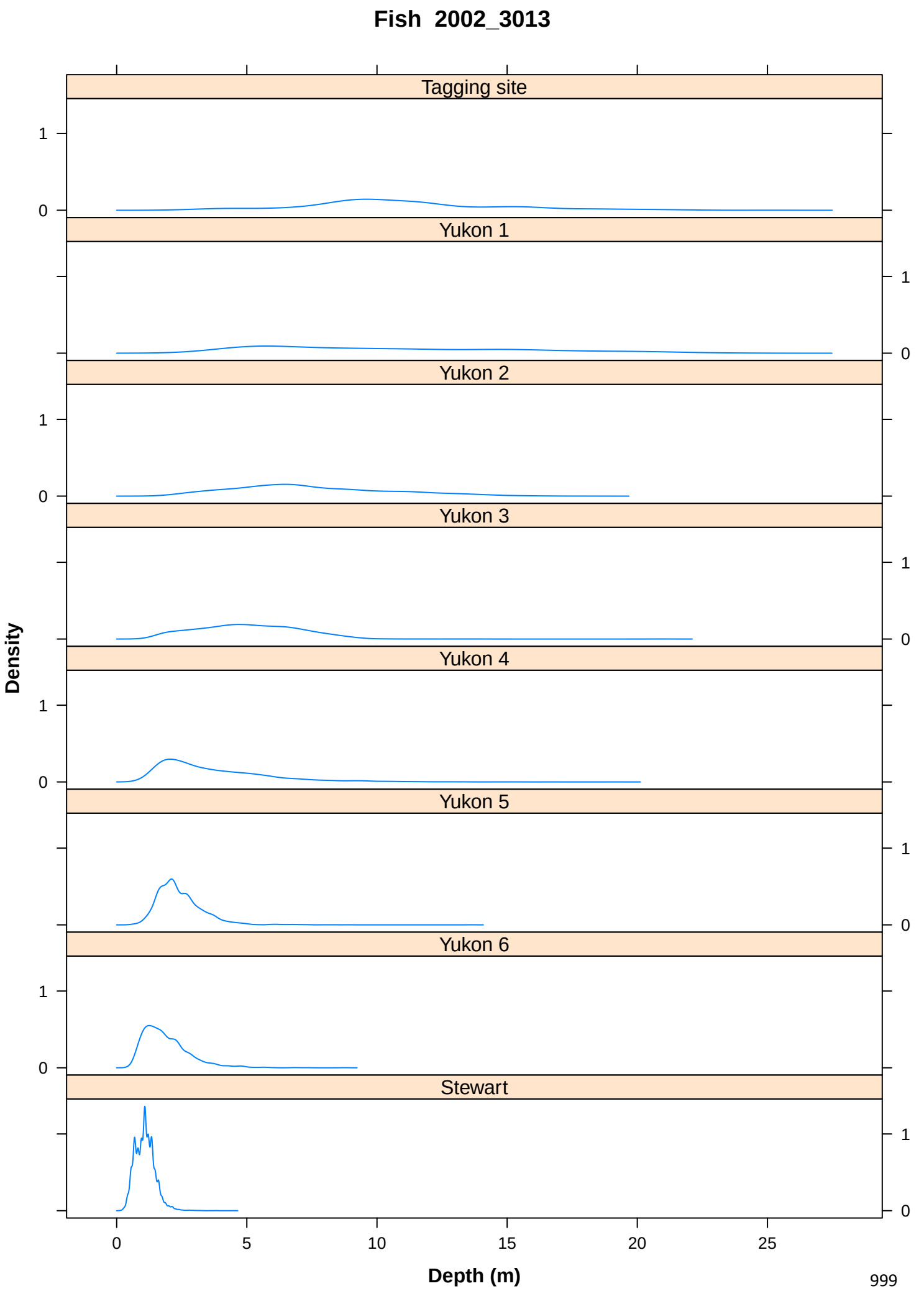

Fish 2004_3055
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6 − Klondike
Depth (m)
Temperature (C)
10
15
20
0
10
20

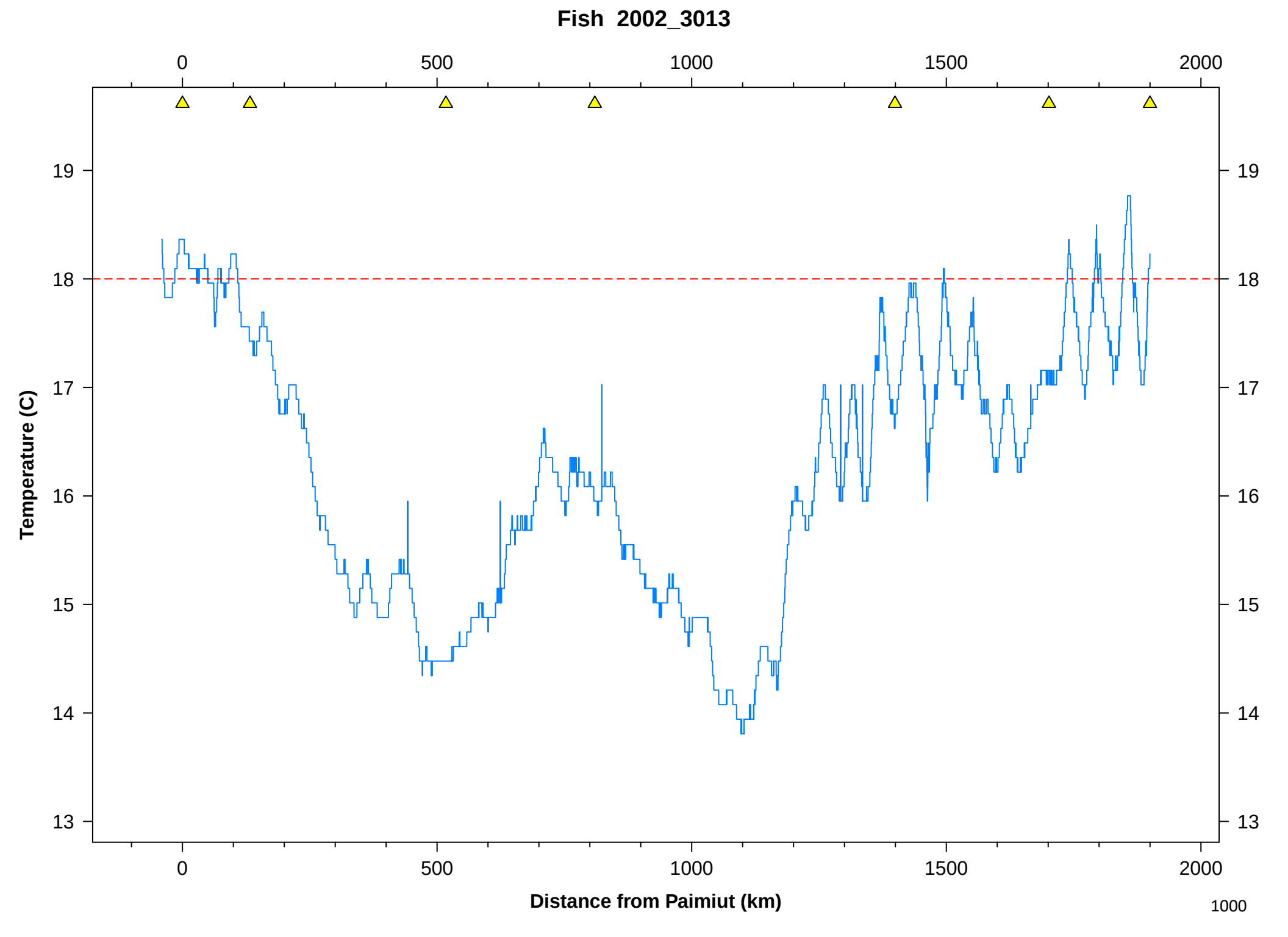
Back to Appendix 9 TOC

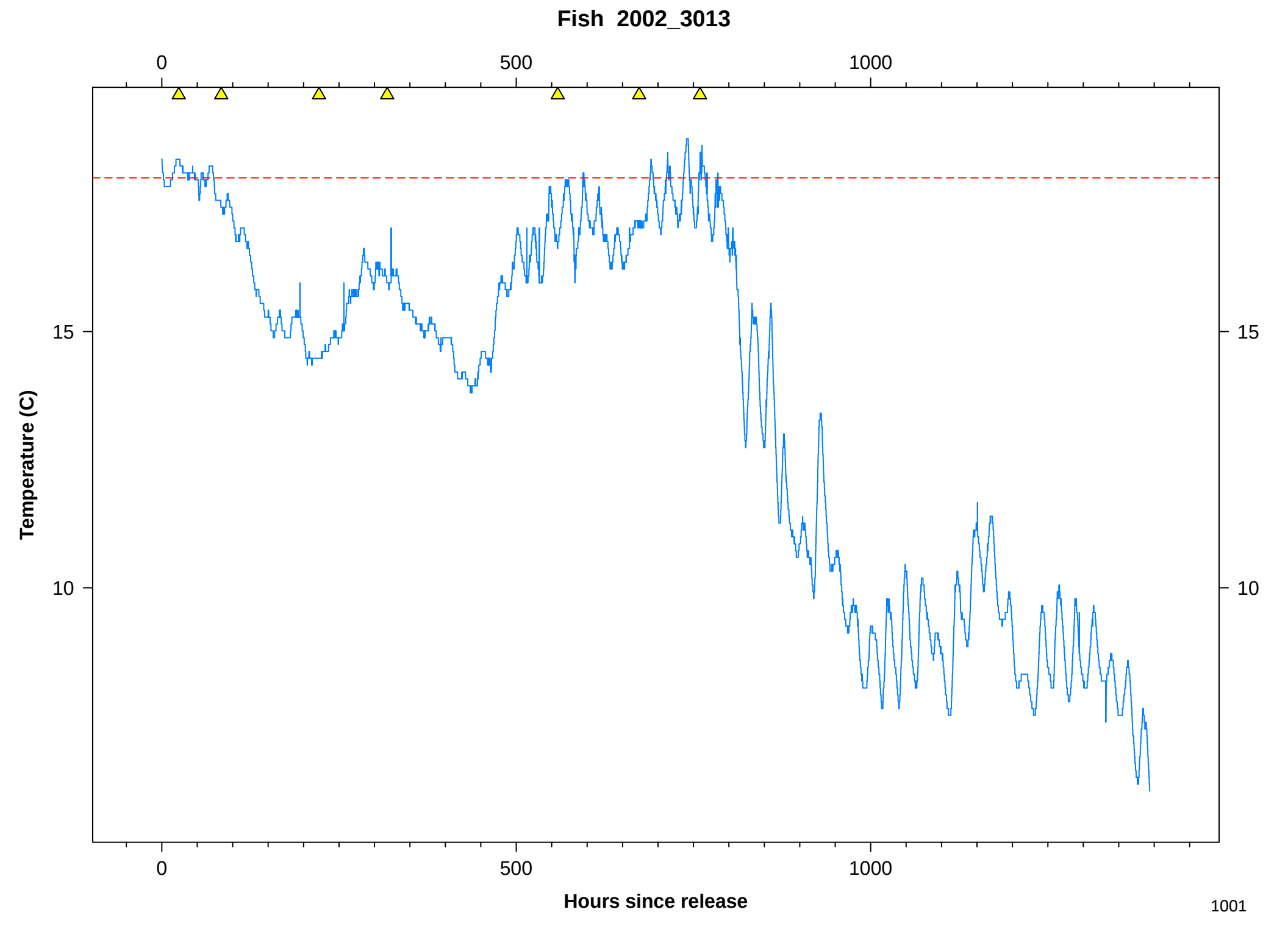


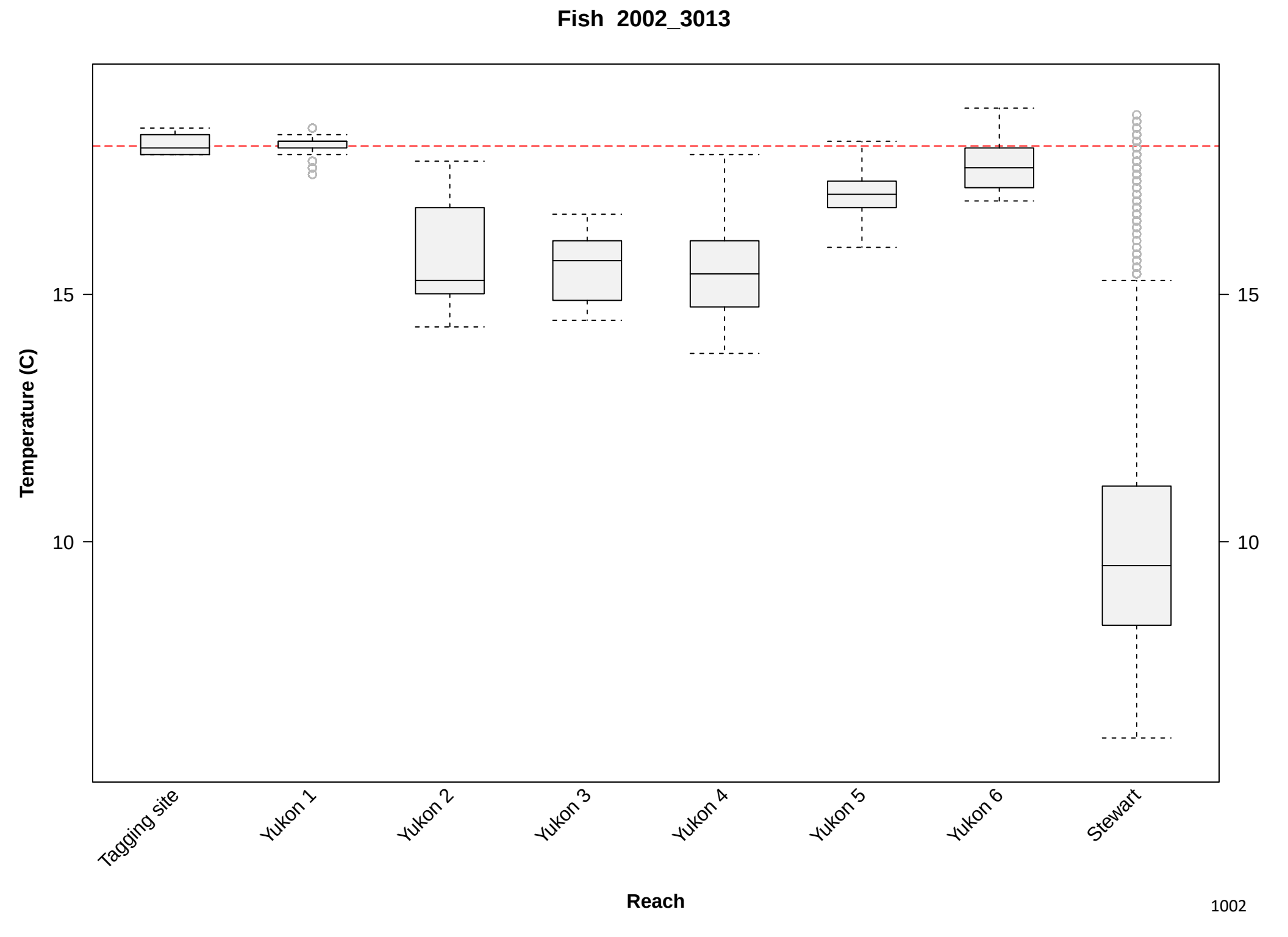

Fish 2002_3013
0
500
1000
0
5
10
15
20
25
Depth (m)
Hours since release
997

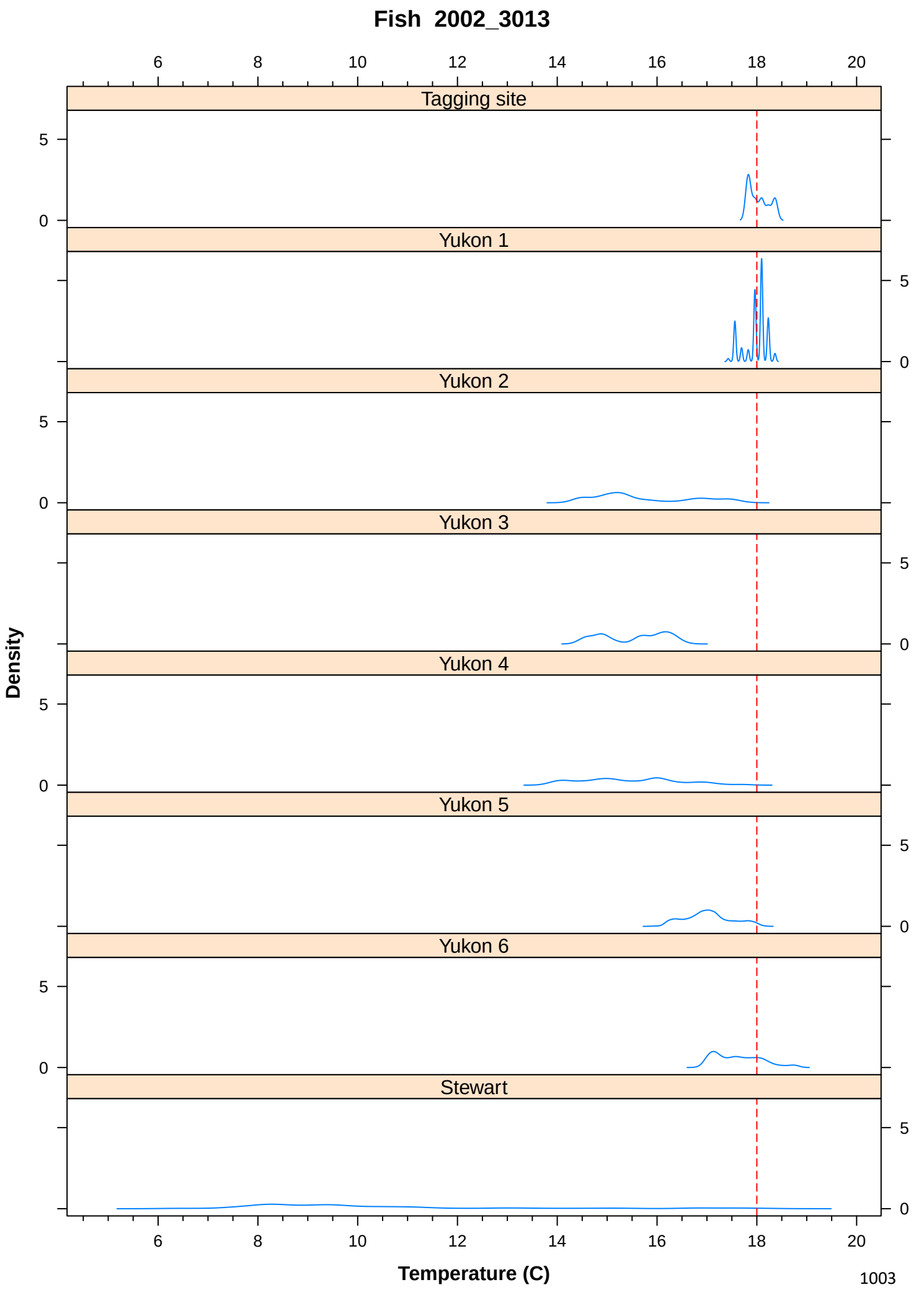

Fish 2002_3013
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Stewart
Reach
998

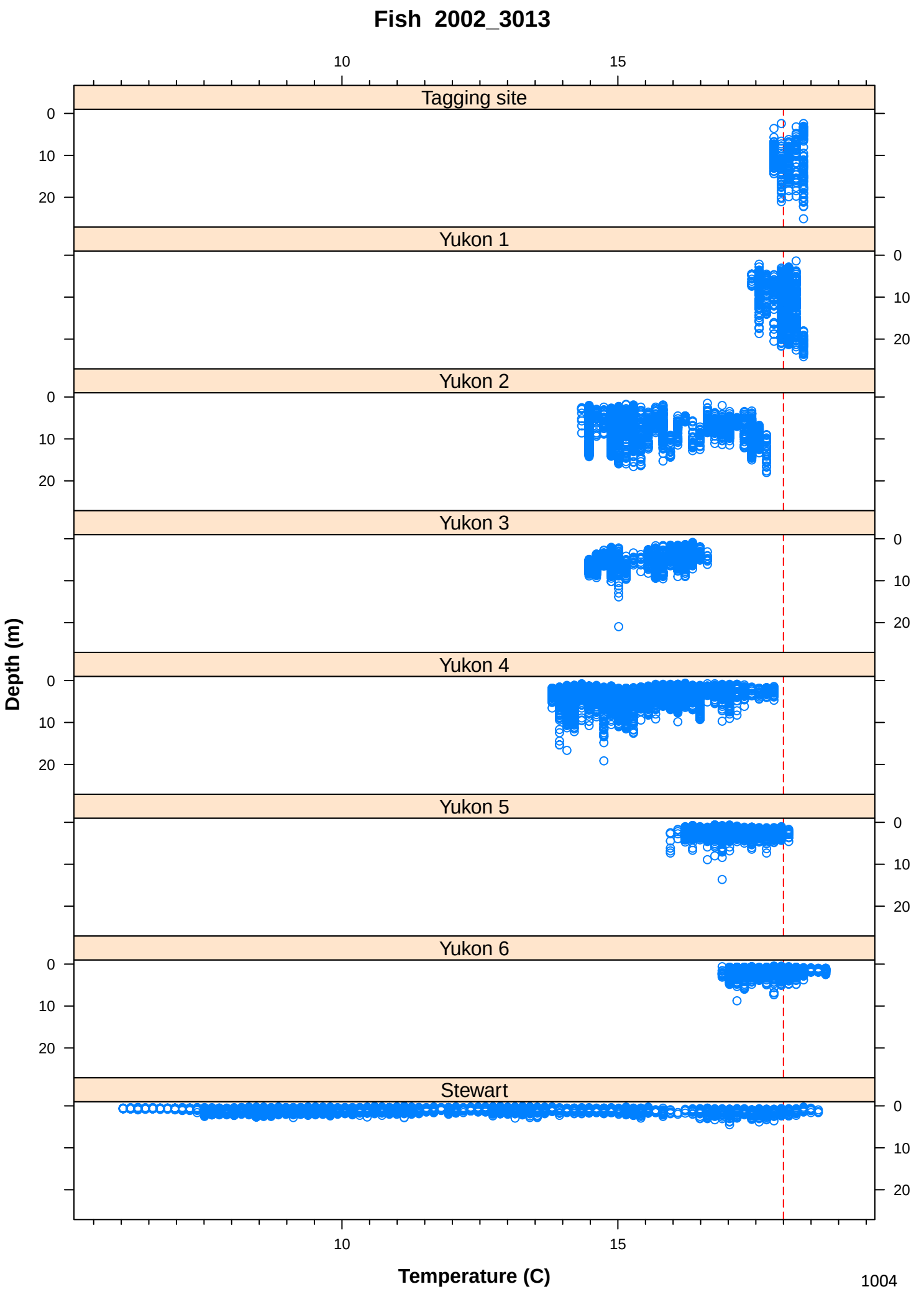

Fish 2002_3013
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Stewart
Density
Depth (m)
0
5
10
15
20
25
1
999

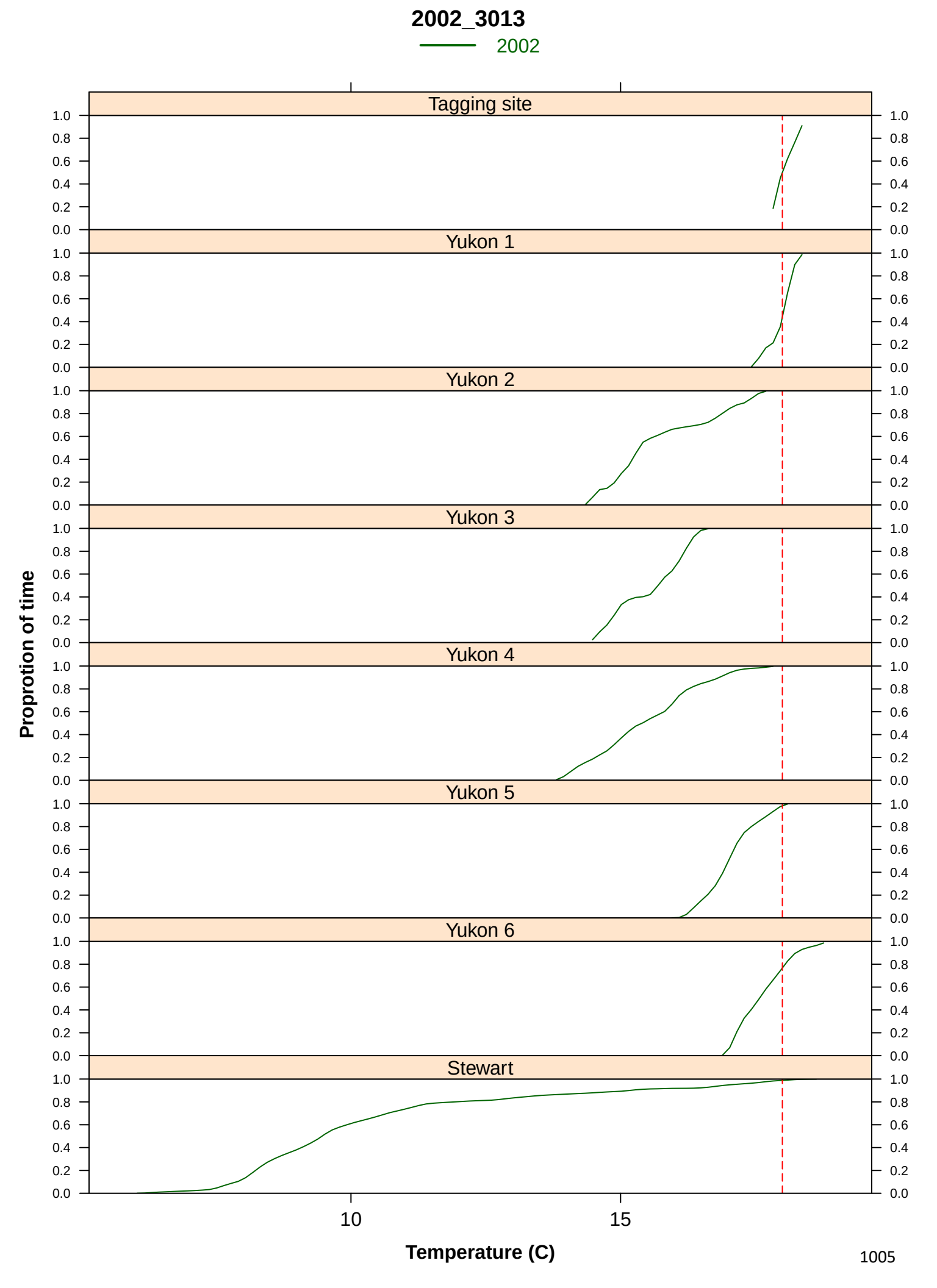

Fish 2002_3013
0
500
1000
1500
2000
19
18
17
16
15
14
13
Temperature (C)
Distance from Paimiut (km)
1000

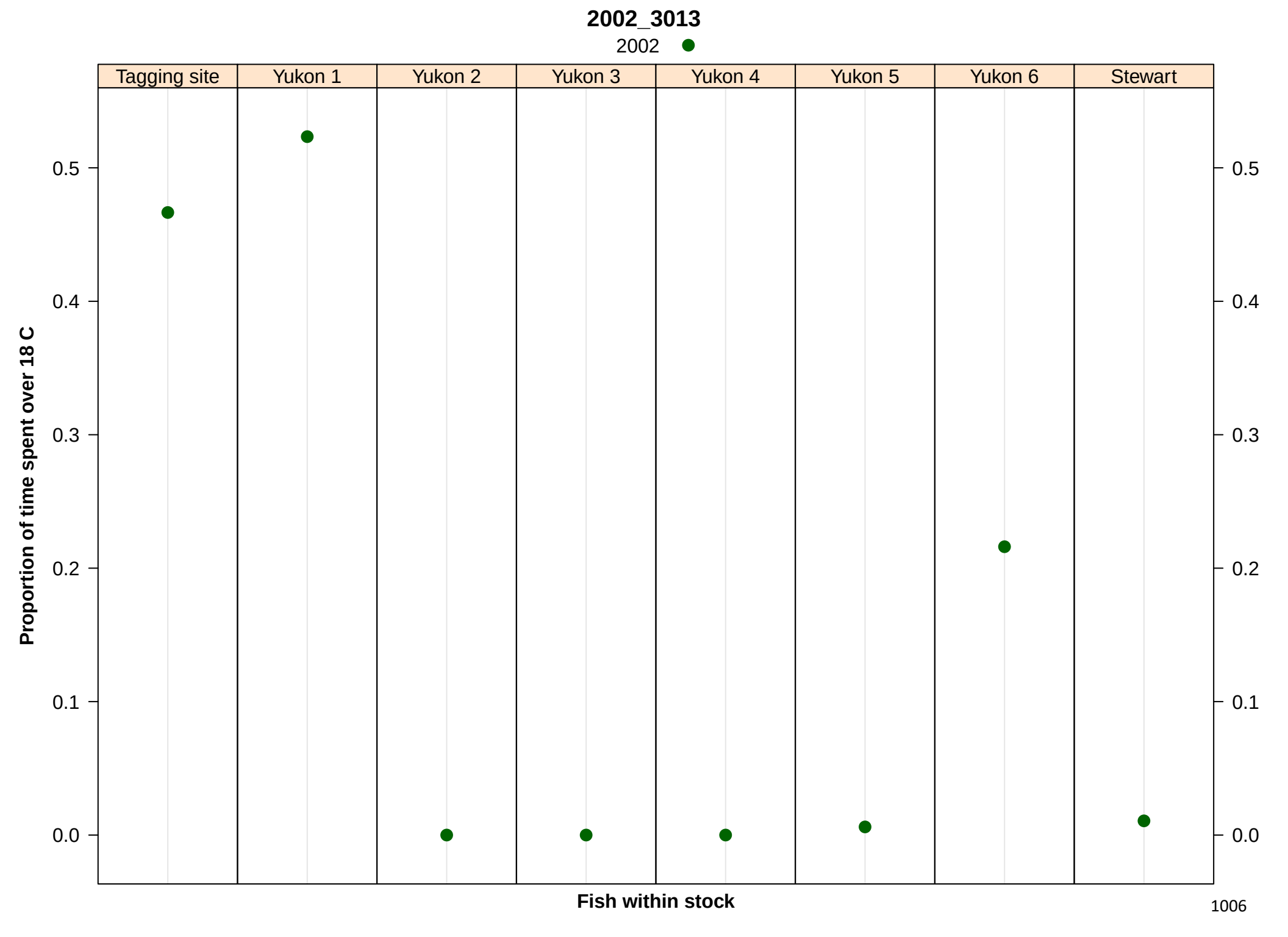

Fish 2002_3013
0
500
1000
15
10
Temperature (C)
Hours since release
1001


Fish 2002_3013
Temperature (C)
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Stewart
Reach
1002

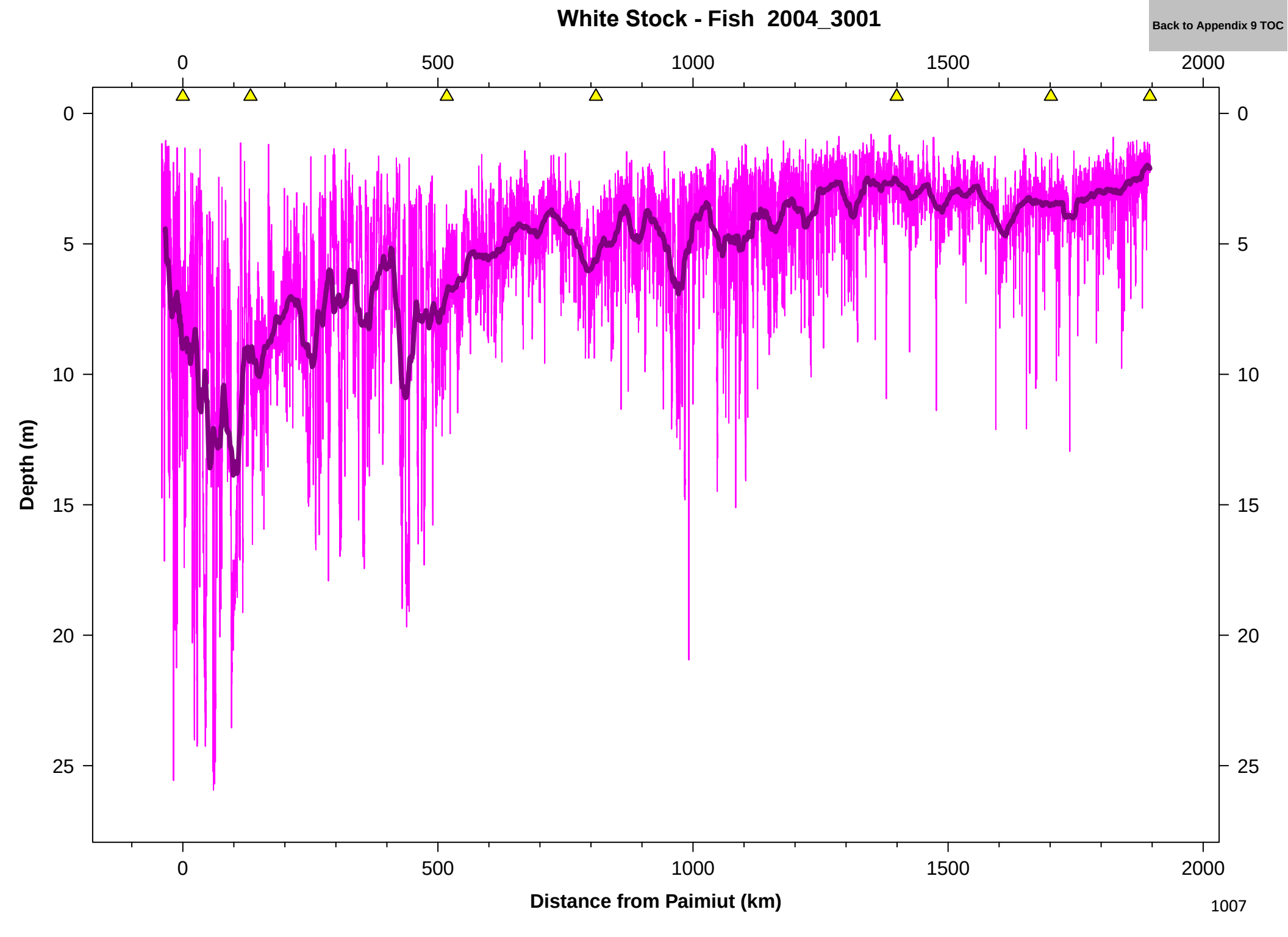

Fish 2002_3013
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Stewart
Density
Temperature (C)
6
8
10
12
14
16
18
20
0
5
1003

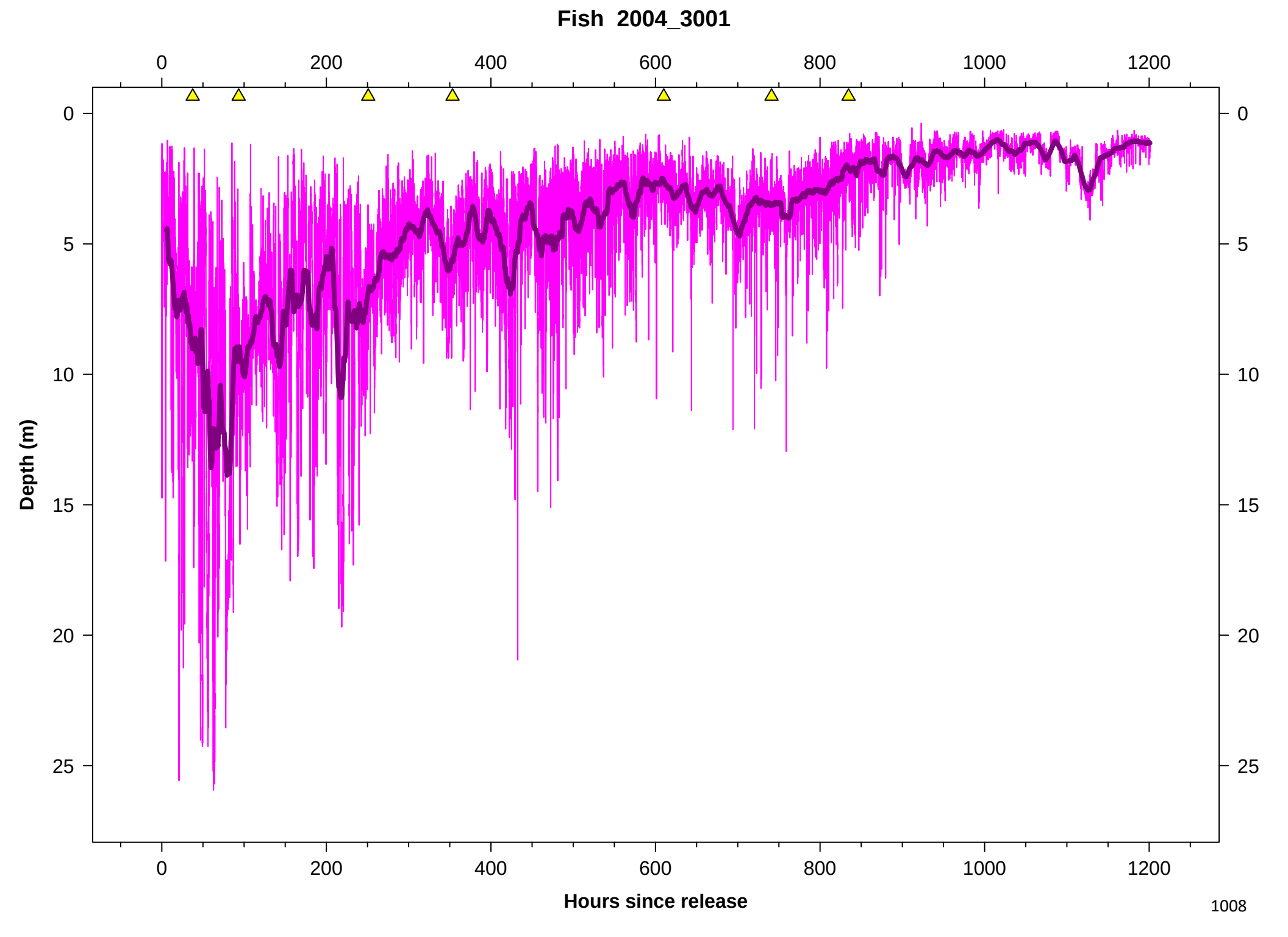

Fish 2002_3013
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Stewart
Depth (m)
Temperature (C)
10
15
0
10
20

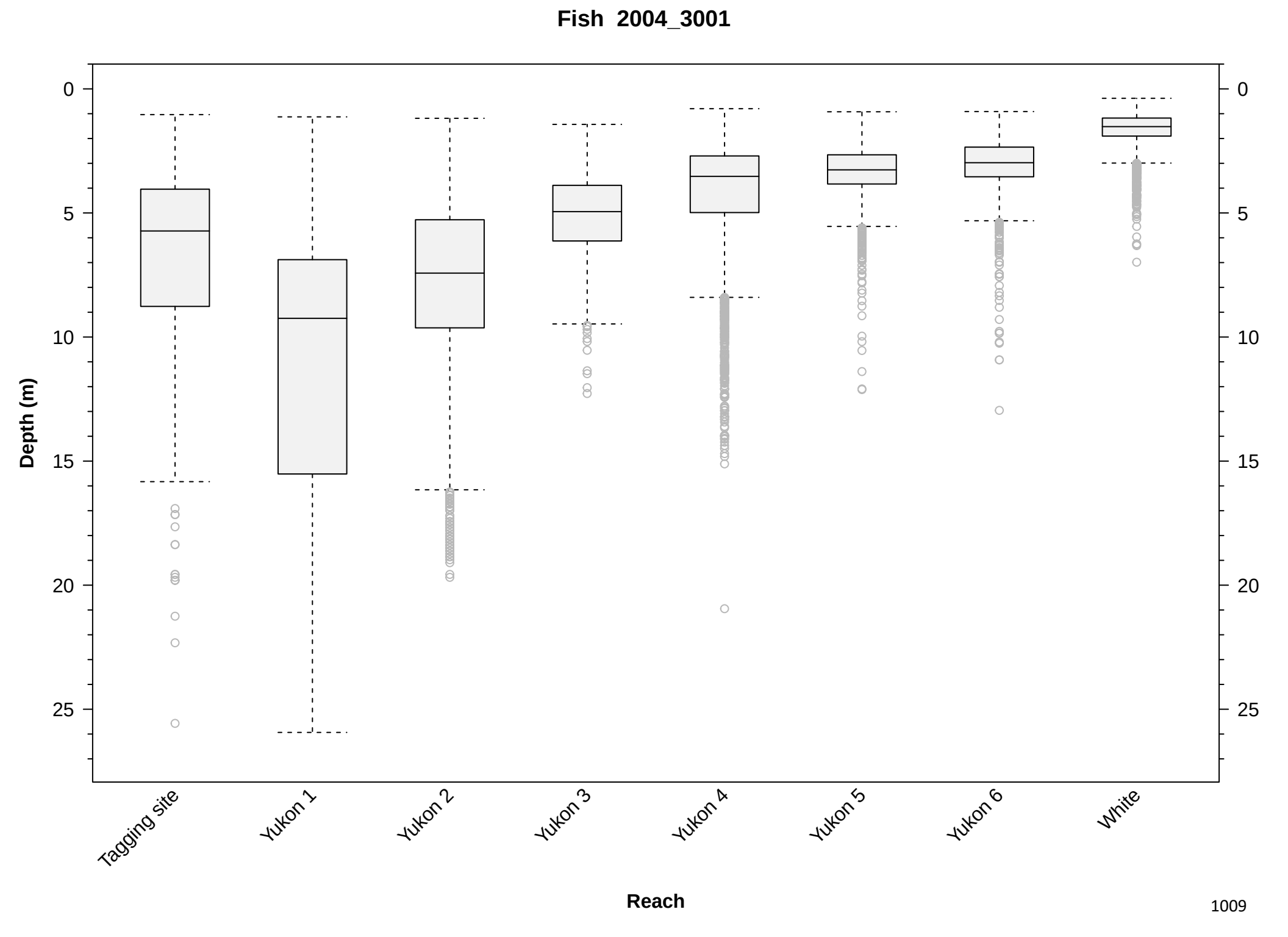

2002_3013
2002
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Stewart
Proprotion of time
Temperature (C)
10
15
1005

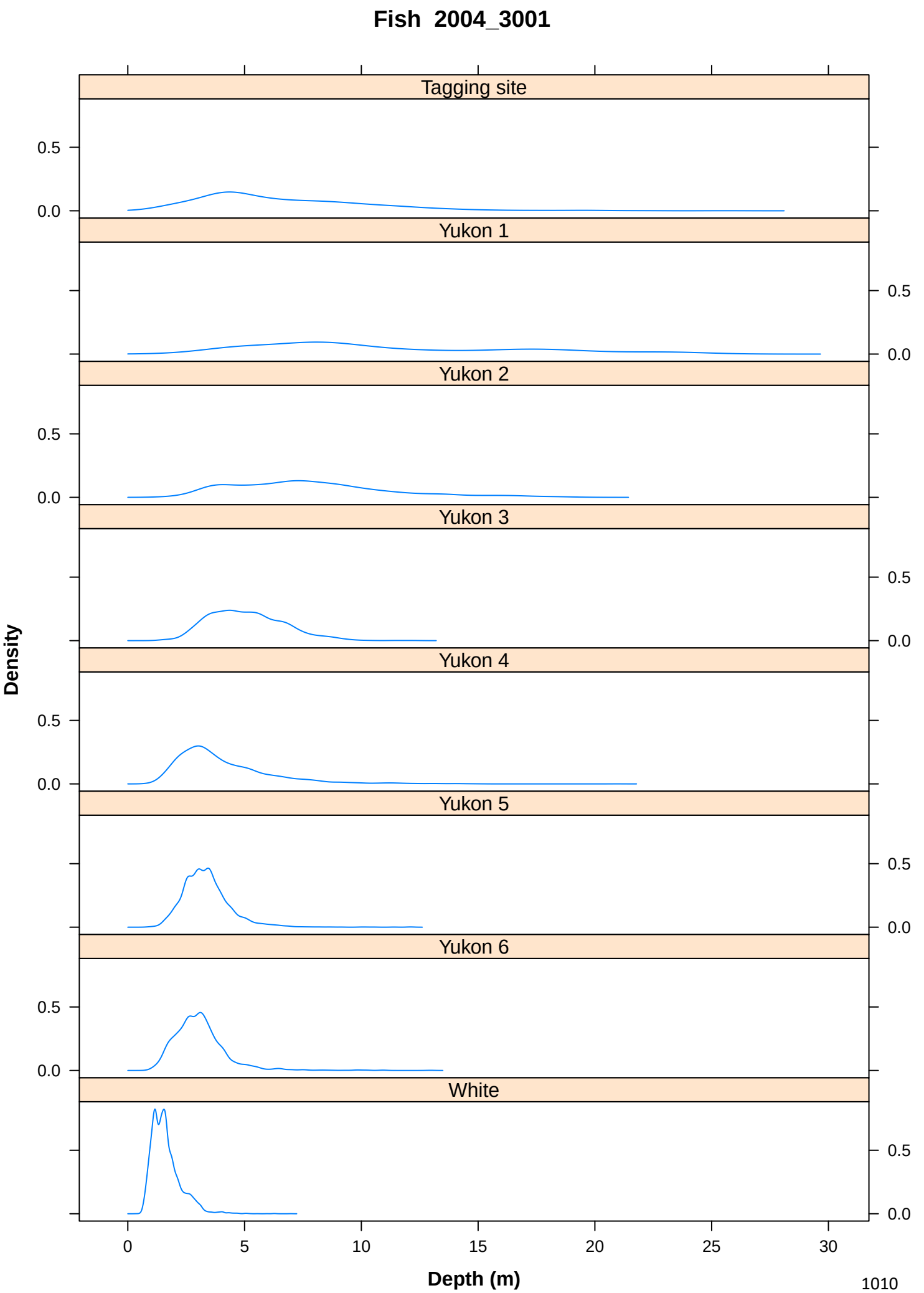

2002_3013
2002
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Stewart
Proportion of time spent over 18 C
0.0
0.1
0.2
0.3
0.4
0.5
Fish within stock
1006

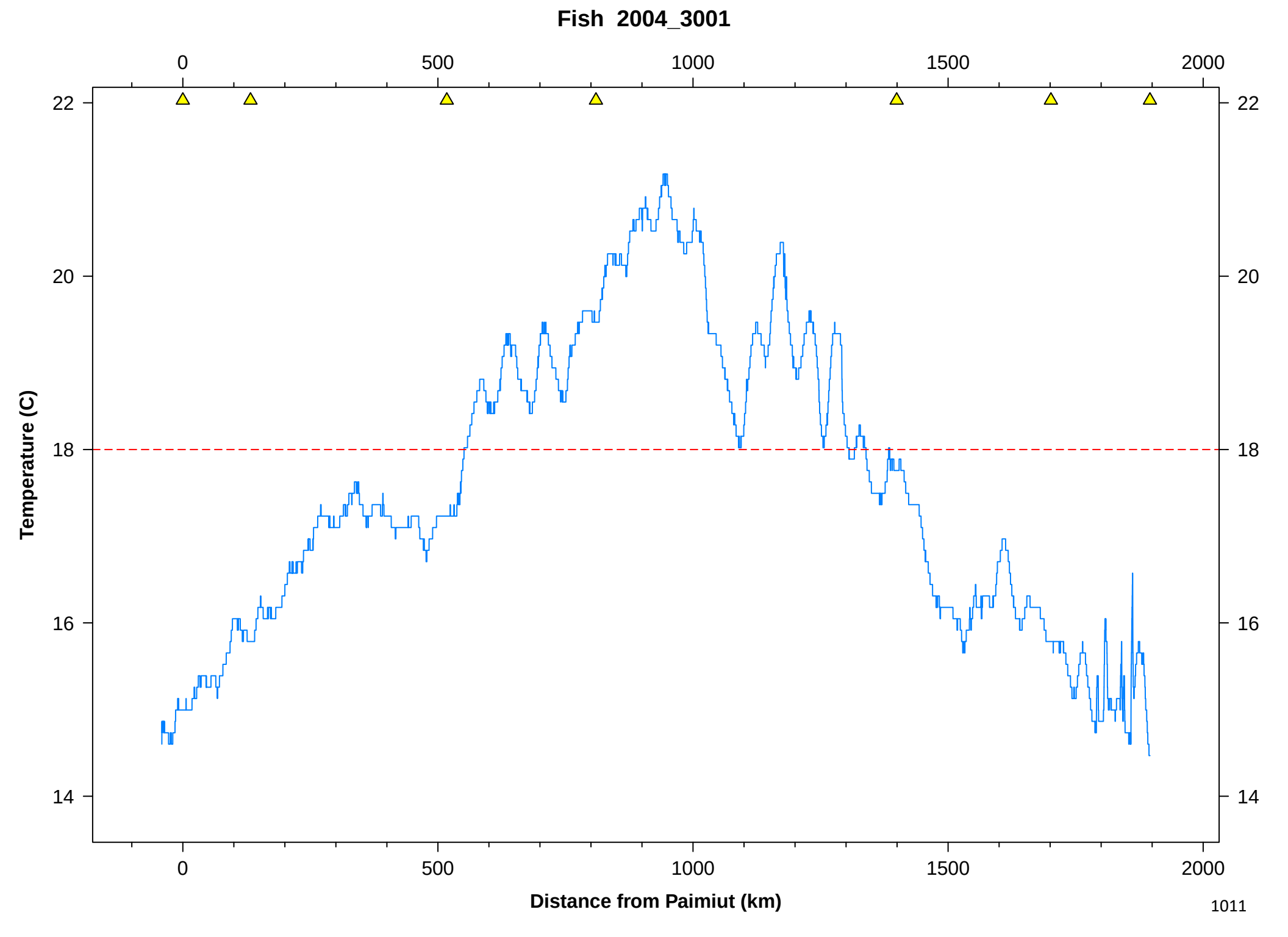
Back to Appendix 9 TOC

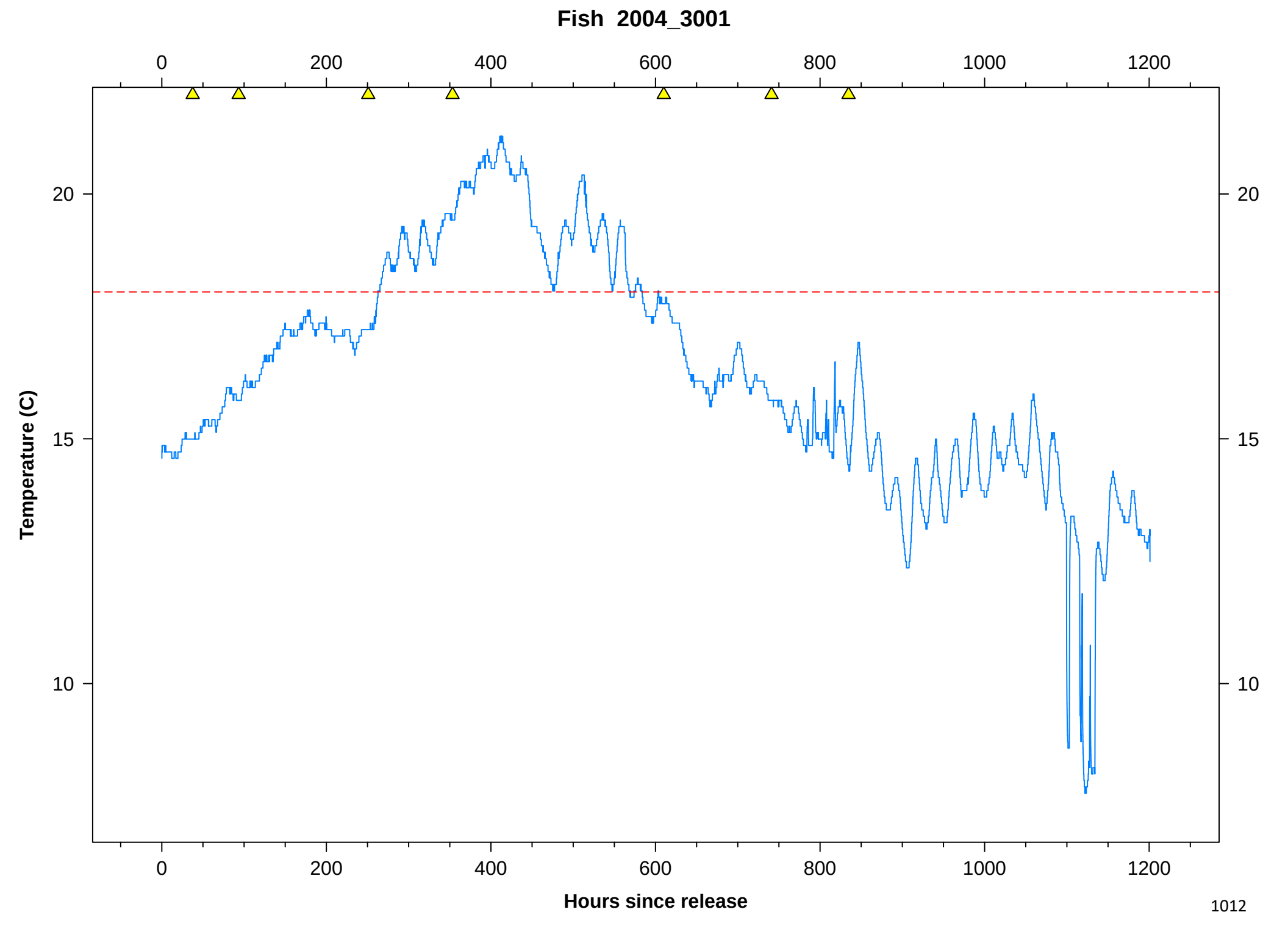


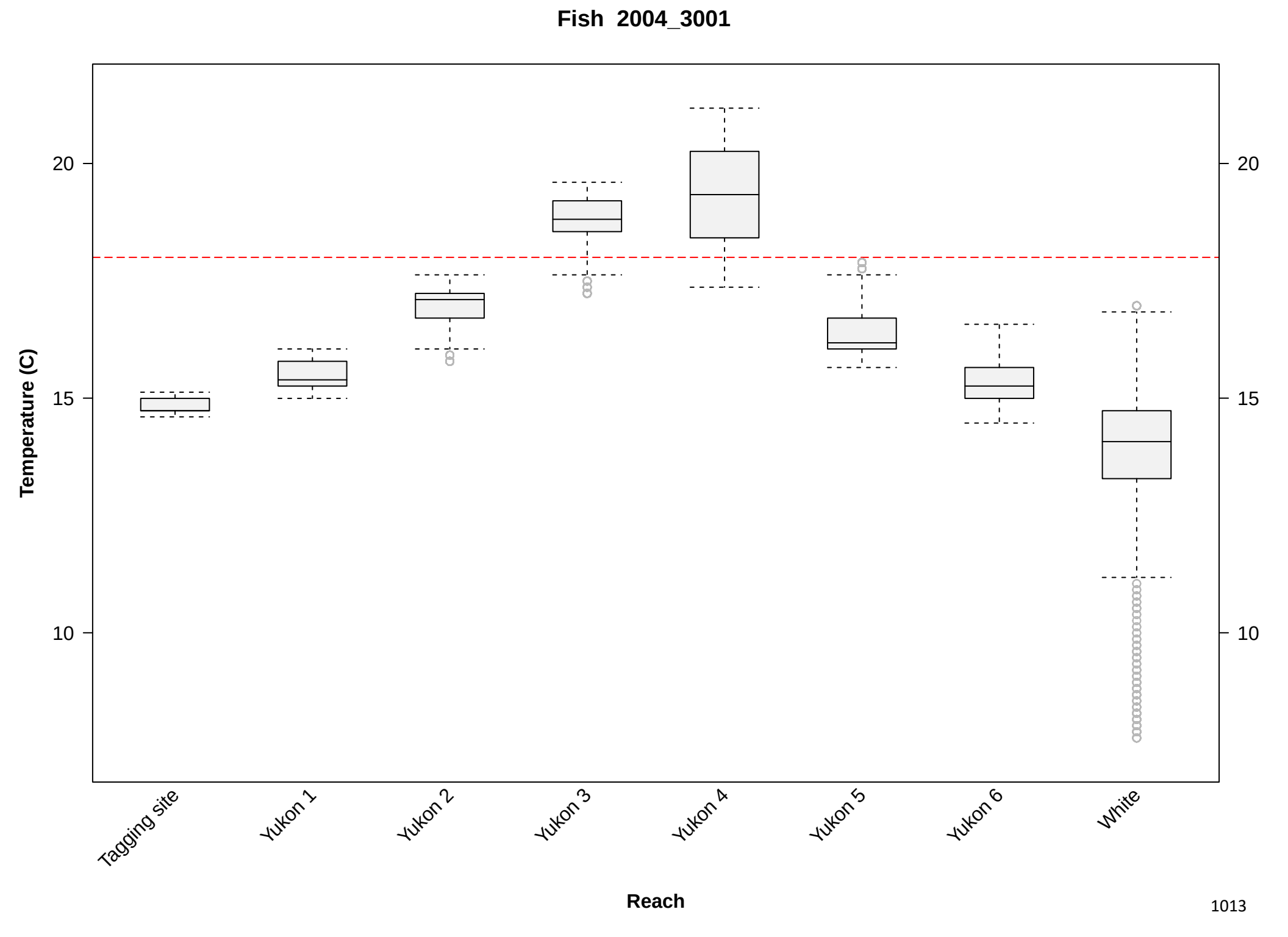

Fish 2004_3001
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Hours since release
1008

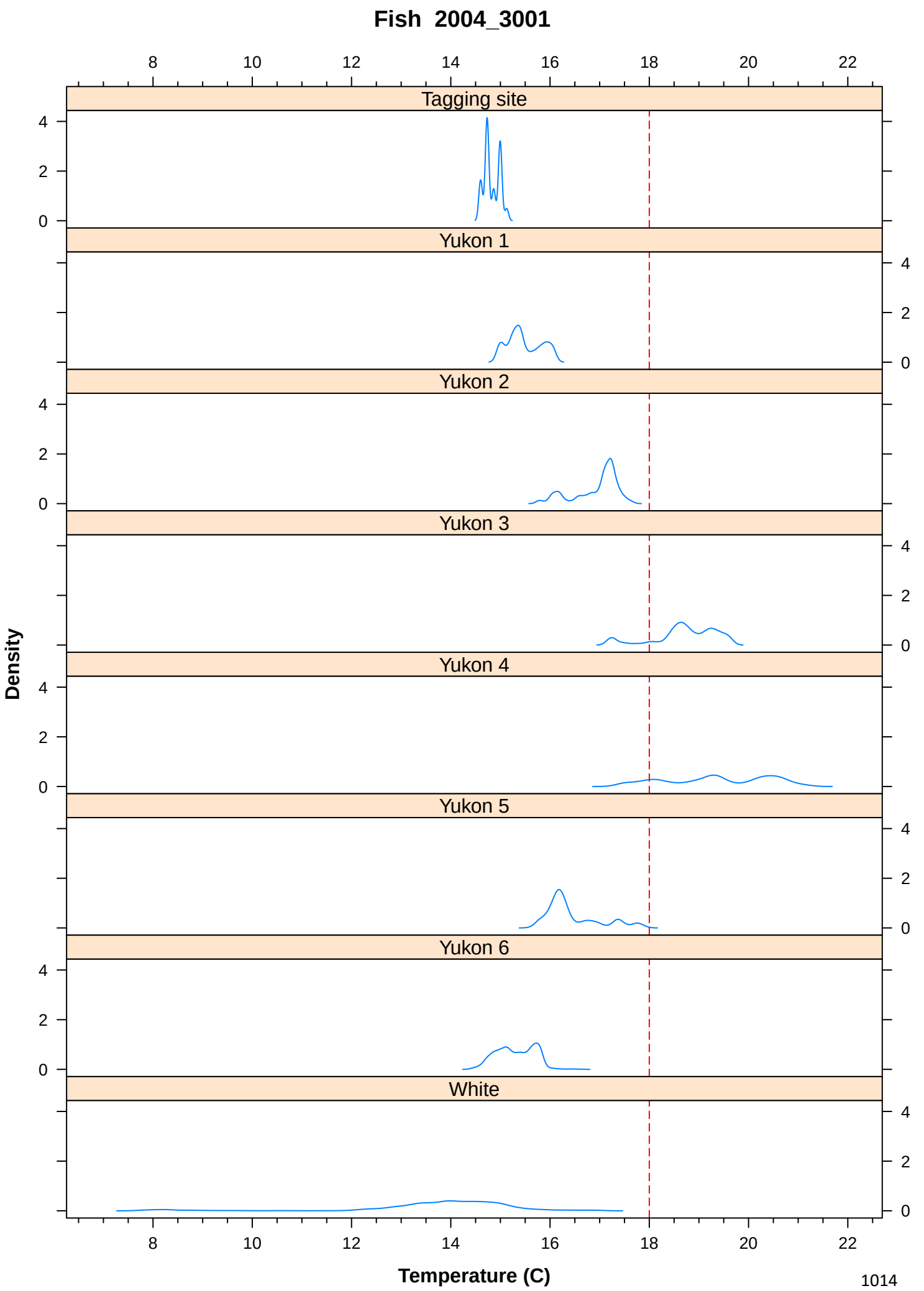

Fish 2004_3001
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
White
Reach
1009

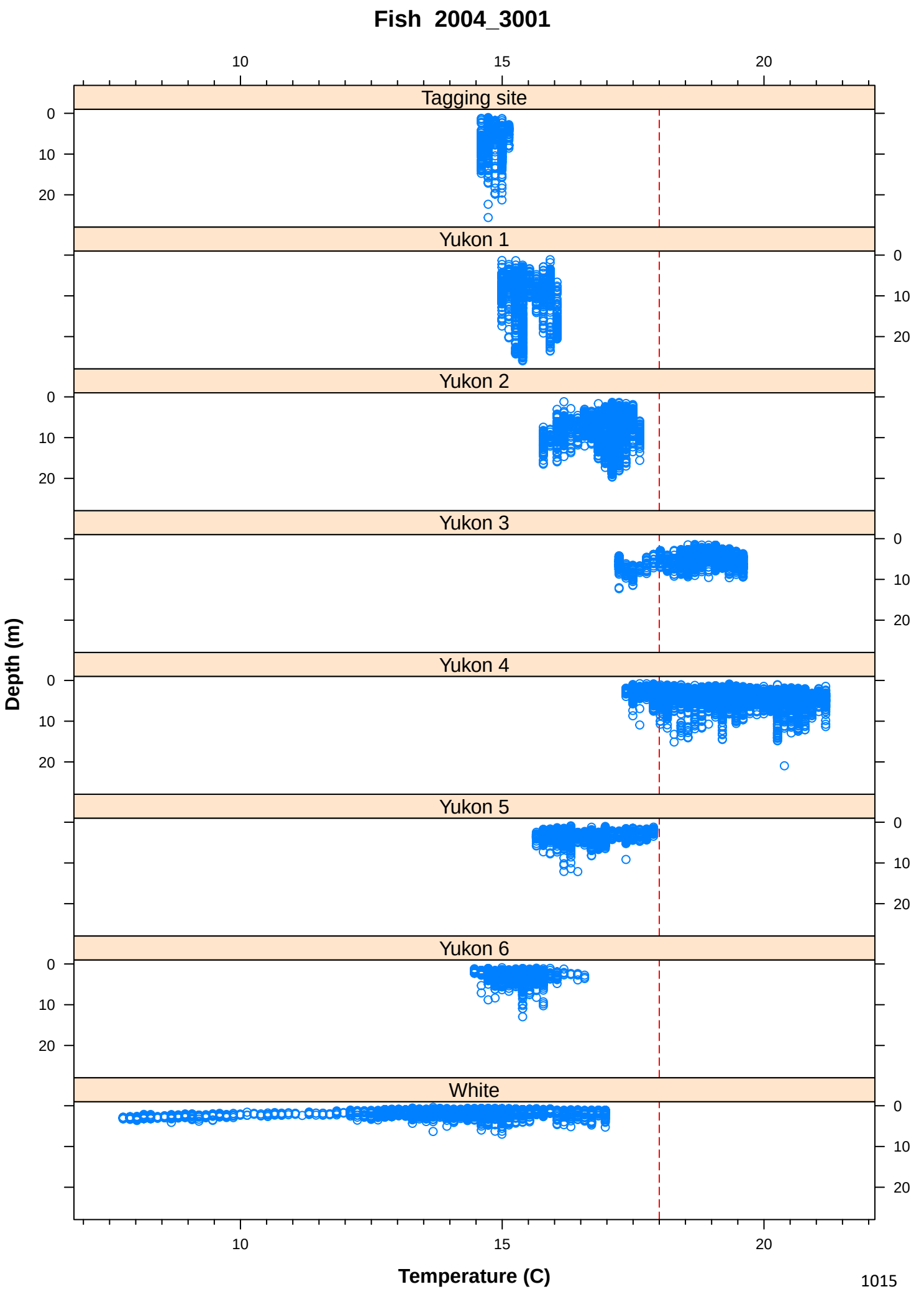

Fish 2004_3001
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
White
Density
0.5
0.0
0
5
10
15
20
25
30
Depth (m)
1010


Fish 2004_3001
0
500
1000
1500
2000
22
20
18
16
14
Temperature (C)
Distance from Paimiut (km)
1011

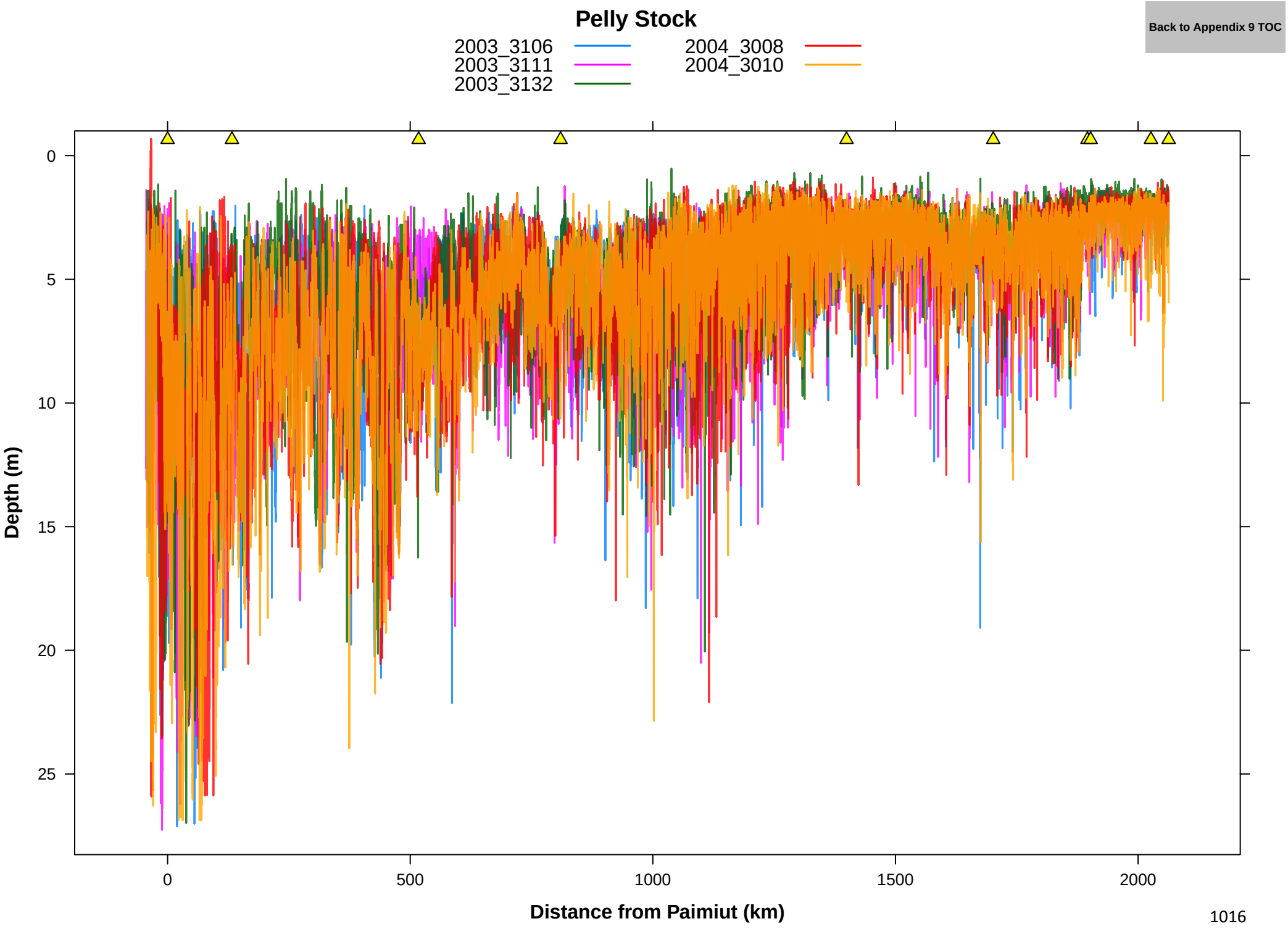

Fish 2004_3001
0
200
400
600
800
1000
1200
20
15
10
Temperature (C)
Hours since release
1012

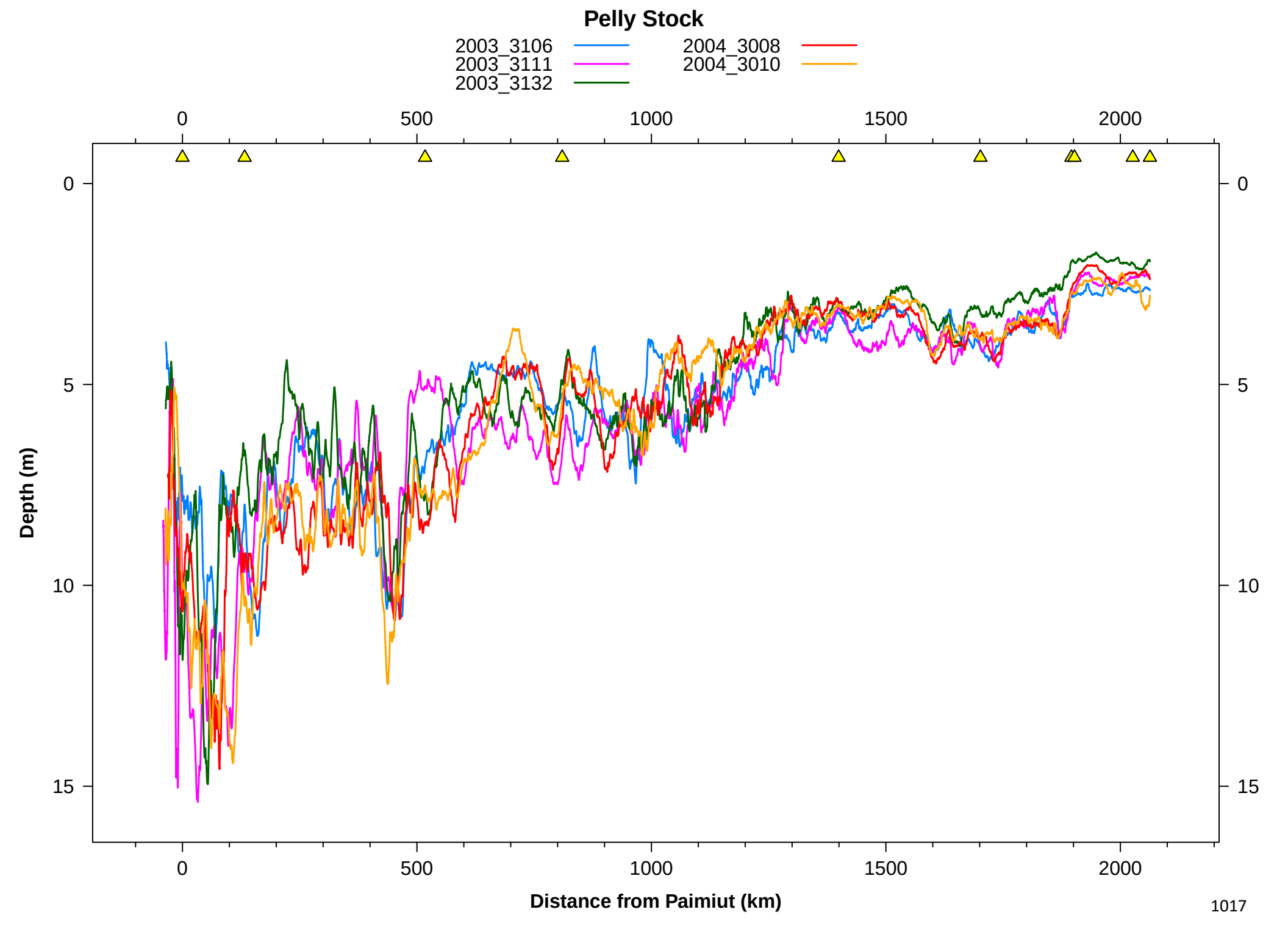

Fish 2004_3001
Temperature (C)
20
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
White
Reach
1013

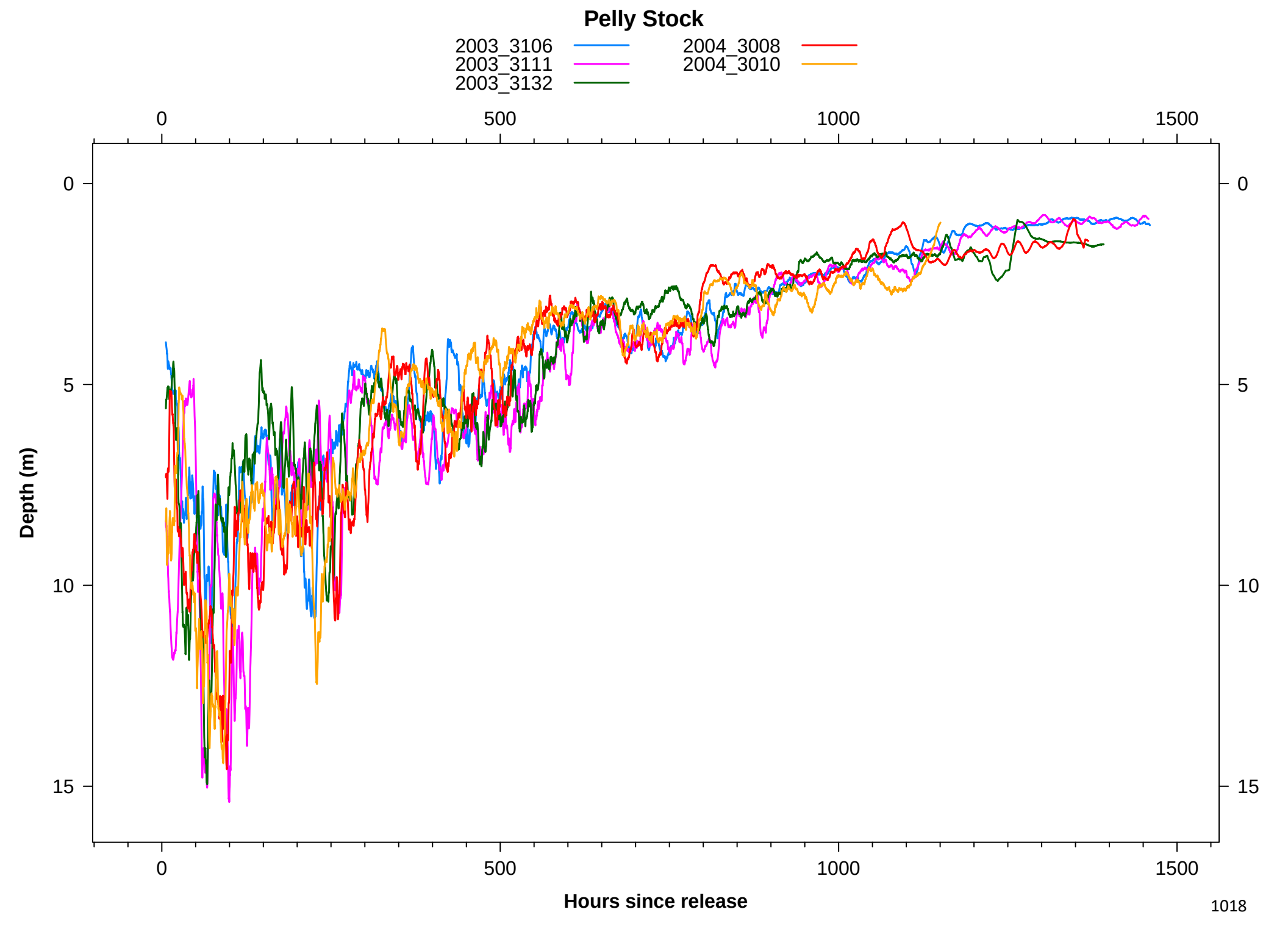

Fish 2004_3001
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
White
Density
Temperature (C)
8
10
12
14
16
18
20
22
0
2
4

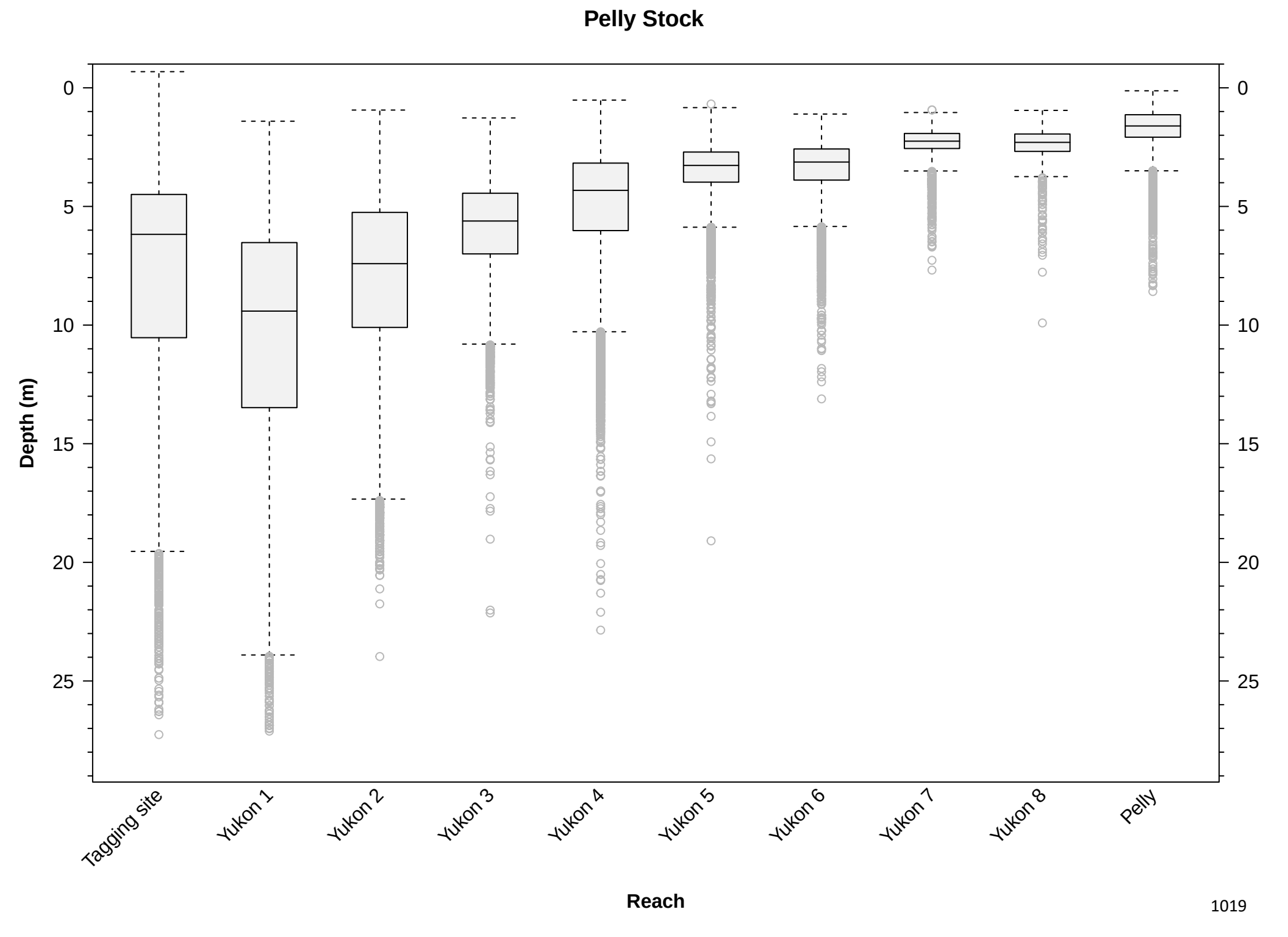

Fish 2004_3001
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
White
Depth (m)
Temperature (C)
10
15
20
0
10
20

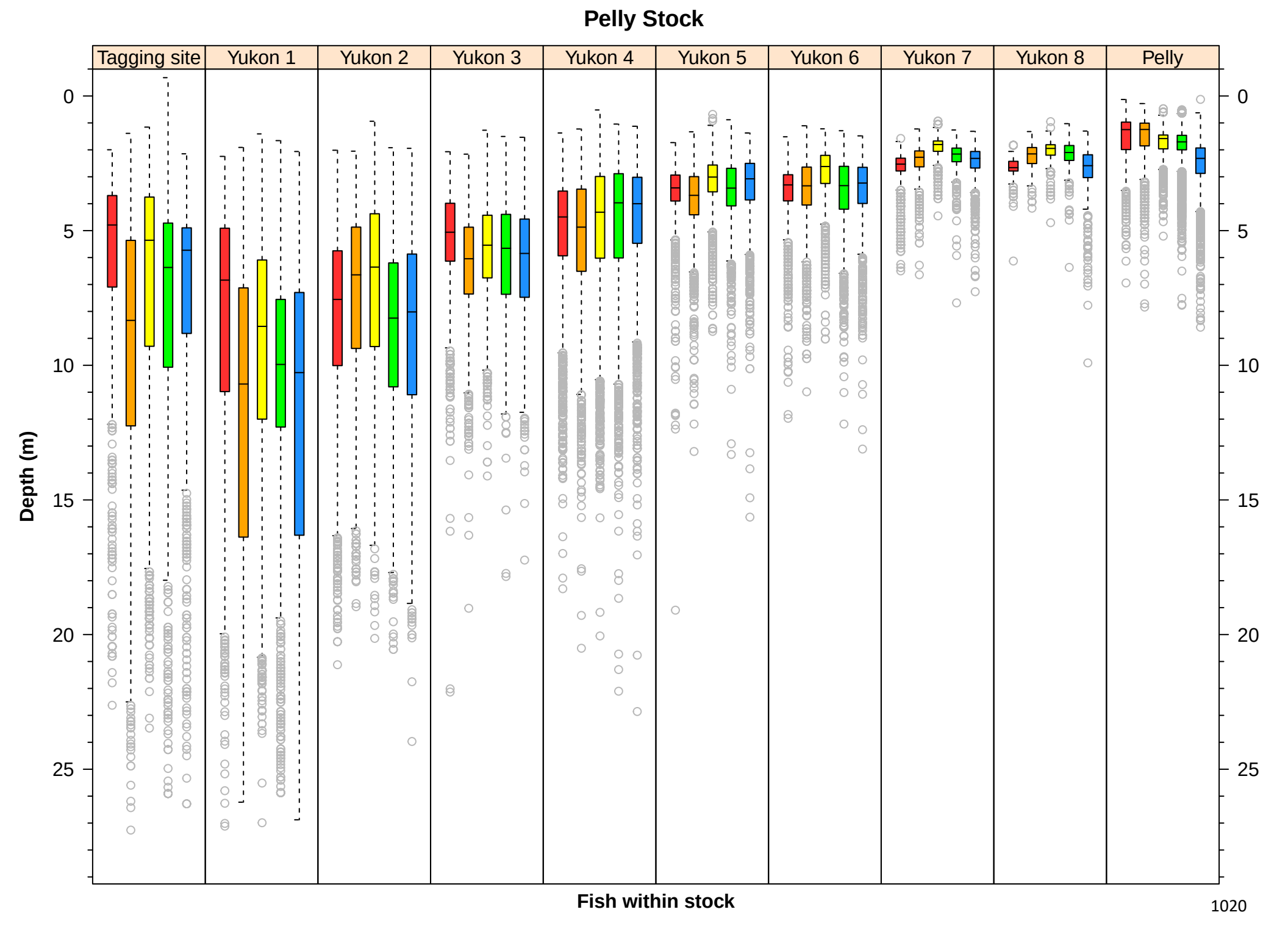
Back to Appendix 9 TOC

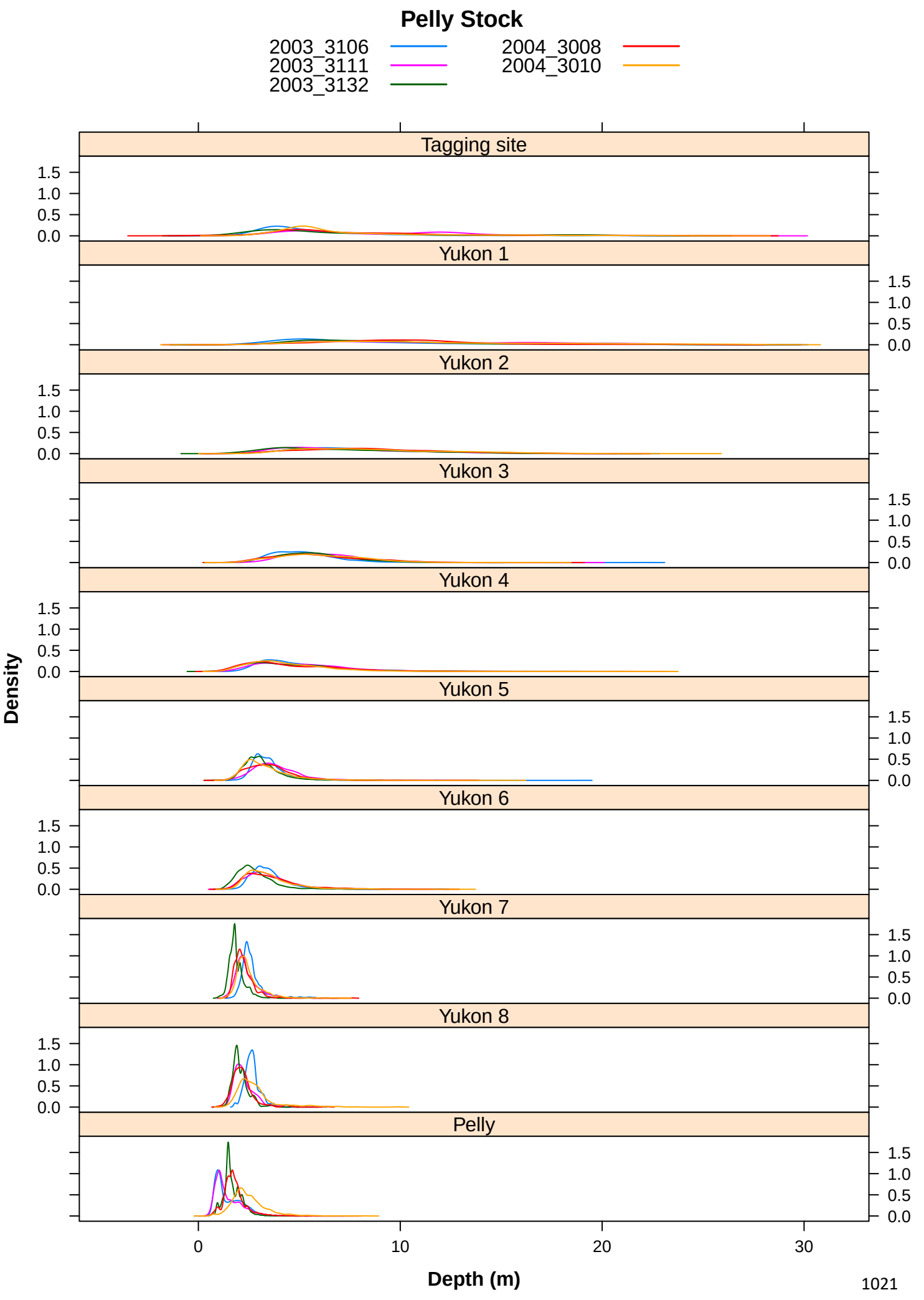


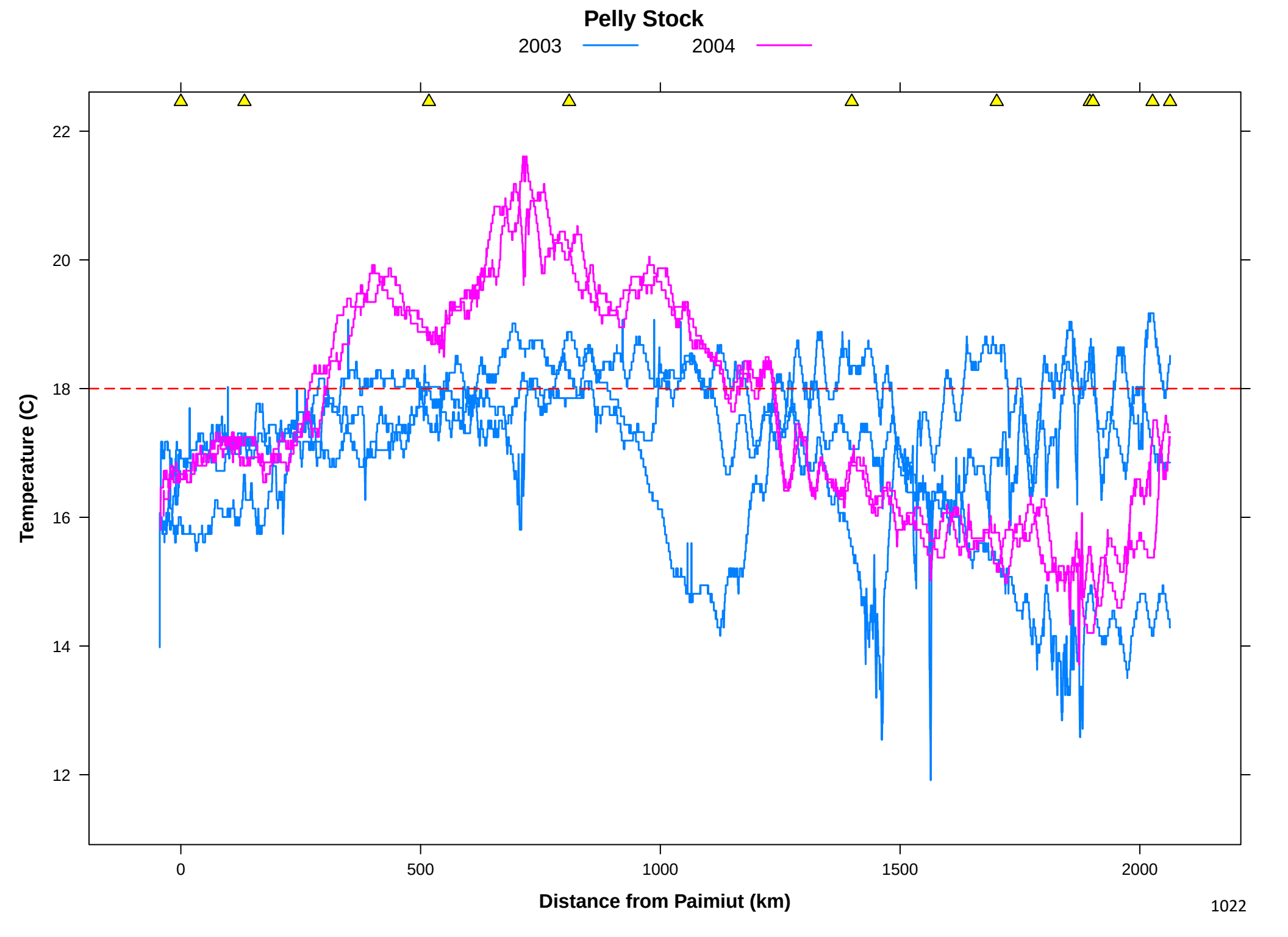

Pelly Stock
2003_3106
2003_3111
2003_3132
2004_3008
2004_3010
0
500
1000
1500
2000
0
5
10
15
Depth (m)
Distance from Paimiut (km)

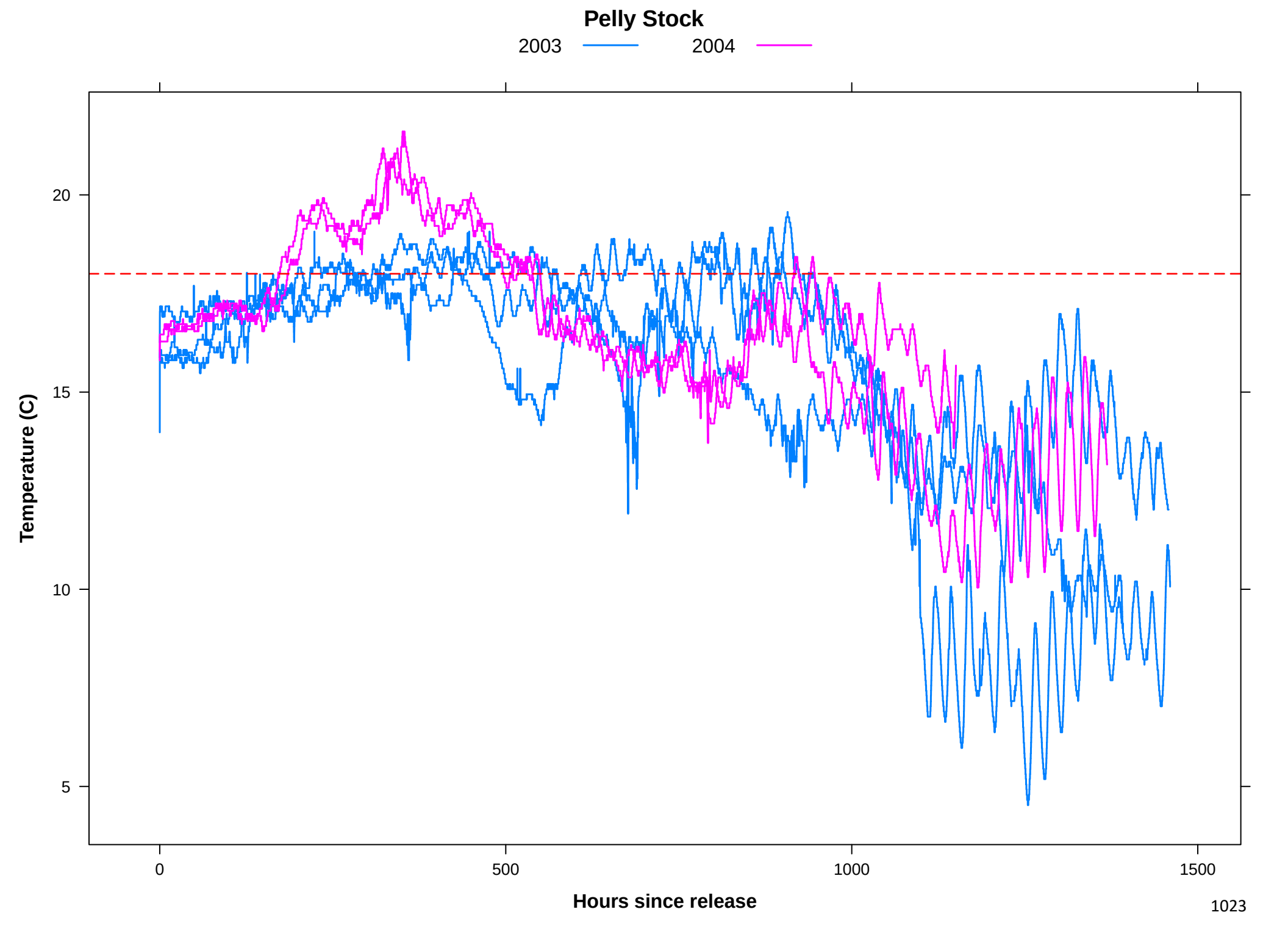

Pelly Stock
2003_3106
2003_3111
2003_3132
2004_3008
2004_3010
0
500
1000
1500
0
5
10
15
Depth (m)
Hours since release
1018

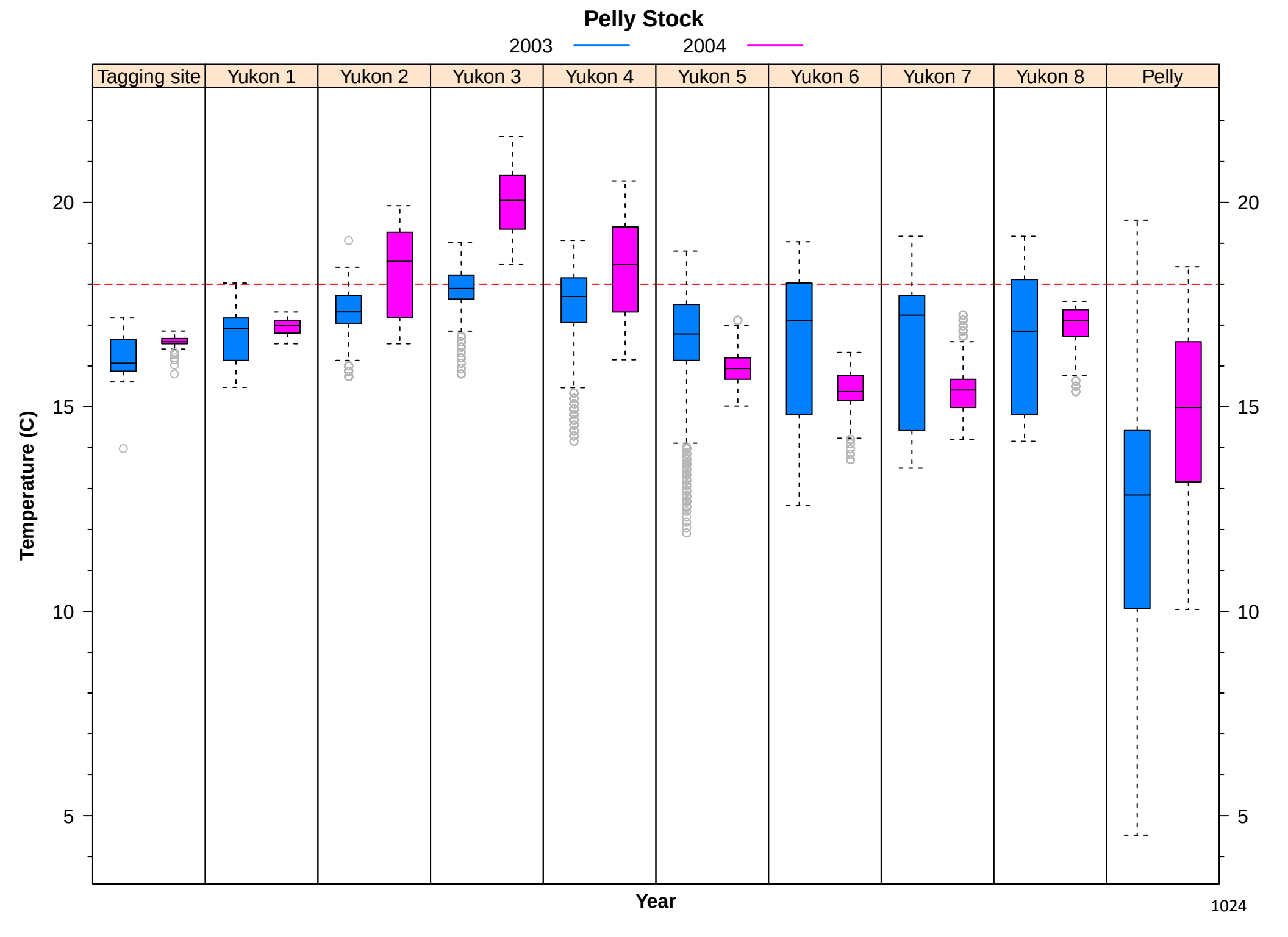

Pelly Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach
1019

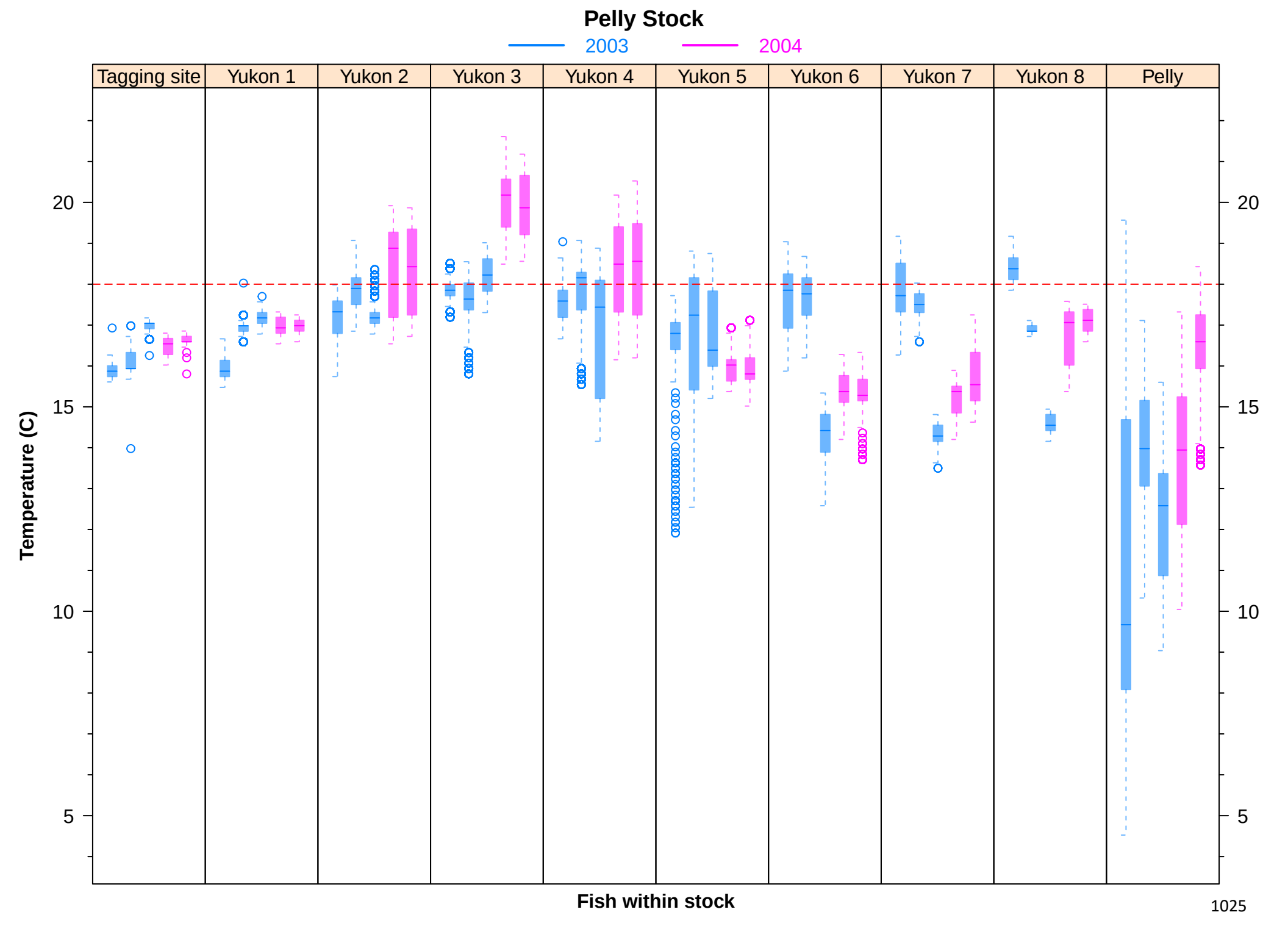

Pelly Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Depth (m)
0
5
10
15
20
25
Fish within stock
1020

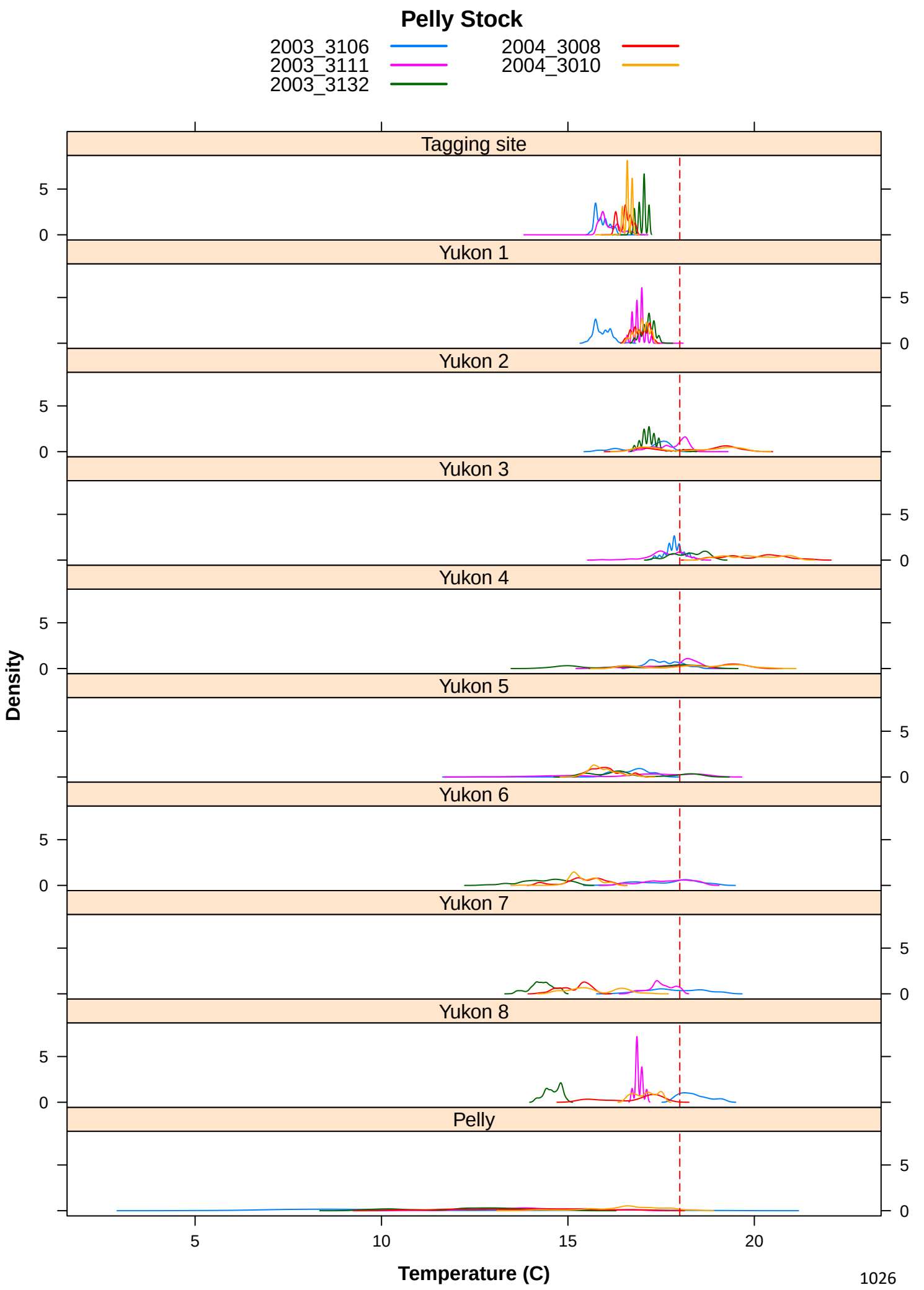

Pelly Stock
2003_3106
2003_3111
2003_3132
2004_3008
2004_3010
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
0.0
0.5
1.0
1.5
0
10
20
30
Depth (m)
1021

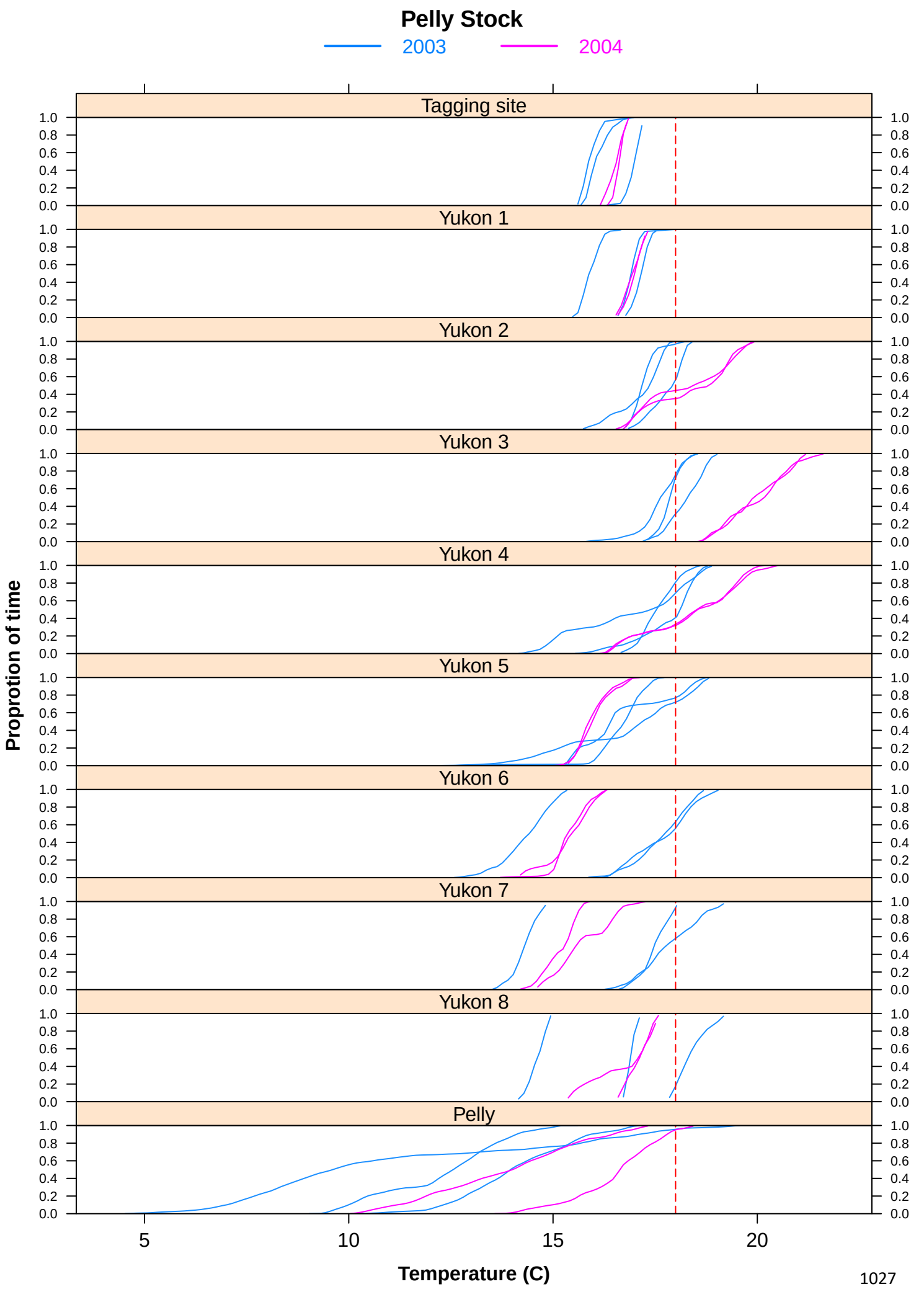

Pelly Stock
2003
2004
22
20
18
16
14
12
Temperature (C)
0
500
1000
1500
2000
Distance from Paimiut (km)
1022

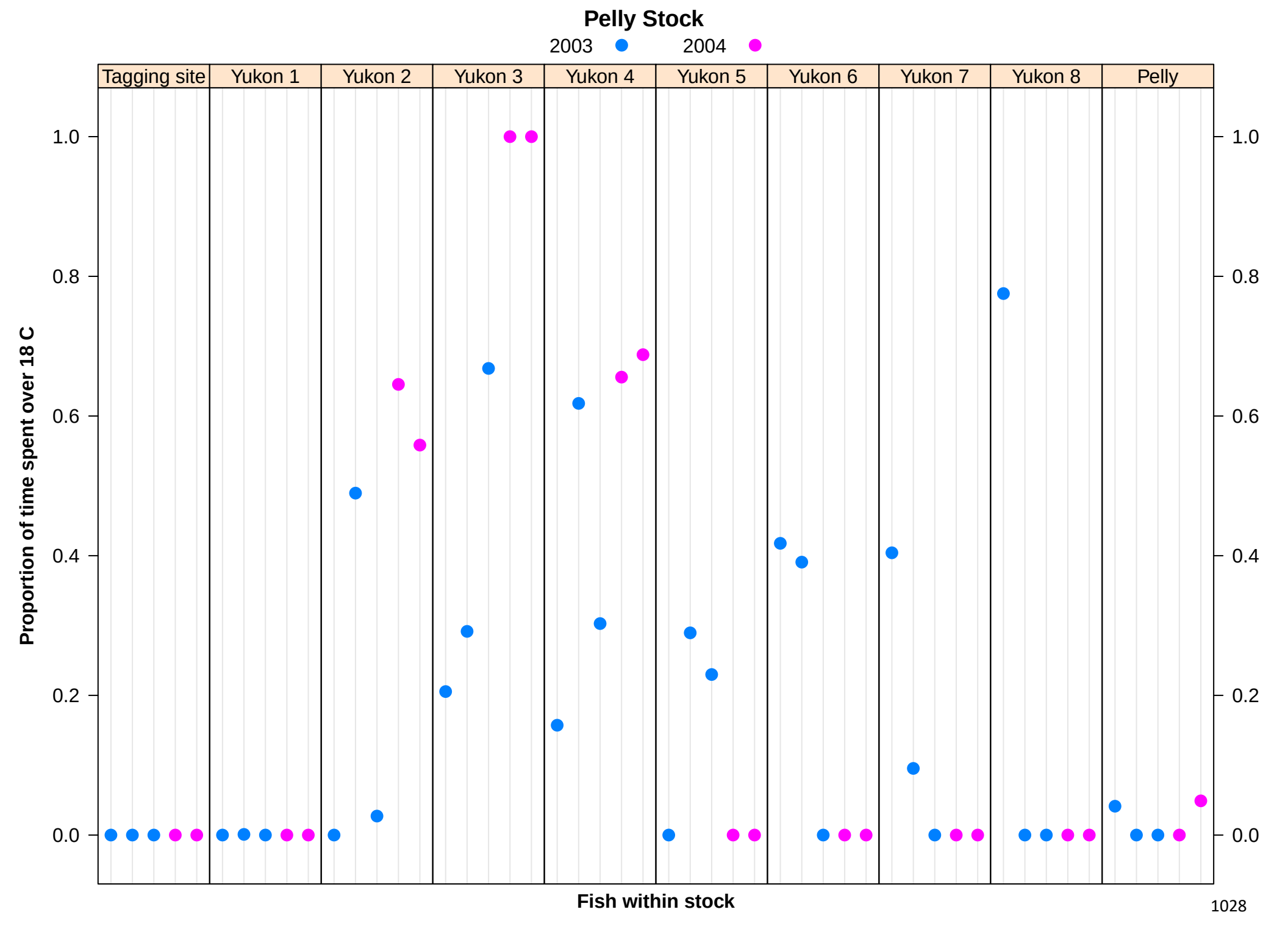

Pelly Stock
2003
2004
Temperature (C)
20
15
10
5
0
500
1000
1500
Hours since release
1023

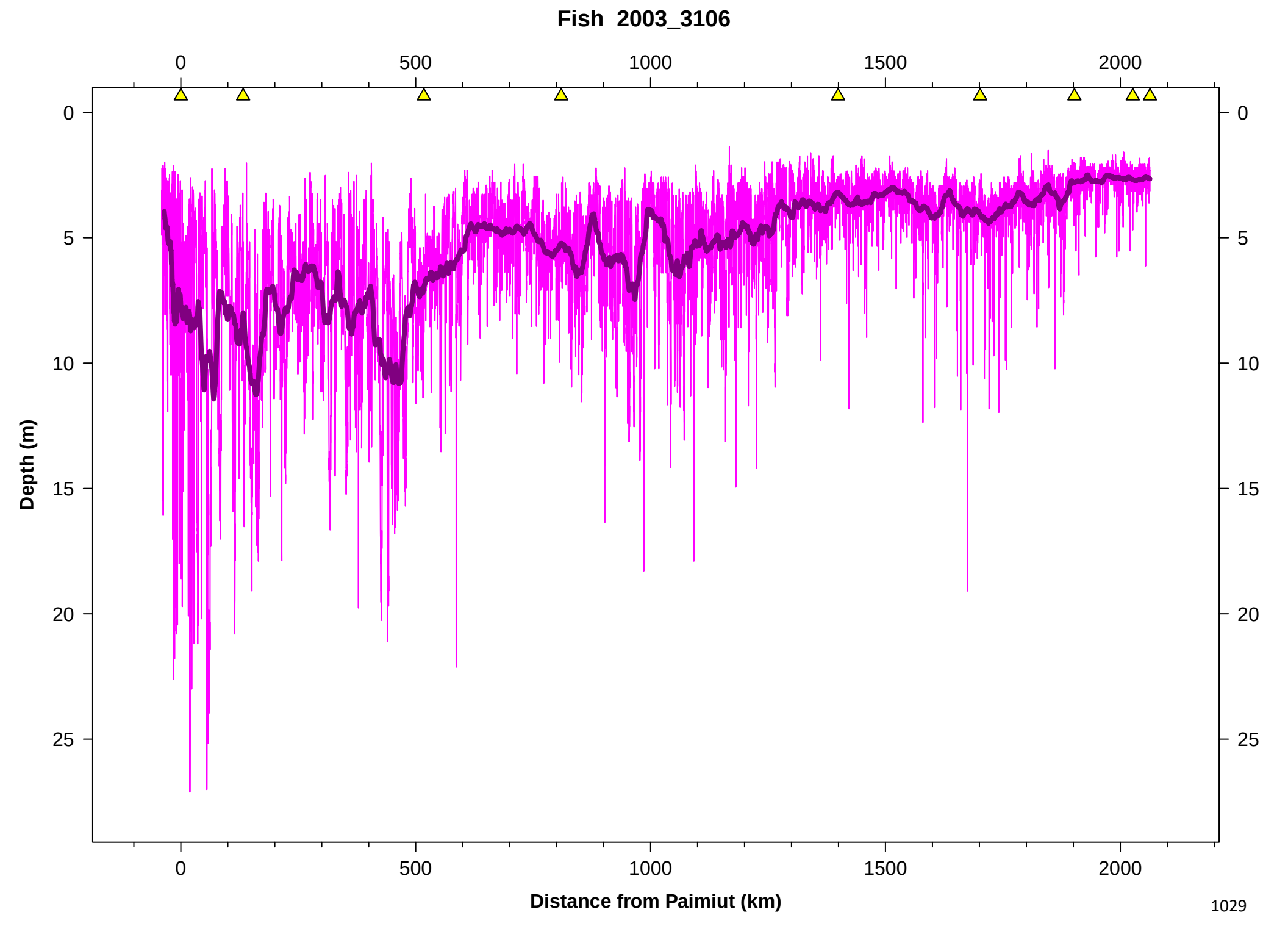

Pelly Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Temperature (C)
20
15
10
5
Year
1024

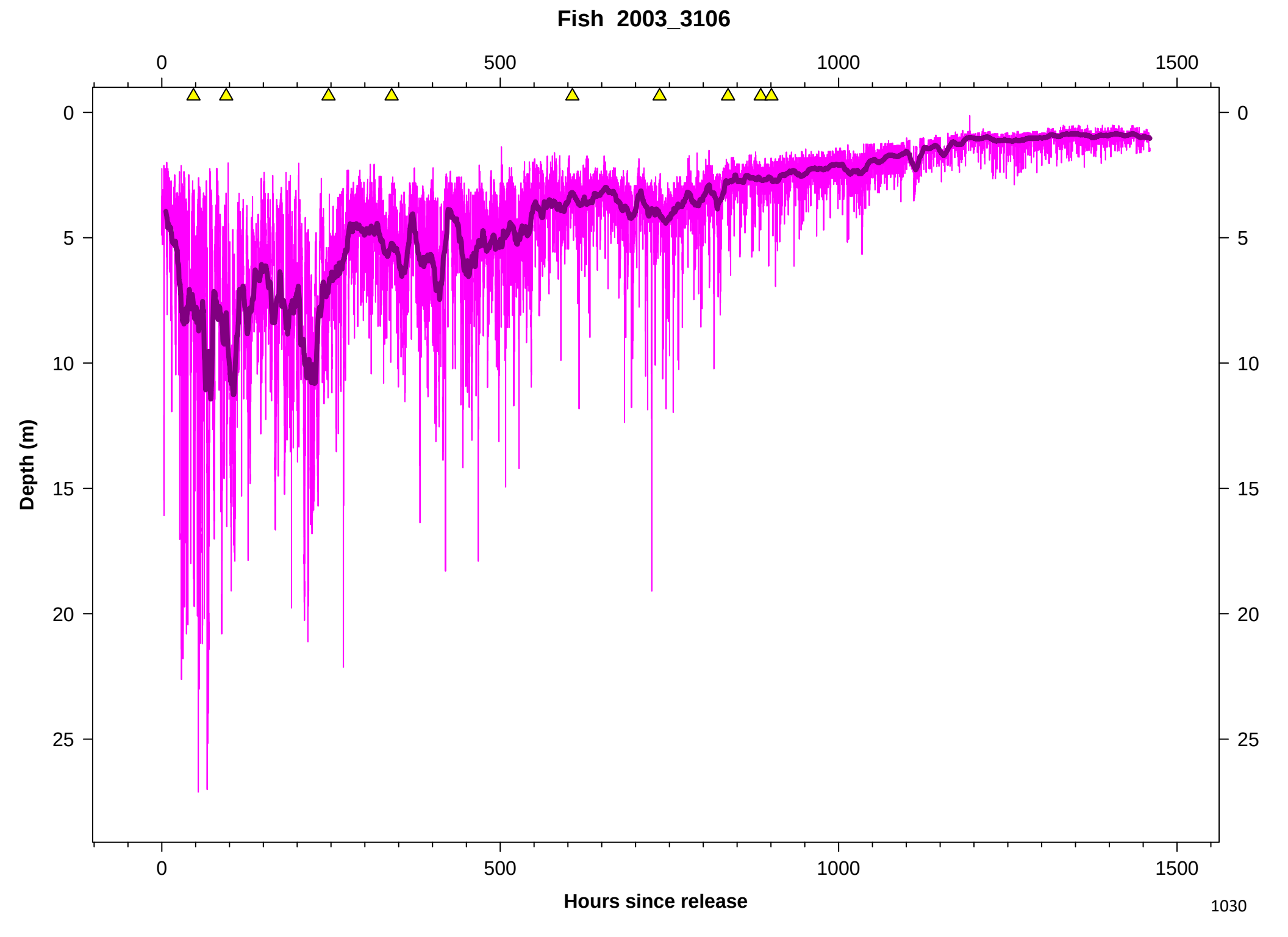

Pelly Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Temperature (C)
20
15
10
5
Fish within stock
1025

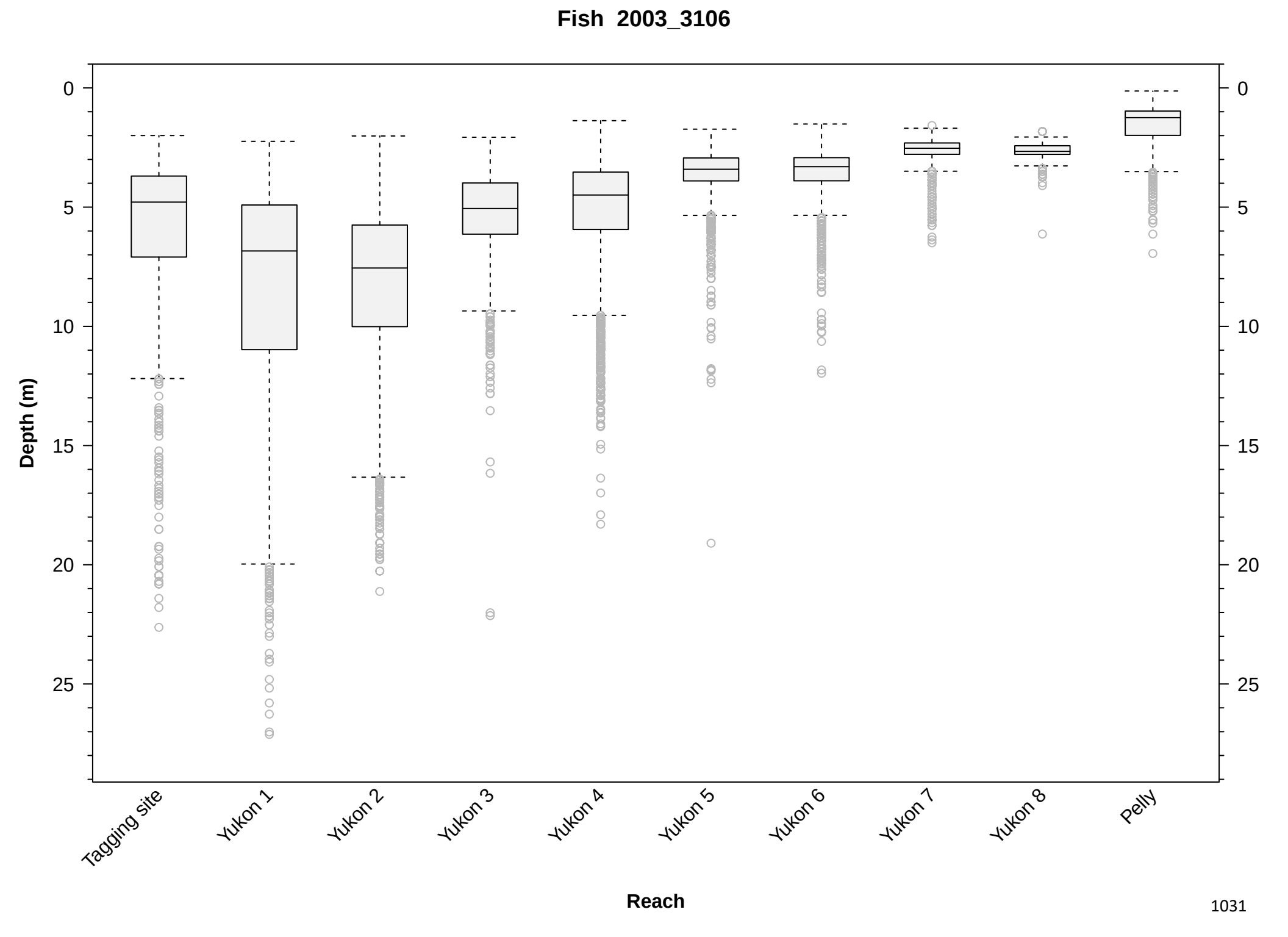

Pelly Stock
2003_3106
2003_3111
2003_3132
2004_3008
2004_3010
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
Temperature (C)
5
10
15
20
0
5
1026

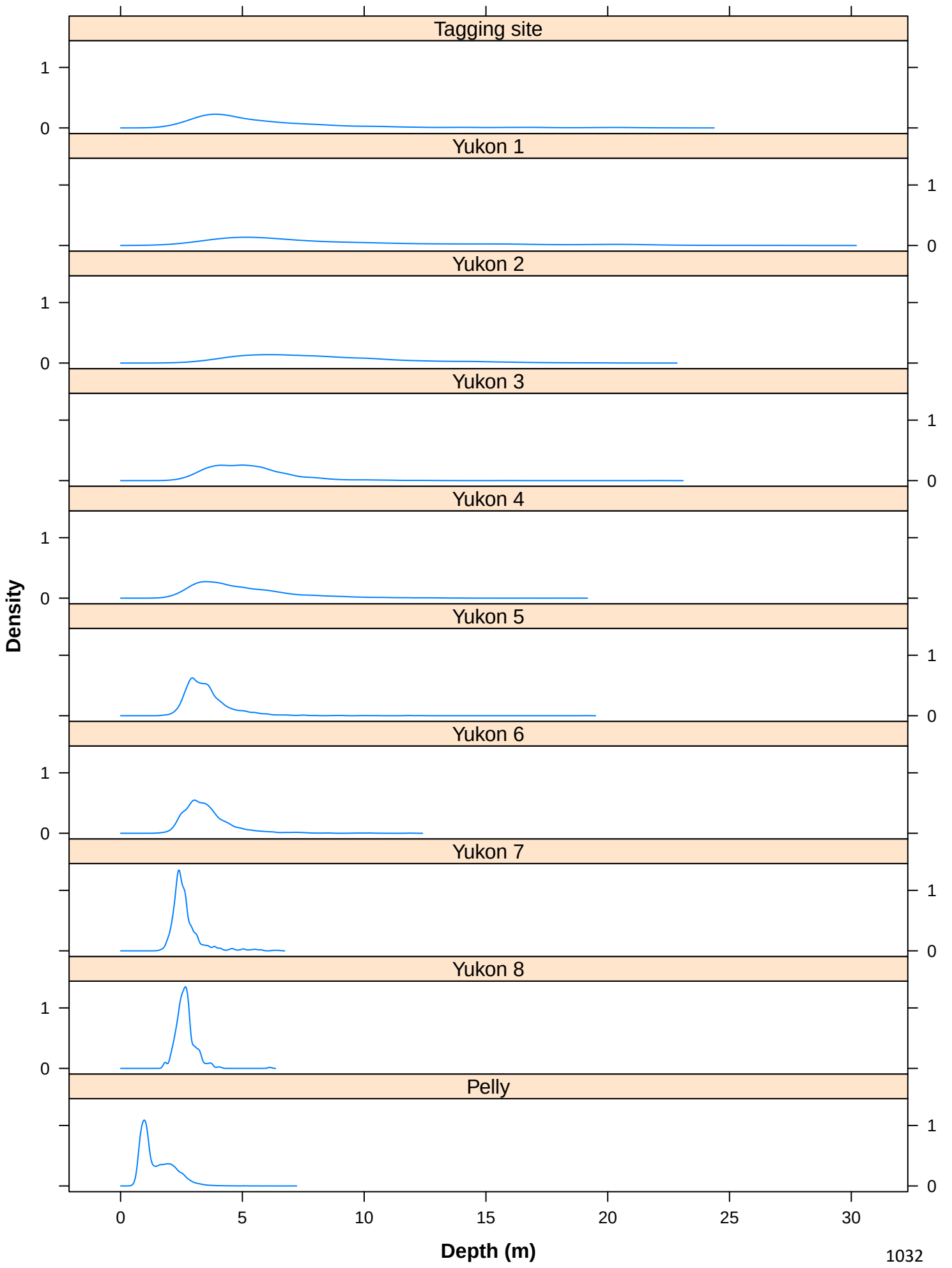

Pelly Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
5
10
15
20

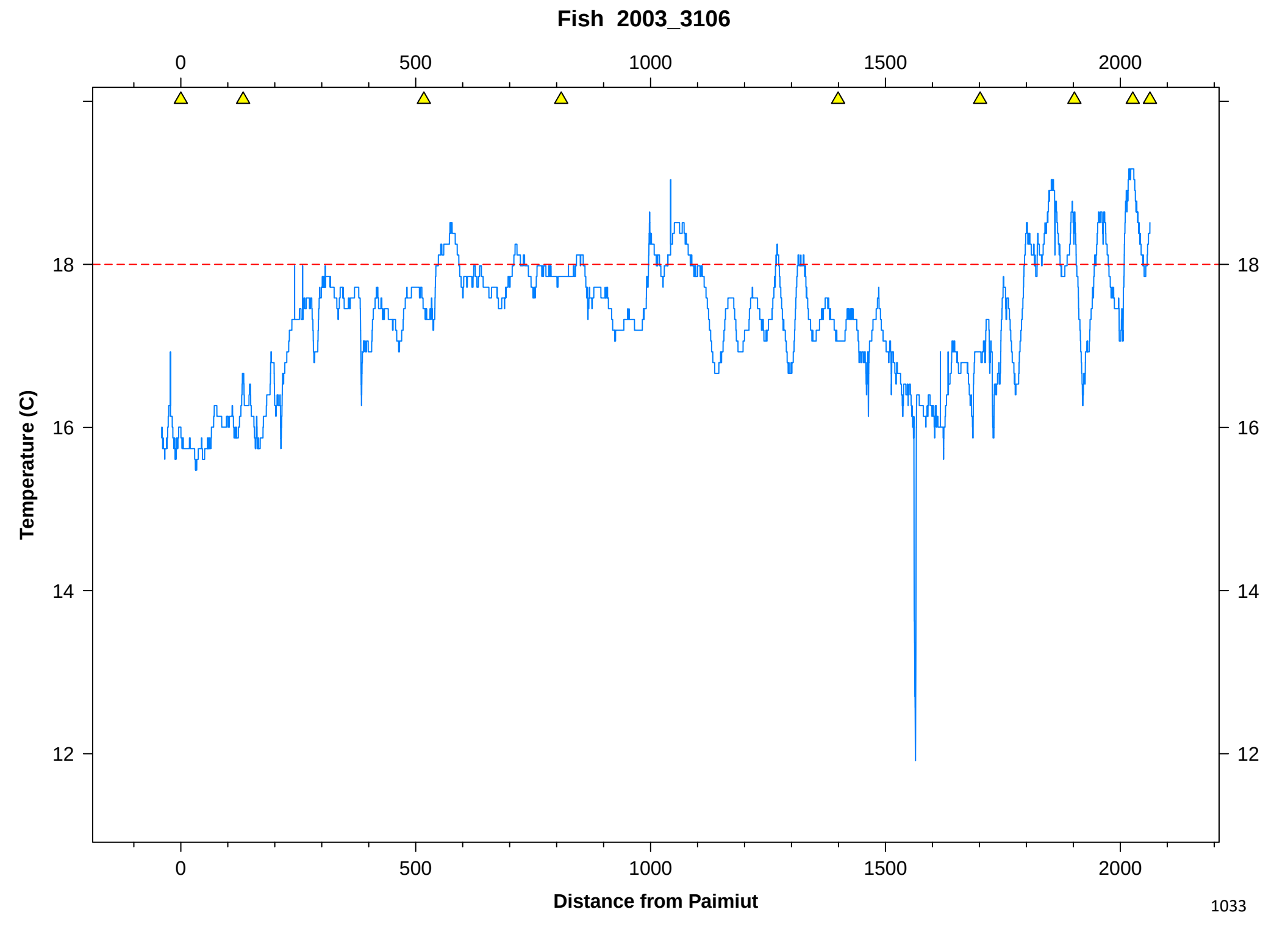

Pelly Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock
1028

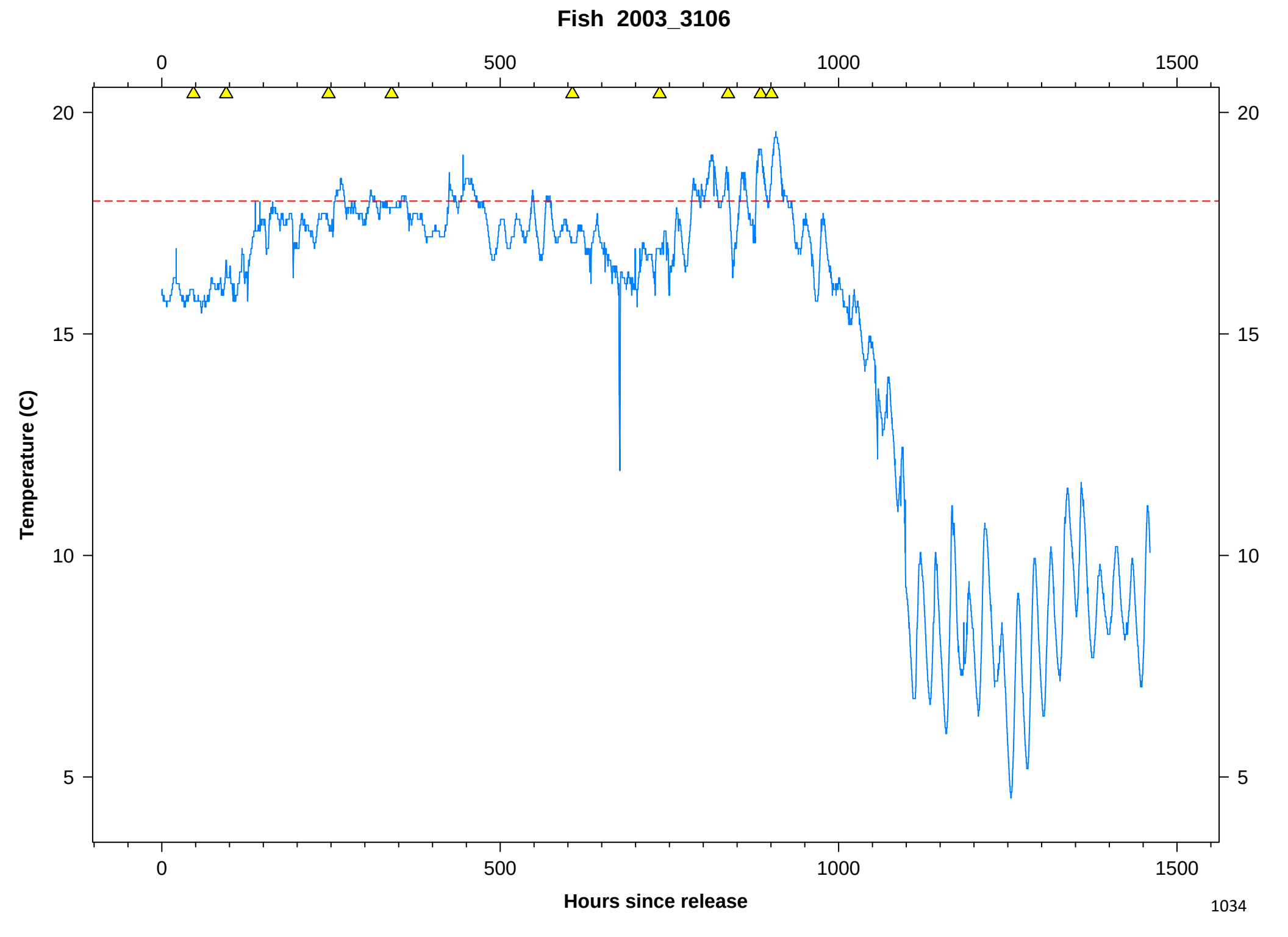

Fish 2003_3106
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

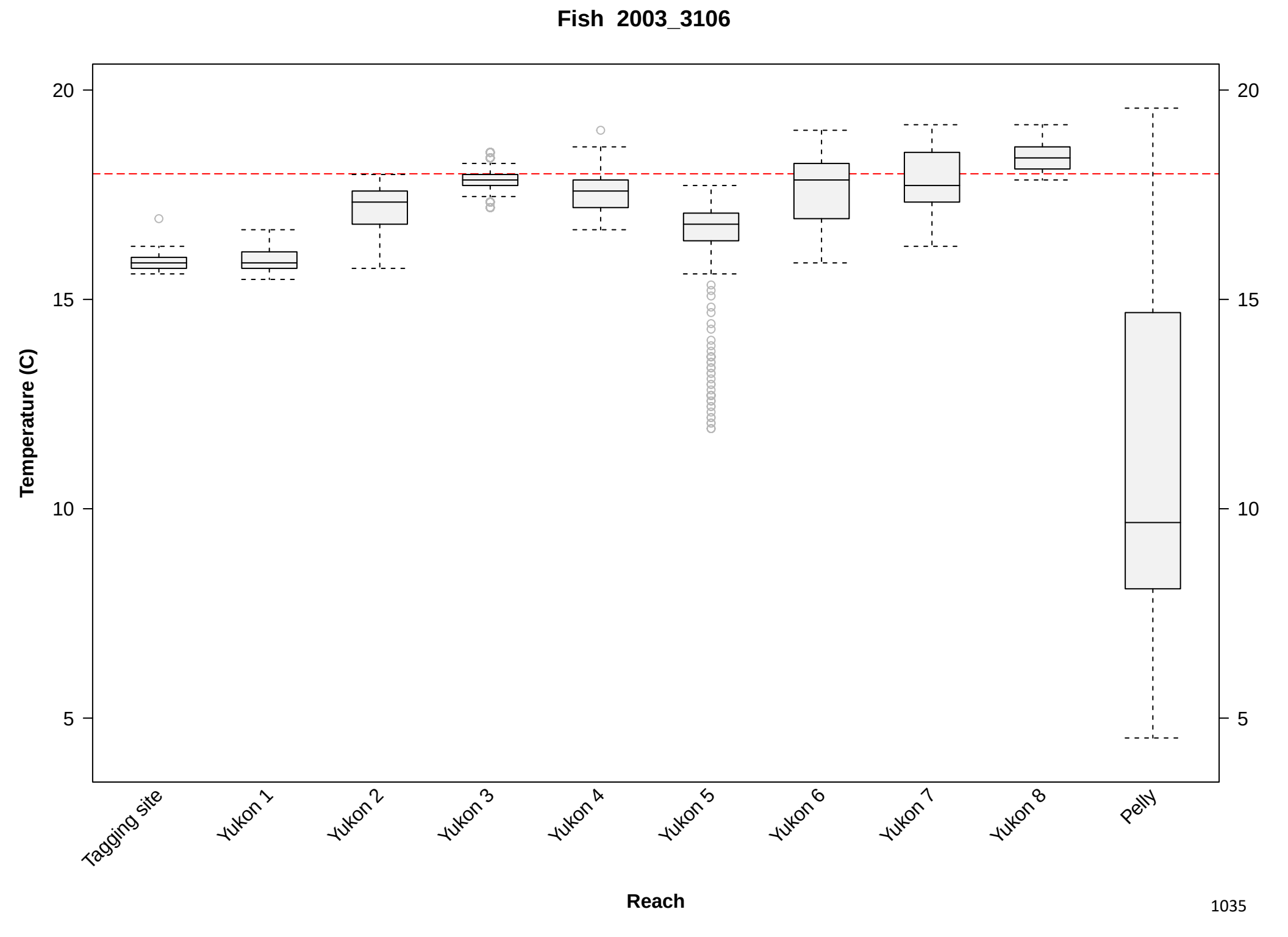

Fish 2003_3106
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Hours since release

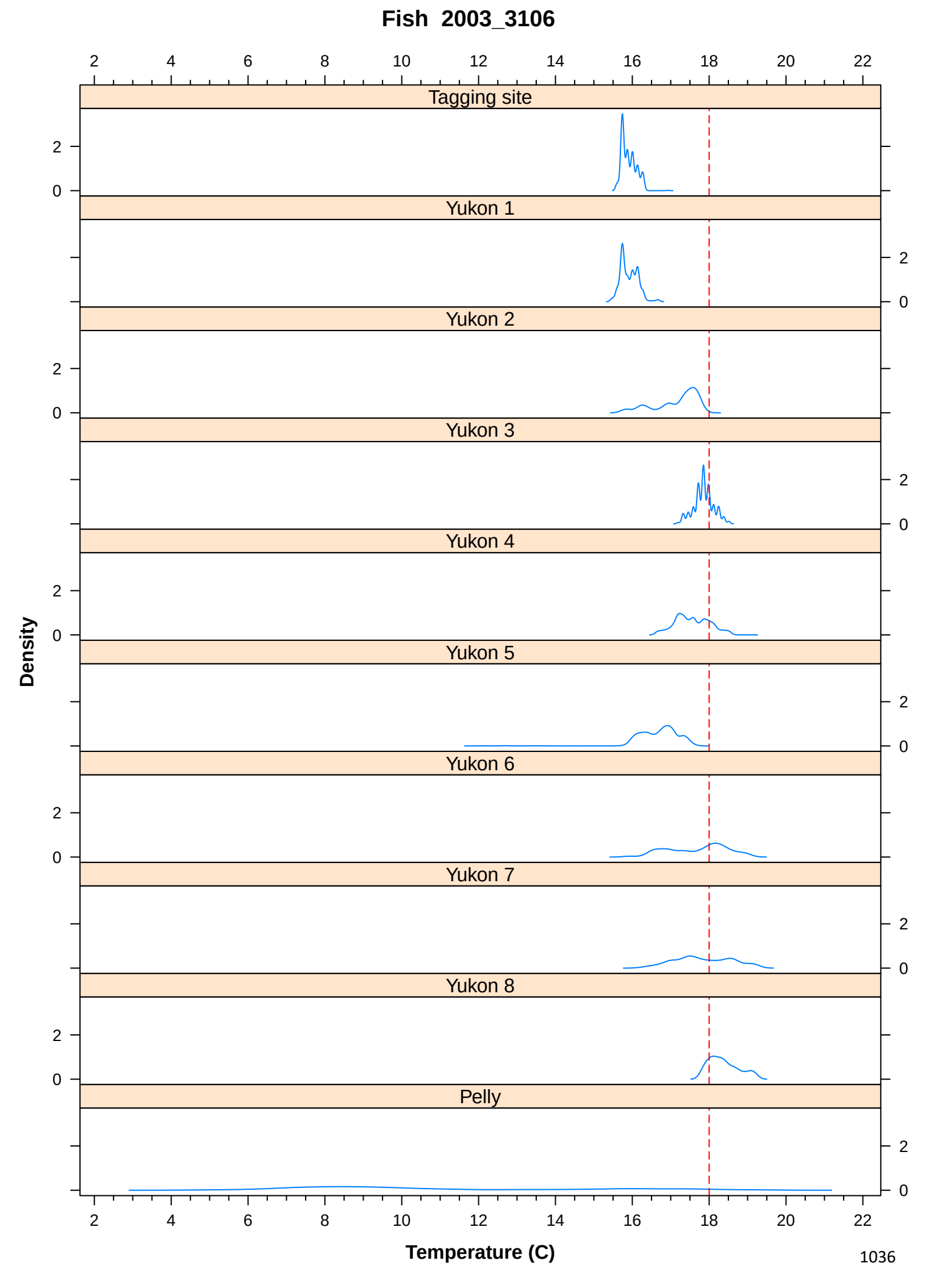

Fish 2003_3106
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach
1031

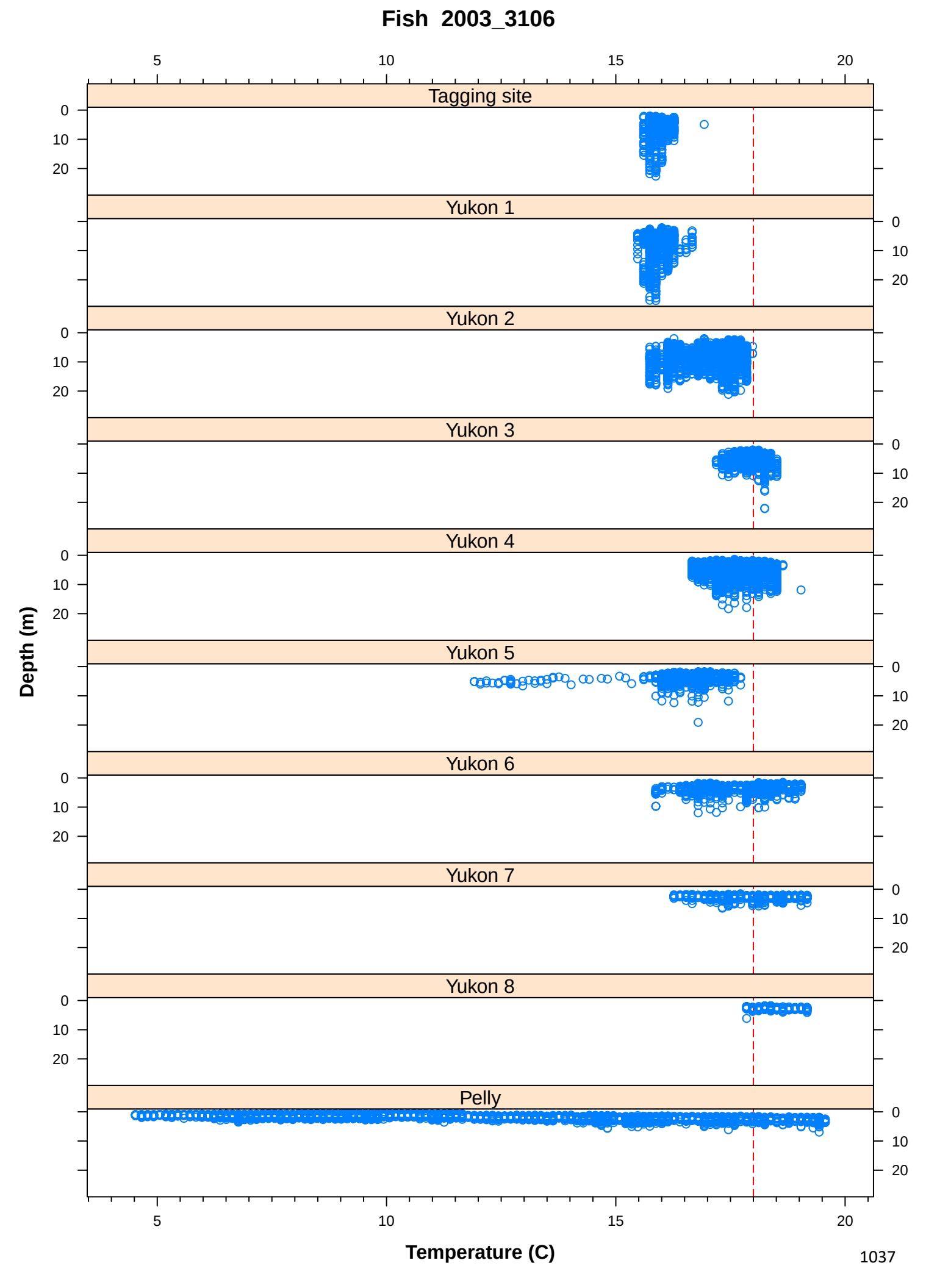

Fish 2003_3106
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
Depth (m)
0
5
10
15
20
25
30
1
0
1032

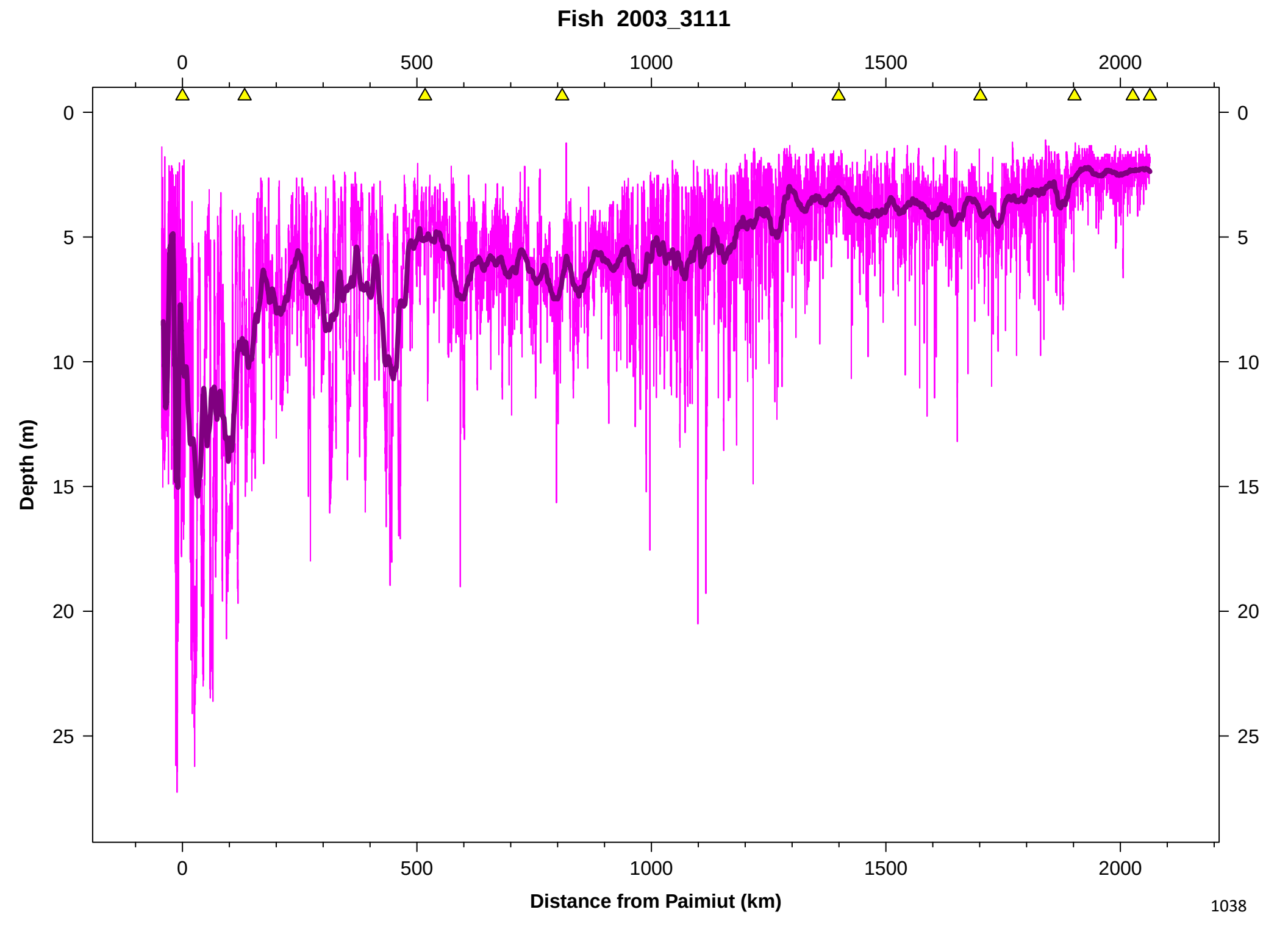

Fish 2003_3106
0
500
1000
1500
2000
18
16
14
12
Temperature (C)
Distance from Paimiut
1033

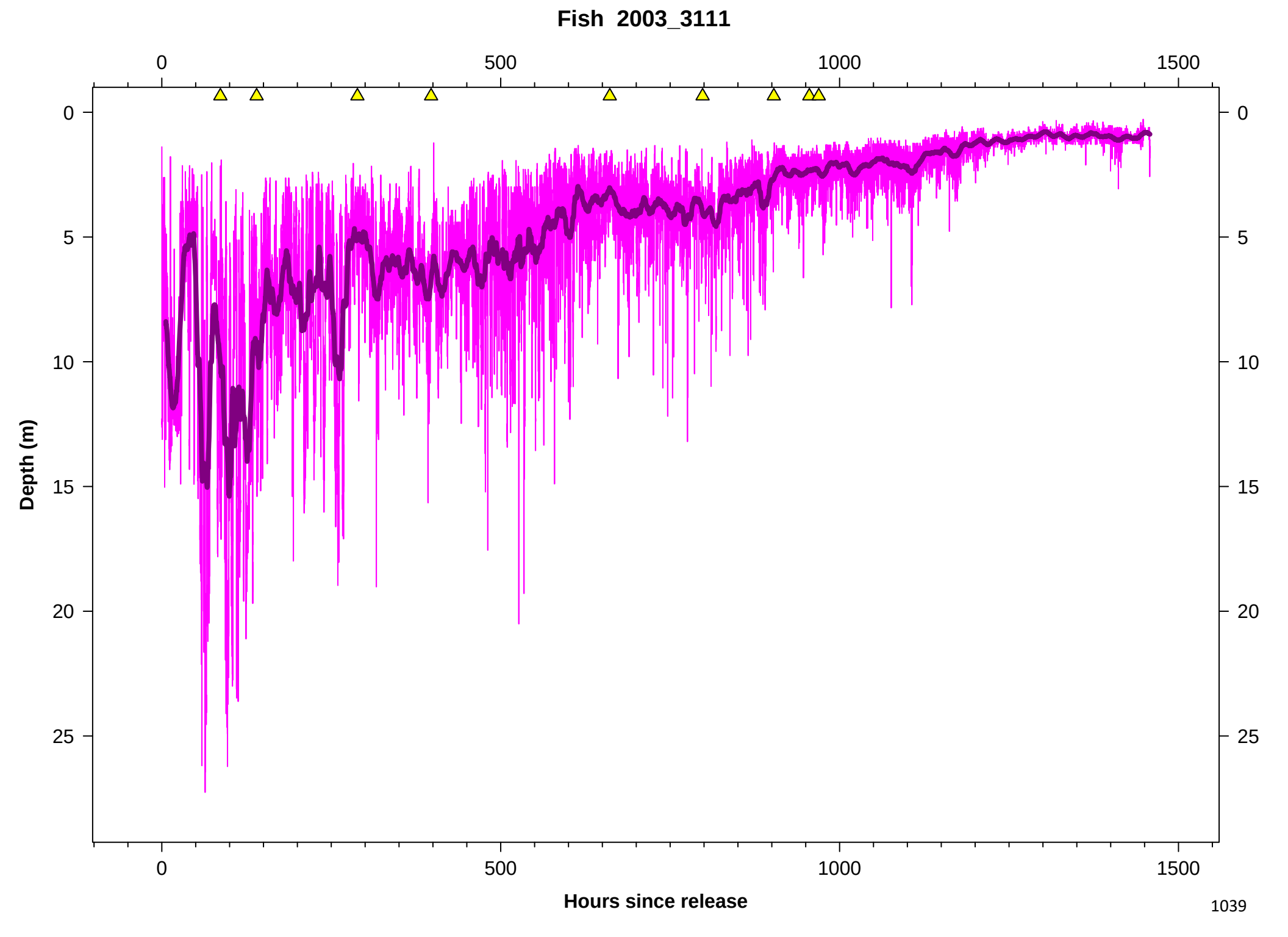

Fish 2003_3106
0
500
1000
1500
20
15
10
5
Temperature (C)
Hours since release
1034

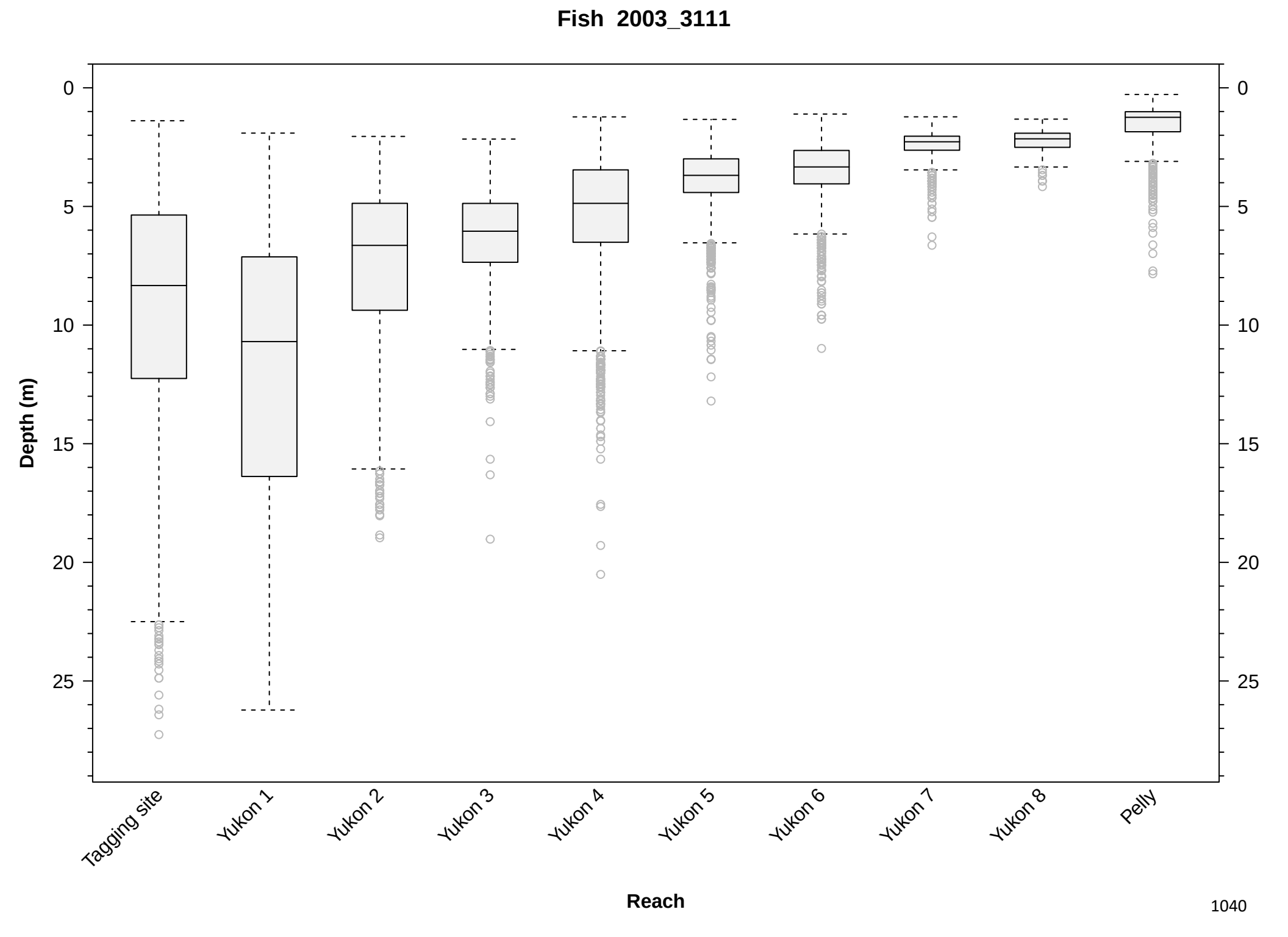

Fish 2003_3106
Temperature (C)
20
15
10
5
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach

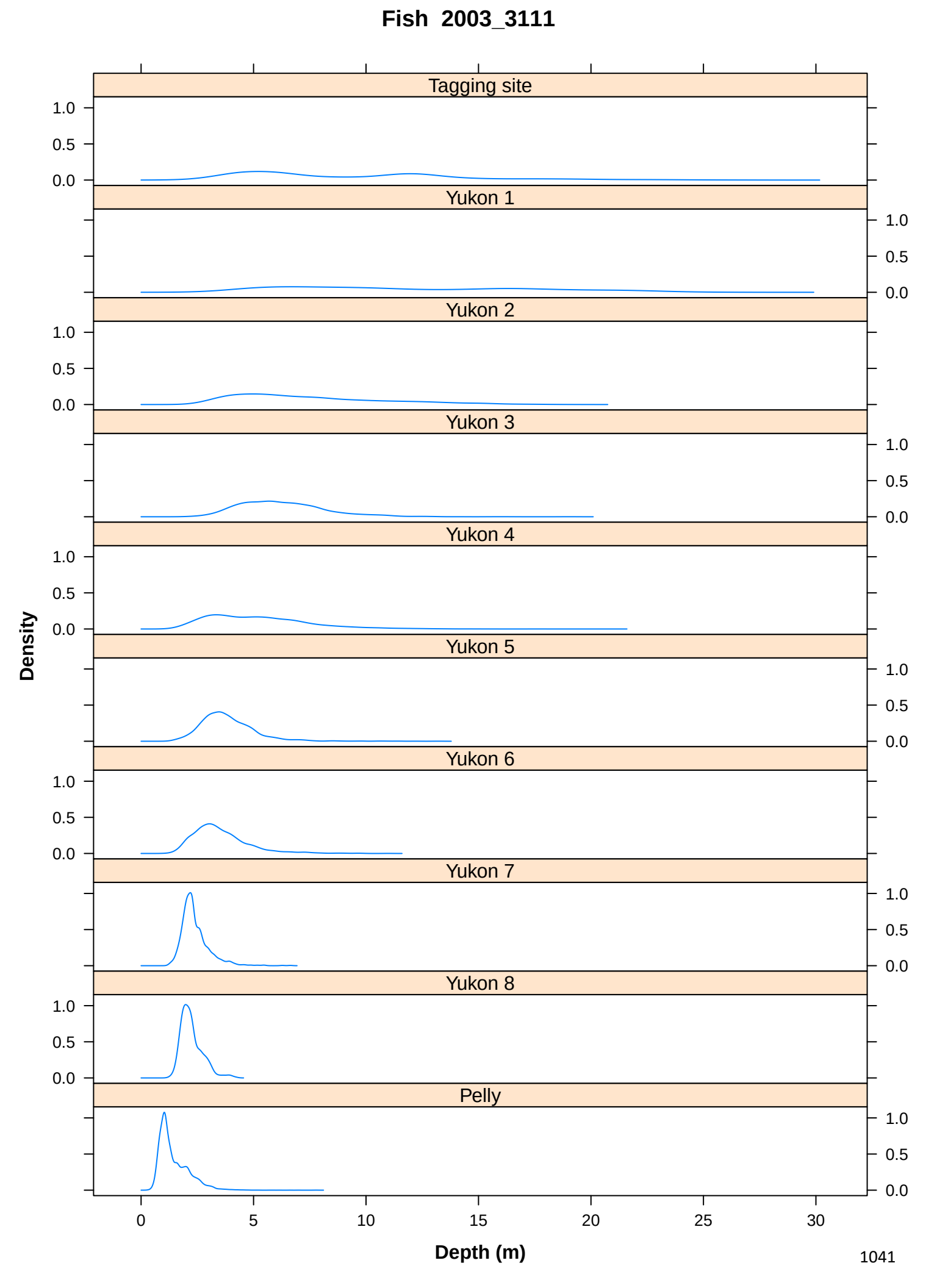

Fish 2003_3106
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
Temperature (C)
2
4
6
8
10
12
14
16
18
20
22
0
2
1036

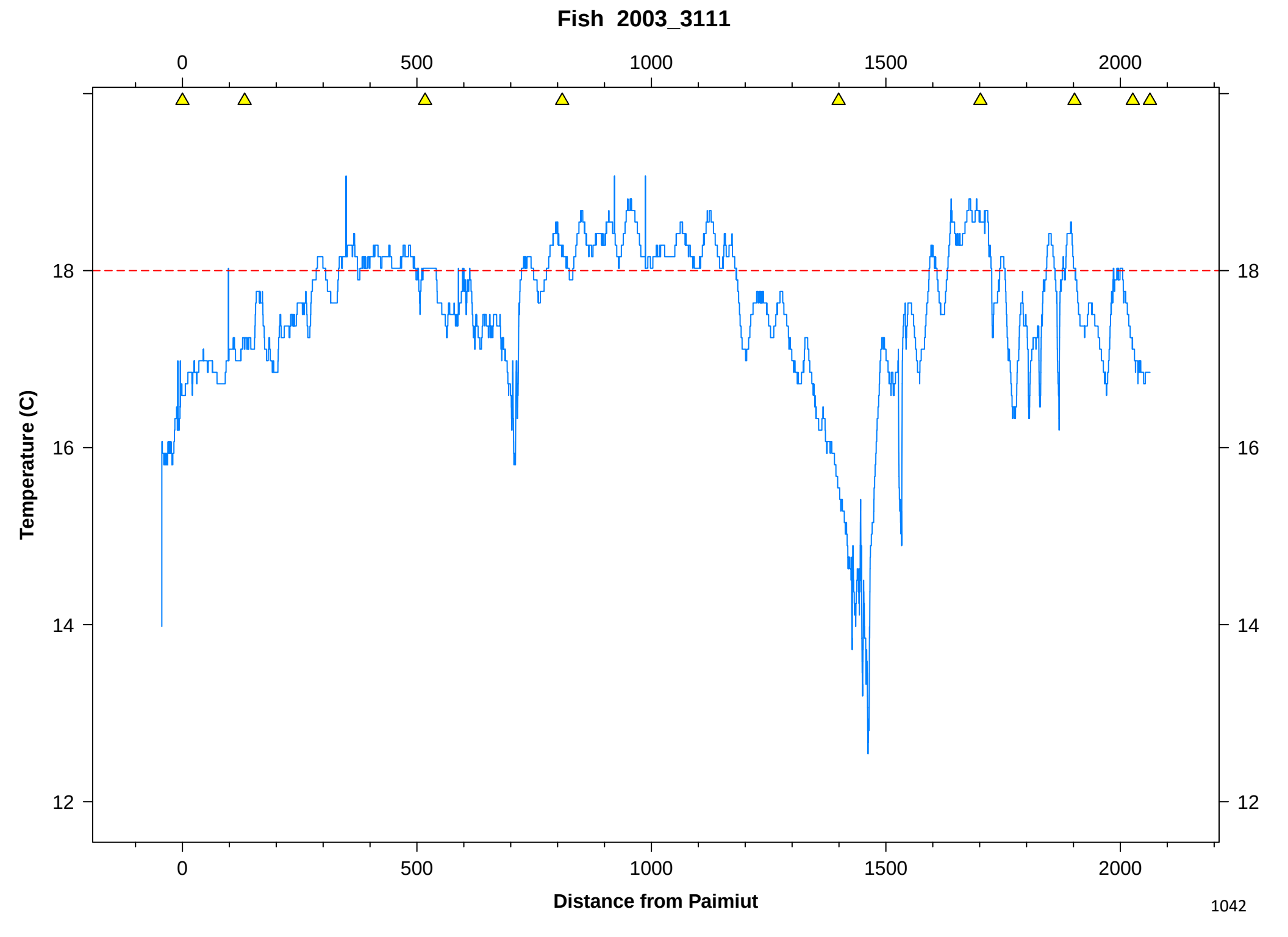

Fish 2003_3106
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Depth (m)
Temperature (C)
5
10
15
20
0
10
20
1037

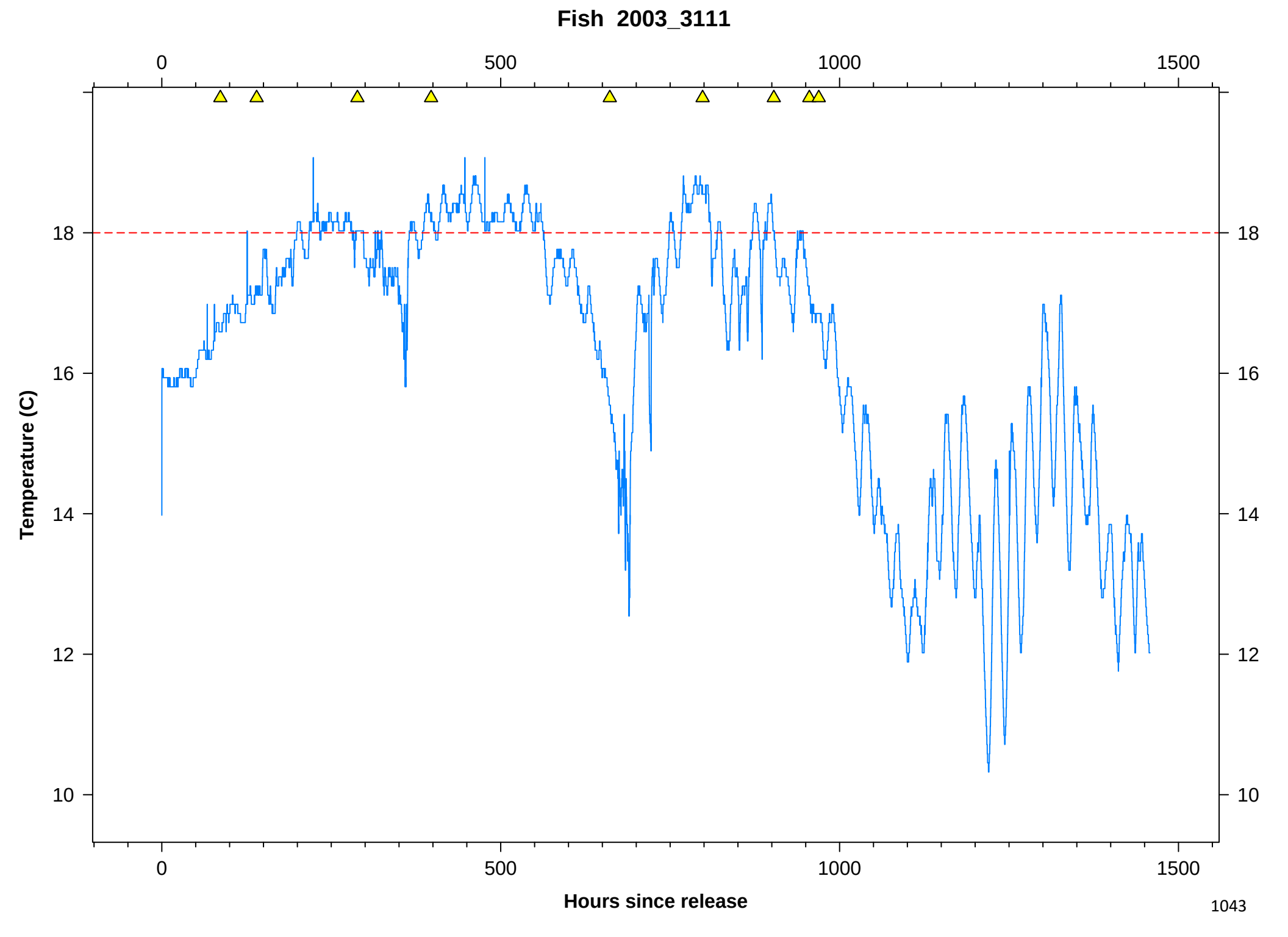

Fish 2003_3111
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

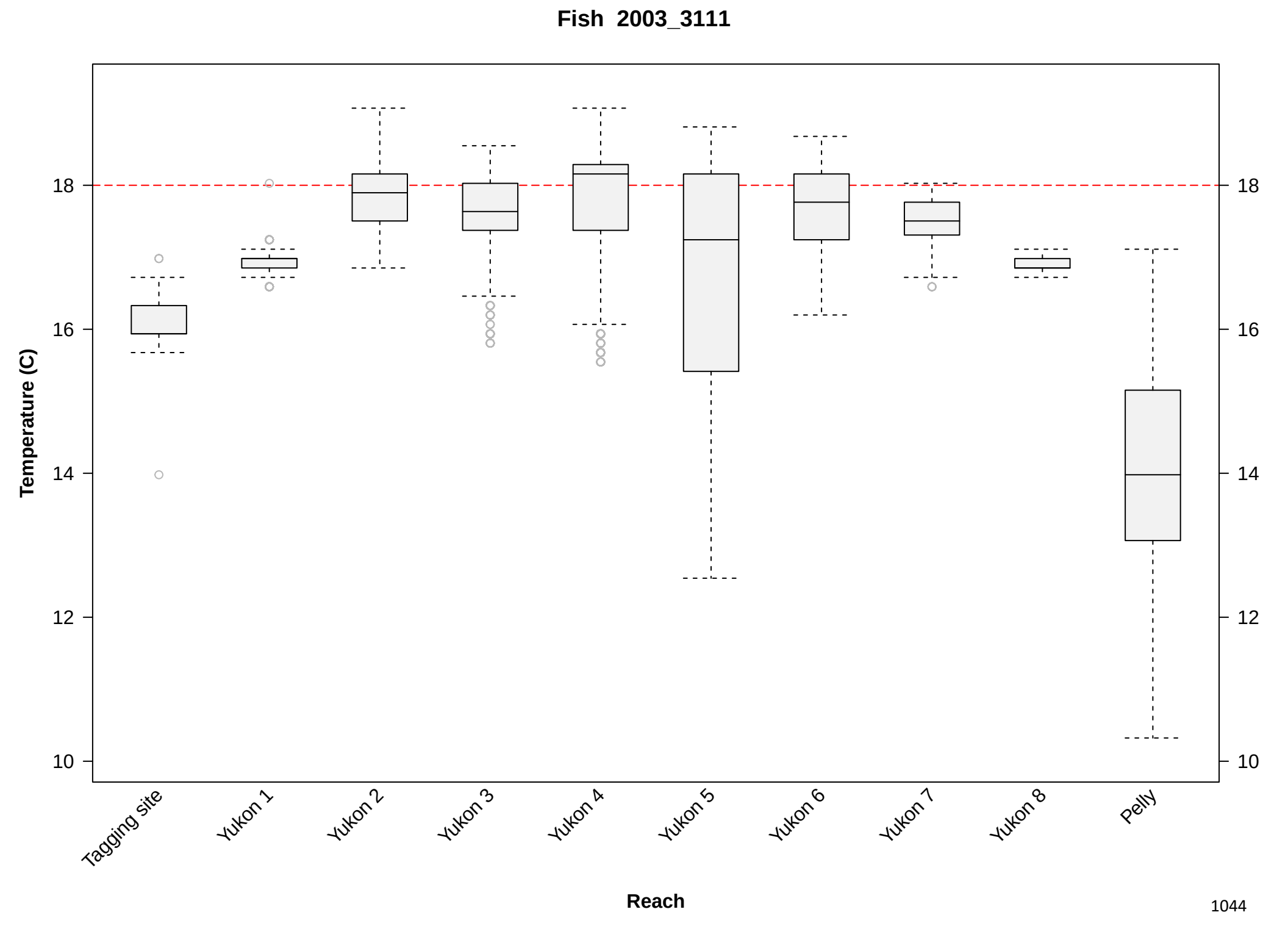

Fish 2003_3111
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Hours since release
1039

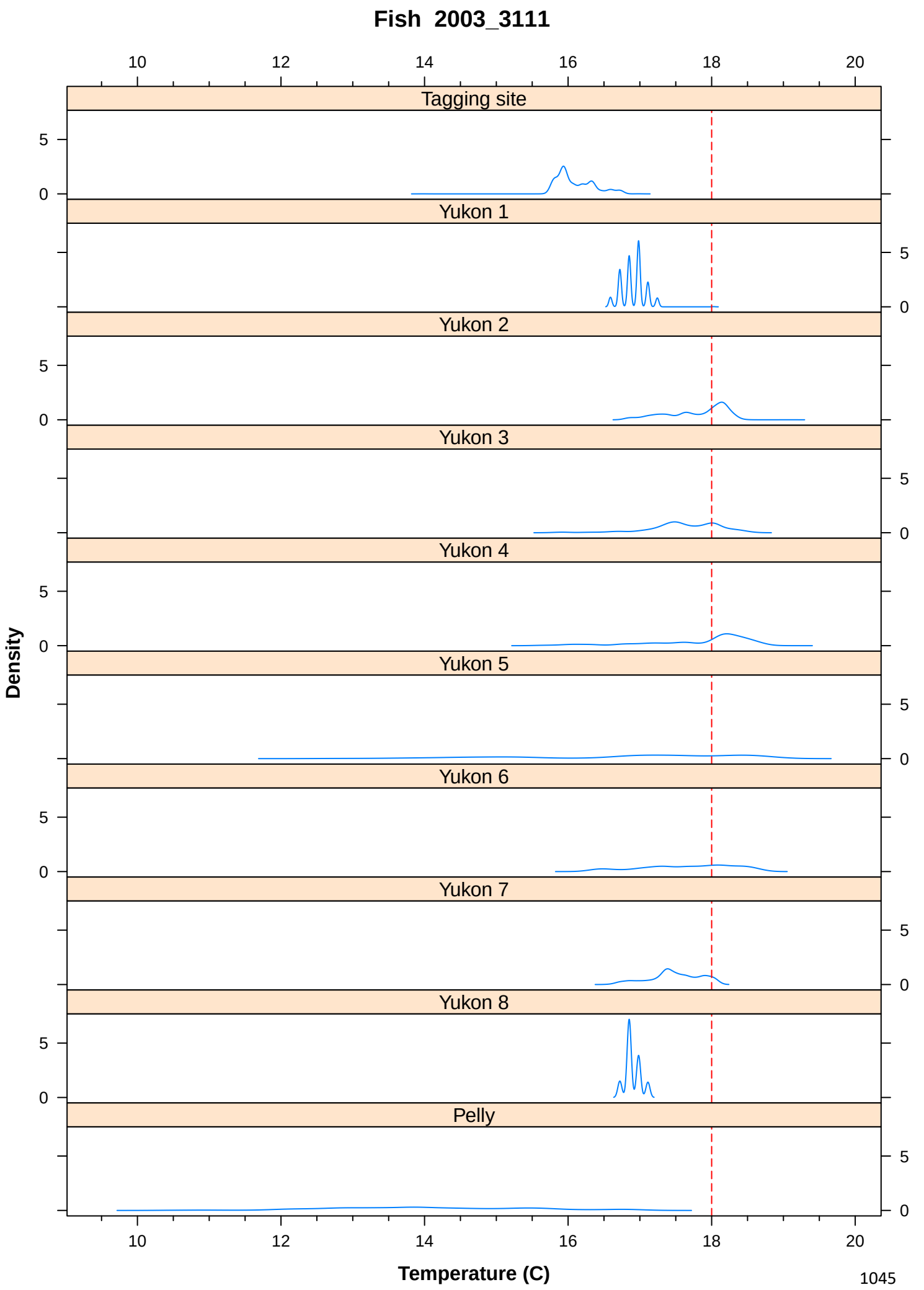

Fish 2003_3111
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach
1040

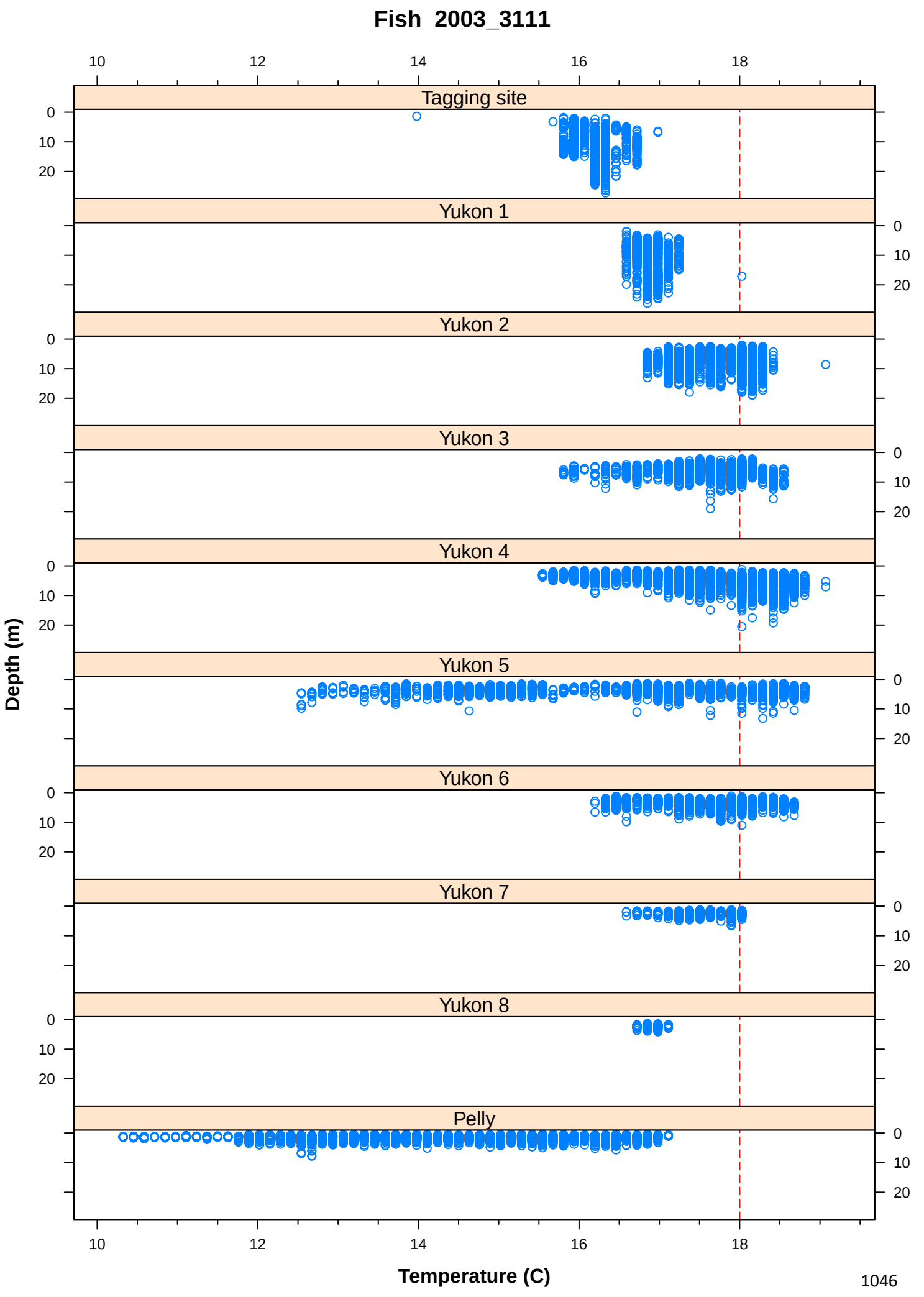

Fish 2003_3111
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
Depth (m)
0
5
10
15
20
25
30
0.0
0.5
1.0
1041

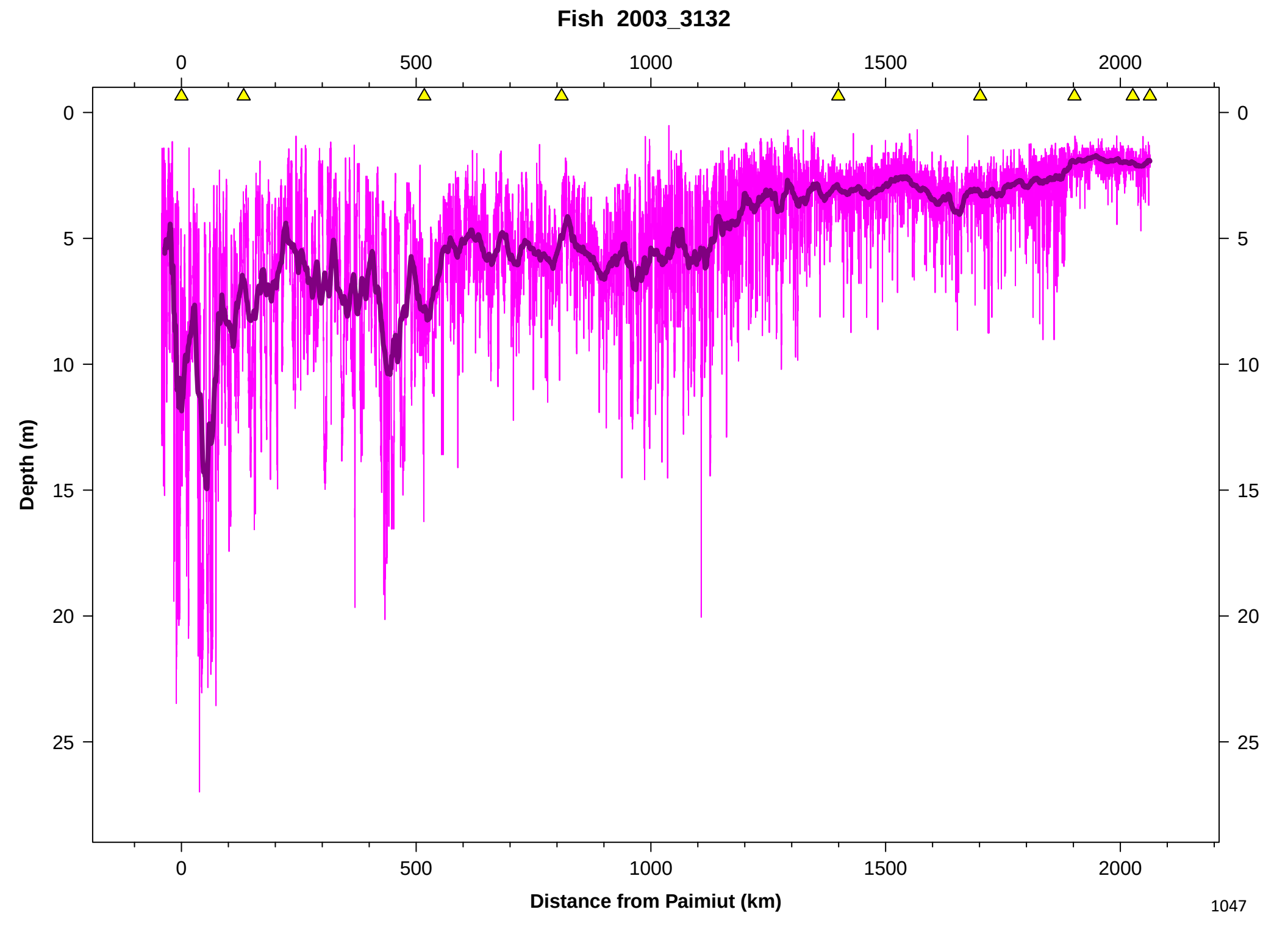

Fish 2003_3111
0
500
1000
1500
2000
18
16
14
12
Temperature (C)
Distance from Paimiut
1042

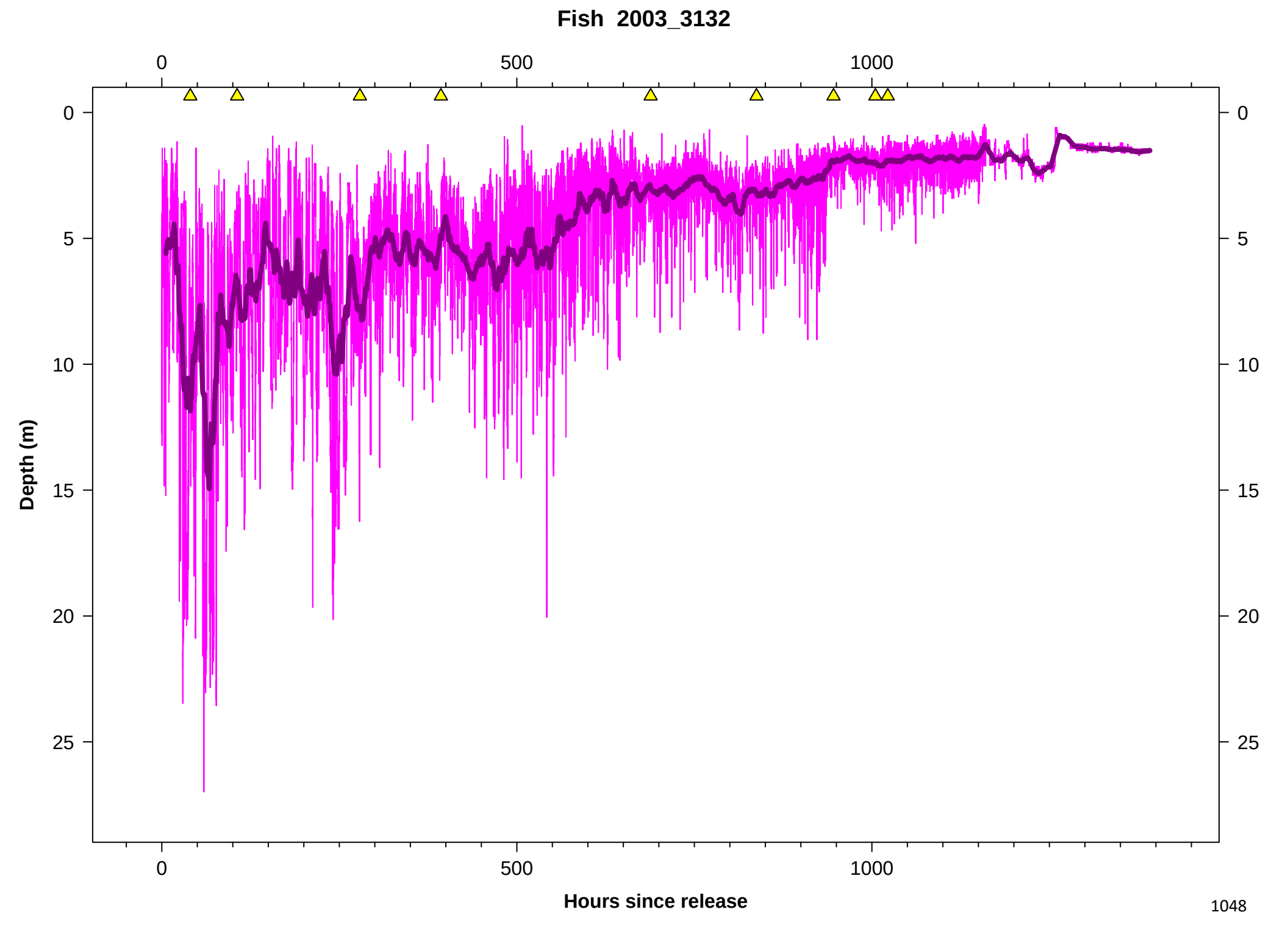

Fish 2003_3111
0
500
1000
1500
18
16
14
12
10
Temperature (C)
Hours since release
1043

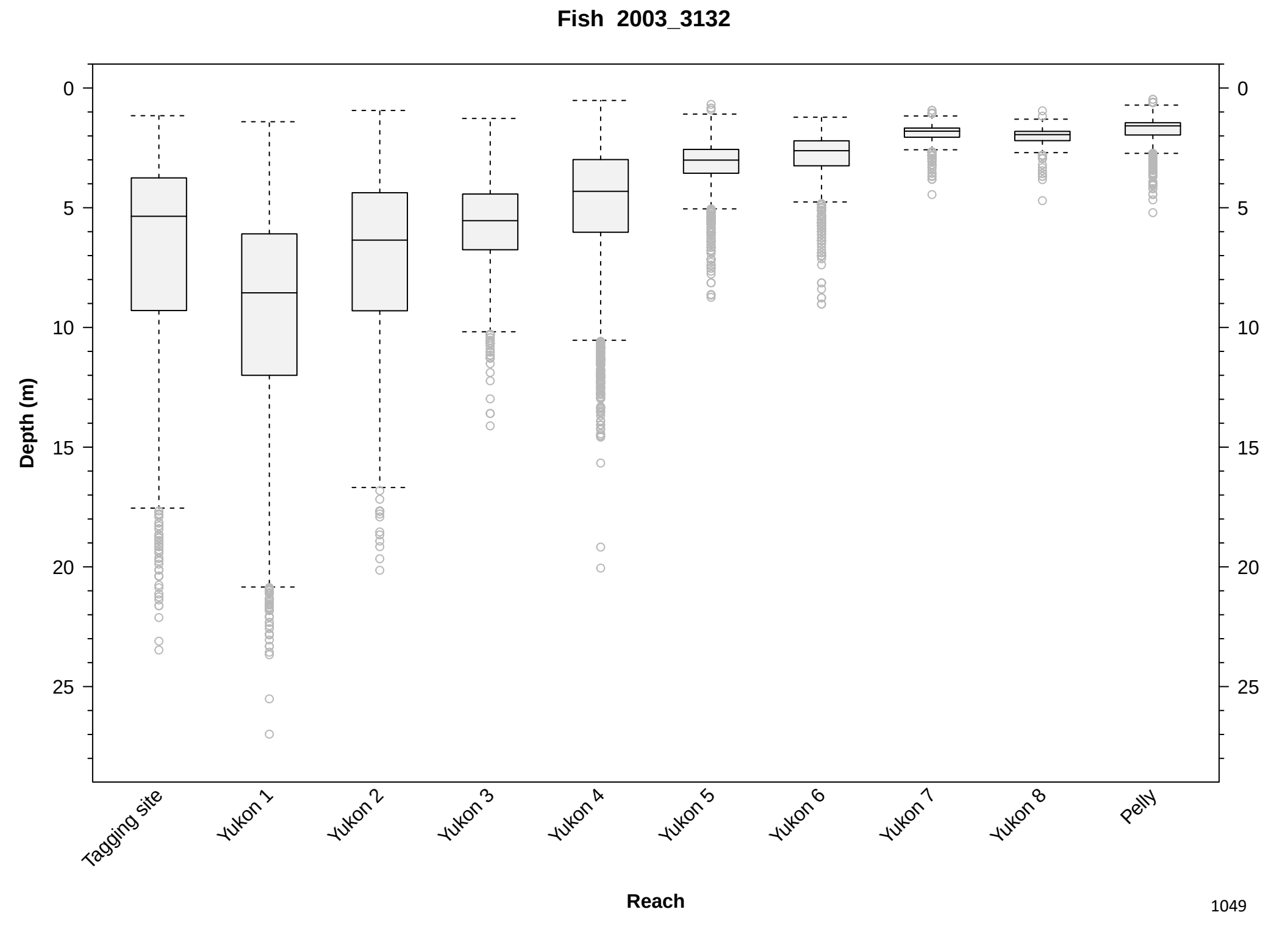

Fish 2003_3111
Temperature (C)
10
12
14
16
18
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach
1044

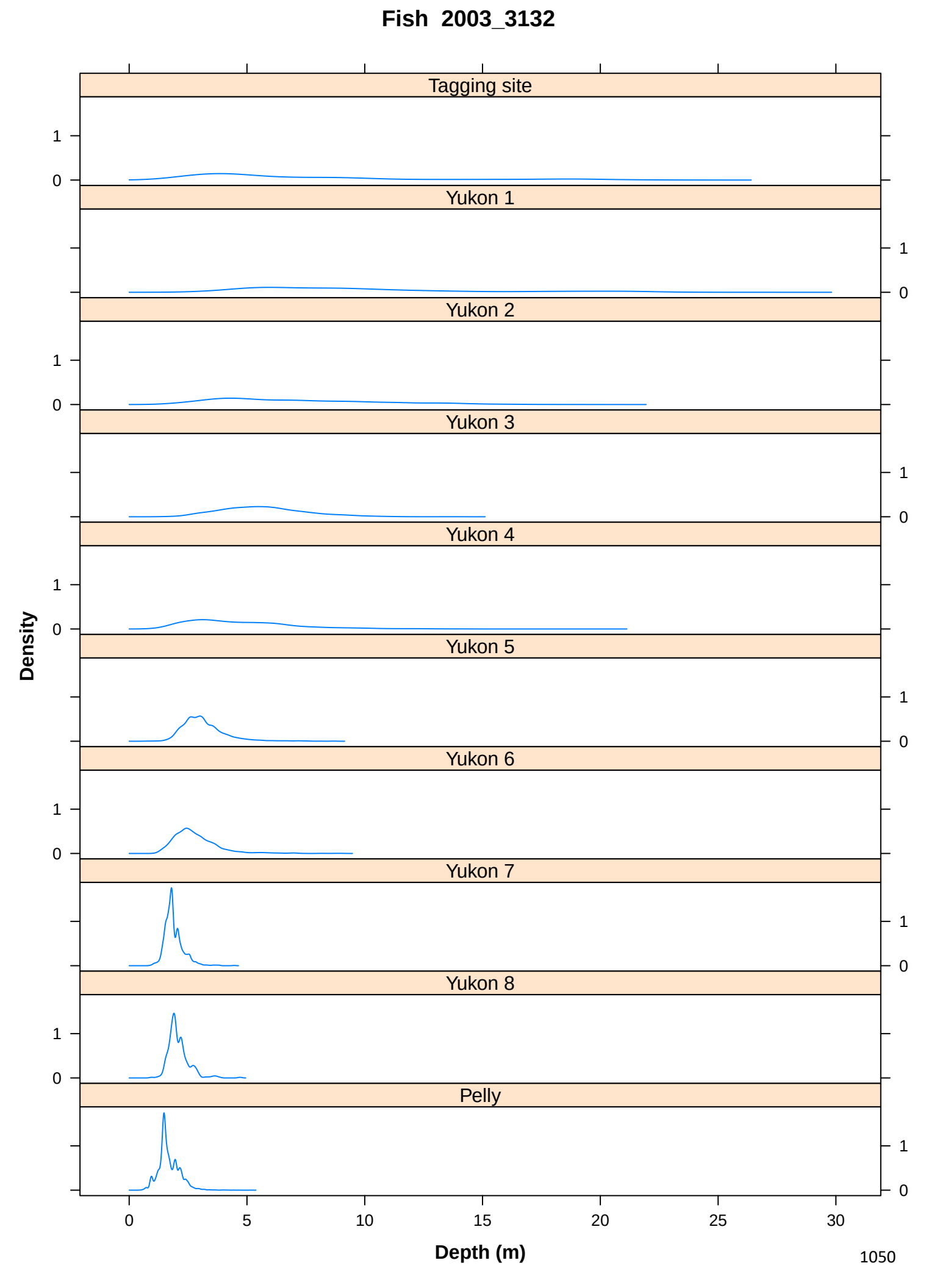

Fish 2003_3111
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
Temperature (C)
10
12
14
16
18
20
0
5

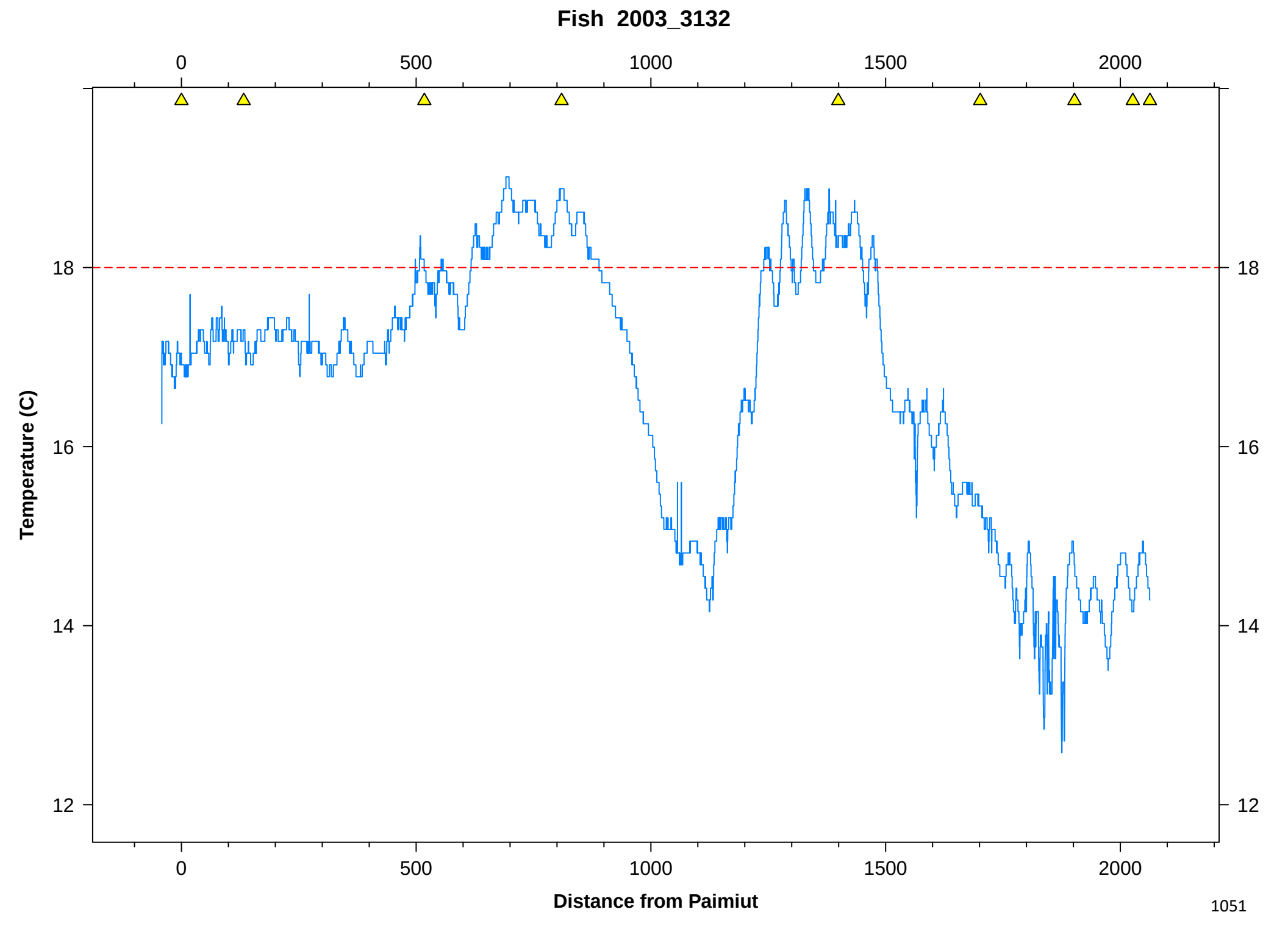

Fish 2003_3111
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Depth (m)
Temperature (C)
10
12
14
16
18
0
10
20

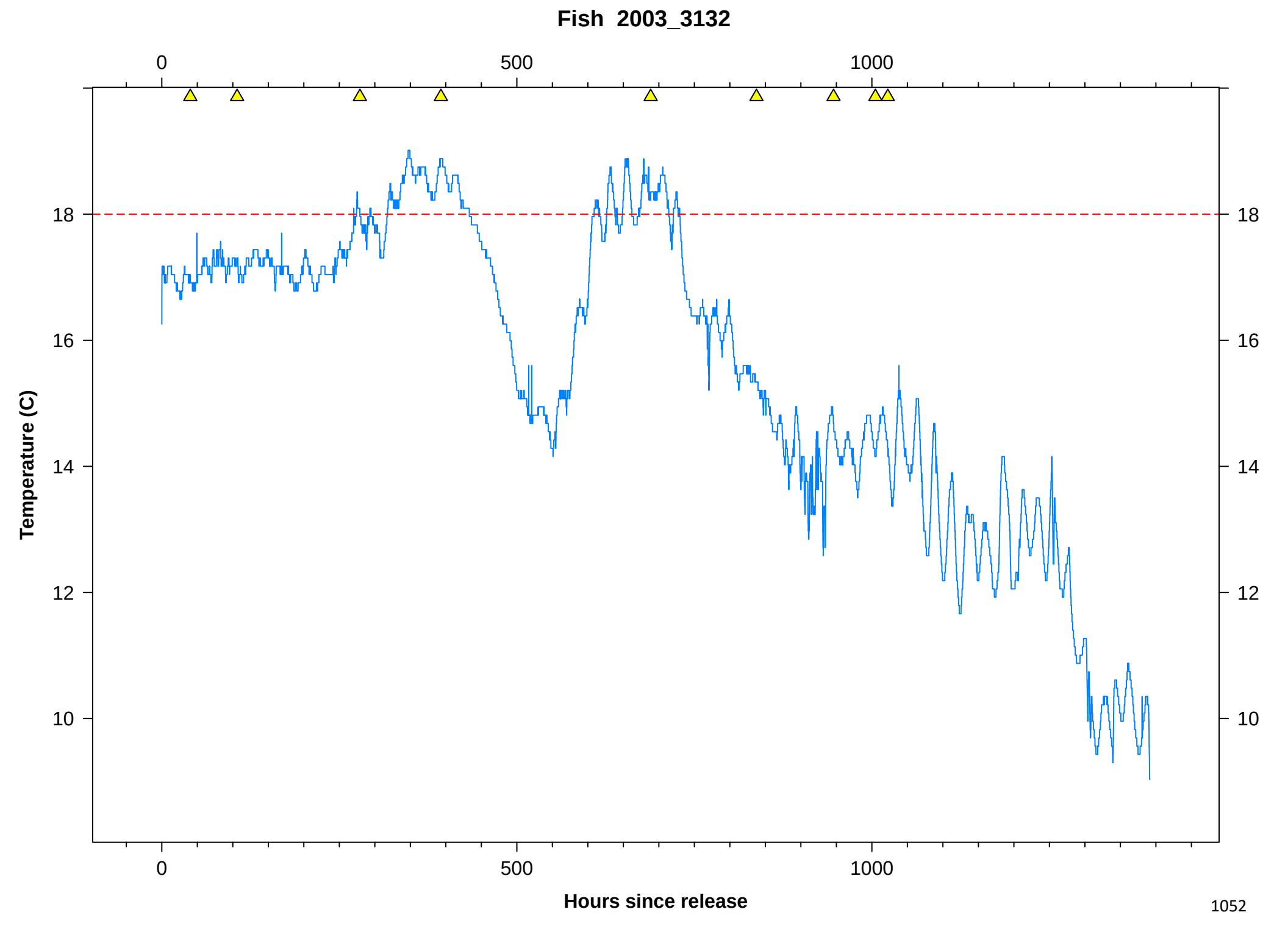

Fish 2003_3132
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
1047

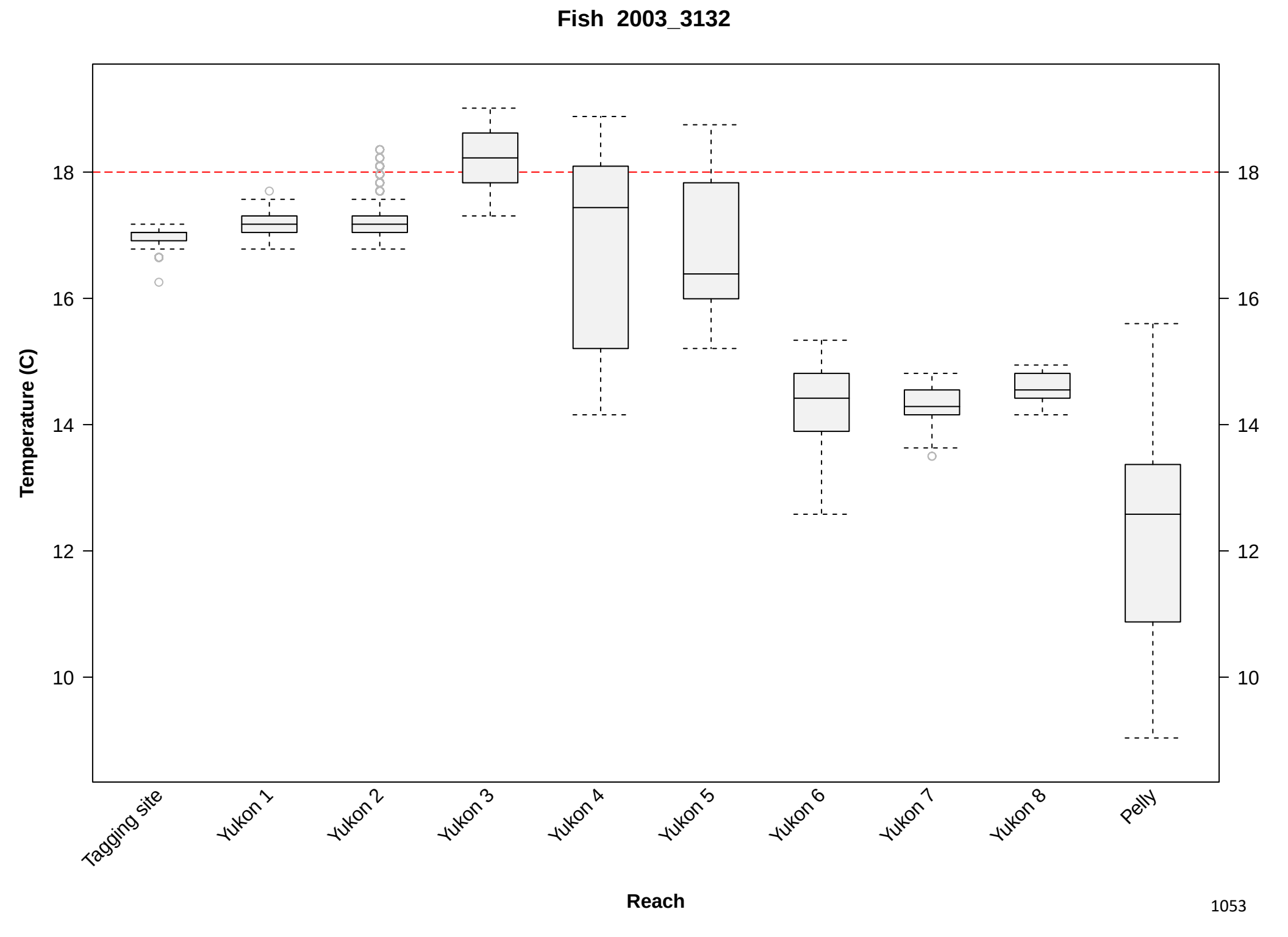

Fish 2003_3132
0
500
1000
0
5
10
15
20
25
Depth (m)
Hours since release
1048

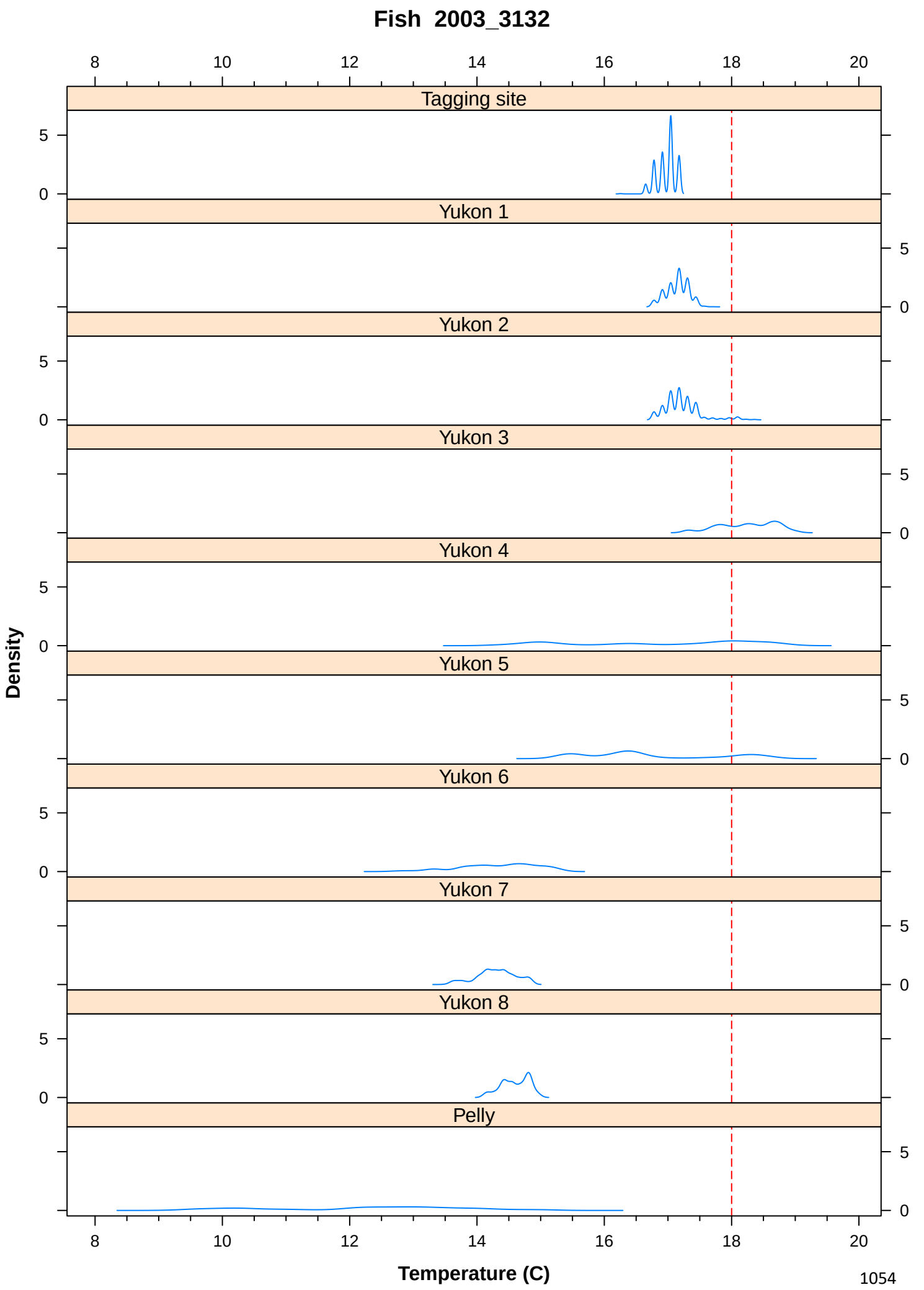

Fish 2003_3132
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach

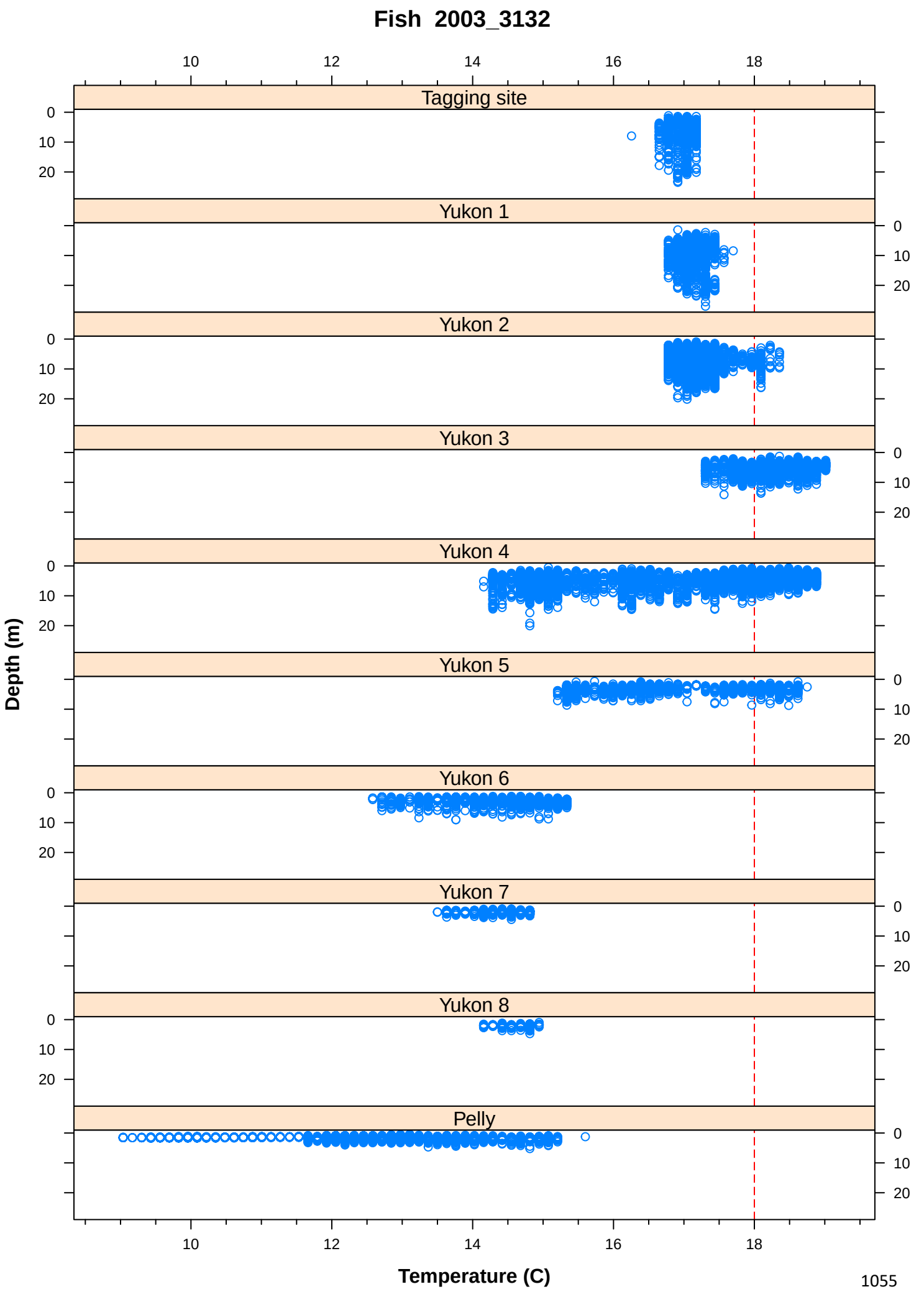

Fish 2003_3132
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
Depth (m)
0
5
10
15
20
25
30
1
0
1050

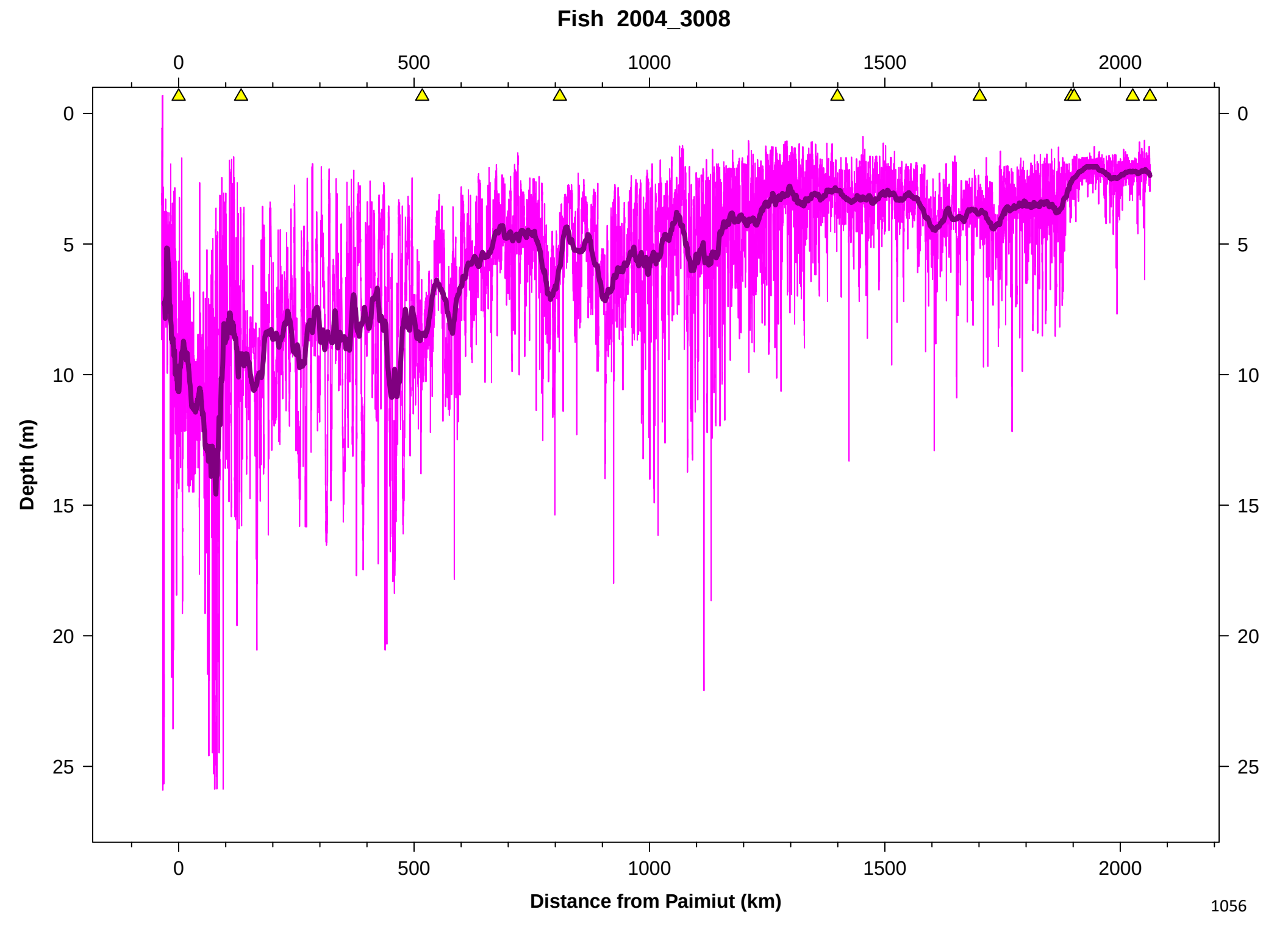

Fish 2003_3132
0
500
1000
1500
2000
18
16
14
12
Temperature (C)
Distance from Paimiut
1051

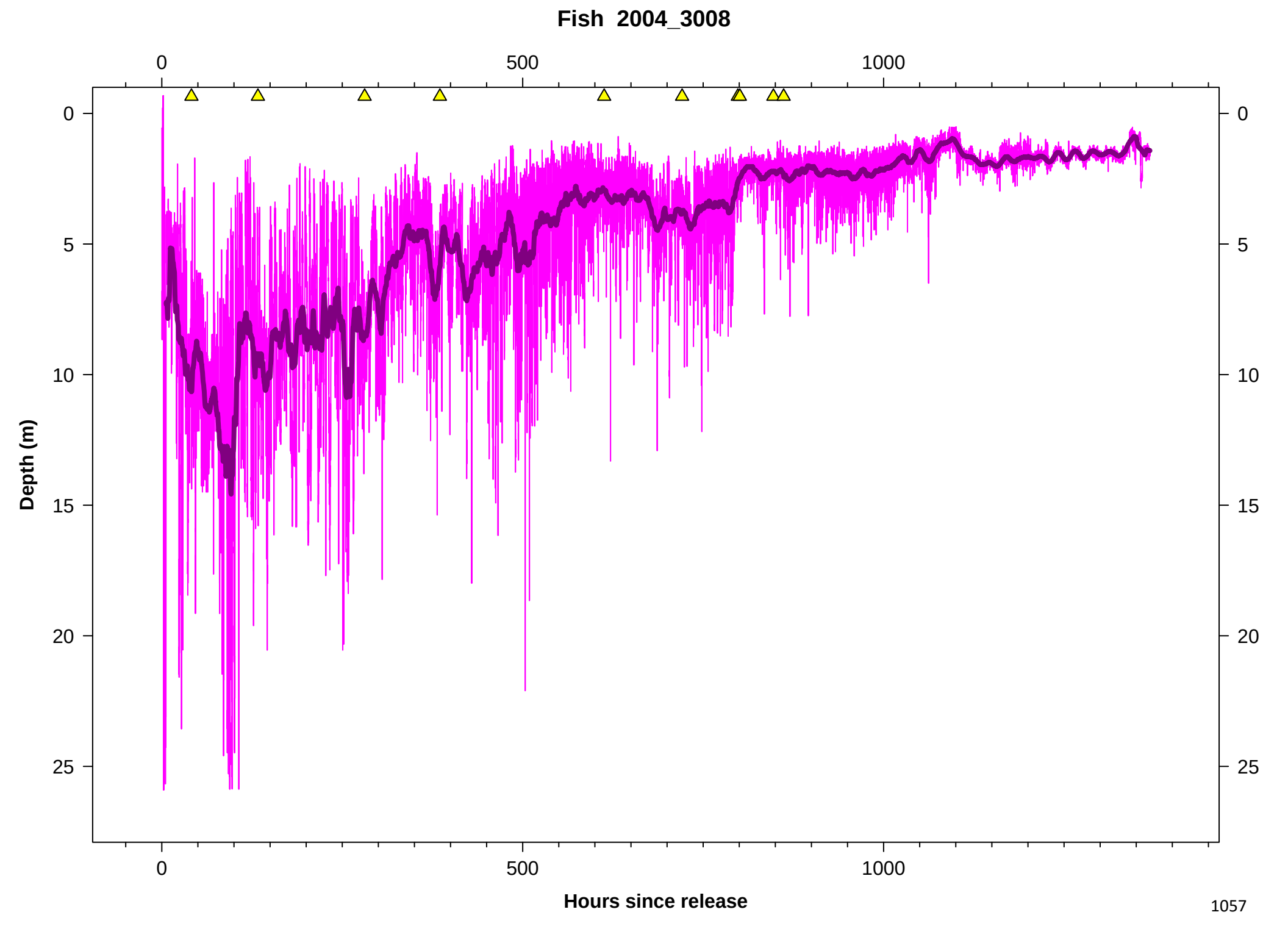

Fish 2003_3132
0
500
1000
18
16
14
12
10
Temperature (C)
Hours since release
1052

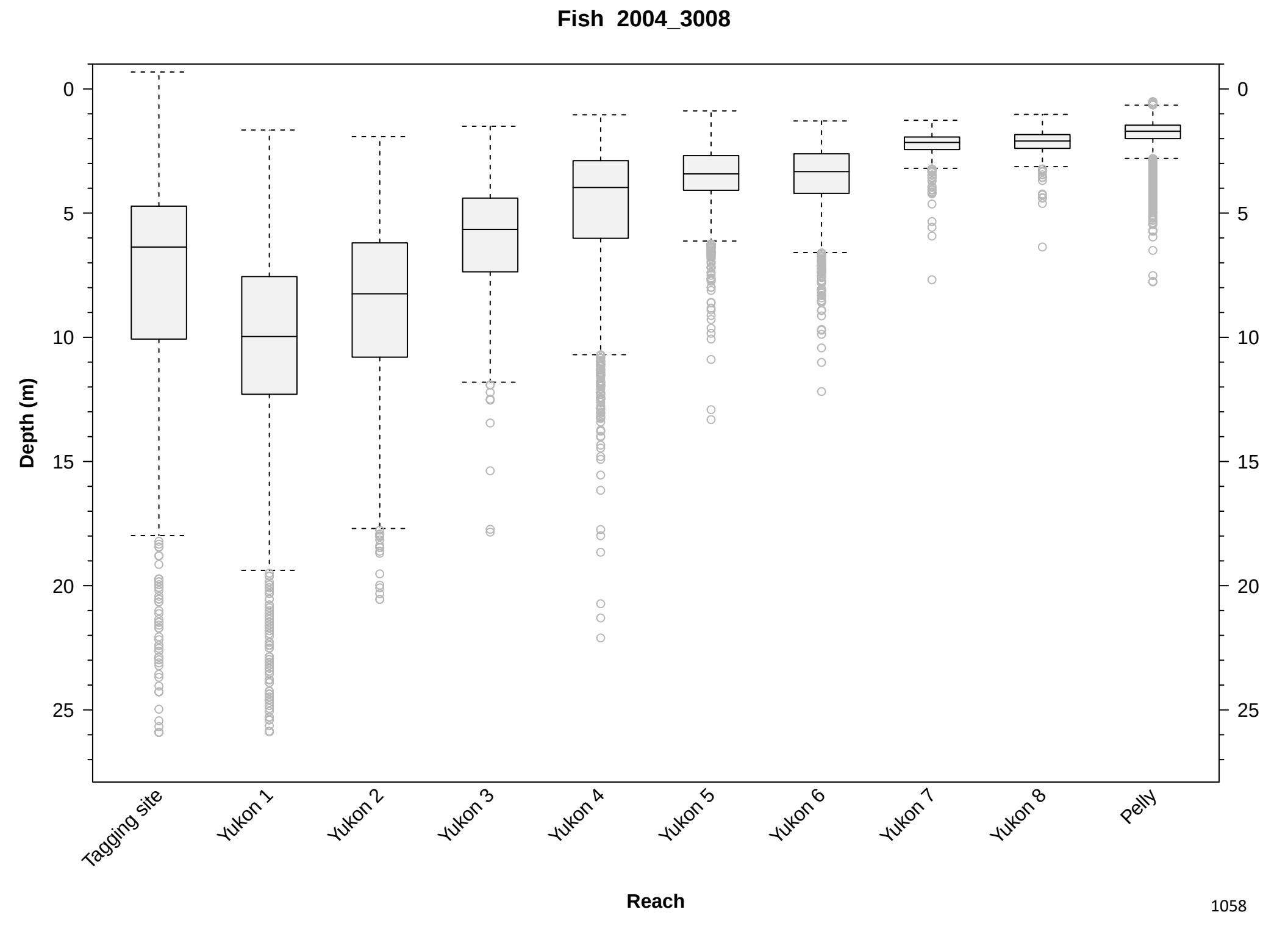

Fish 2003_3132
Temperature (C)
18
16
14
12
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach
1053

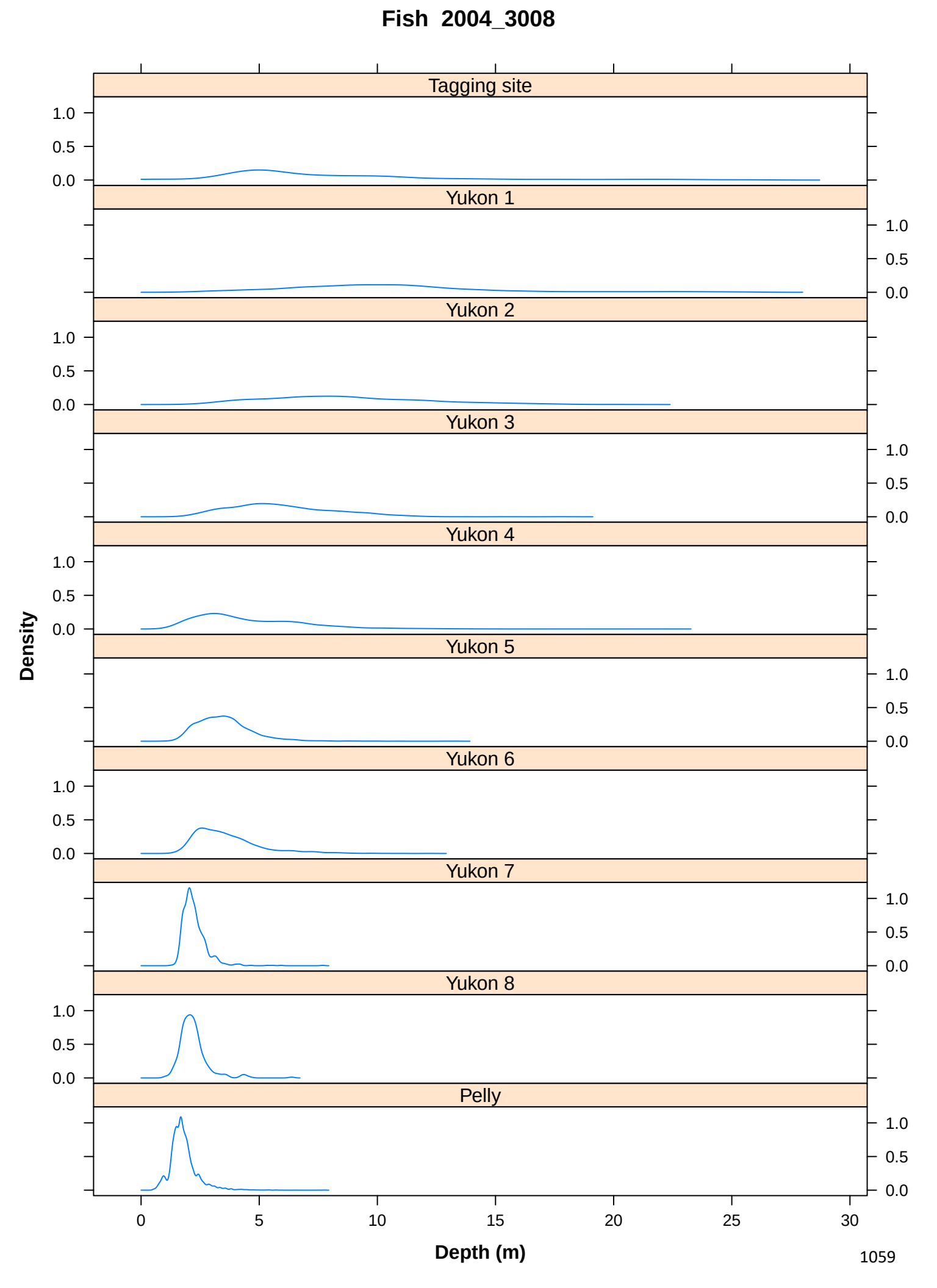

Fish 2003_3132
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
Temperature (C)
8
10
12
14
16
18
20
0
5
1054

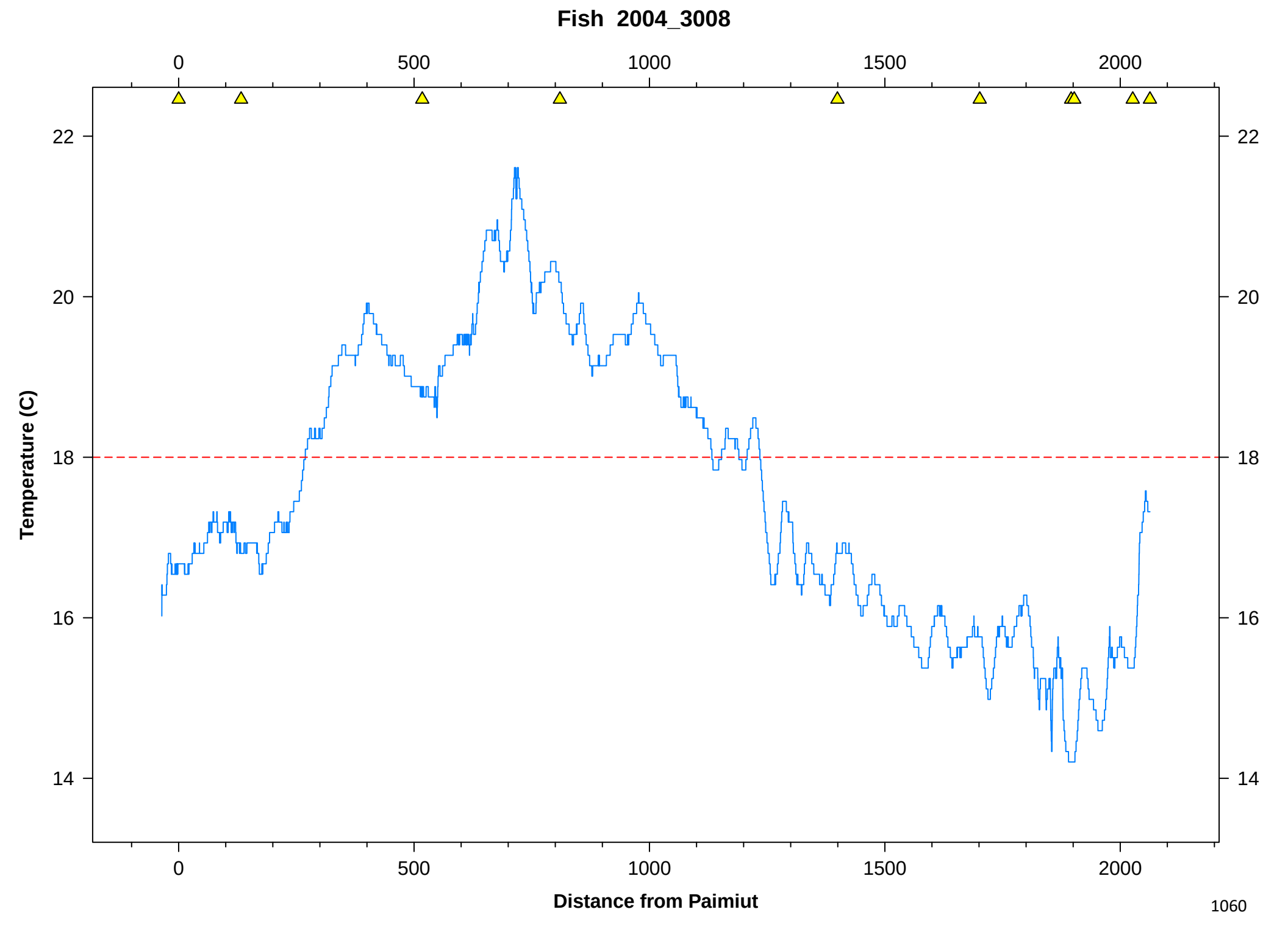

Fish 2003_3132
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Depth (m)
Temperature (C)
10
12
14
16
18
0
10
20
1055

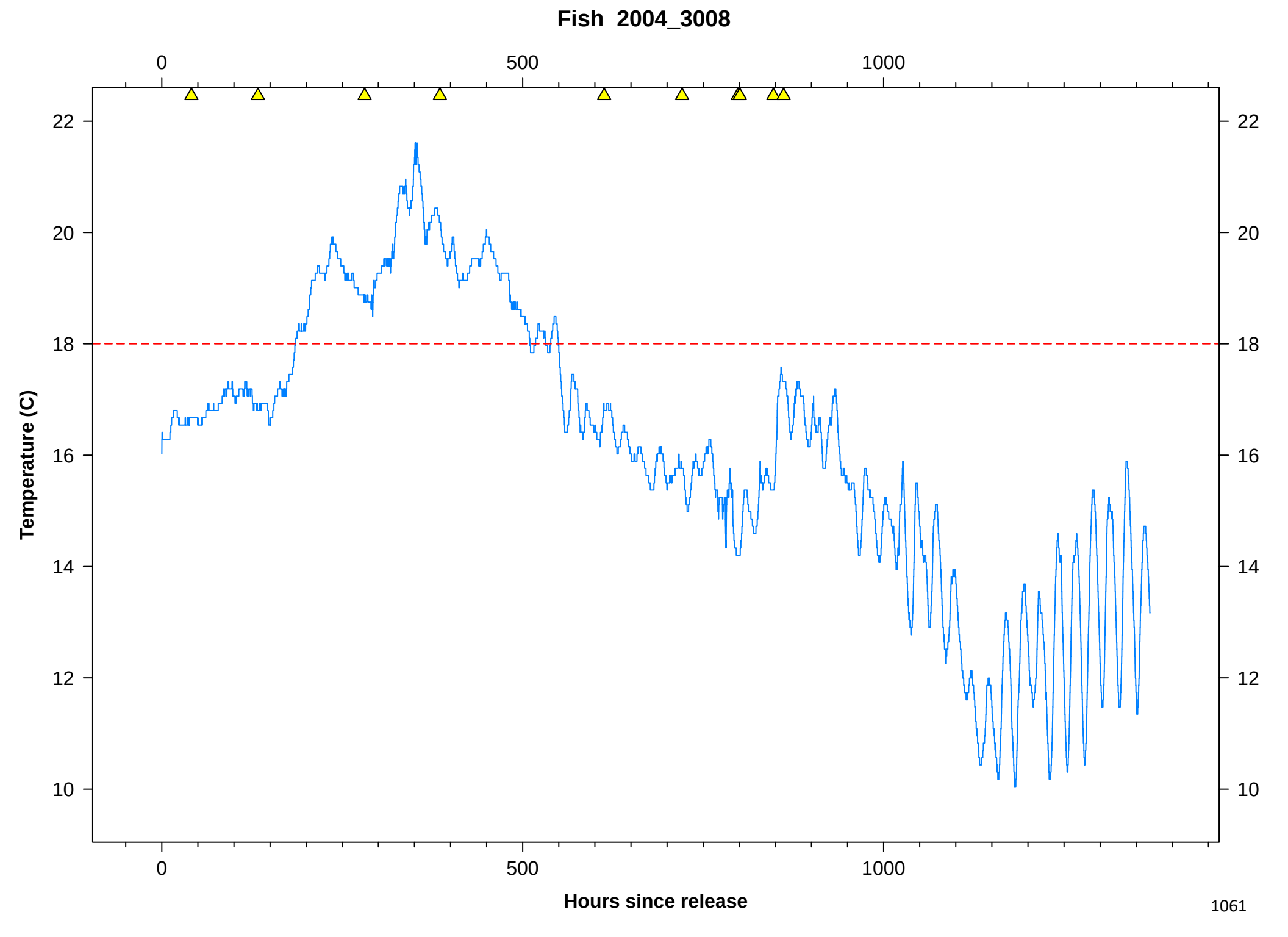

Fish 2004_3008
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

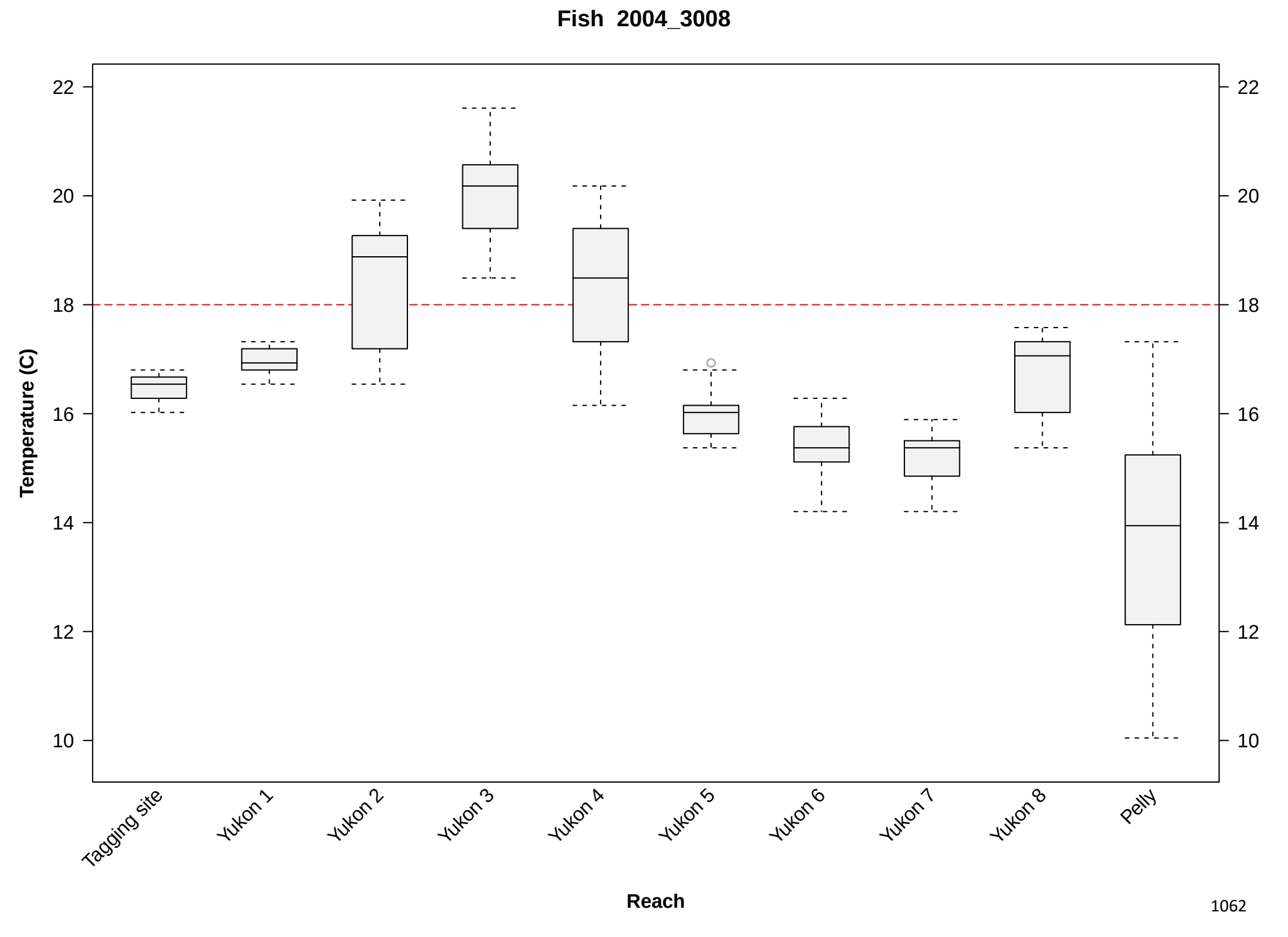

Fish 2004_3008
0
500
1000
0
5
10
15
20
25
Depth (m)
Hours since release
1057

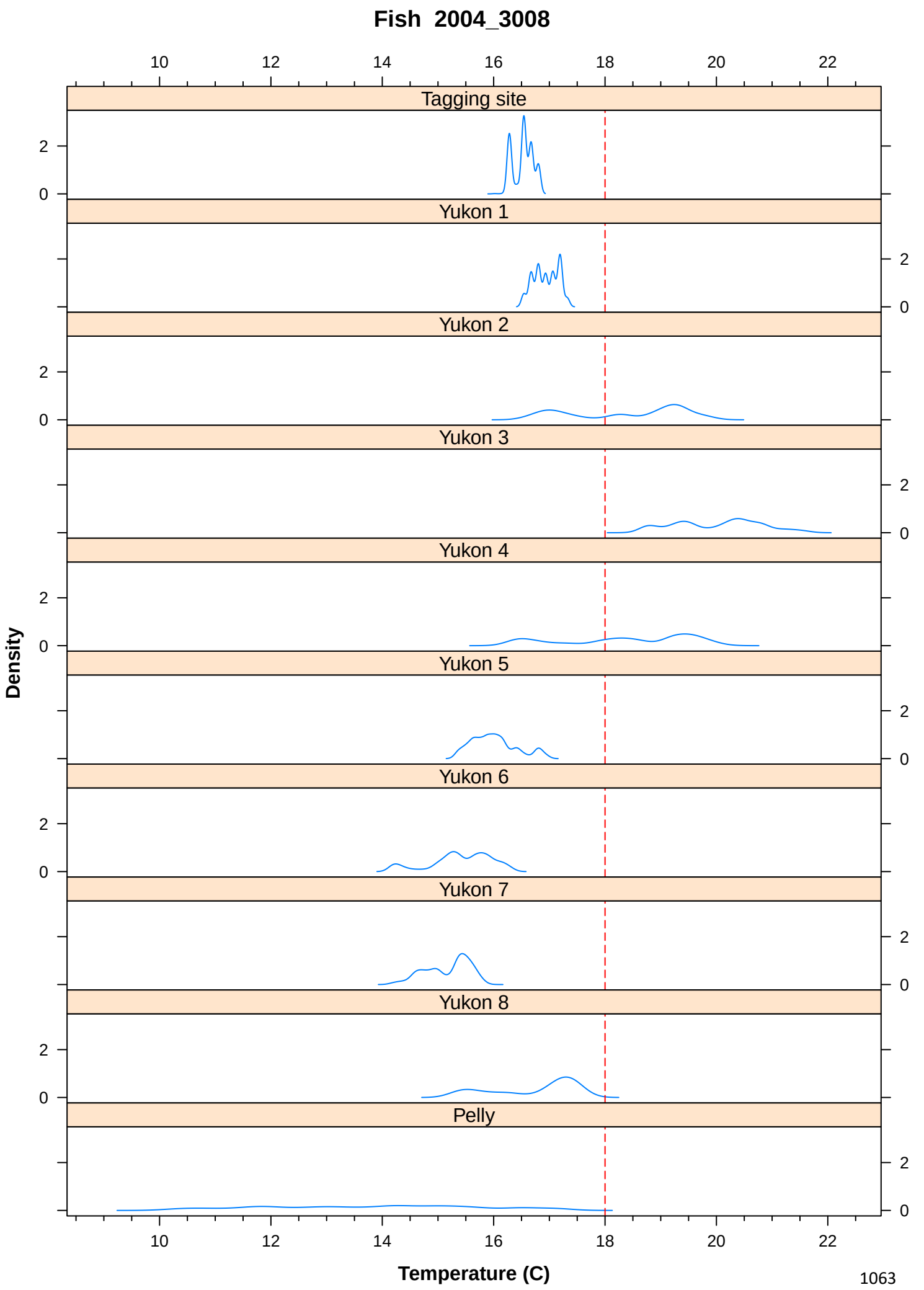

Fish 2004_3008
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach

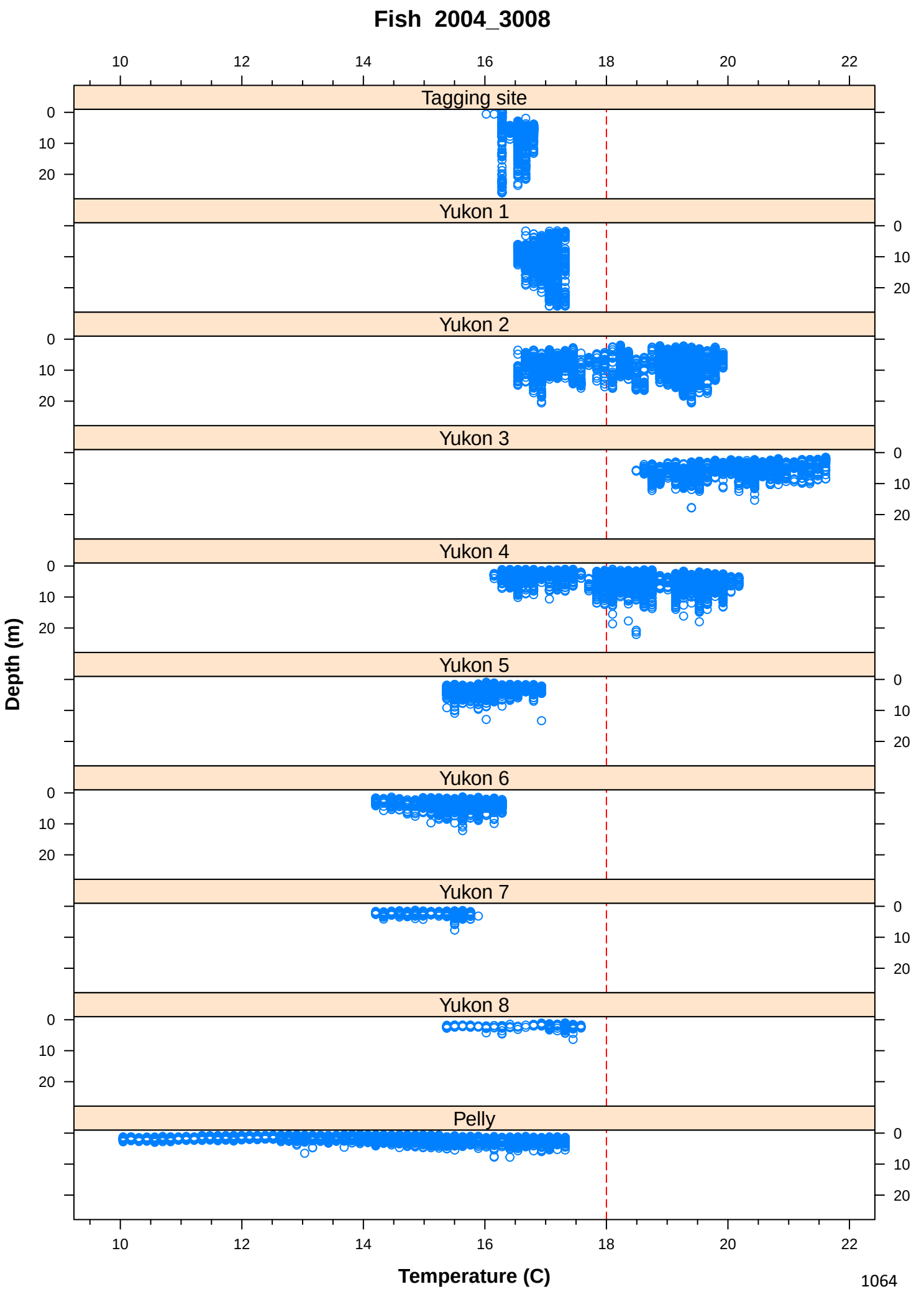

Fish 2004_3008
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
1.0
0.5
0.0
0
5
10
15
20
25
30
Depth (m)
1059

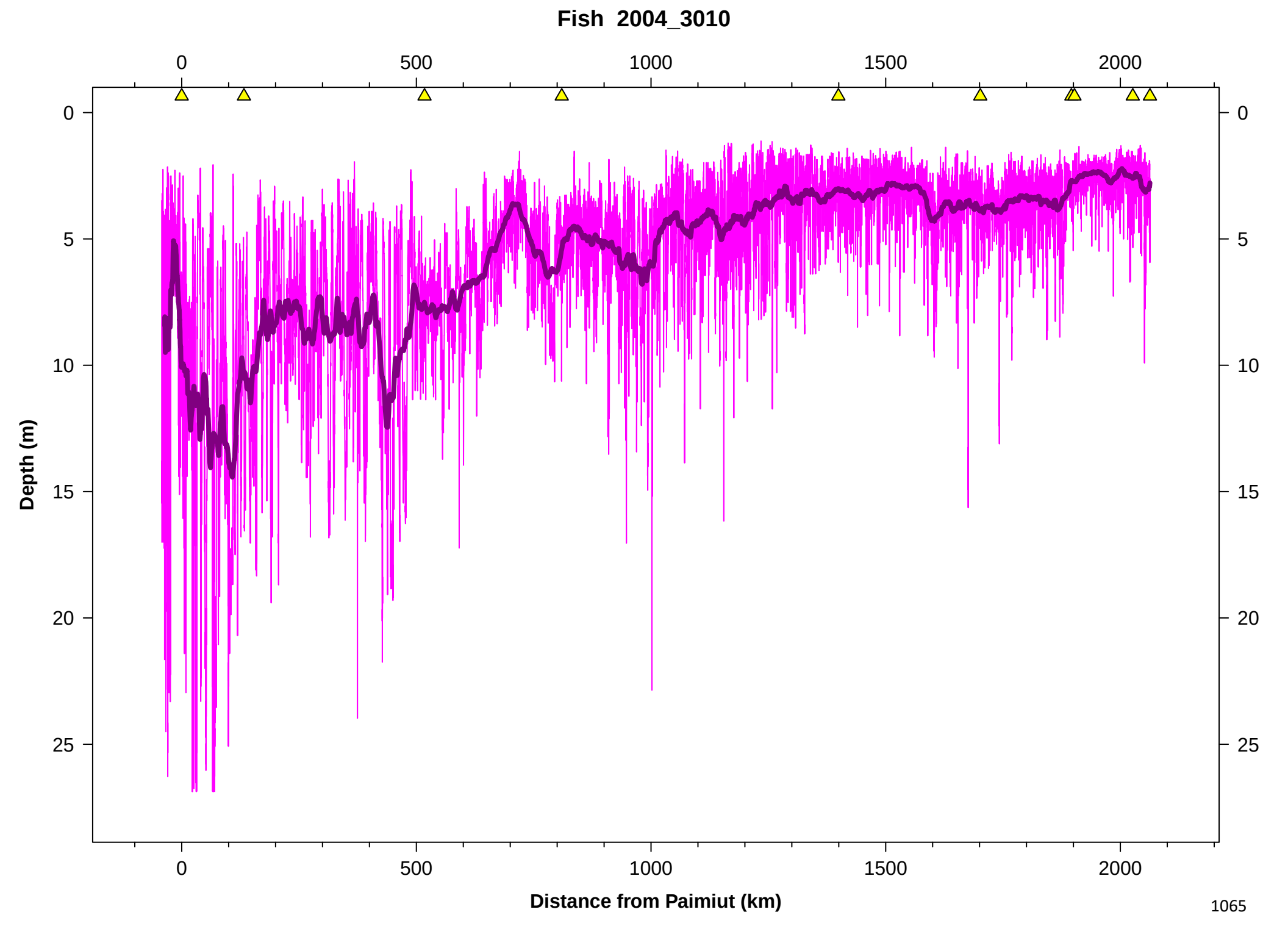

Fish 2004_3008
0
500
1000
1500
2000
22
20
18
16
14
Temperature (C)
Distance from Paimiut
1060

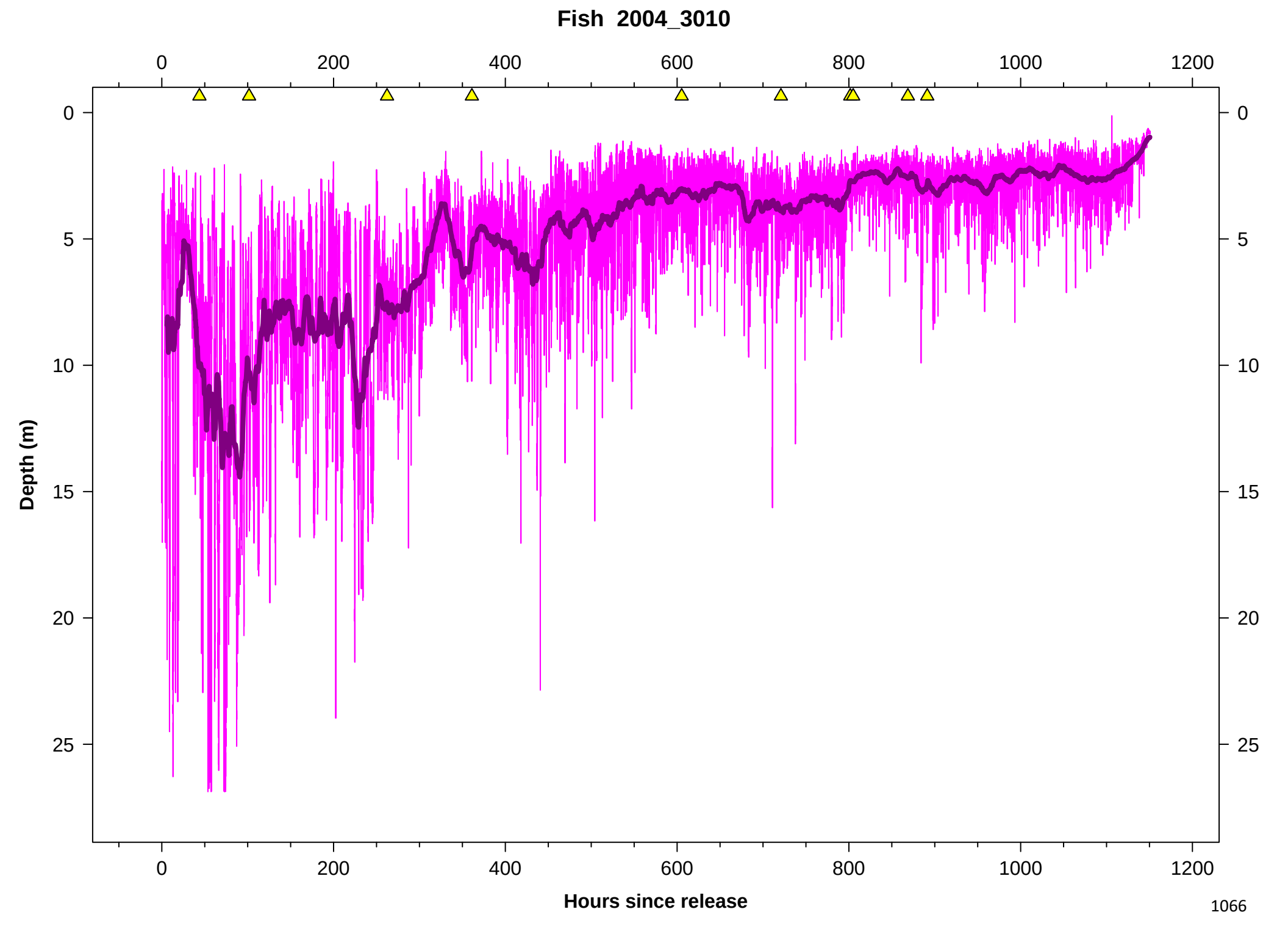

Fish 2004_3008
0
500
1000
22
20
18
16
14
12
10
Temperature (C)
Hours since release
1061

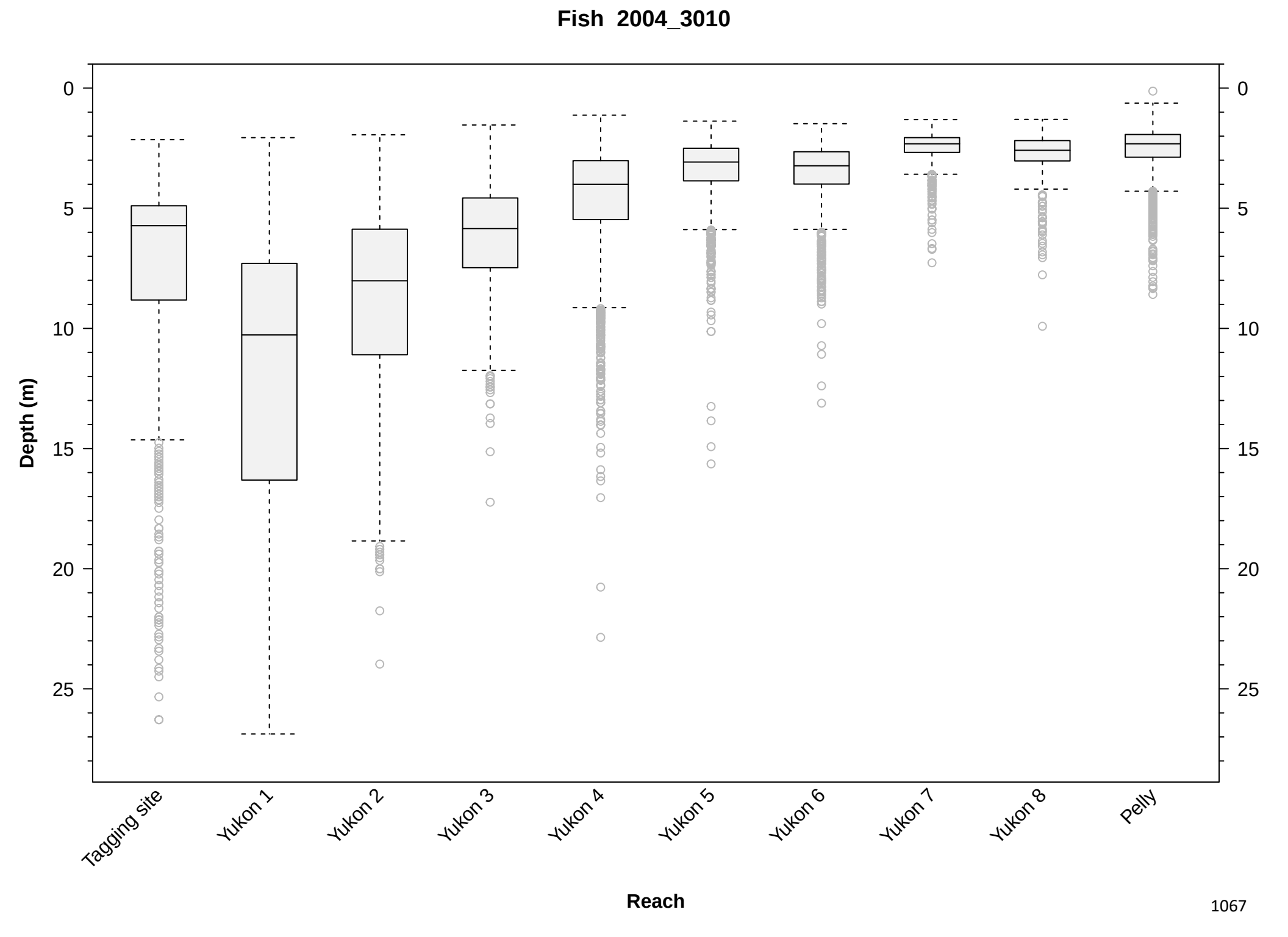

Fish 2004_3008
Temperature (C)
22
20
18
16
14
12
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach
1062

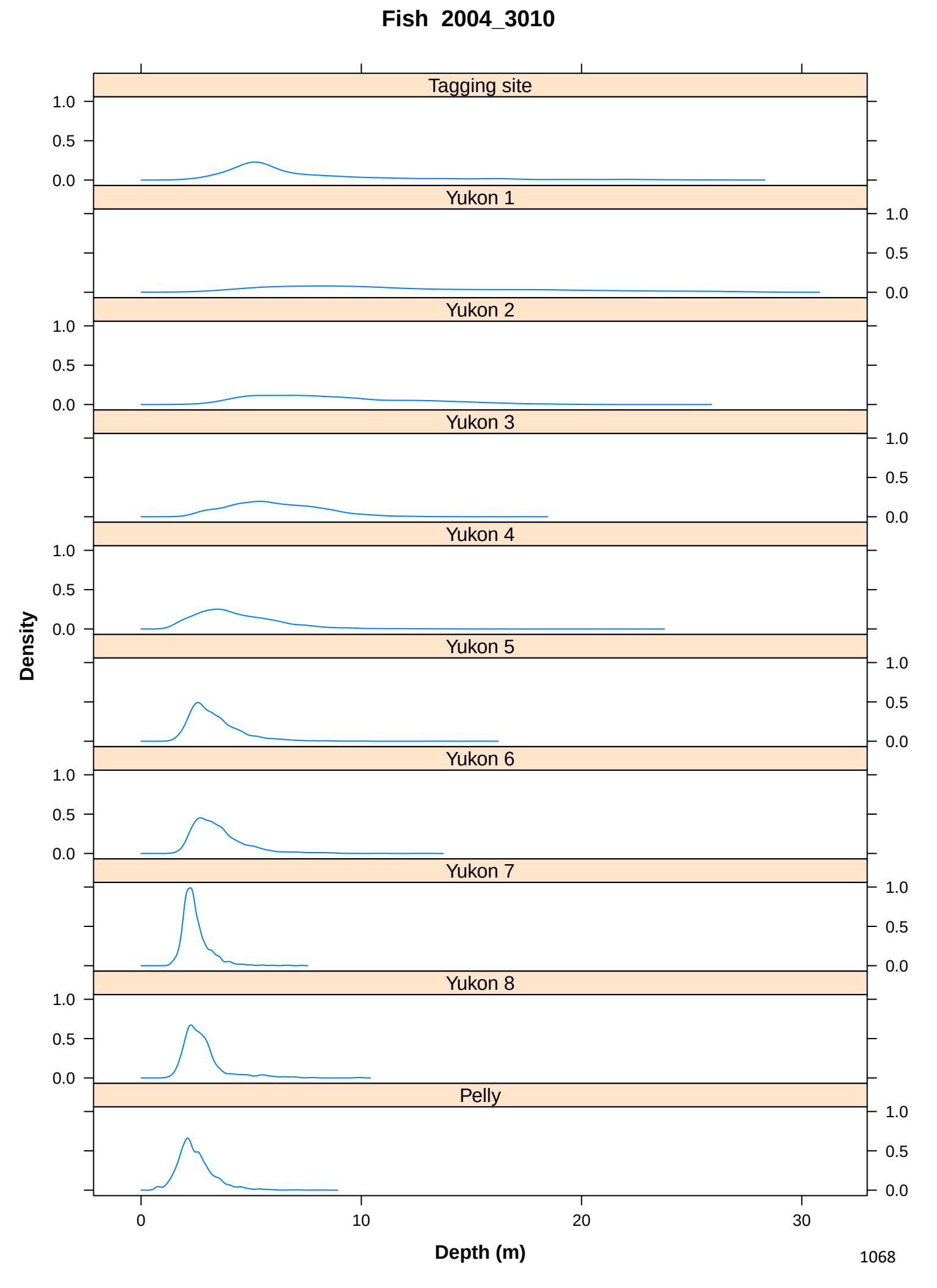

Fish 2004_3008
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
Temperature (C)
10
12
14
16
18
20
22
0
2

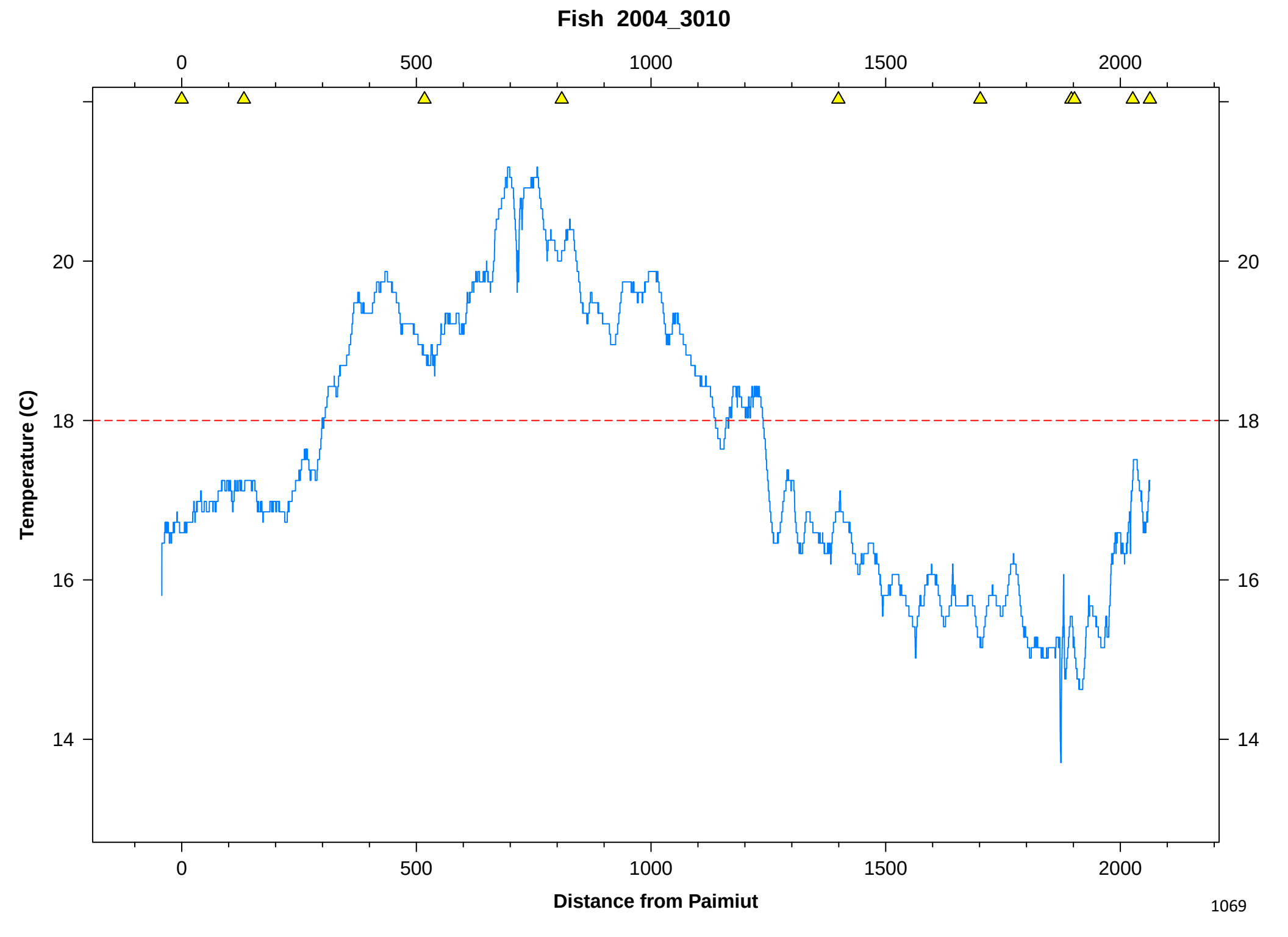

Fish 2004_3008
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Depth (m)
Temperature (C)
10
12
14
16
18
20
22
0
10
20

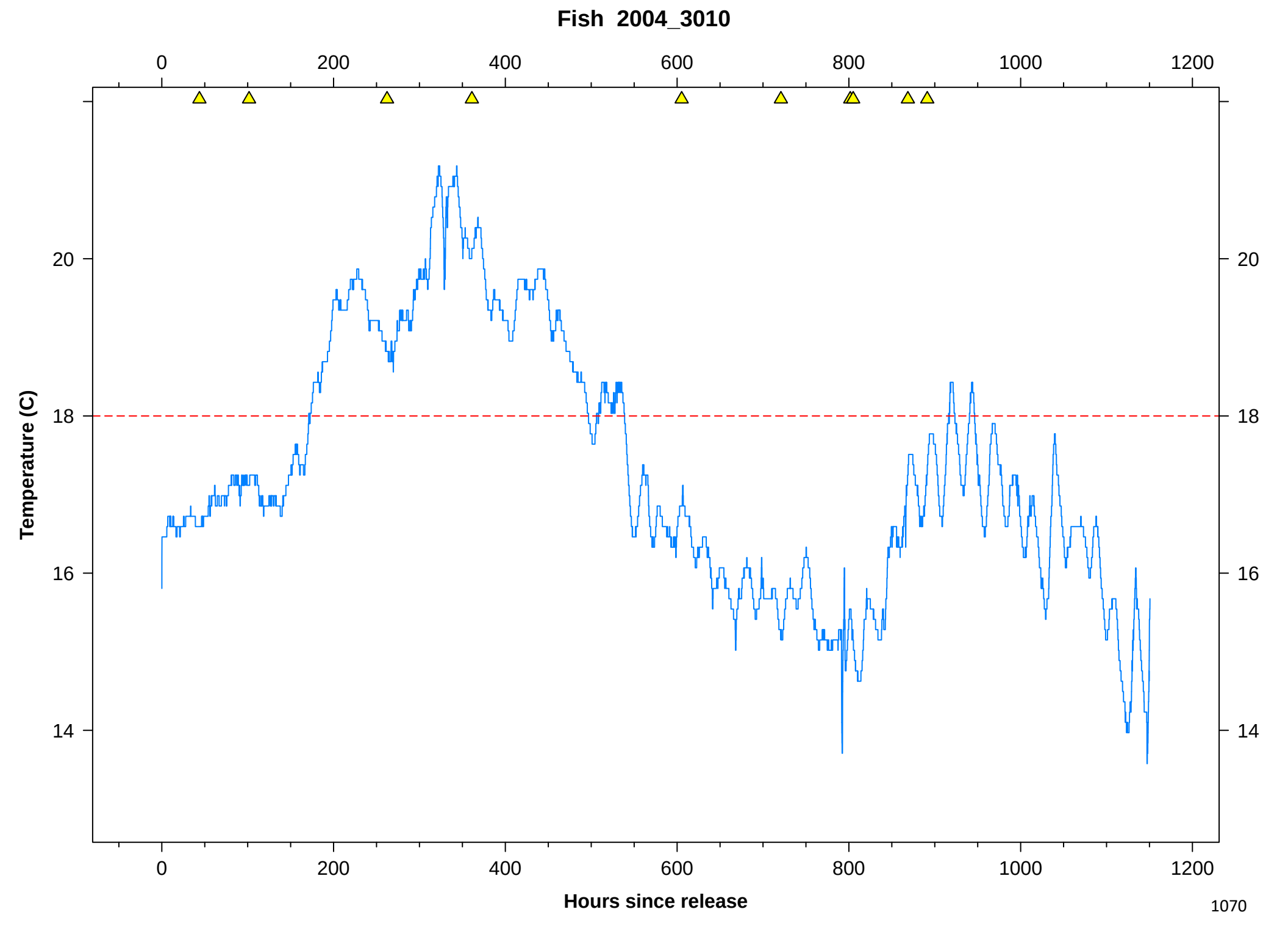

Fish 2004_3010
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

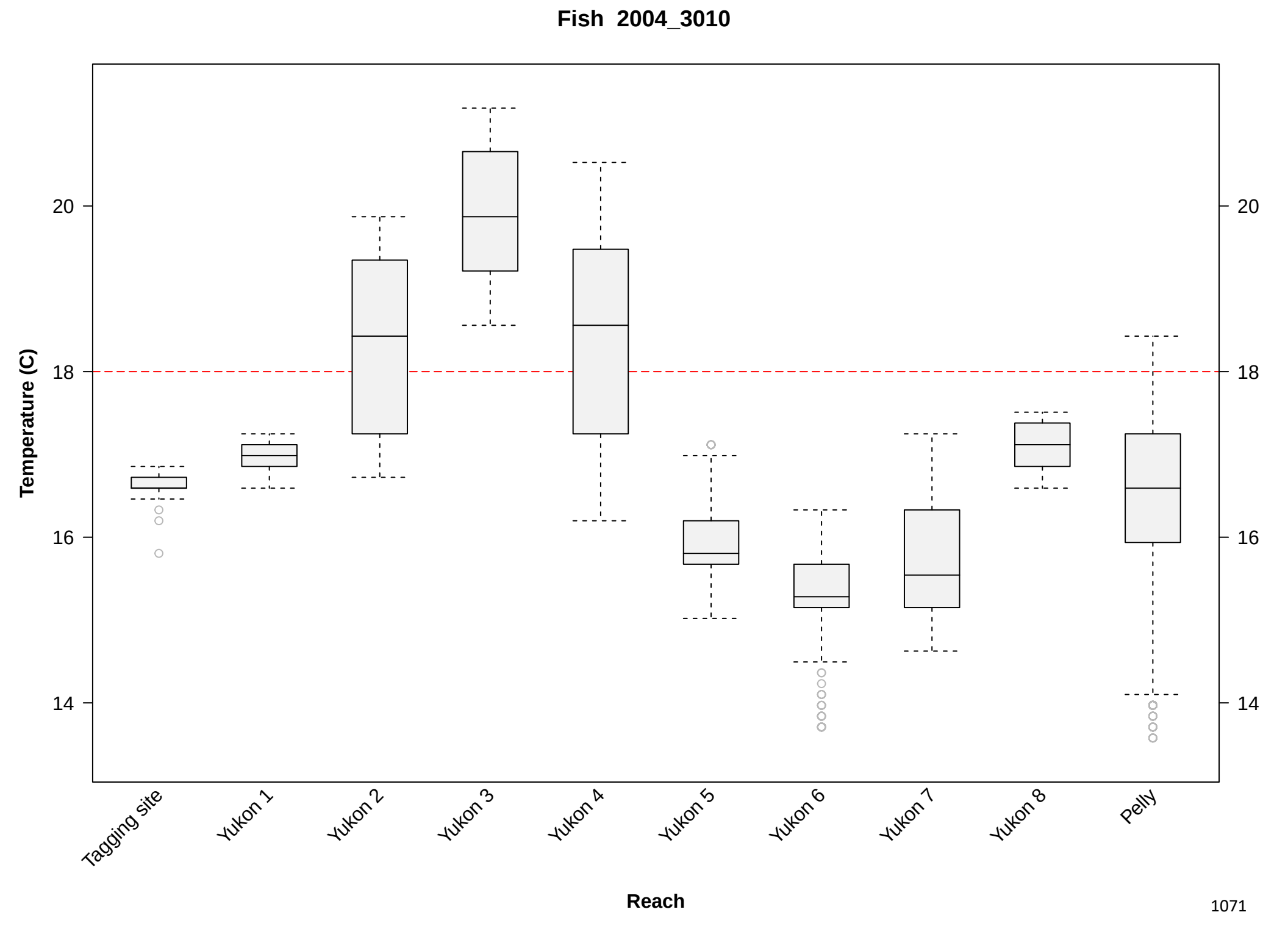

Fish 2004_3010
0
200
400
600
800
1000
1200
0
5
10
15
20
25
Depth (m)
Hours since release
1066

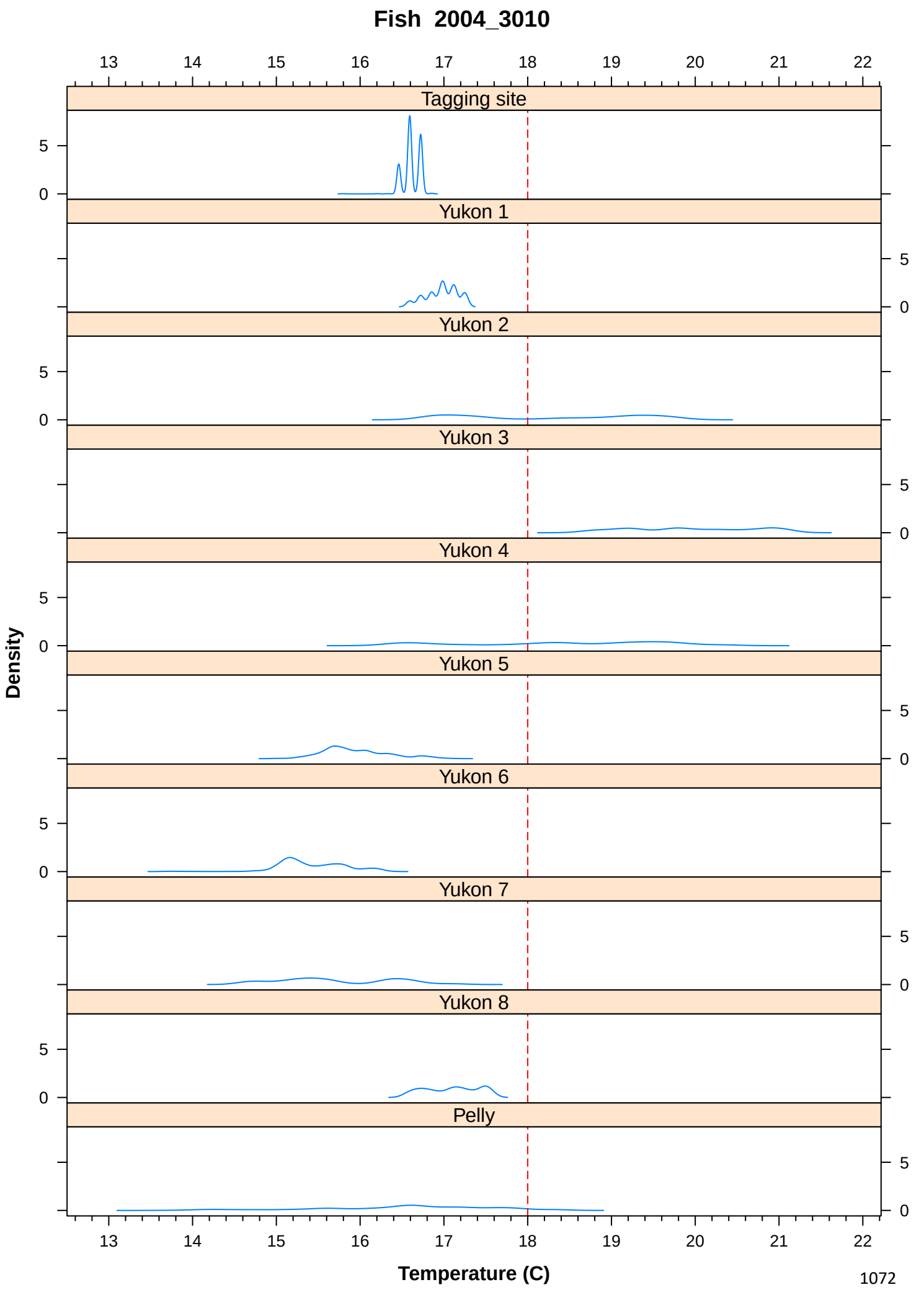

Fish 2004_3010
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach
1067

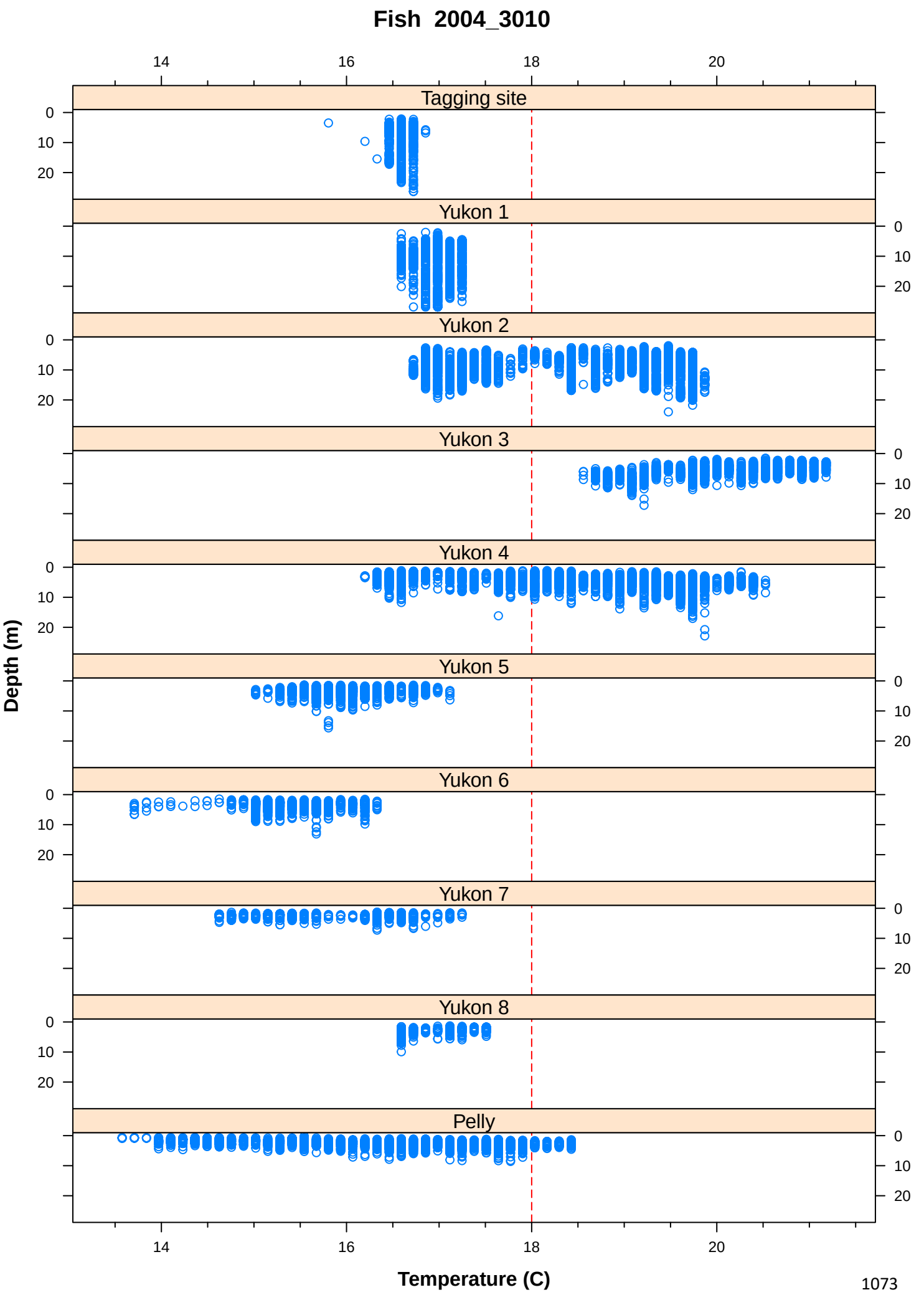

Fish 2004_3010
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
1.0
0.5
0.0
0
10
20
30
Depth (m)
1068

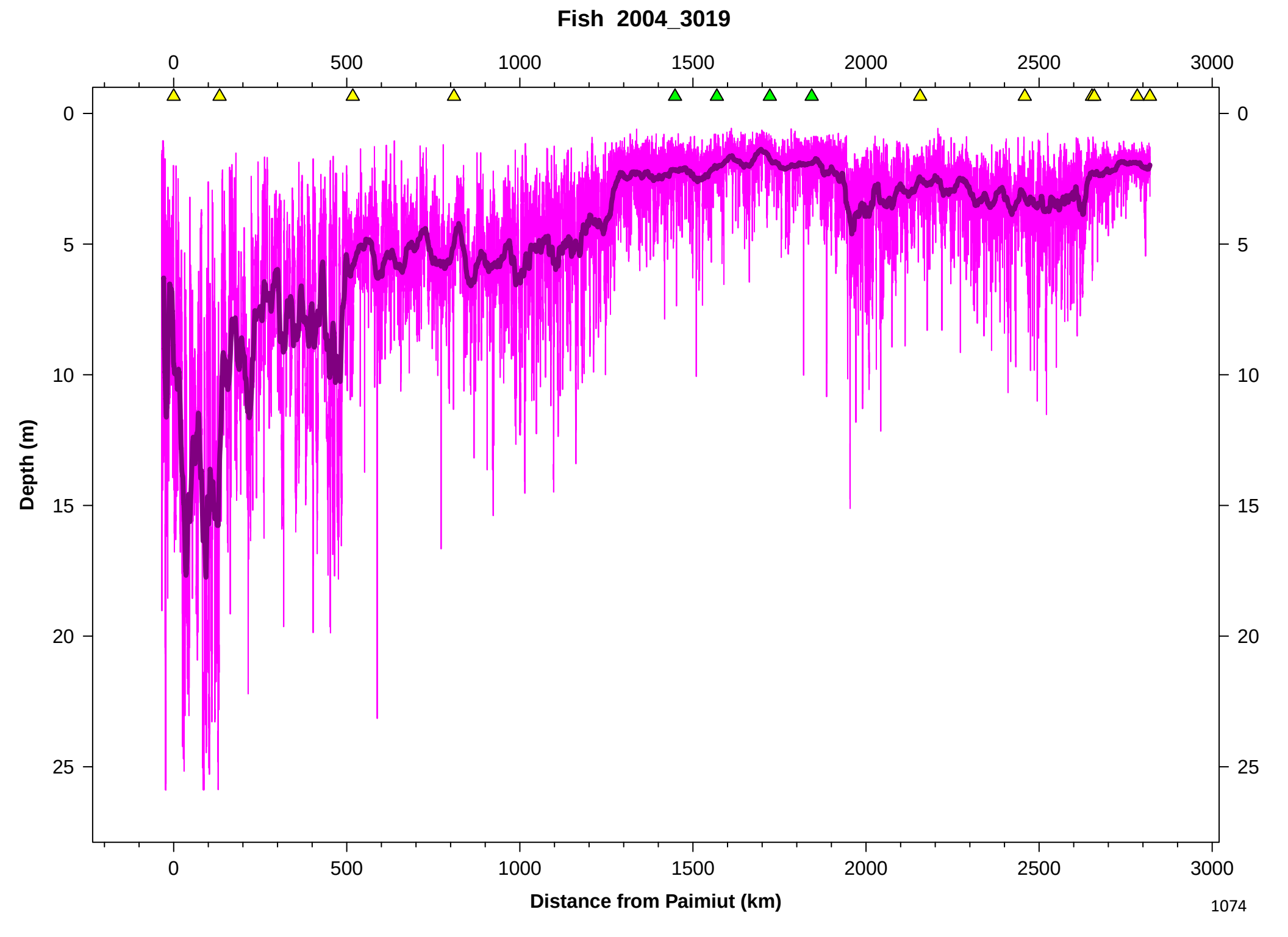

Fish 2004_3010
0
500
1000
1500
2000
20
18
16
14
Temperature (C)
Distance from Paimiut
1069

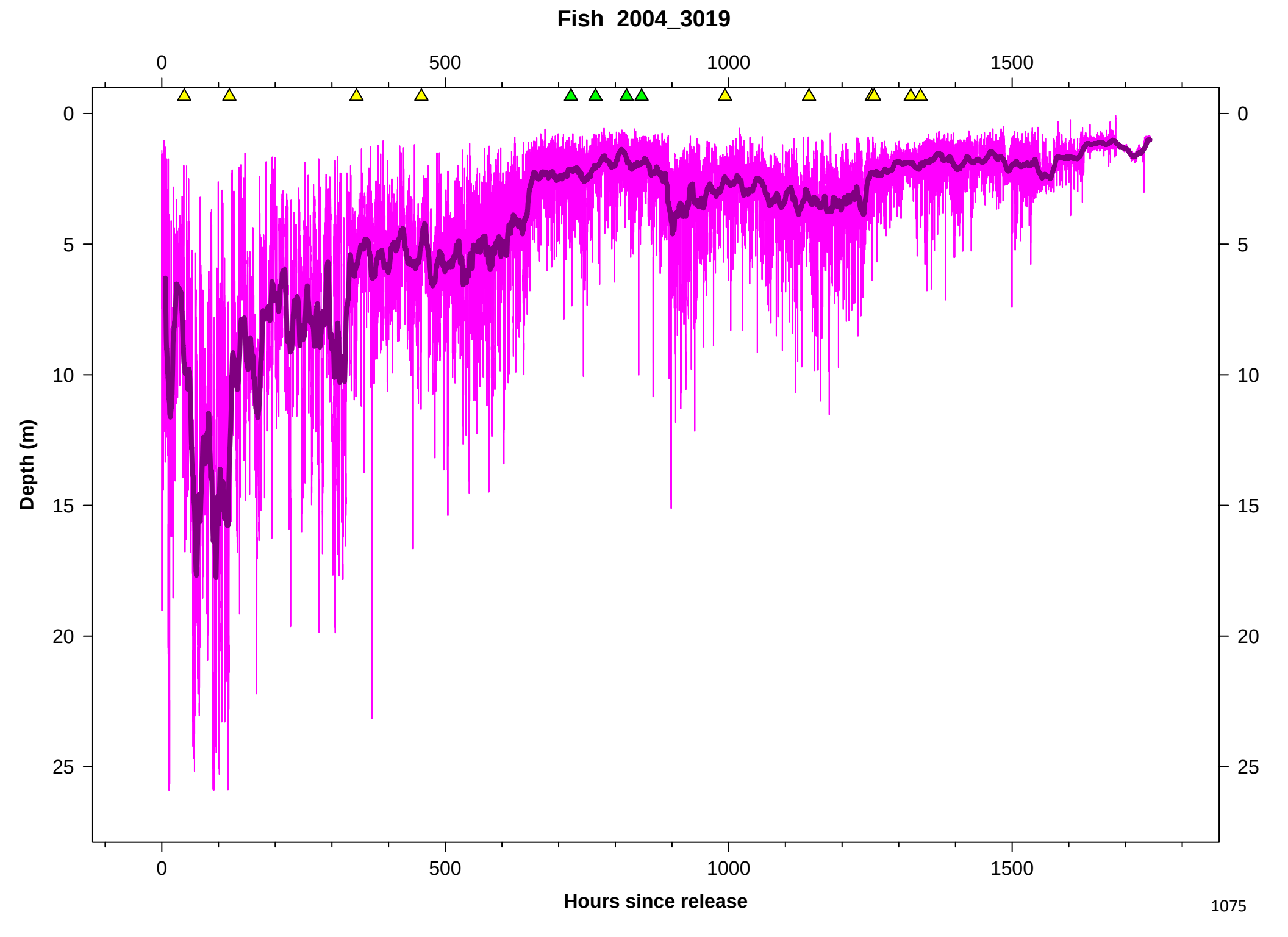

Fish 2004_3010
0
200
400
600
800
1000
1200
20
18
16
14
Temperature (C)
Hours since release
1070

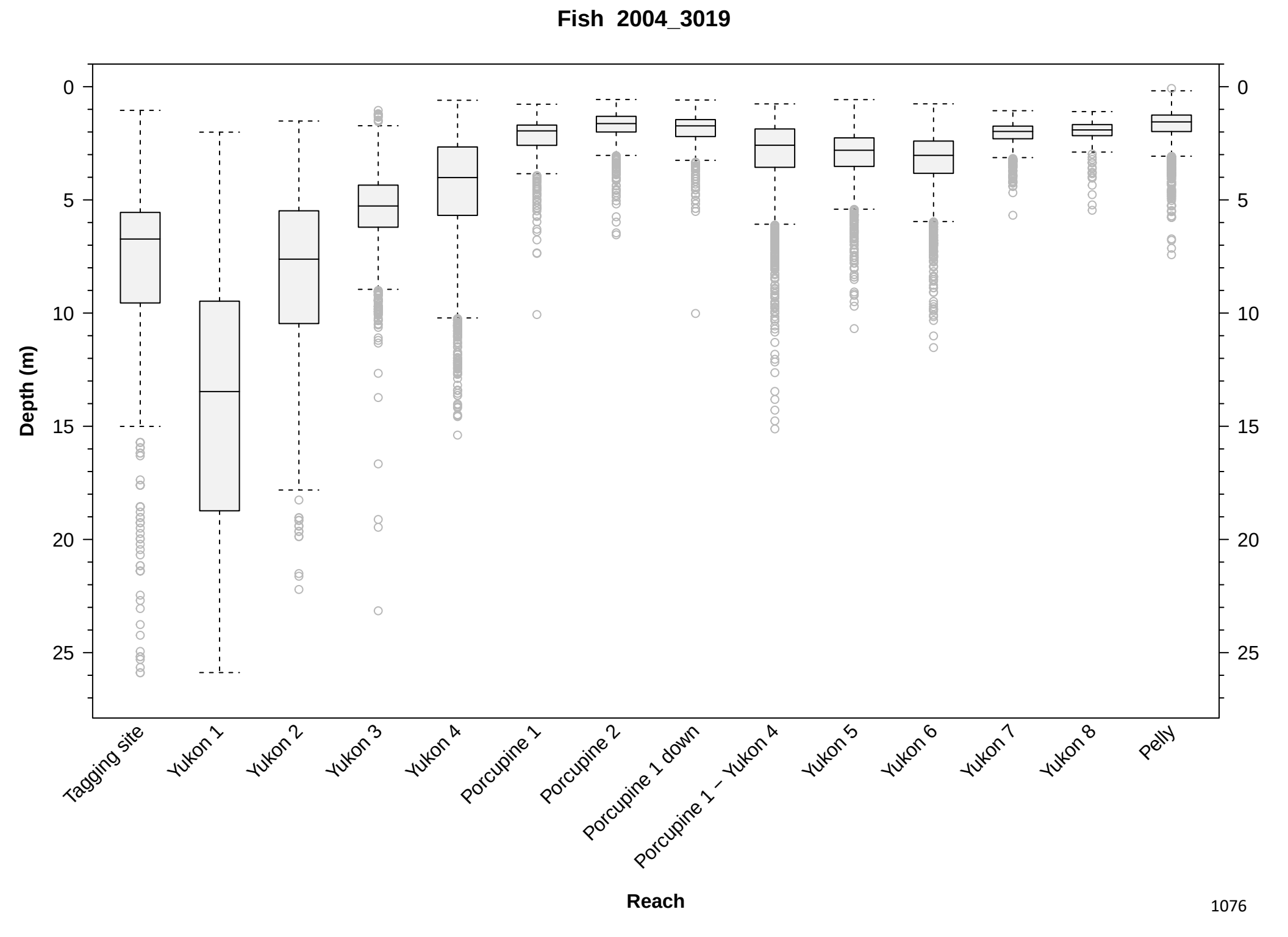

Fish 2004_3010
Temperature (C)
20
18
16
14
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach
1071

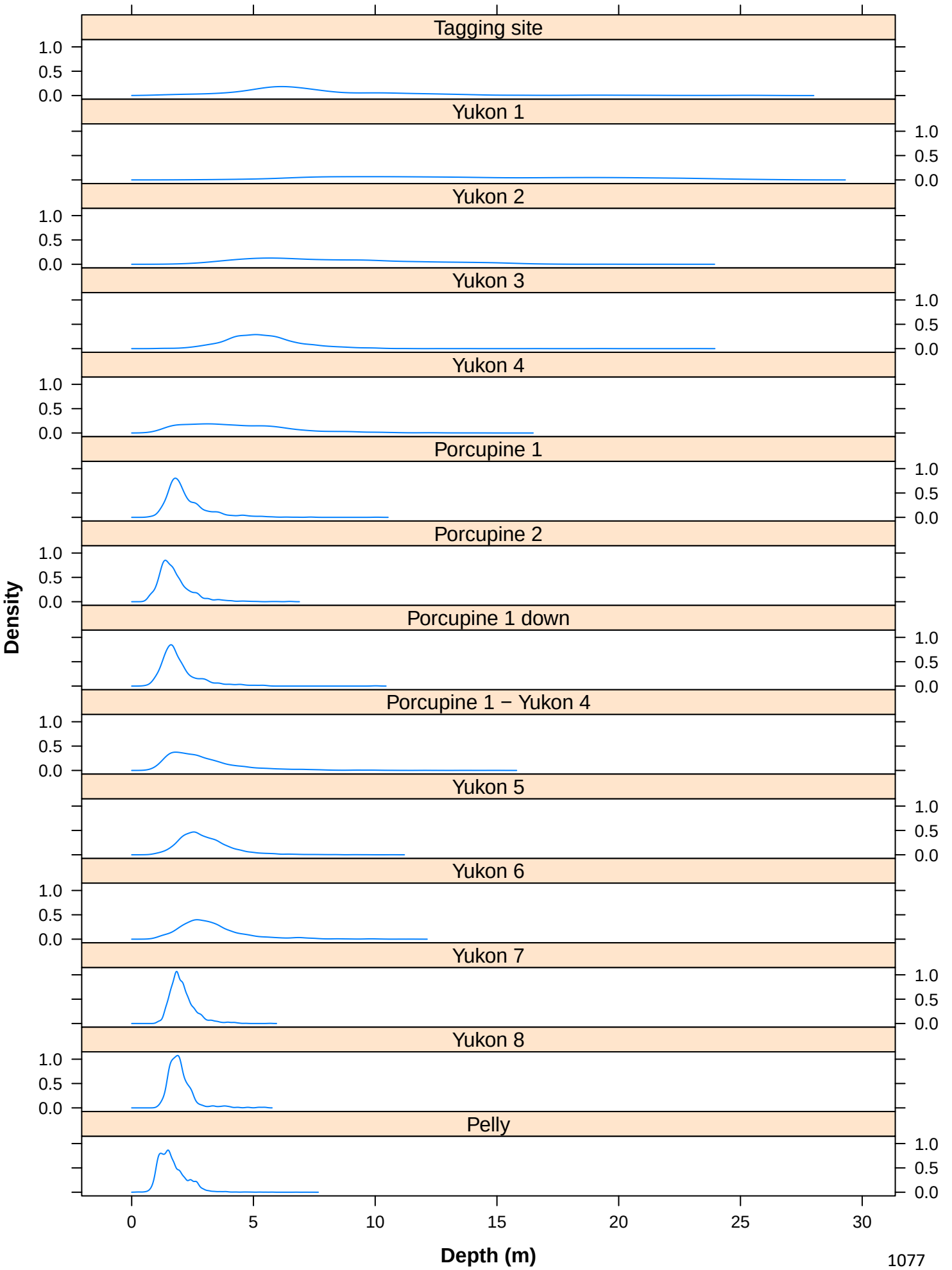

Fish 2004_3010
13
14
15
16
17
18
19
20
21
22
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
5
0
Density
Temperature (C)
1072

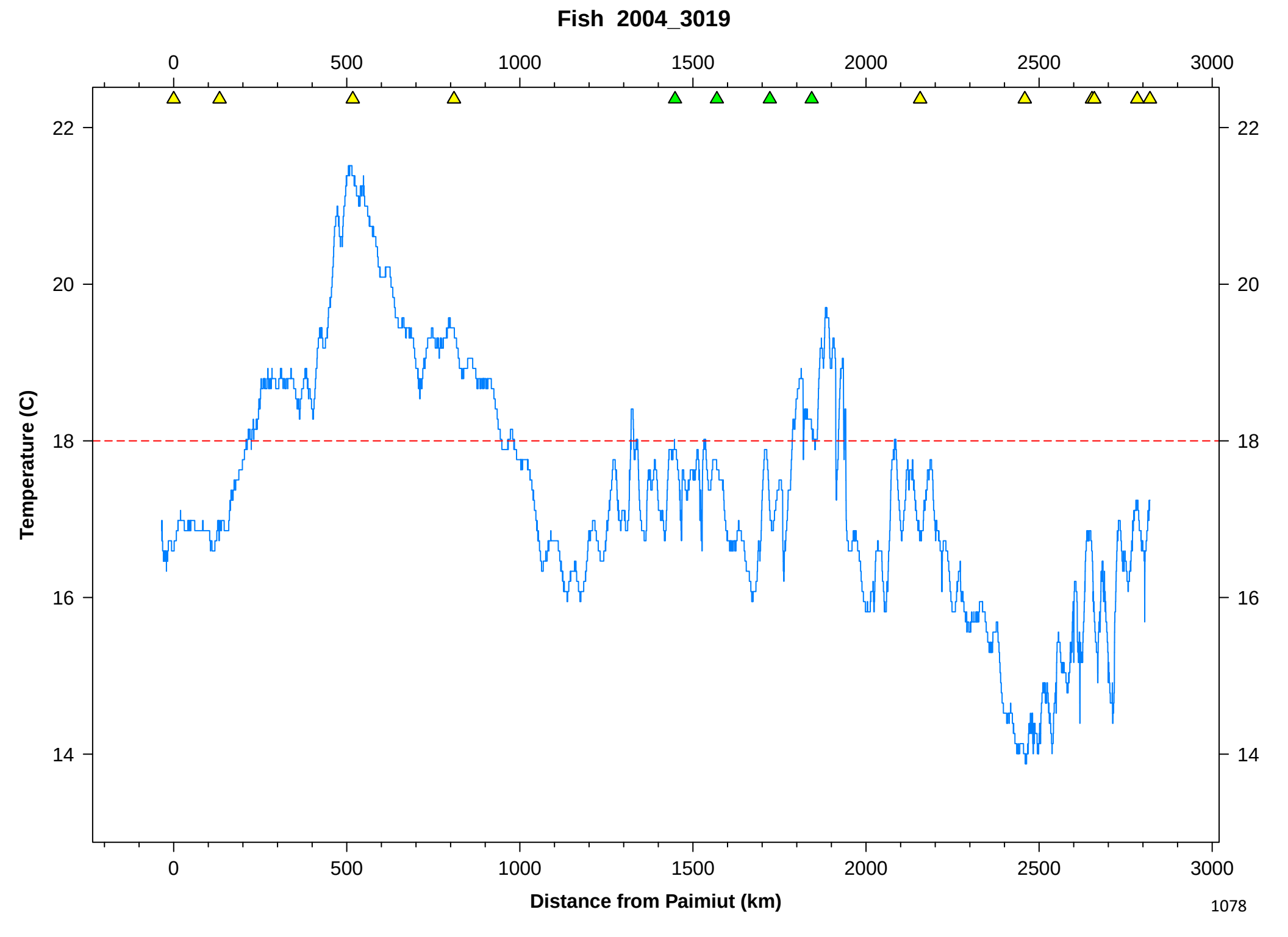

Fish 2004_3010
14
16
18
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
0
10
20
Depth (m)
Temperature (C)
1073

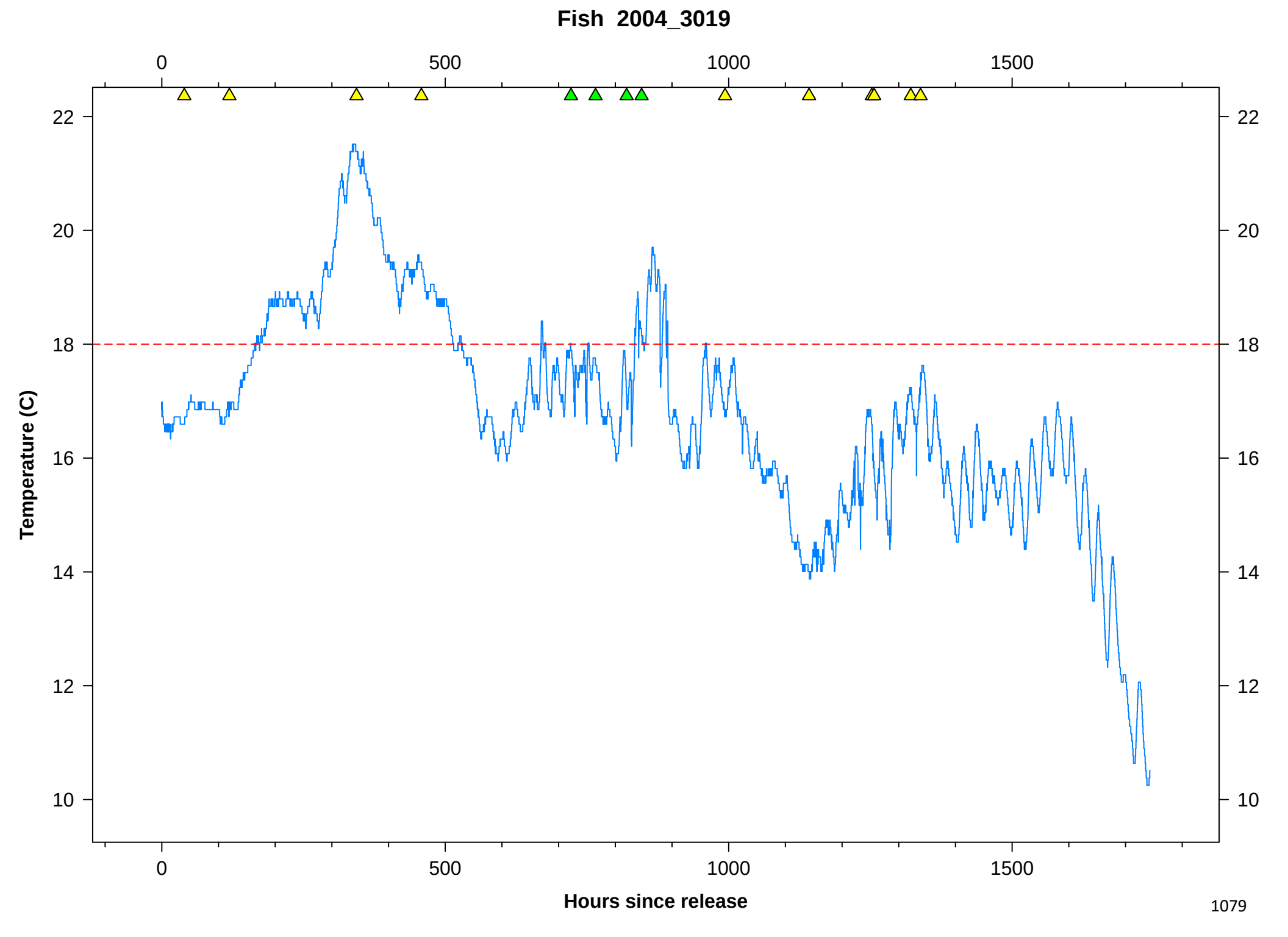

Fish 2004_3019
0
500
1000
1500
2000
2500
3000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
1074

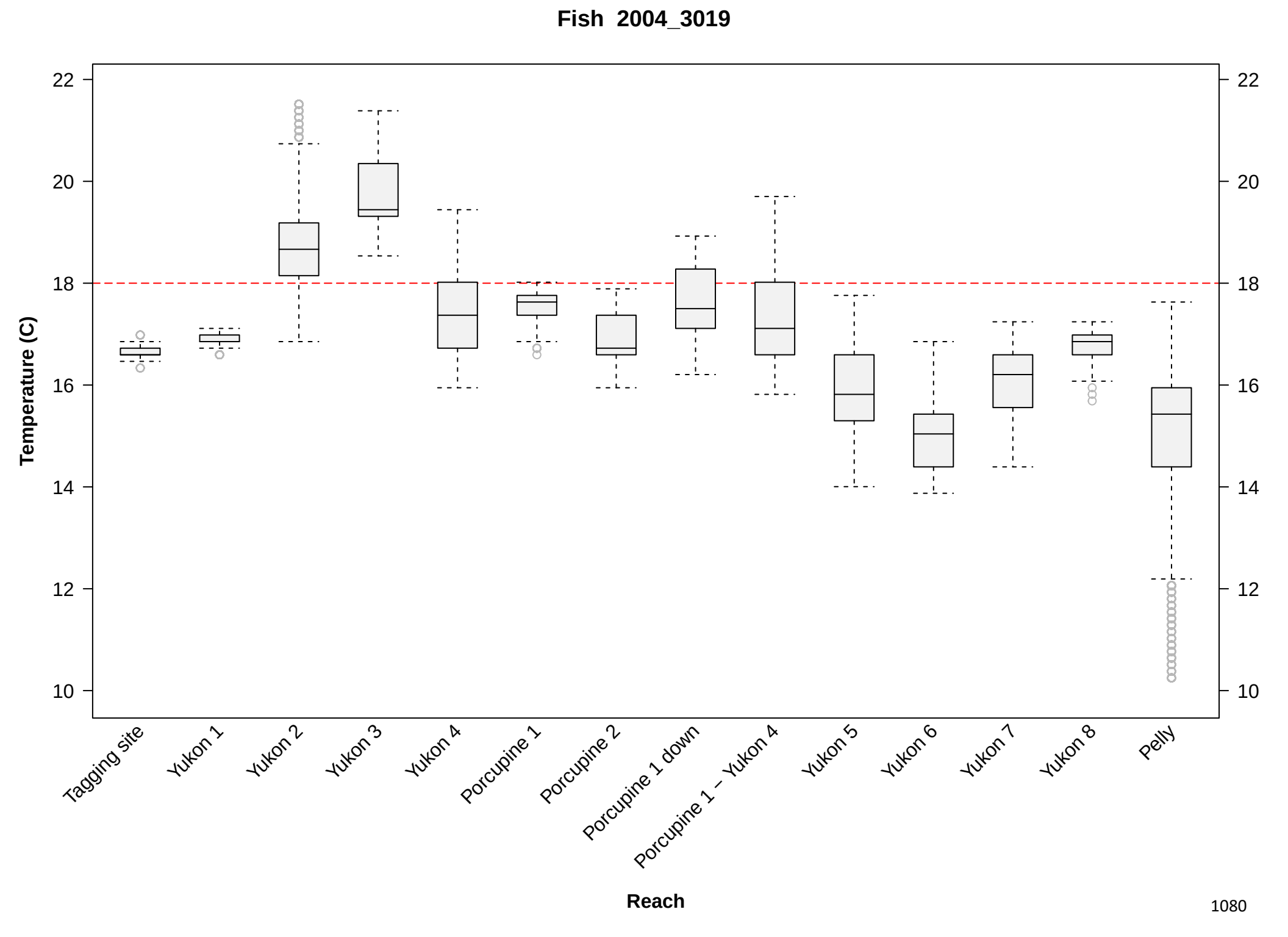

Fish 2004_3019
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Hours since release
1075

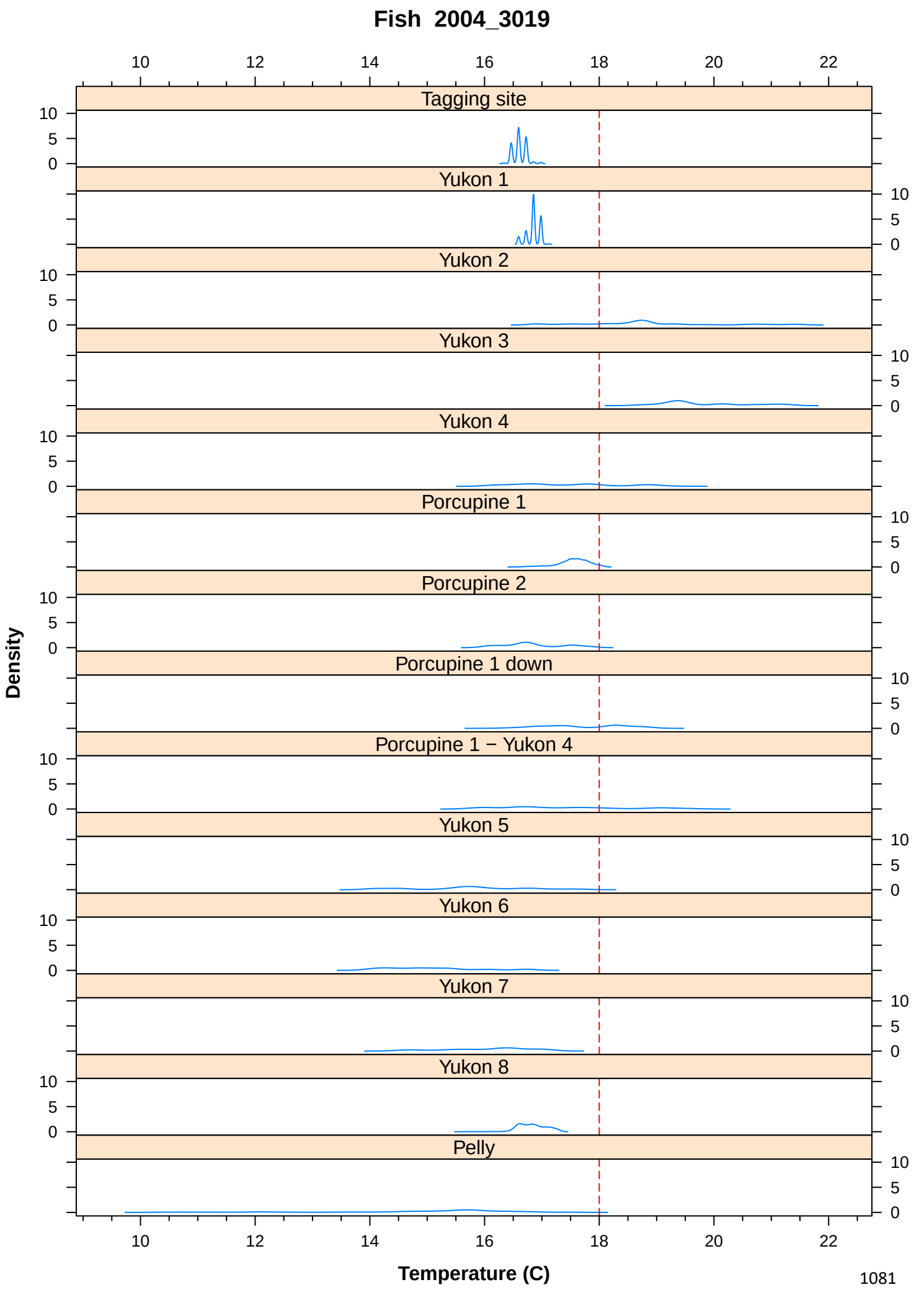

Fish 2004_3019
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Porcupine 2
Porcupine 1 down
Porcupine 1 – Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach

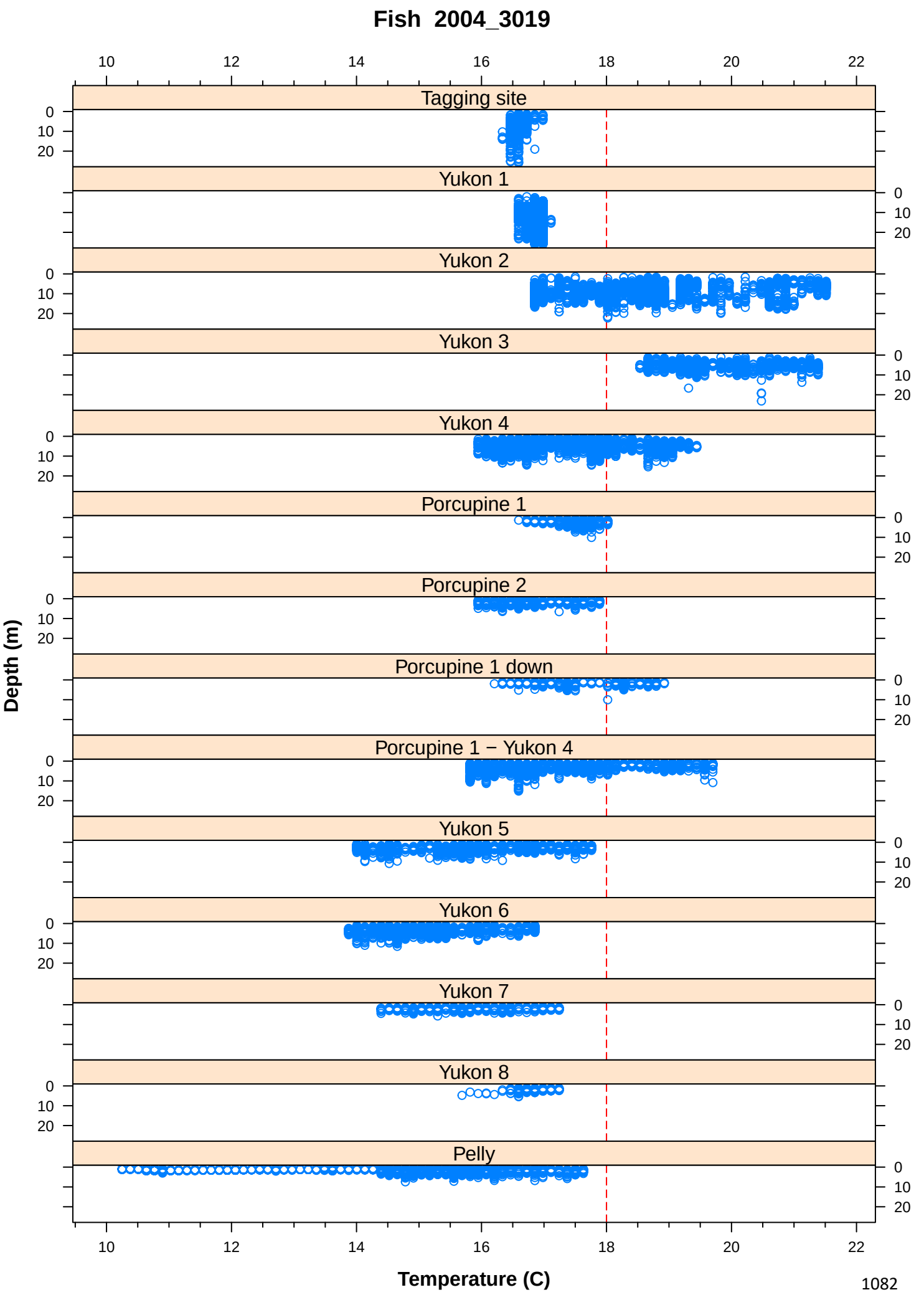

Fish 2004_3019
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Porcupine 2
Porcupine 1 down
Porcupine 1 − Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
1.0
0.5
0.0
0
5
10
15
20
25
30
Depth (m)
1077

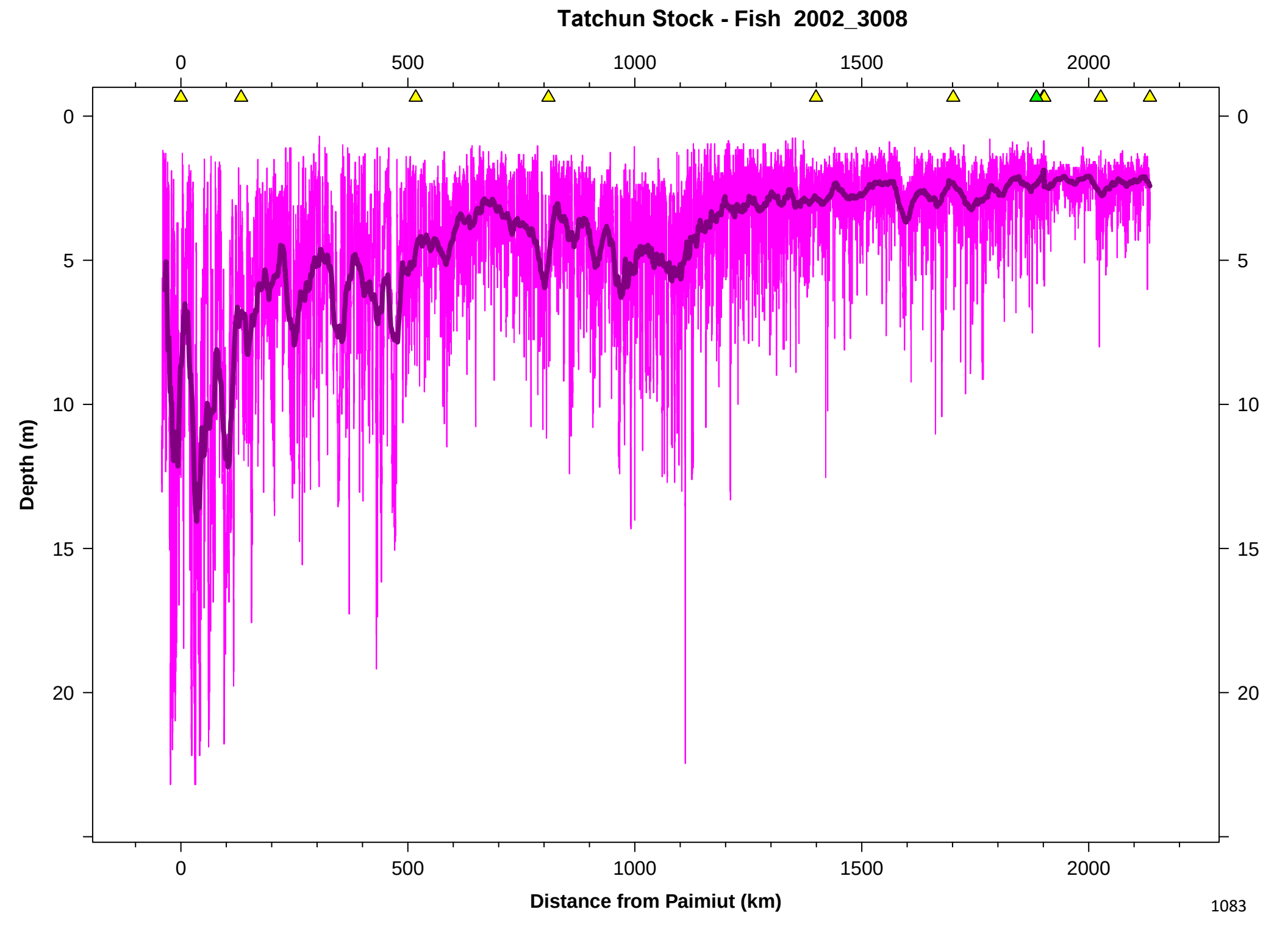

Fish 2004_3019
0
500
1000
1500
2000
2500
3000
22
20
18
16
14
Temperature (C)
Distance from Paimiut (km)
1078

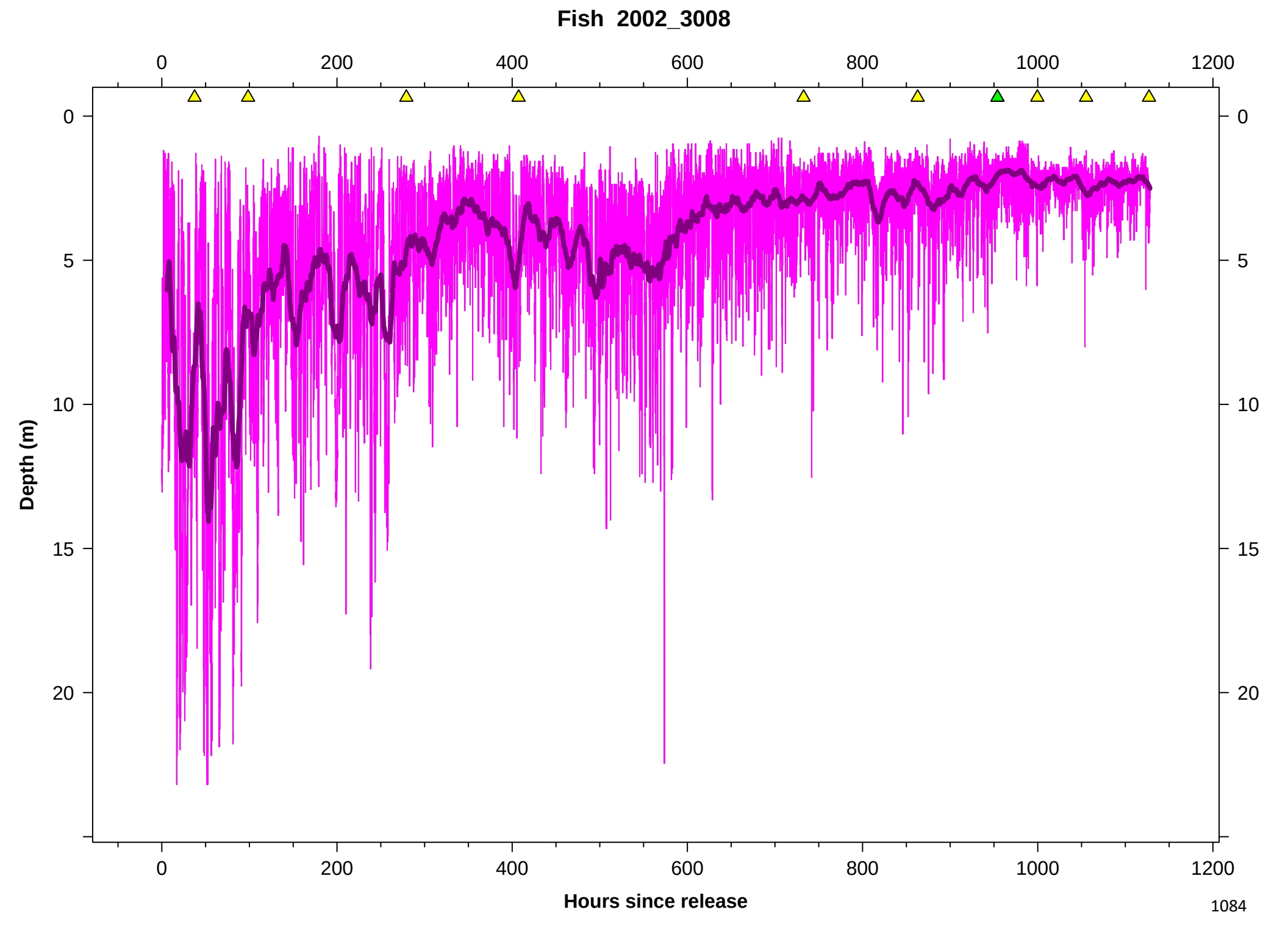

Fish 2004_3019
0
500
1000
1500
22
20
18
16
14
12
10
Temperature (C)
Hours since release
1079

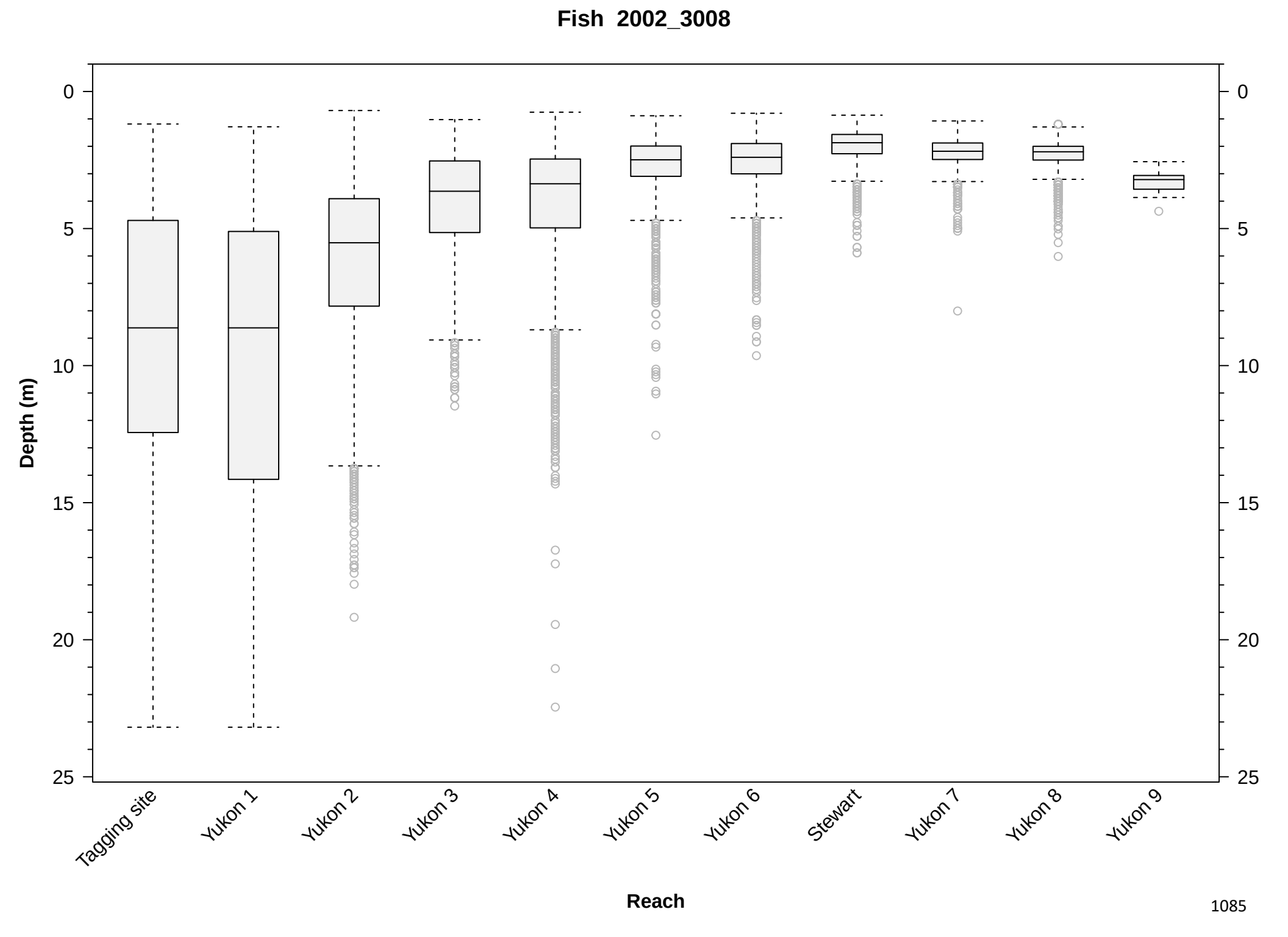

Fish 2004_3019
Temperature (C)
22
20
18
16
14
12
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Porcupine 2
Porcupine 1 down
Porcupine 1 – Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Reach
1080

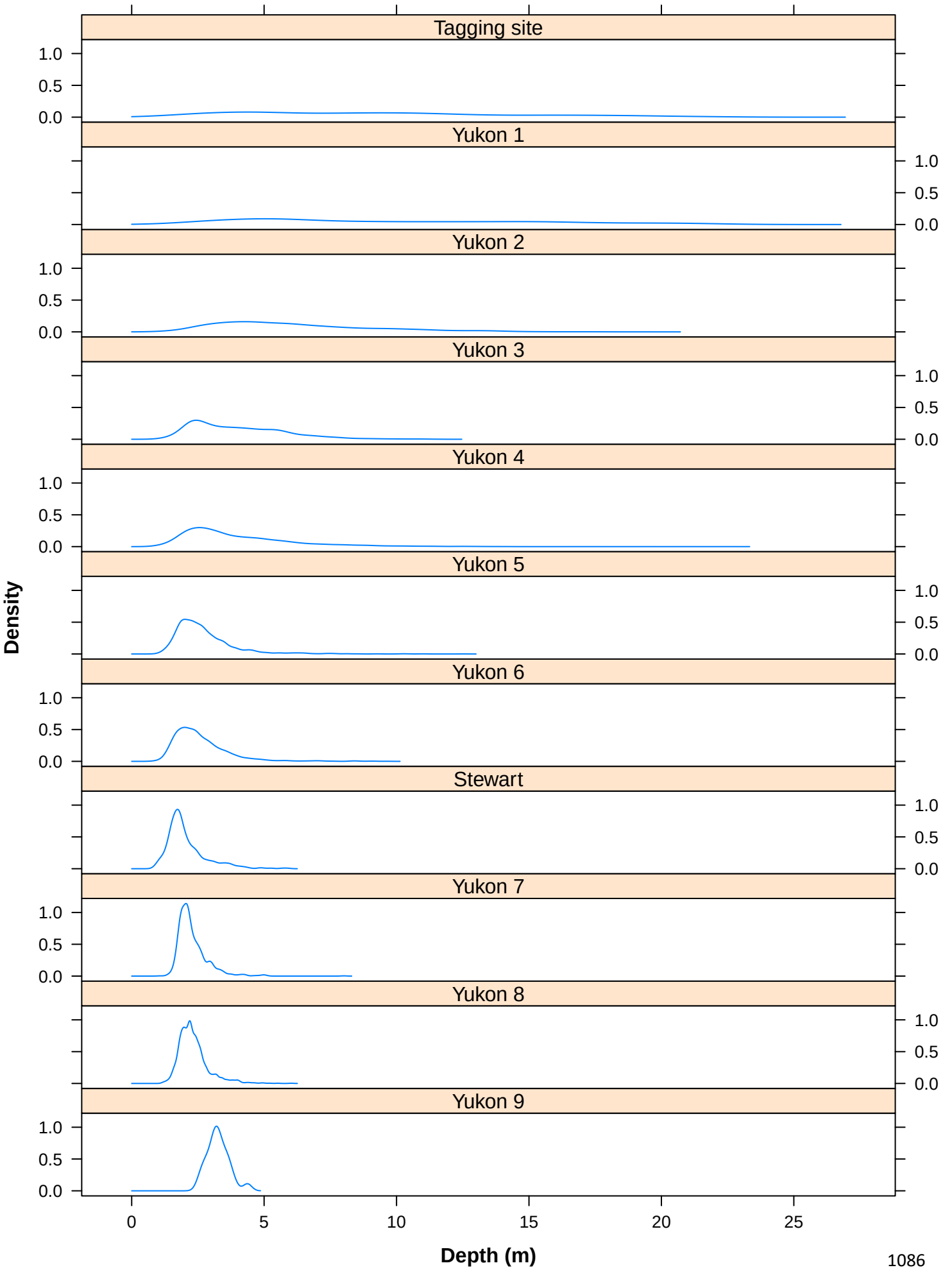

Fish 2004_3019
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Porcupine 2
Porcupine 1 down
Porcupine 1 − Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Density
Temperature (C)
10
12
14
16
18
20
22
0
5
10
1081

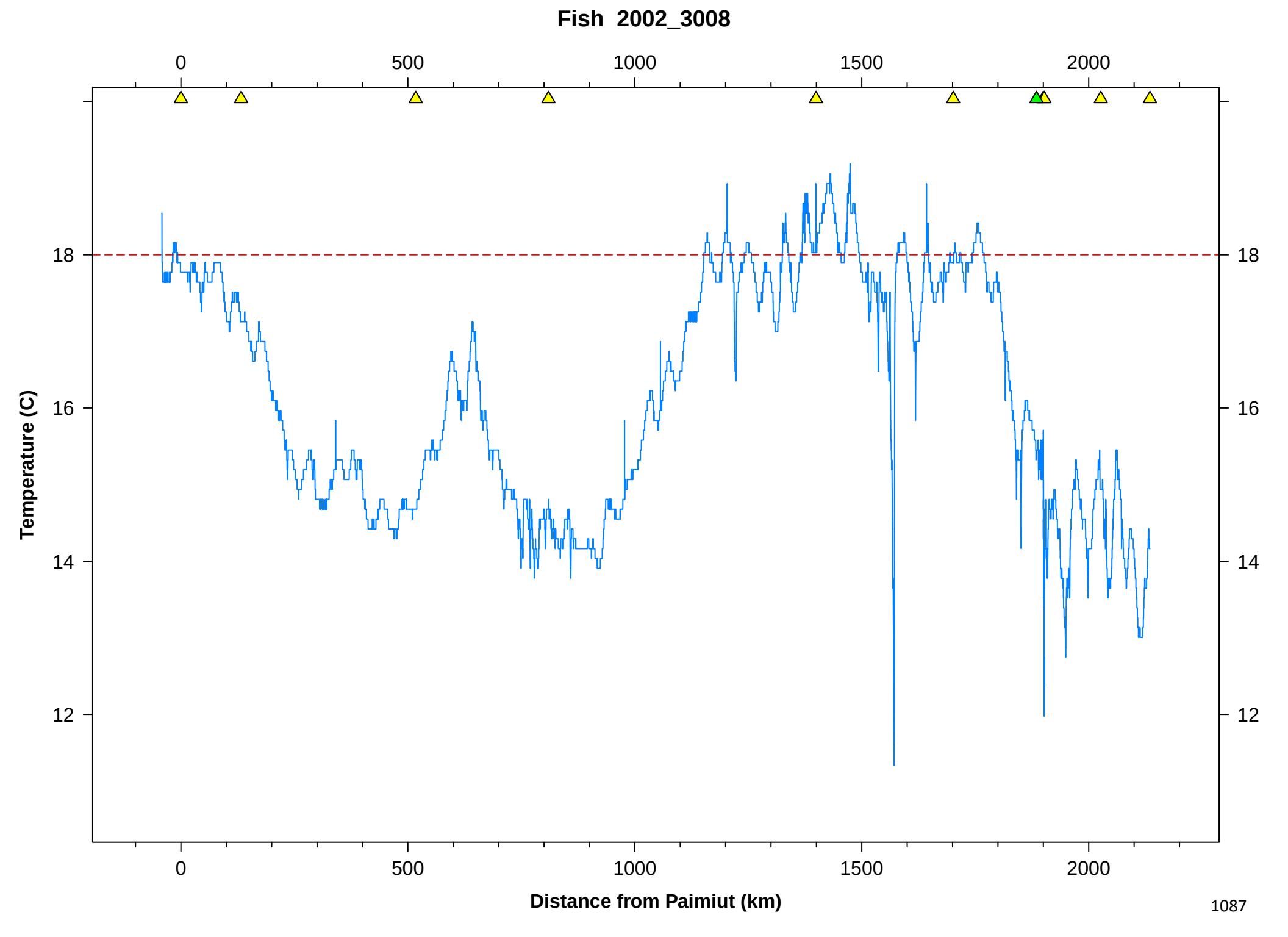

Fish 2004_3019
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Porcupine 1
Porcupine 2
Porcupine 1 down
Porcupine 1 − Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Pelly
Depth (m)
Temperature (C)
10
12
14
16
18
20
22
0
10
20
1082

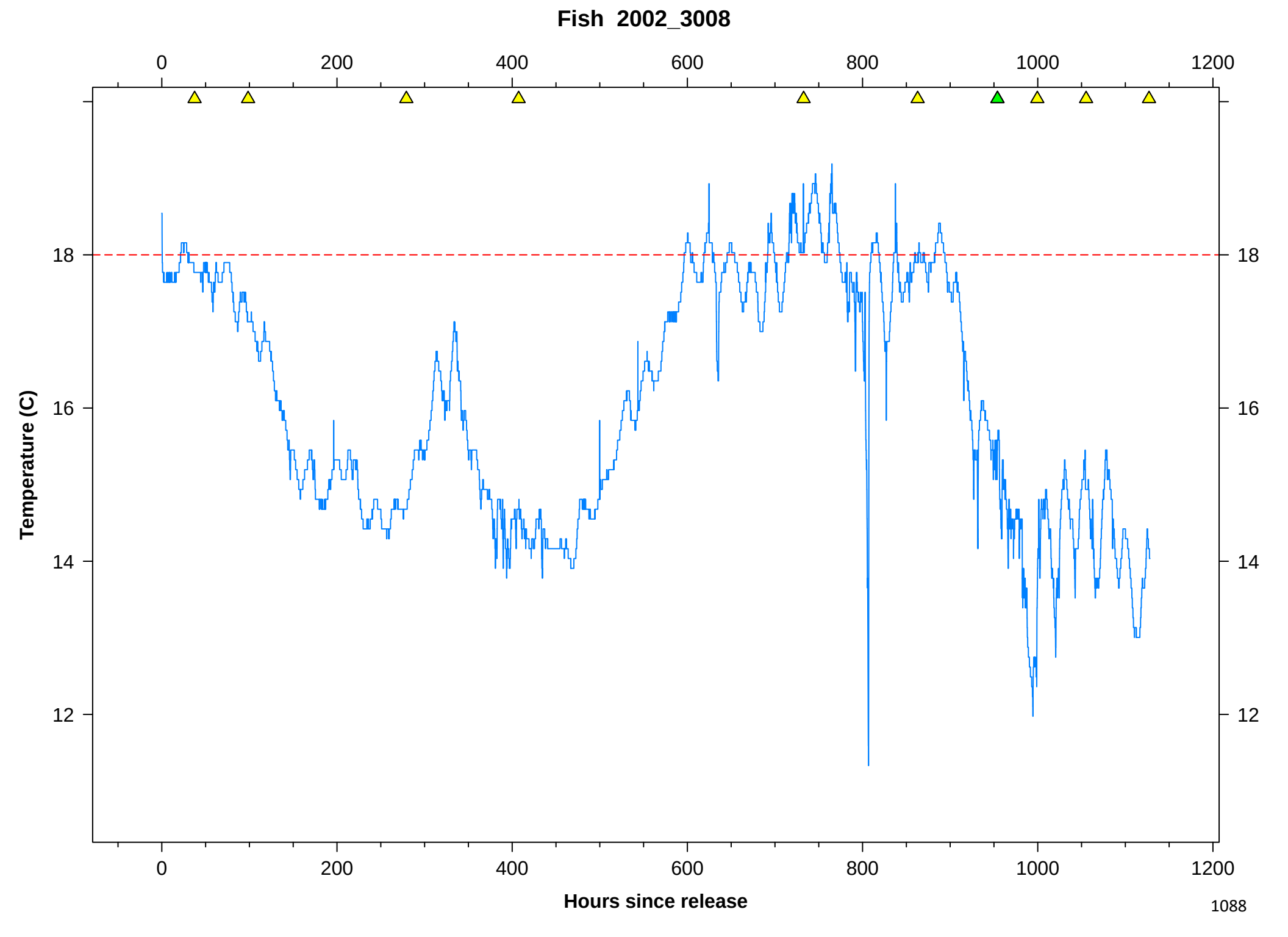

Tatchun Stock - Fish 2002_3008
0
500
1000
1500
2000
Depth (m)
0
5
10
15
20
Distance from Paimiut (km)
1083

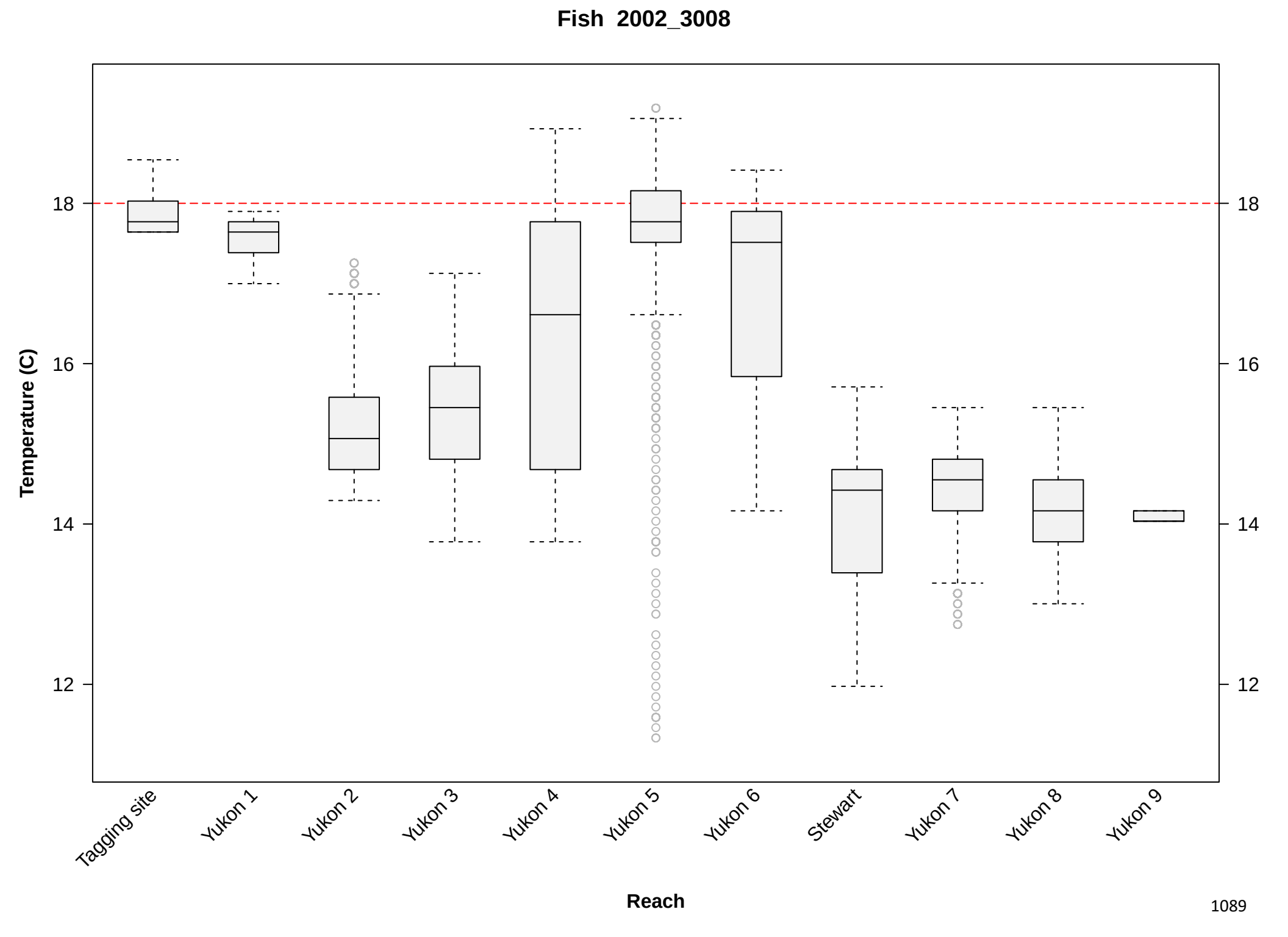

Fish 2002_3008
0
200
400
600
800
1000
1200
0
5
10
15
20
Depth (m)
Hours since release
1084

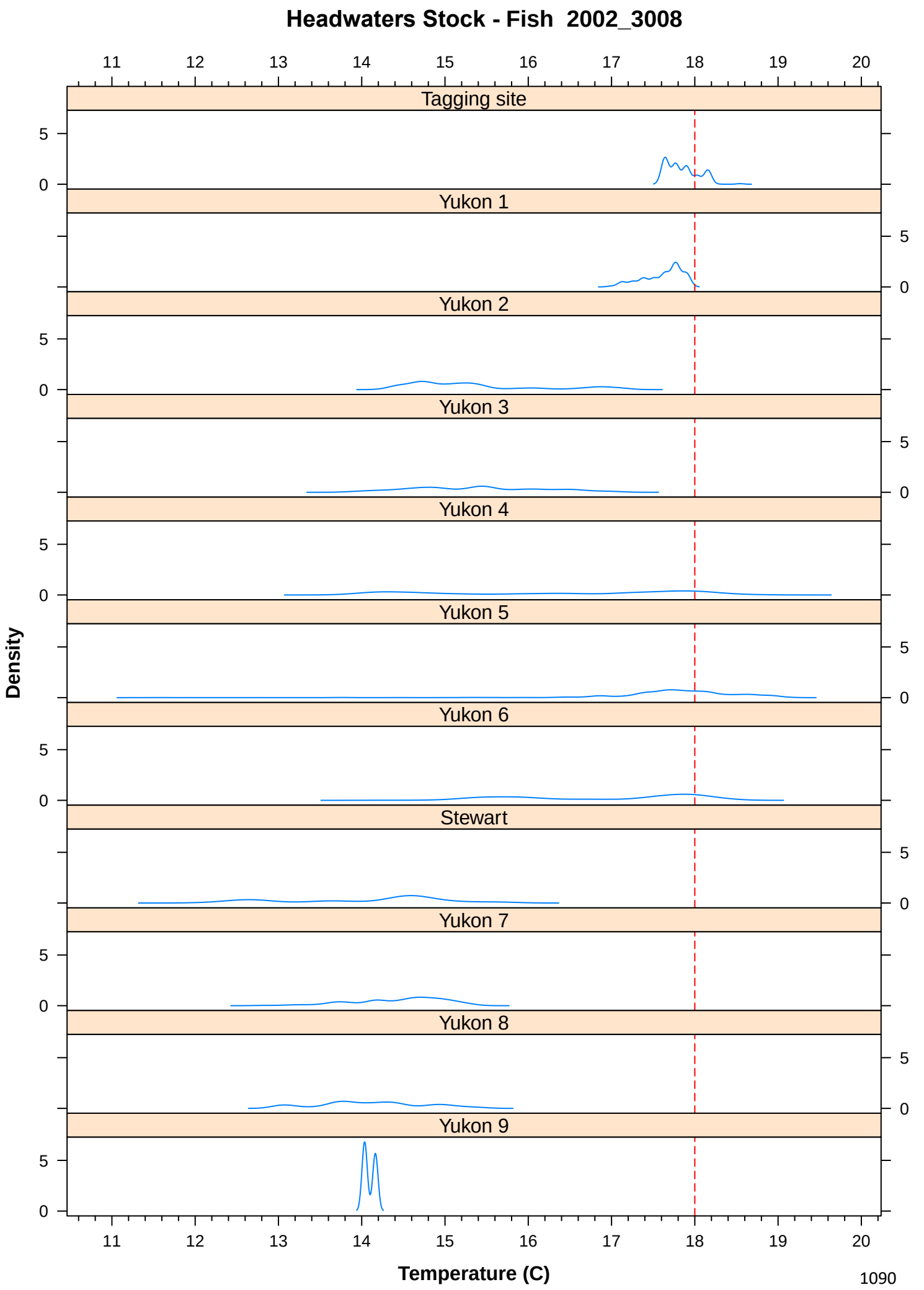

Fish 2002_3008
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Stewart
Yukon 7
Yukon 8
Yukon 9
Reach

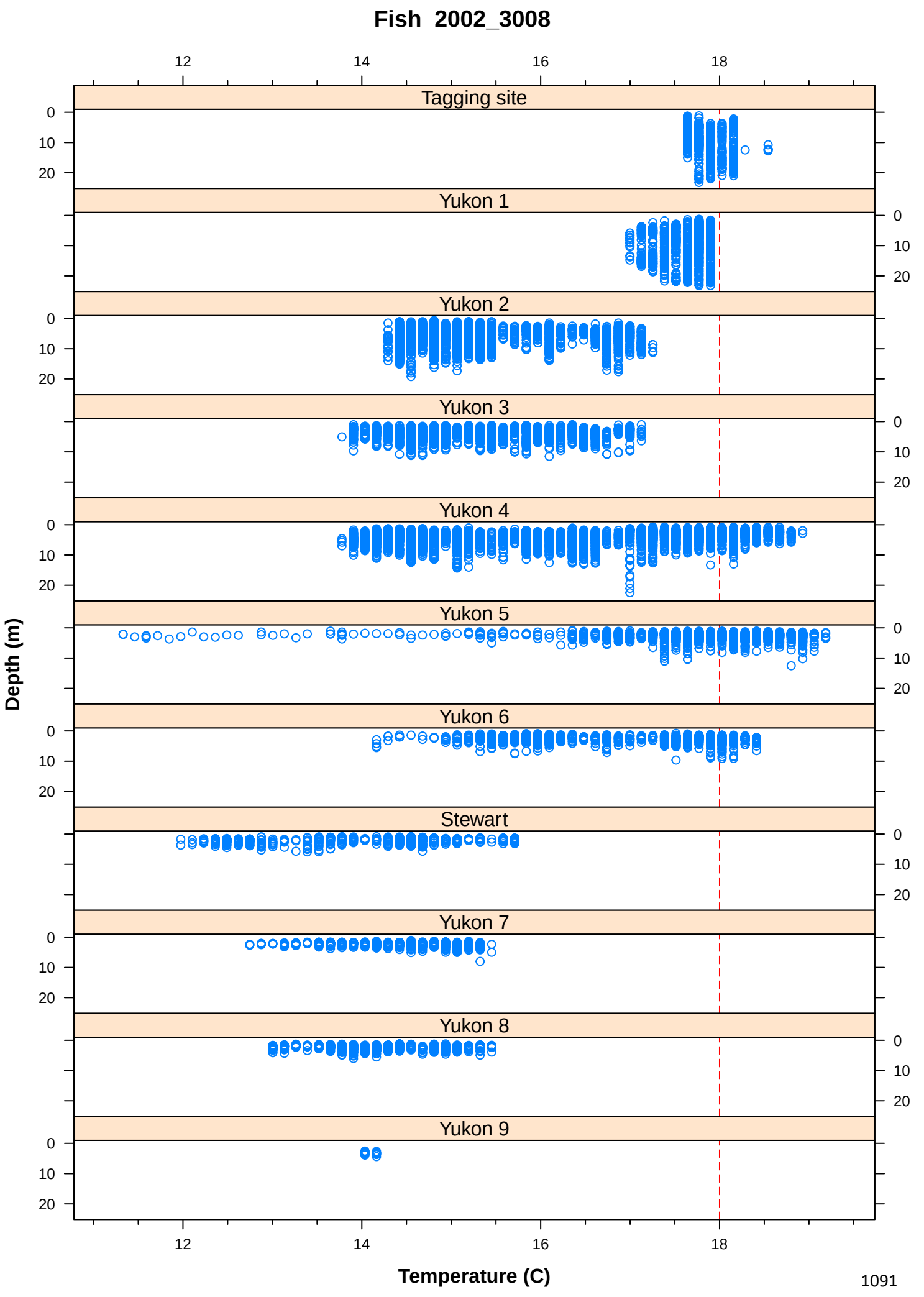

Fish 2002_3008
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Stewart
Yukon 7
Yukon 8
Yukon 9
Density
1.0
0.5
0.0
0
5
10
15
20
25
Depth (m)
1086


Fish 2002_3008
0
500
1000
1500
2000
18
16
14
12
Temperature (C)
Distance from Paimiut (km)
1087

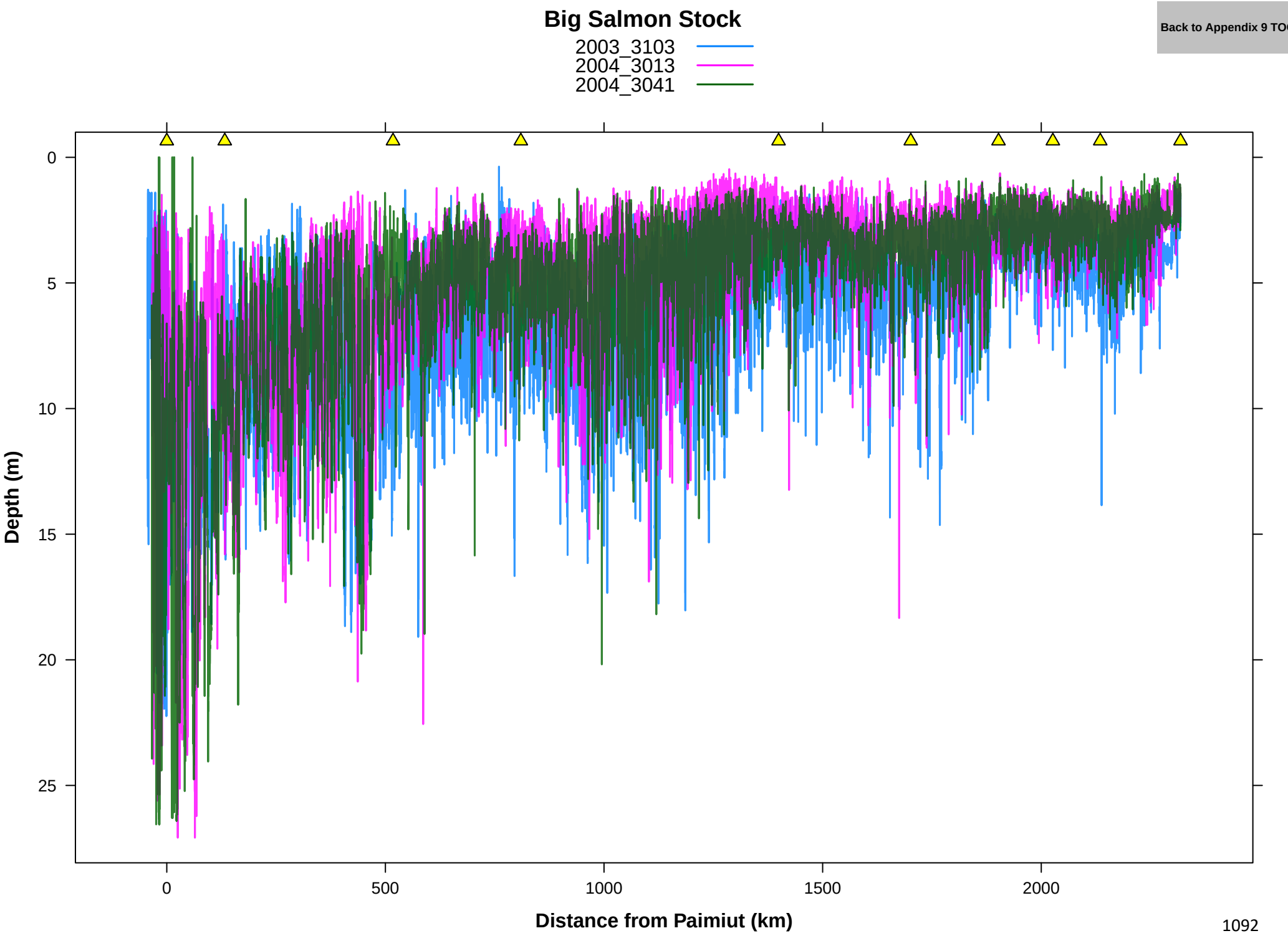

Fish 2002_3008
0
200
400
600
800
1000
1200
18
16
14
12
Temperature (C)
Hours since release
1088

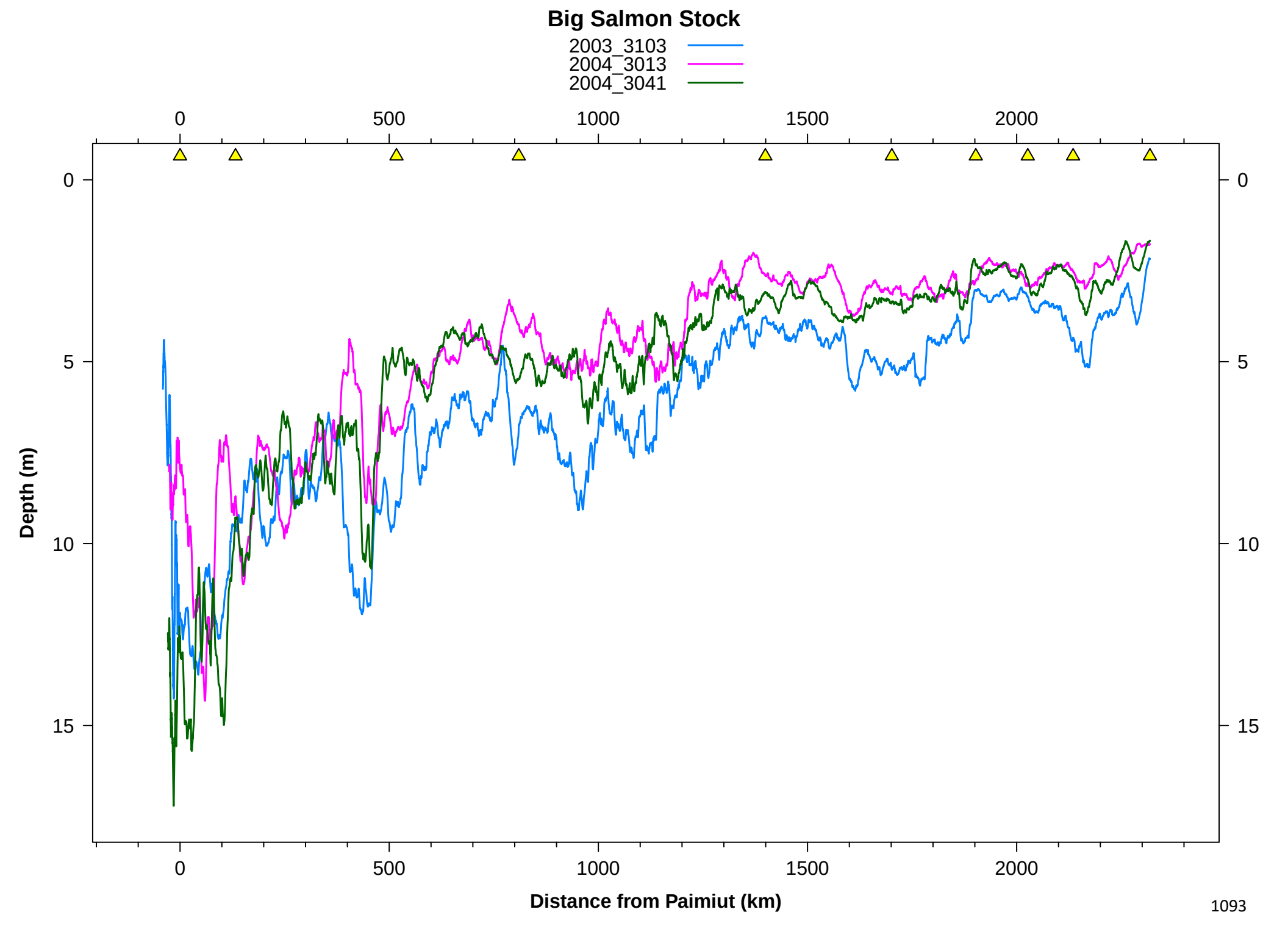

Fish 2002_3008
Temperature (C)
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Stewart
Yukon 7
Yukon 8
Yukon 9
Reach
1089

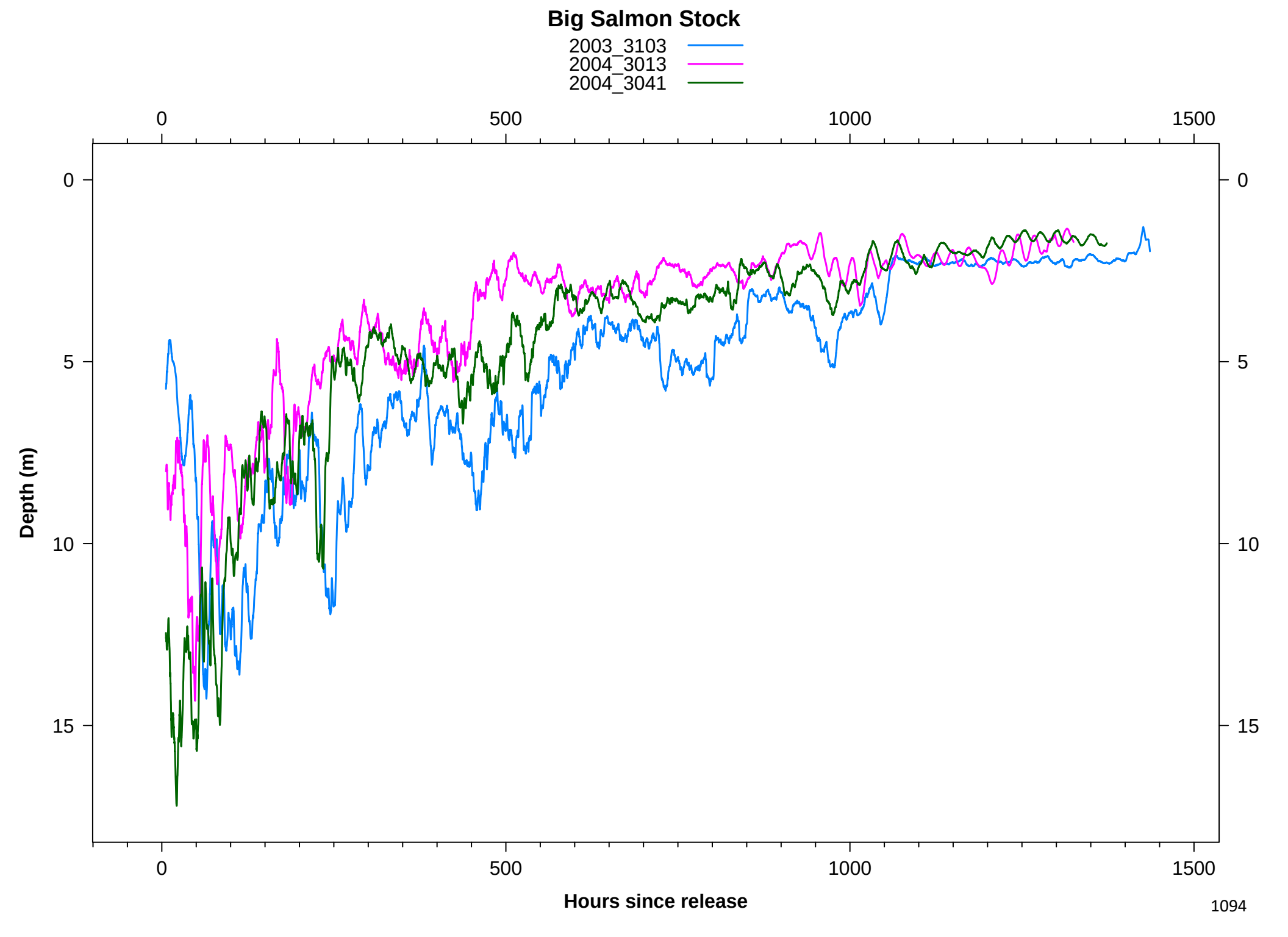

Headwaters Stock - Fish 2002_3008
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Stewart
Yukon 7
Yukon 8
Yukon 9
Density
Temperature (C)
11
12
13
14
15
16
17
18
19
20
0
5
1090

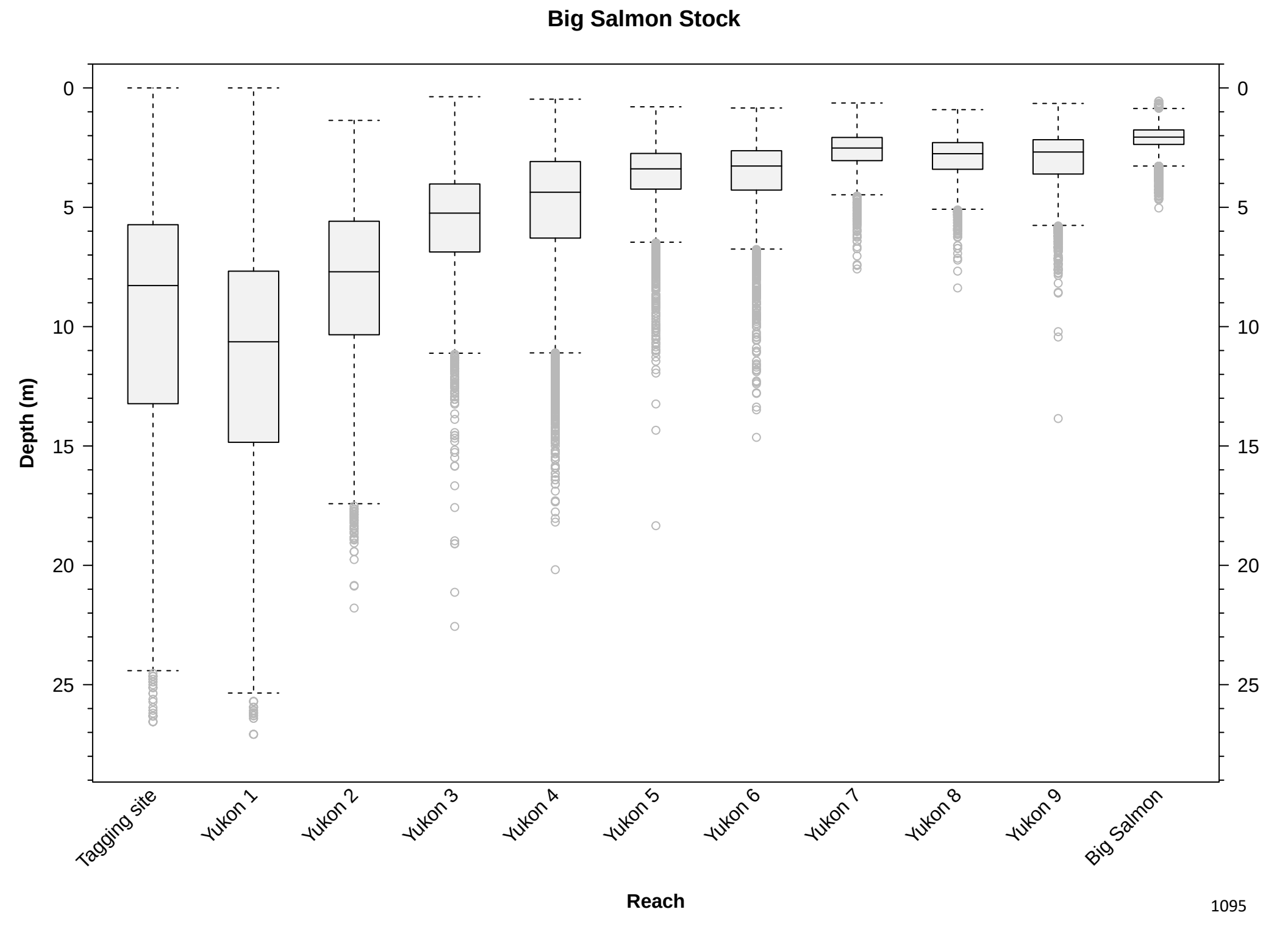

Fish 2002_3008
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Stewart
Yukon 7
Yukon 8
Yukon 9
Depth (m)
Temperature (C)
12
14
16
18
0
10
20
1091

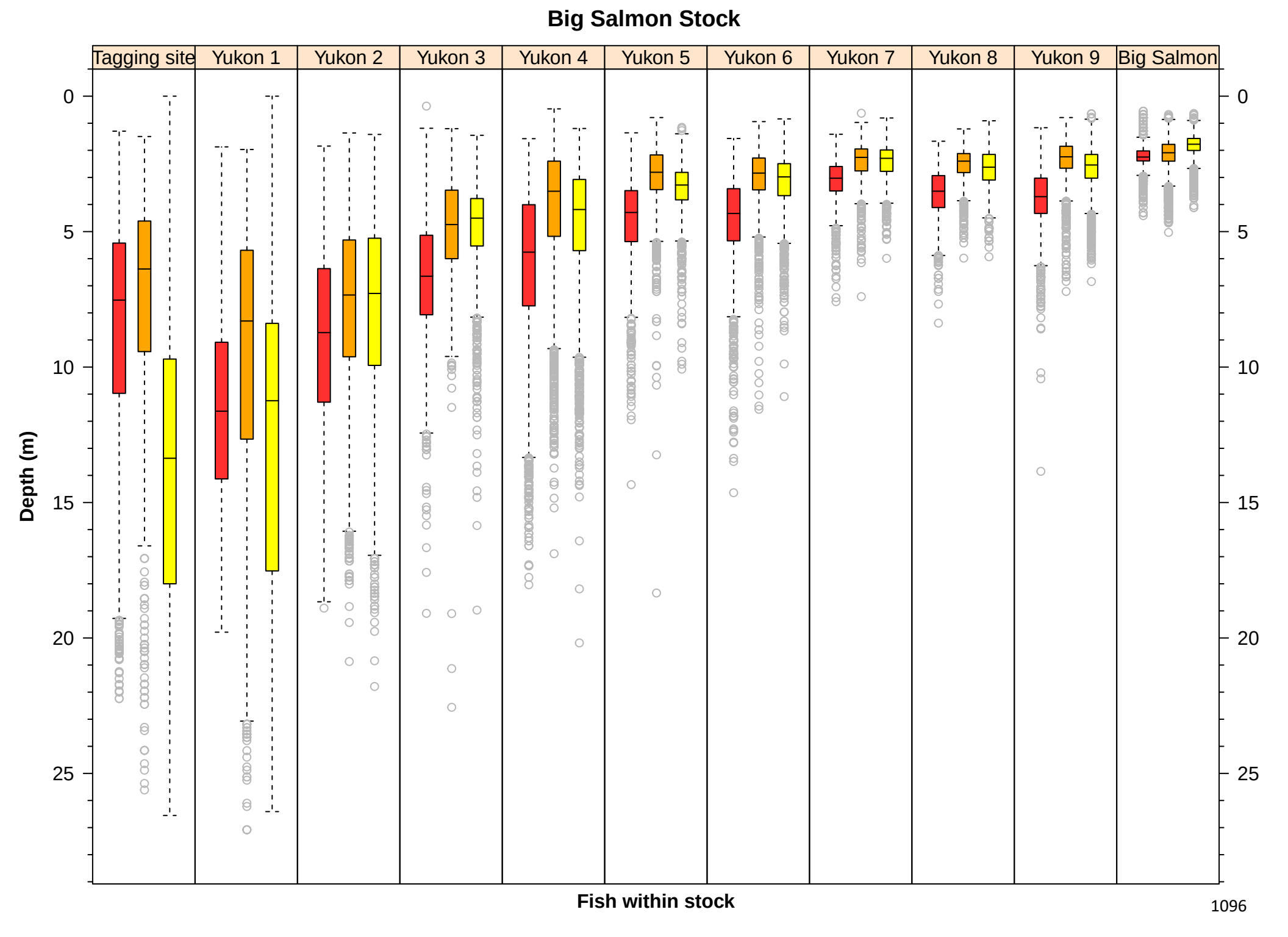
Back to Appendix 9 TOC

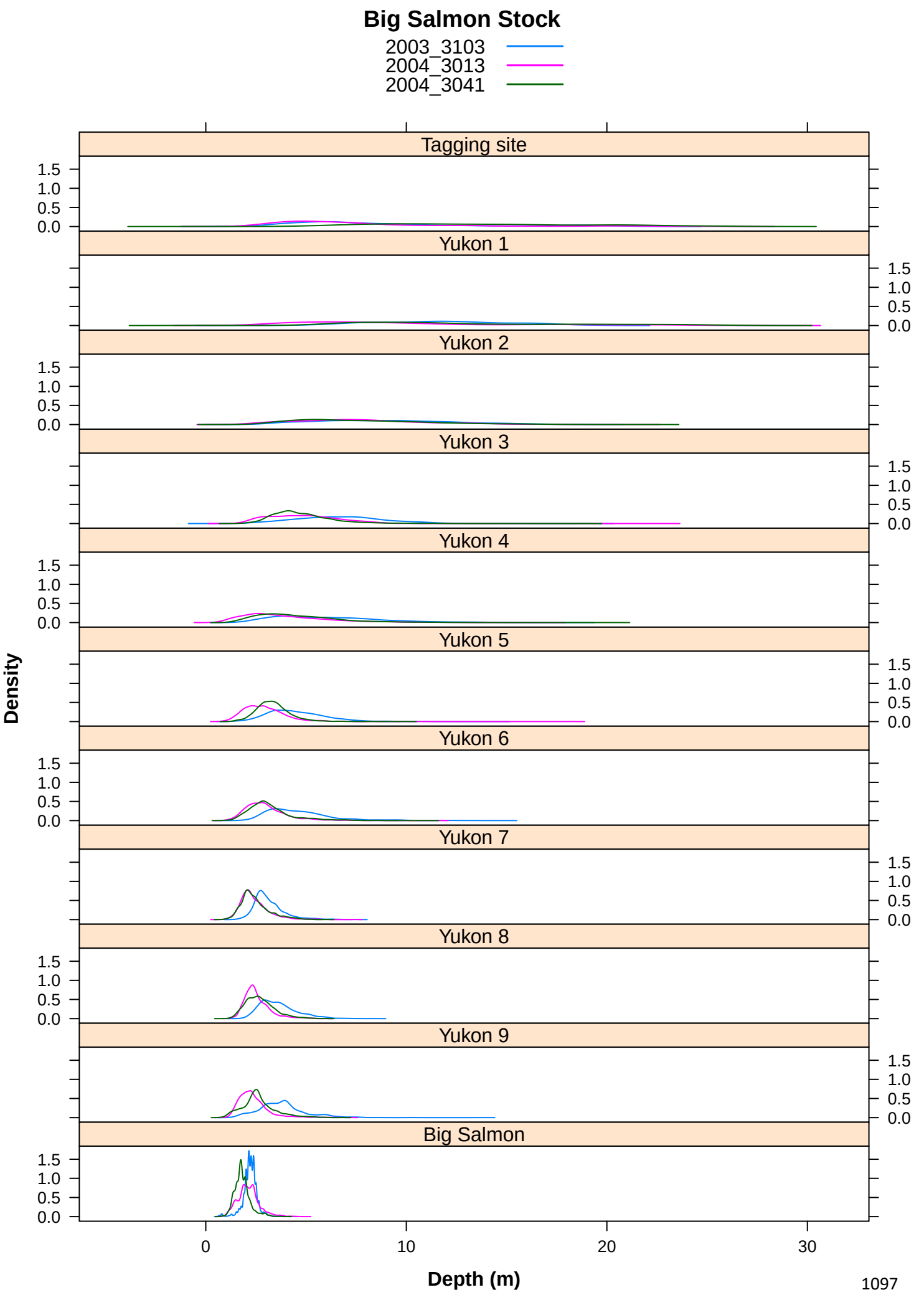


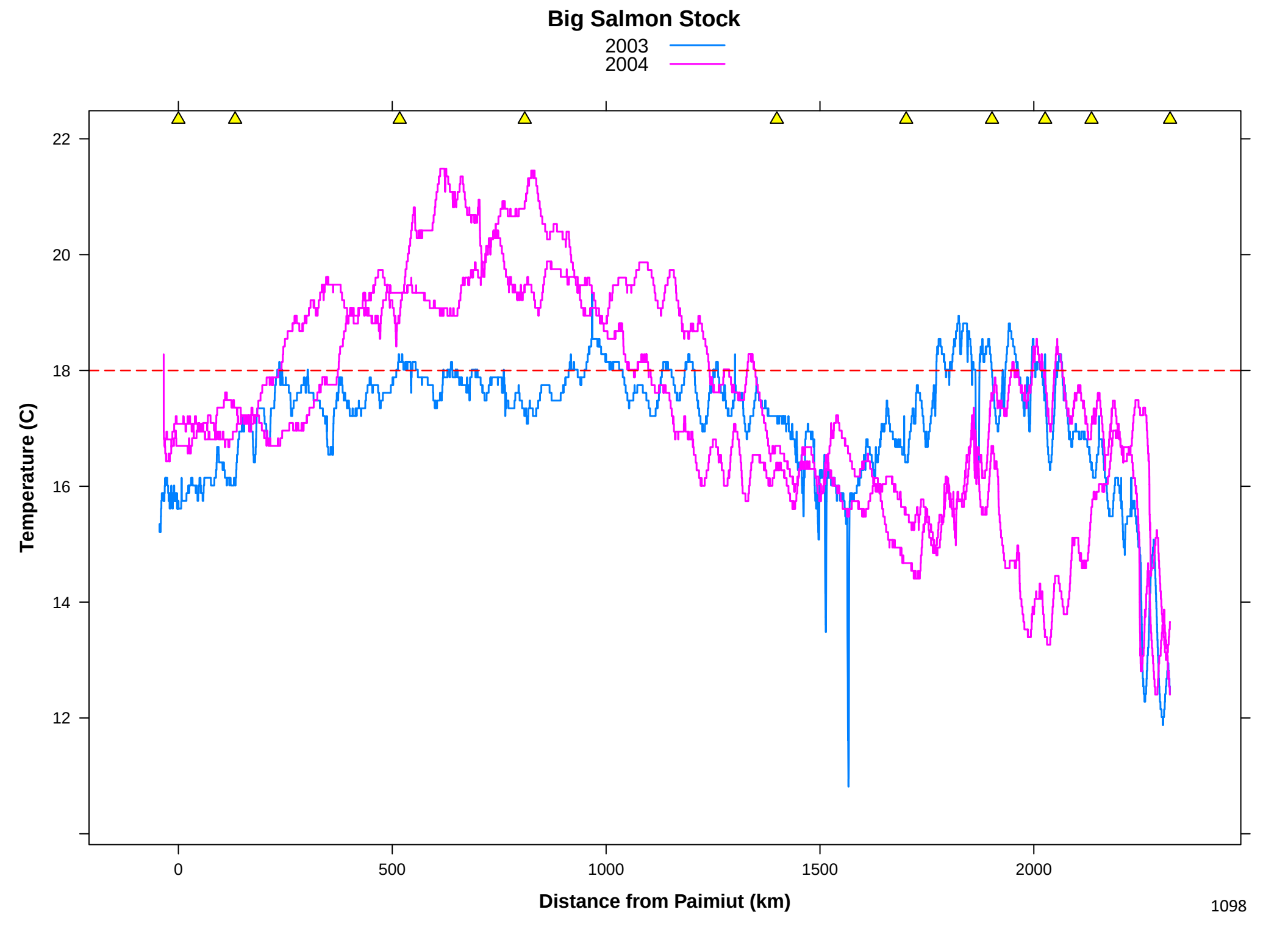

Big Salmon Stock
2003_3103
2004_3013
2004_3041
0
500
1000
1500
2000
Depth (m)
0
5
10
15
Distance from Paimiut (km)
1093

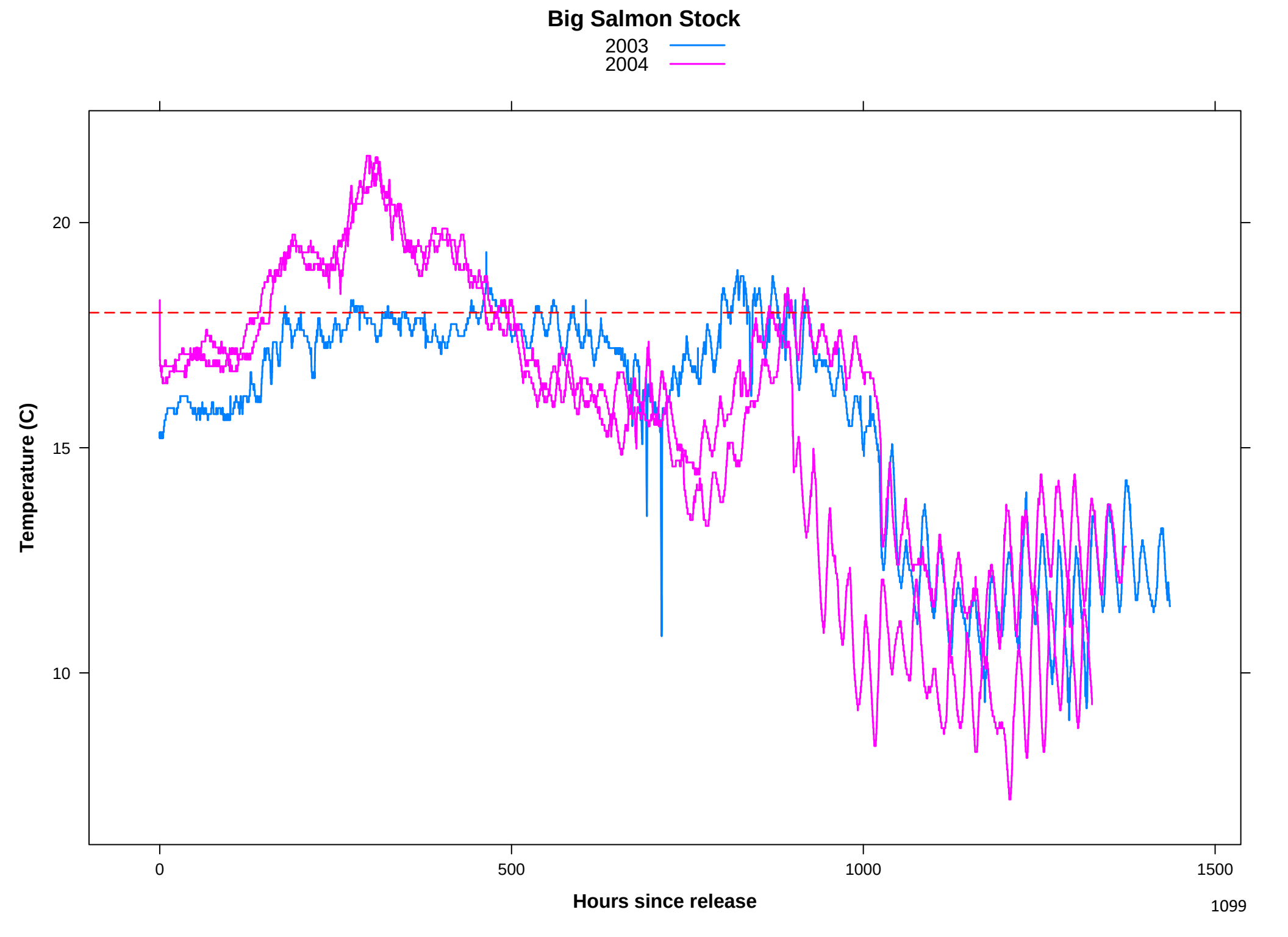

Big Salmon Stock
2003_3103
2004_3013
2004_3041
0
500
1000
1500
0
5
10
15
Depth (m)
Hours since release
1094

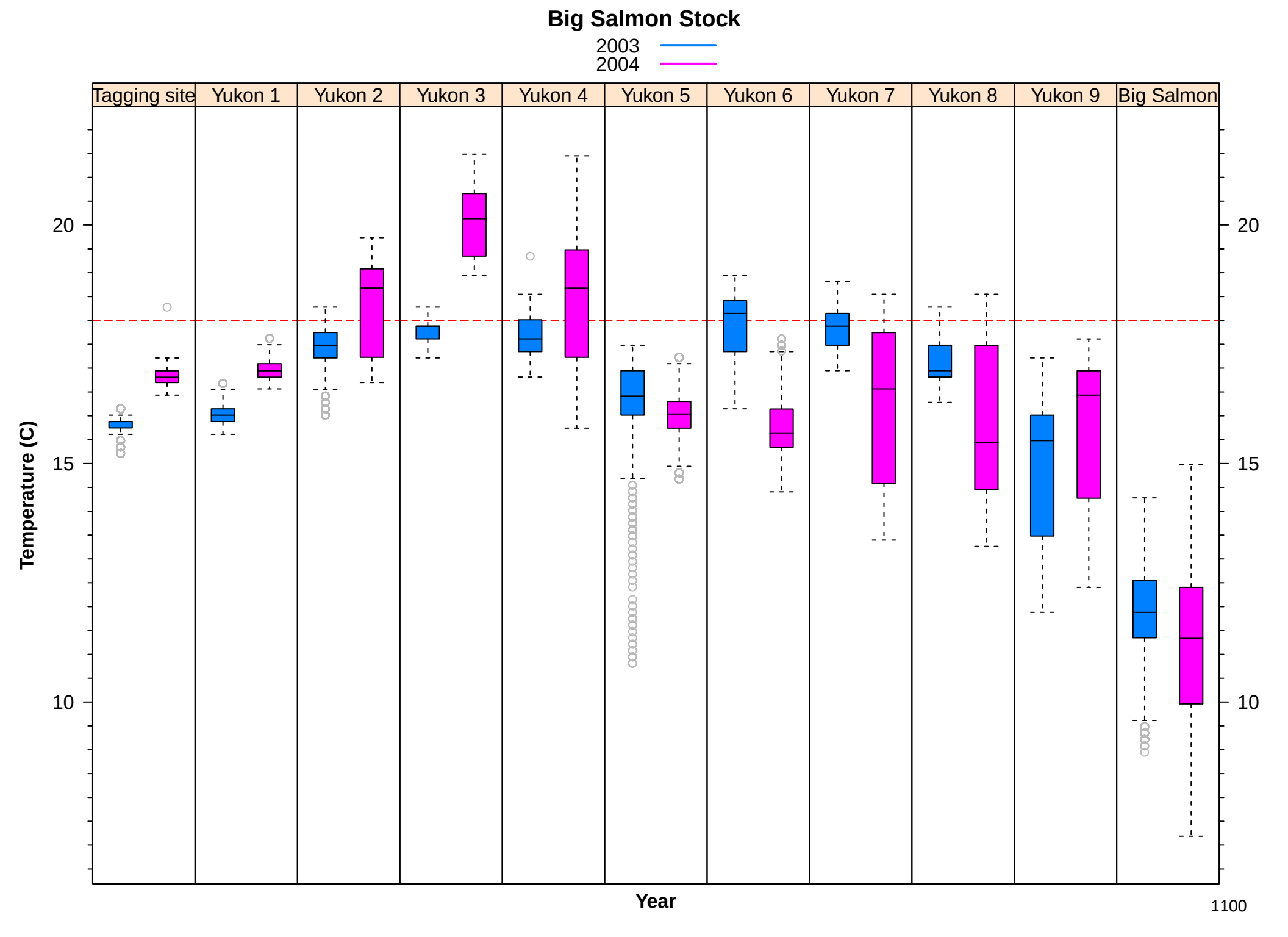

Big Salmon Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Reach
1095

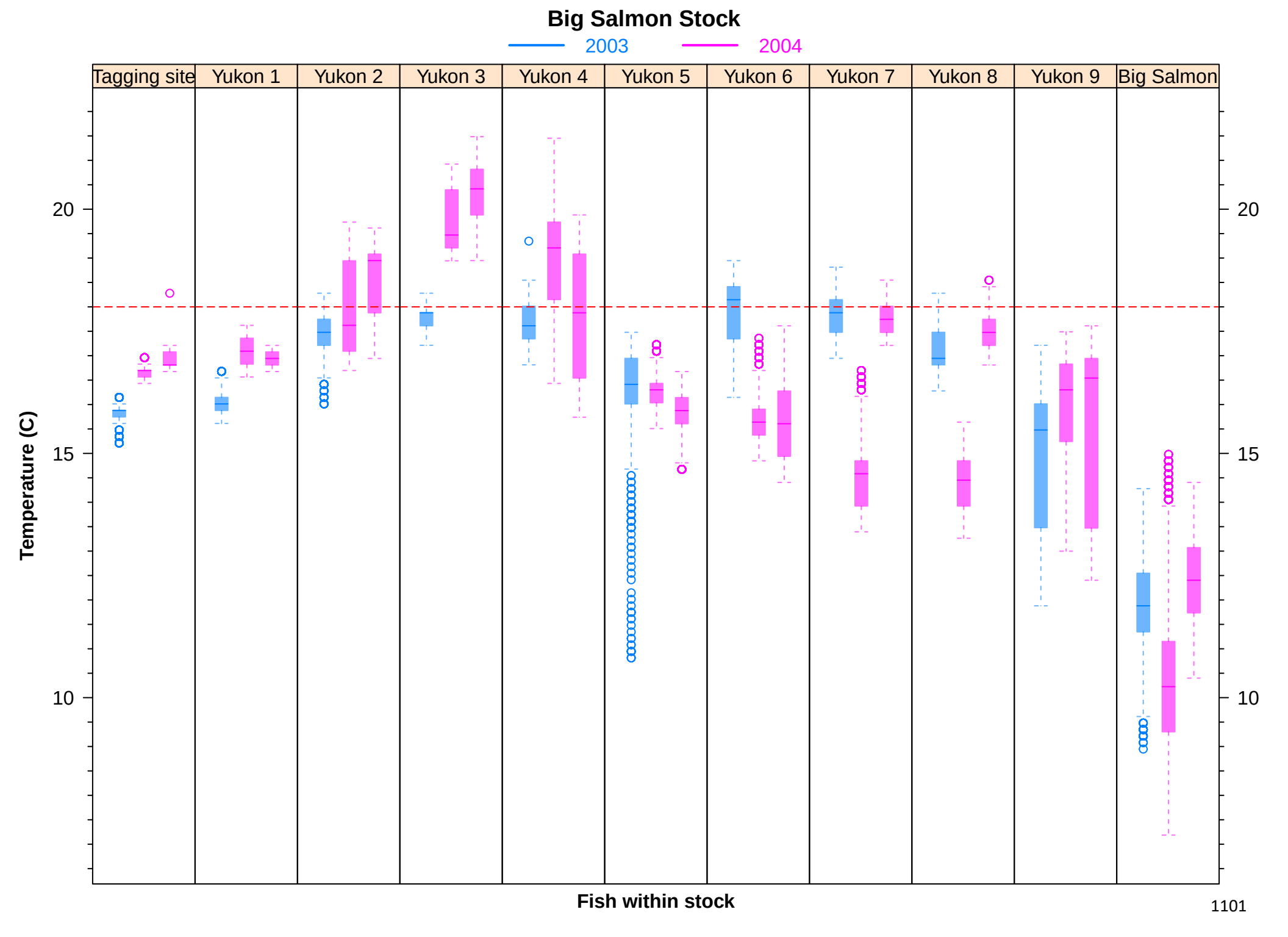

Big Salmon Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Depth (m)
0
5
10
15
20
25
Fish within stock
1096

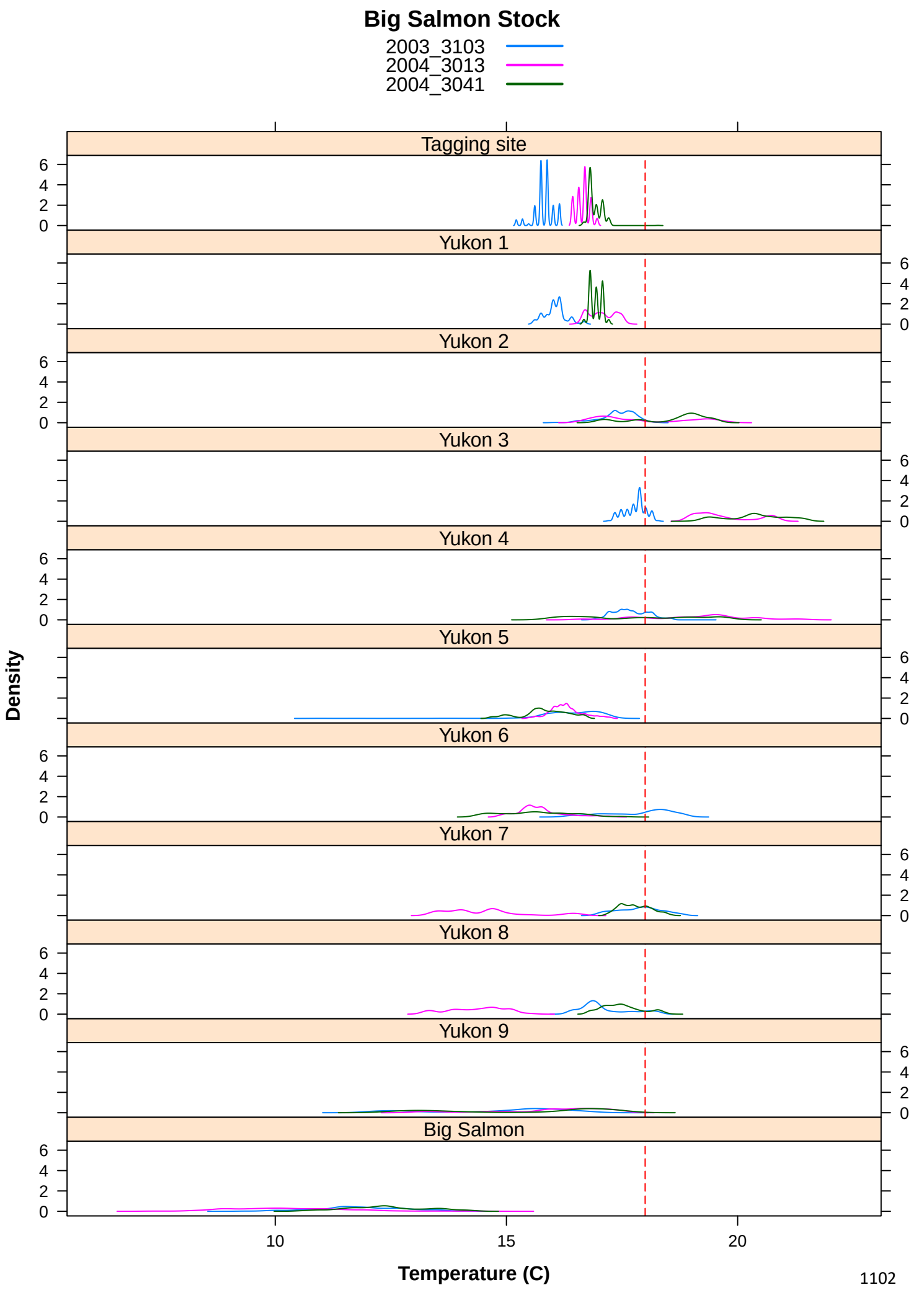

Big Salmon Stock
2003_3103
2004_3013
2004_3041
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Density
0.0
0.5
1.0
1.5
0
10
20
30
Depth (m)
1097

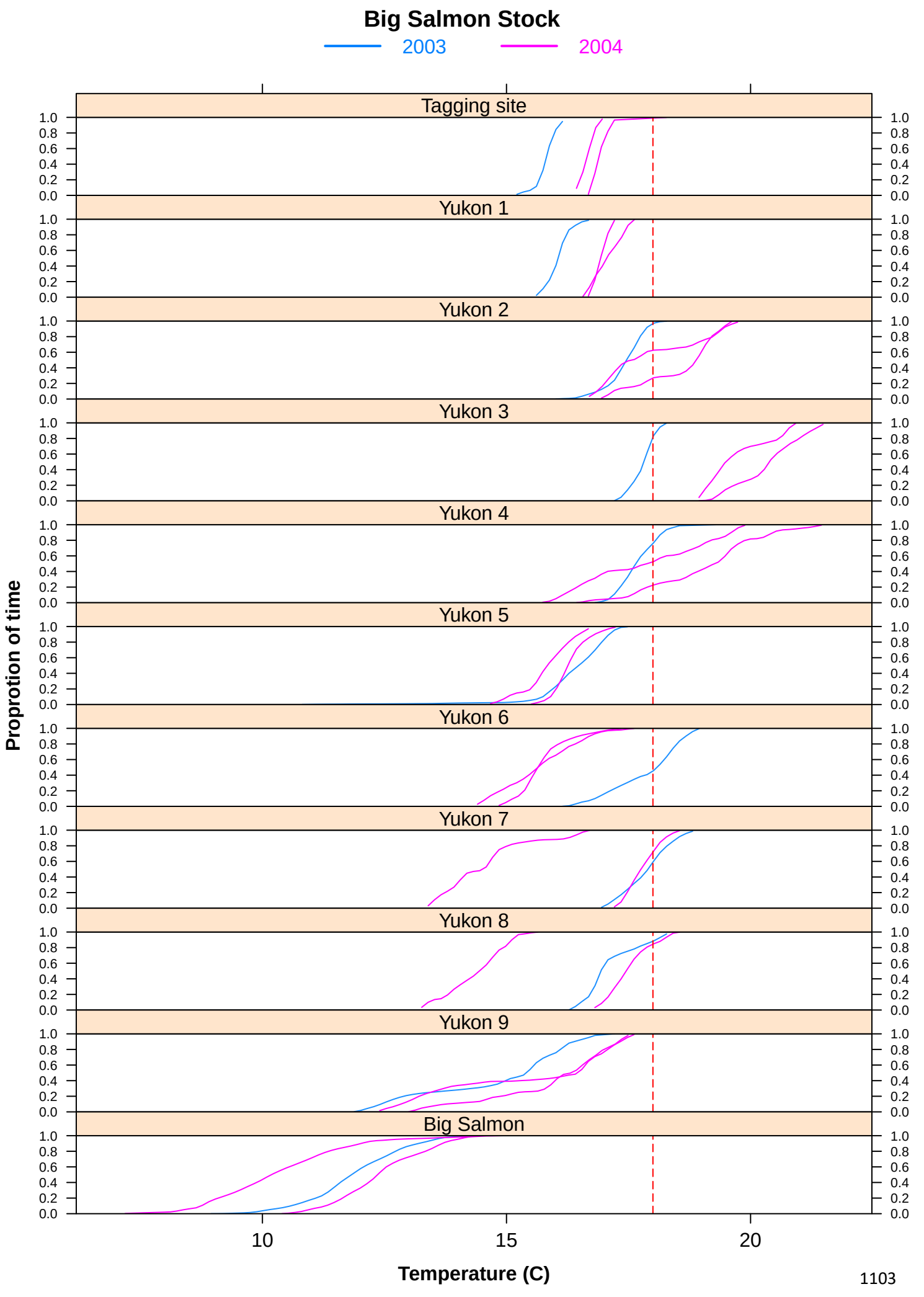

Big Salmon Stock
2003
2004
22
20
18
16
14
12
Temperature (C)
0
500
1000
1500
2000
Distance from Paimiut (km)
1098

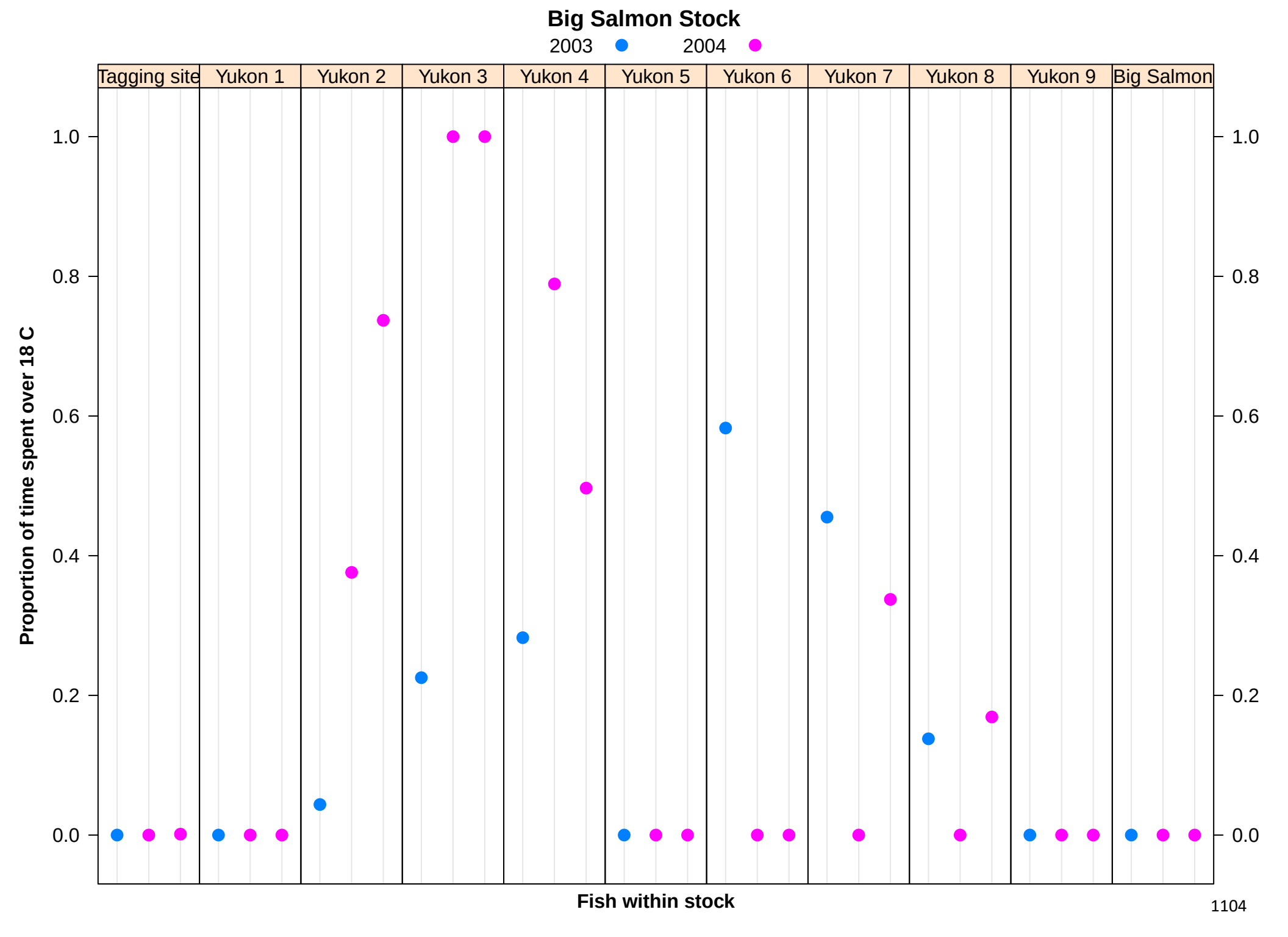

Big Salmon Stock
2003
2004
Temperature (C)
20
15
10
0
500
1000
1500
Hours since release
1099

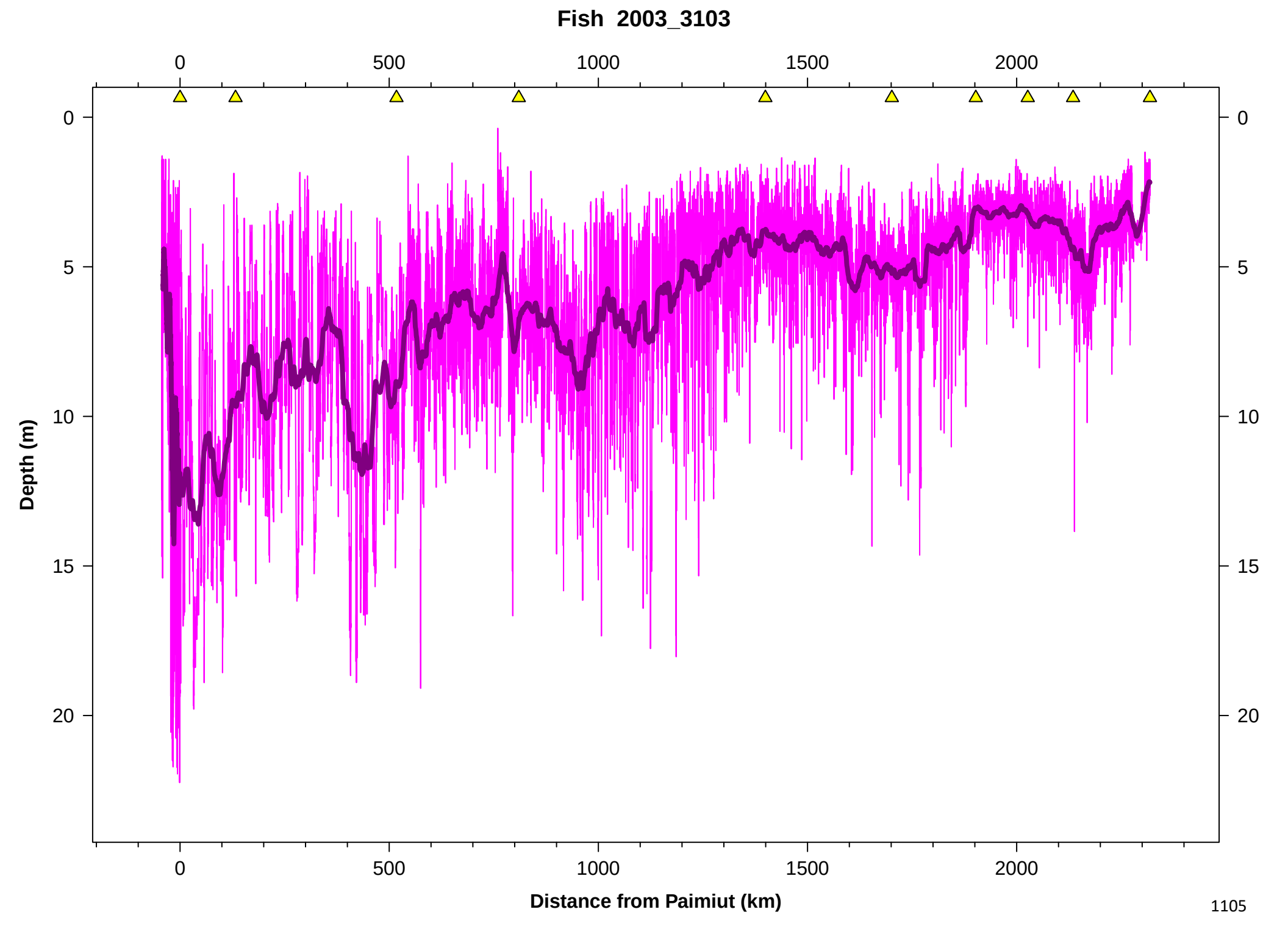

Big Salmon Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Temperature (C)
20
15
10
Year
1100

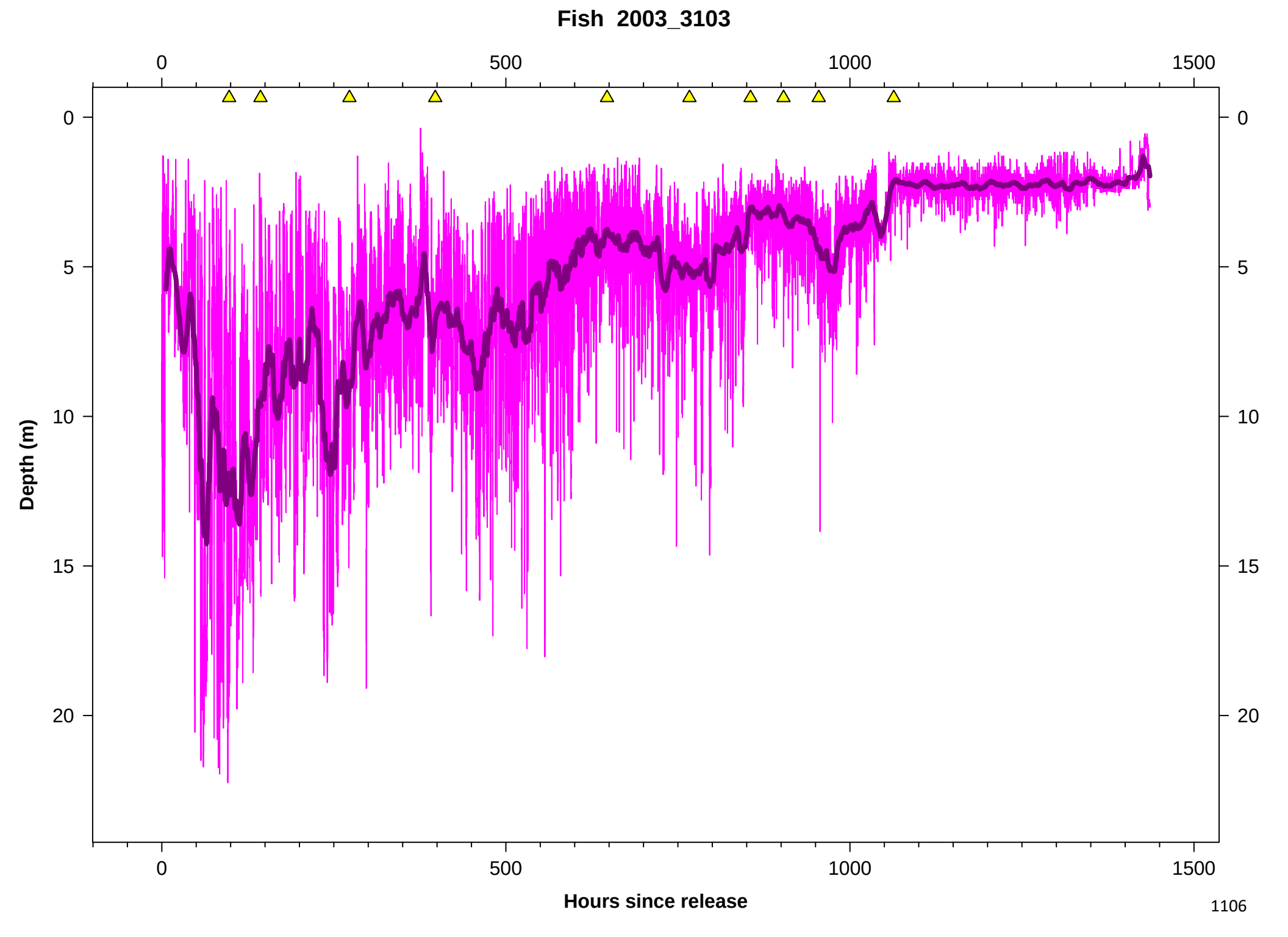

Big Salmon Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Temperature (C)
20
15
10
Fish within stock
1101

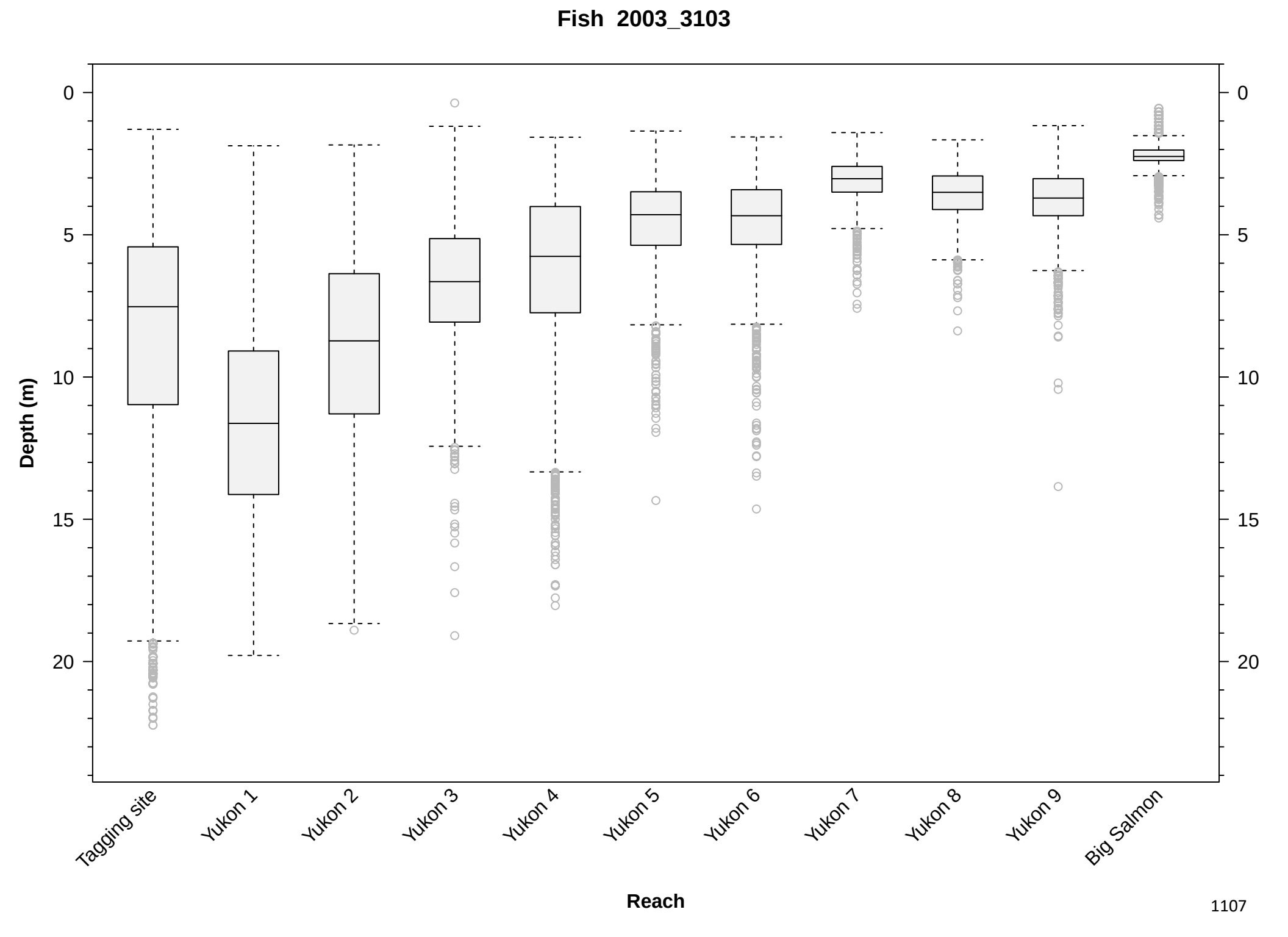

Big Salmon Stock
2003_3103
2004_3013
2004_3041
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Density
0
2
4
6
10
15
20
Temperature (C)

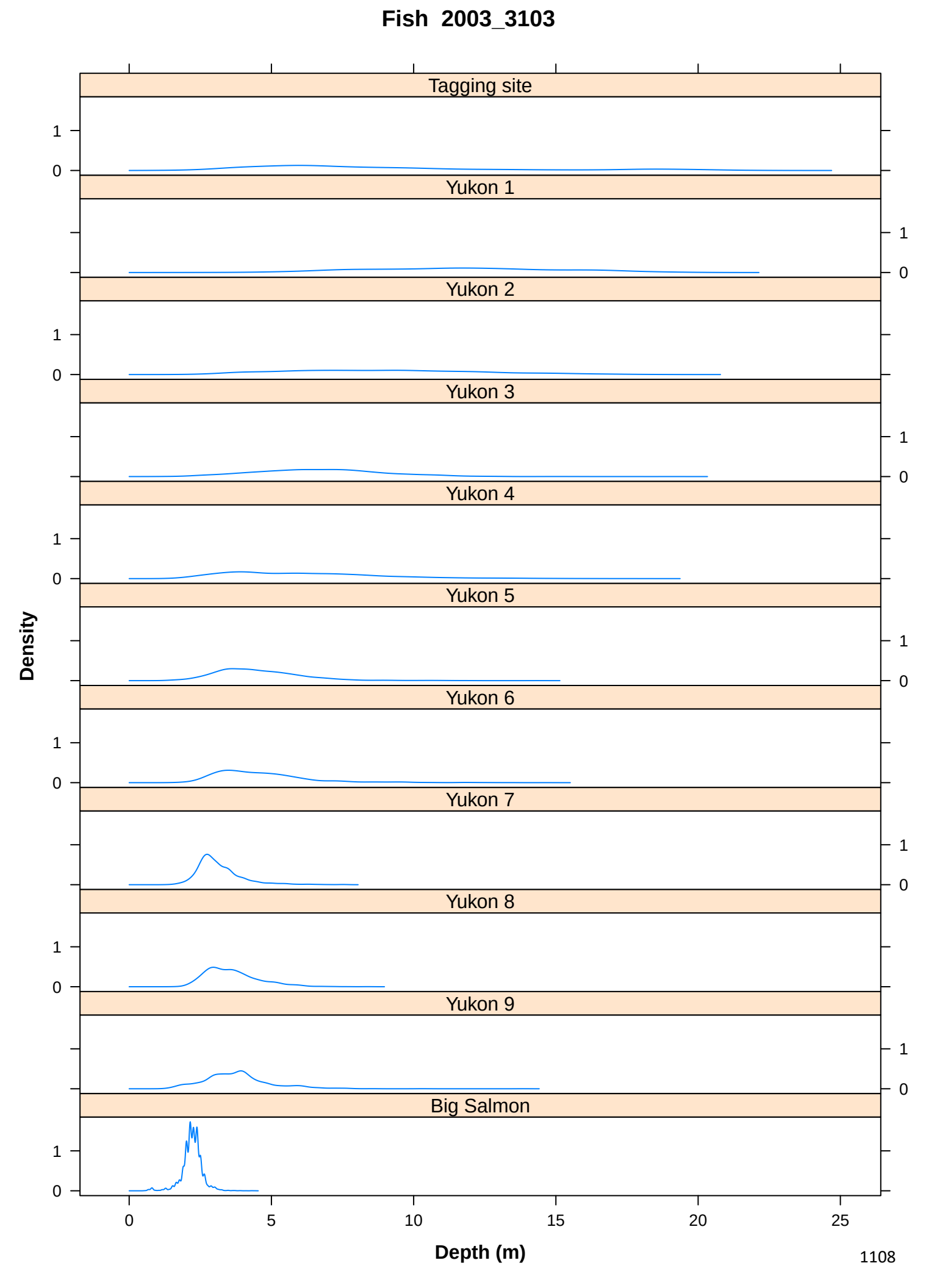

Big Salmon Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Proprotion of time
Temperature (C)
10
15
20
1103

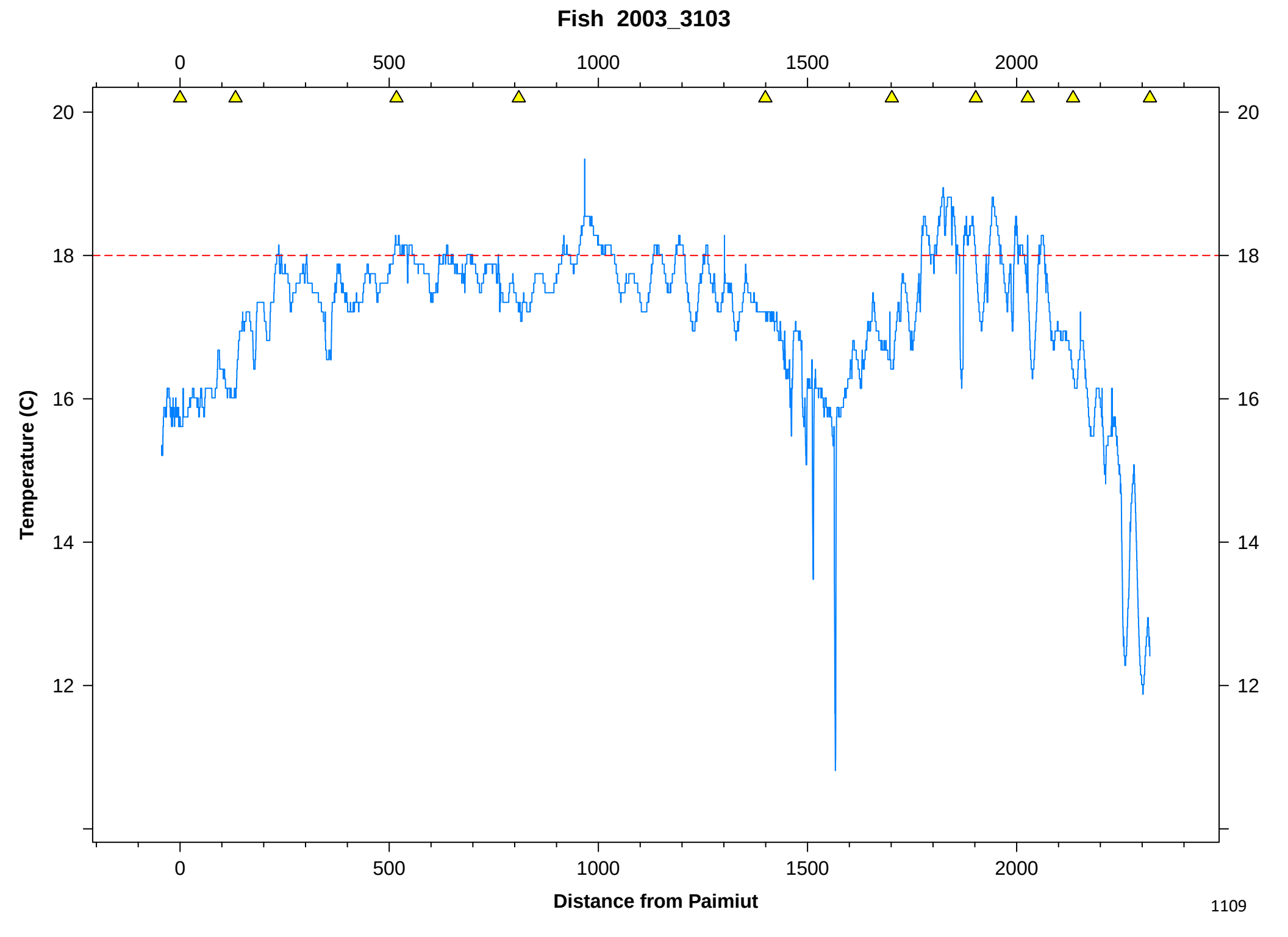

Big Salmon Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock
1104

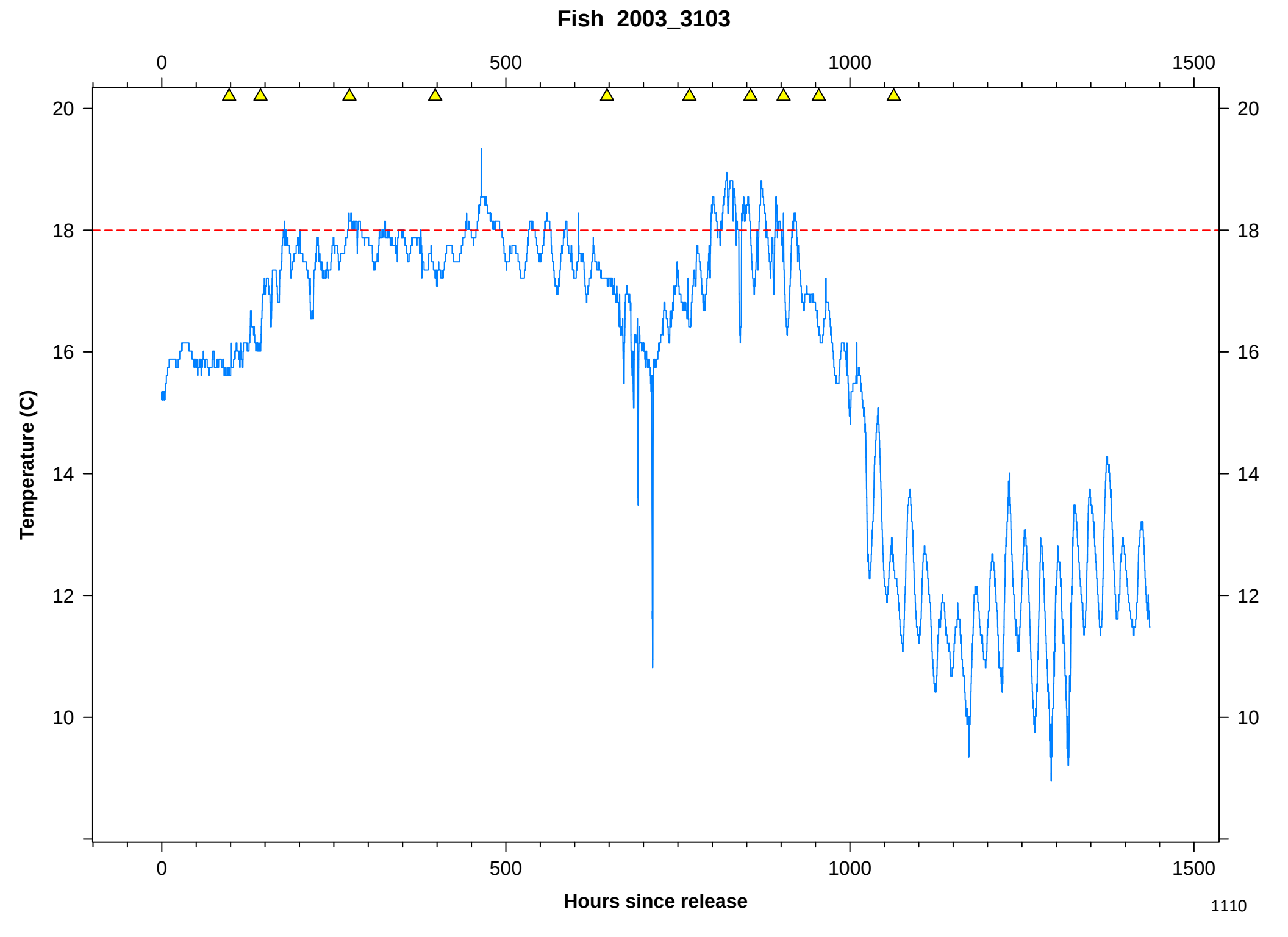

Fish 2003_3103
0
500
1000
1500
2000
0
5
10
15
20
Depth (m)
Distance from Paimiut (km)
1105

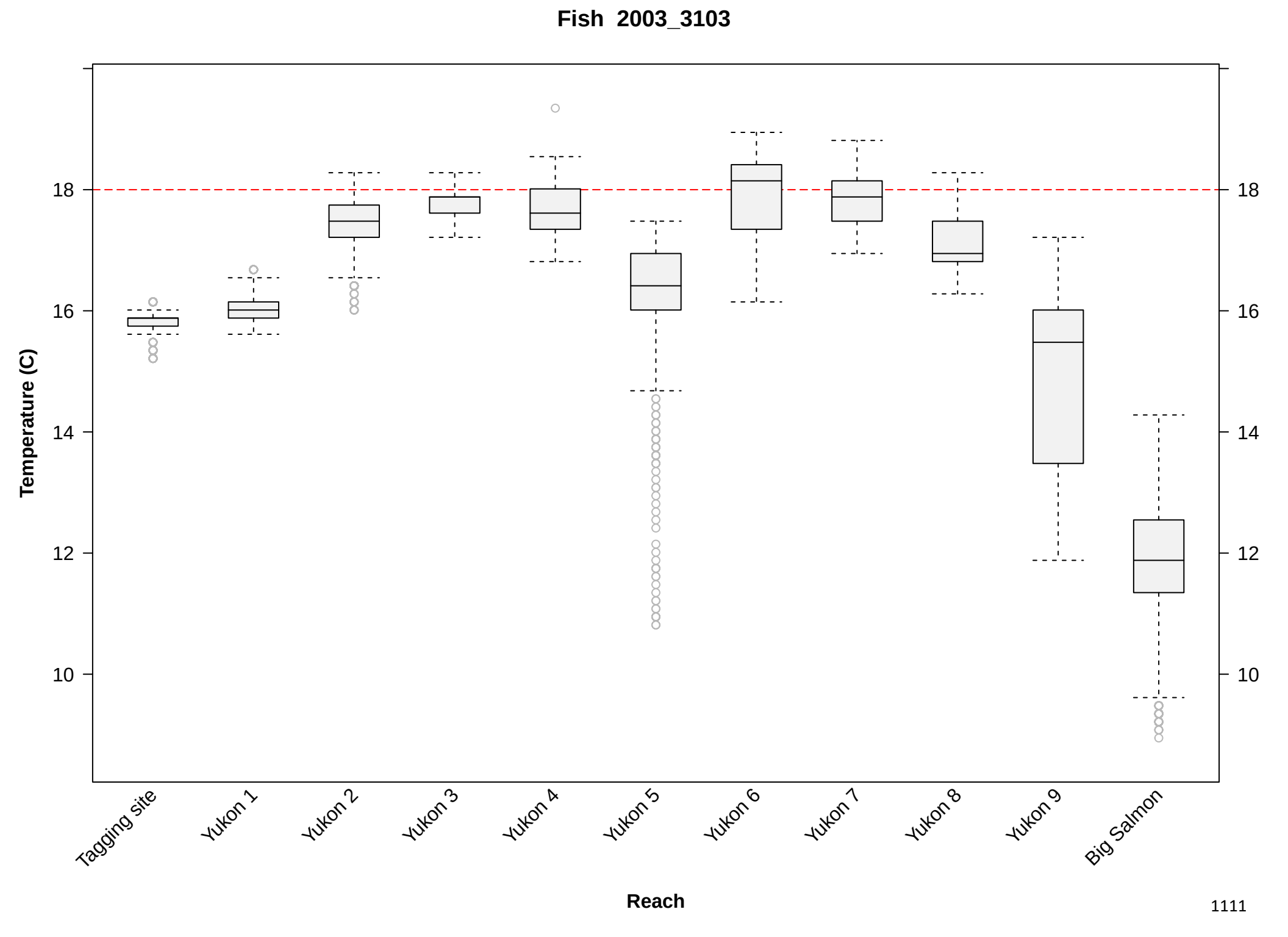

Fish 2003_3103
0
500
1000
1500
0
5
10
15
20
Depth (m)
Hours since release
1106

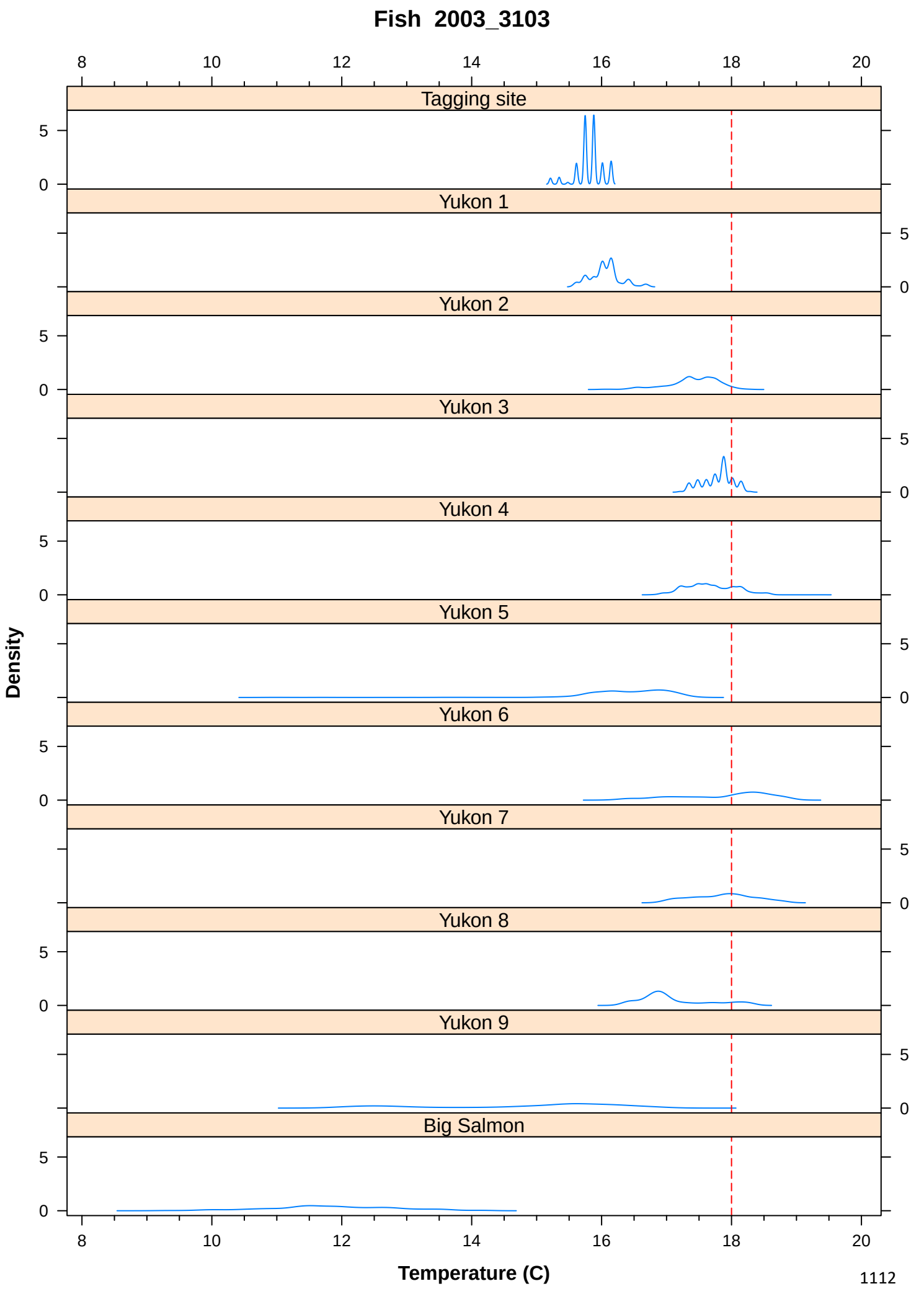

Fish 2003_3103
Depth (m)
0
5
10
15
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Reach
1107

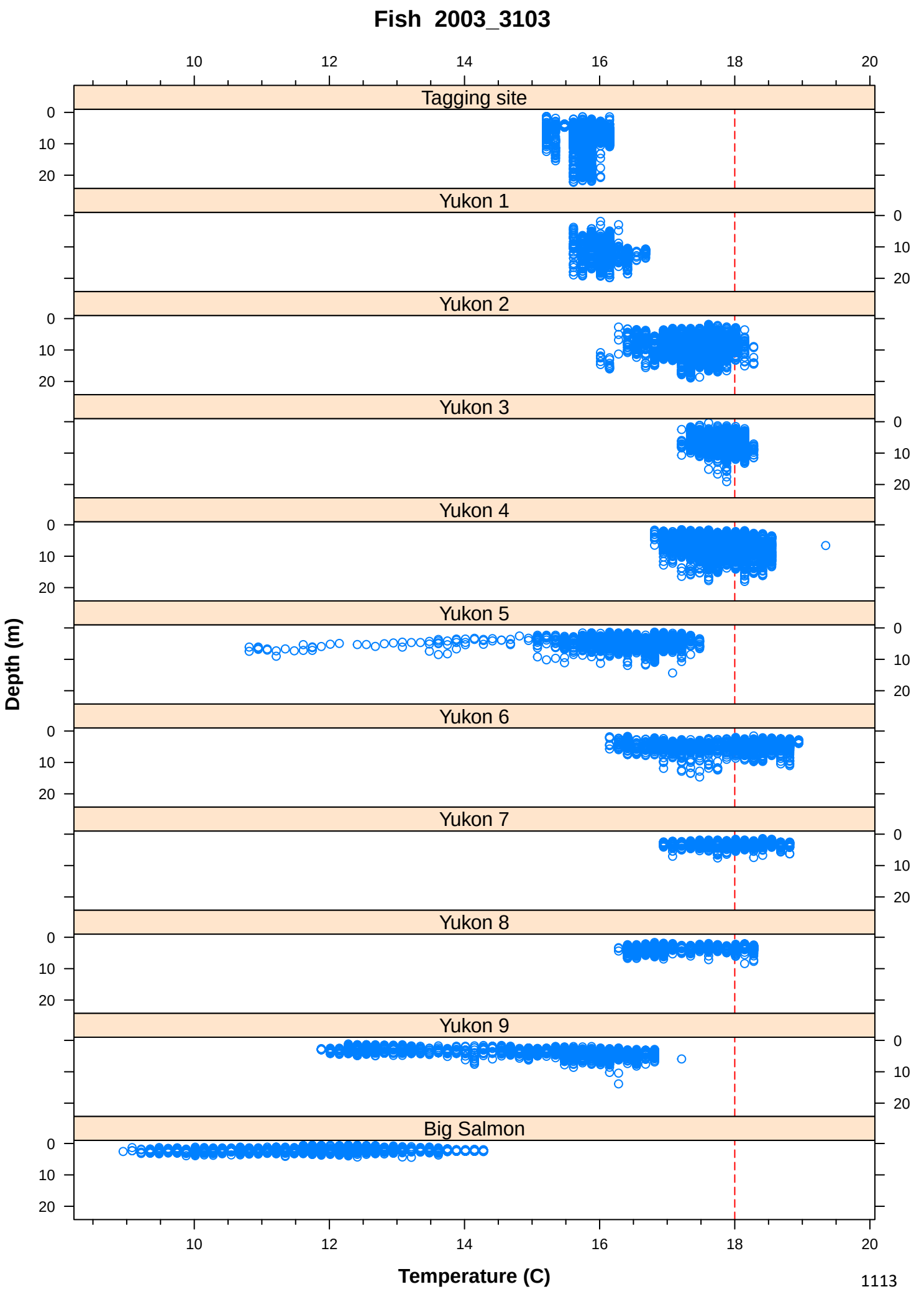

Fish 2003_3103
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Density
Depth (m)
0
5
10
15
20
25
1
0
1108

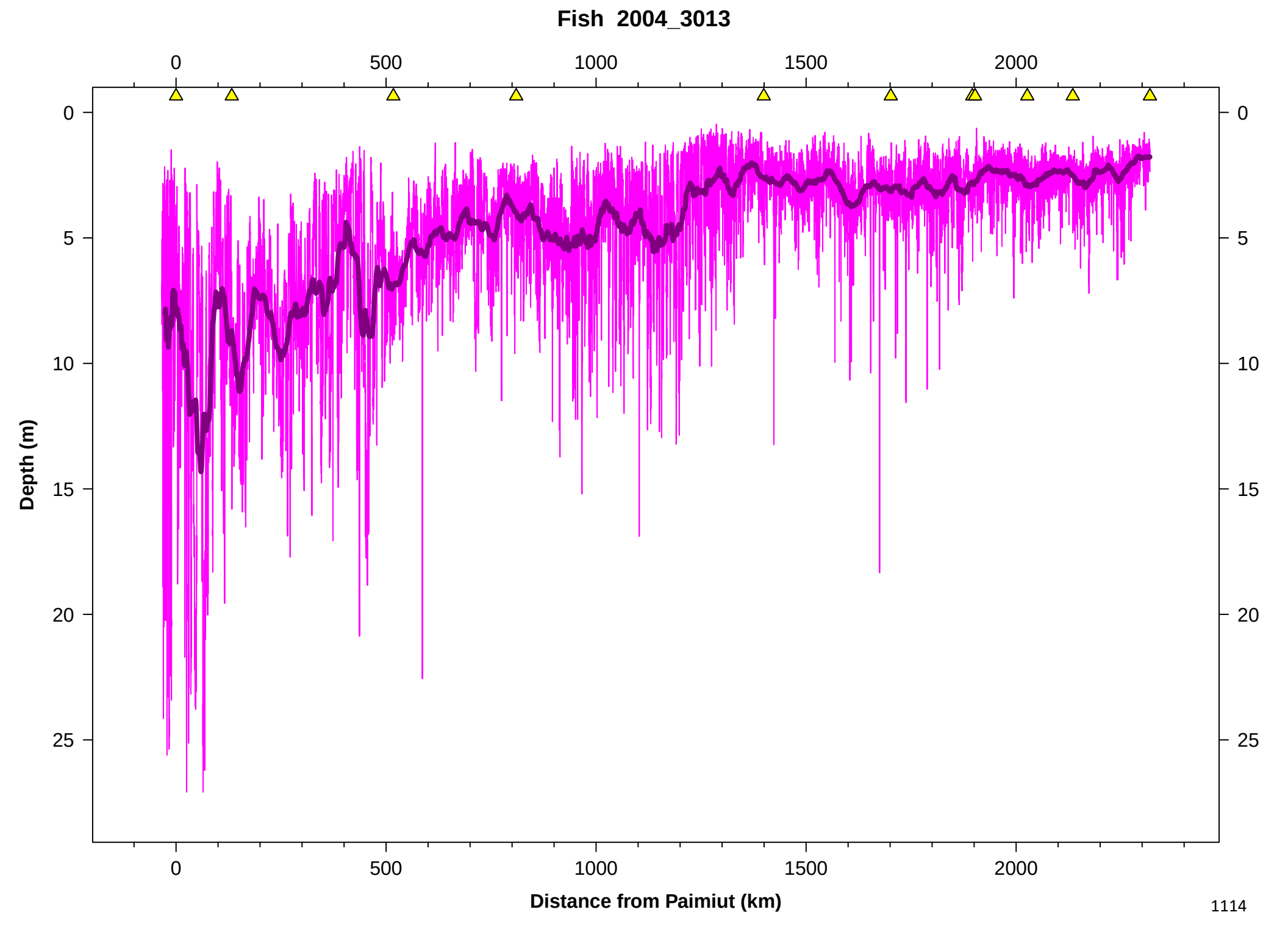

Fish 2003_3103
0
500
1000
1500
2000
20
18
16
14
12
Temperature (C)
Distance from Paimiut
1109

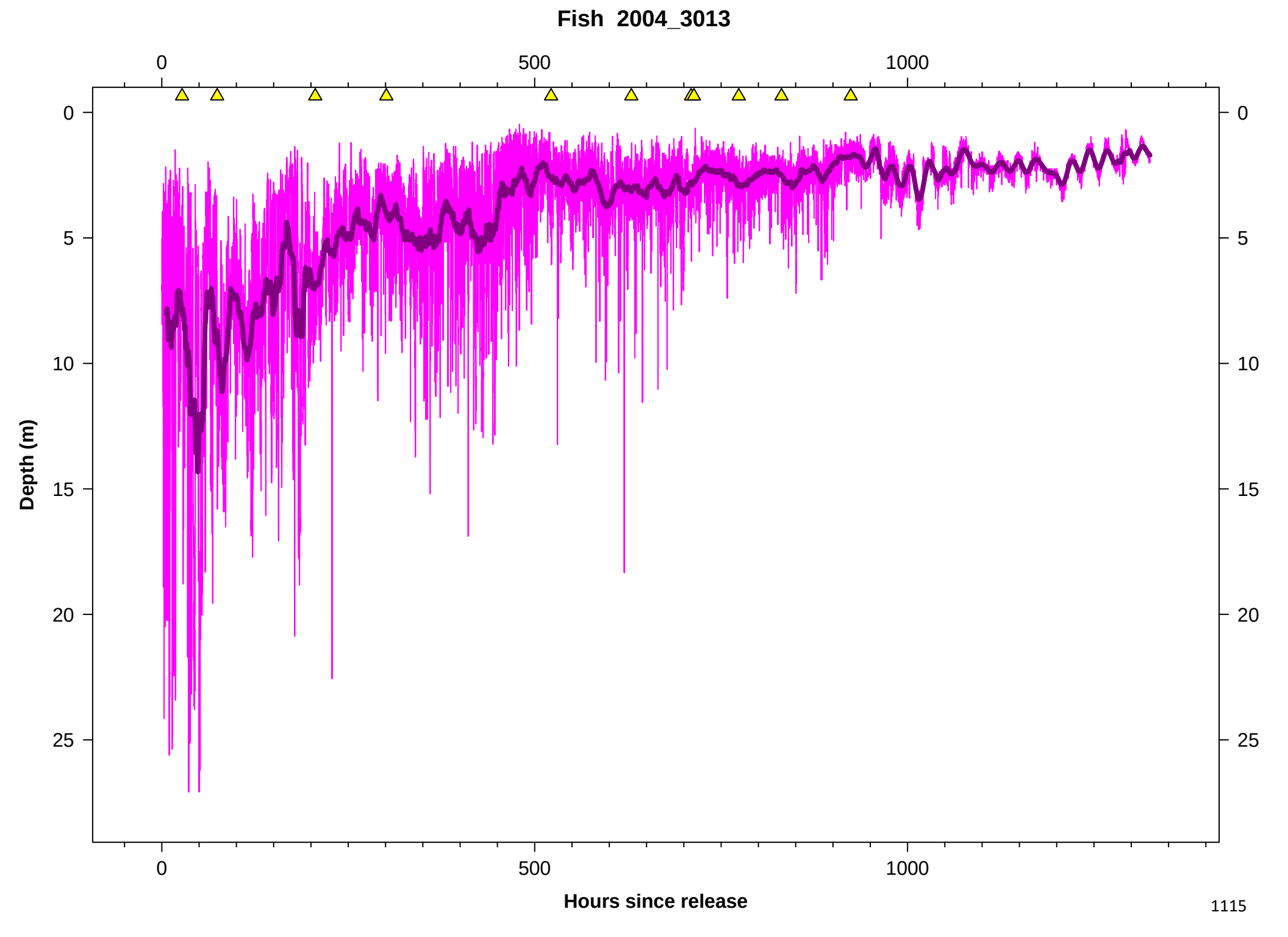

Fish 2003_3103
0
500
1000
1500
20
18
16
14
12
10
Temperature (C)
Hours since release
1110

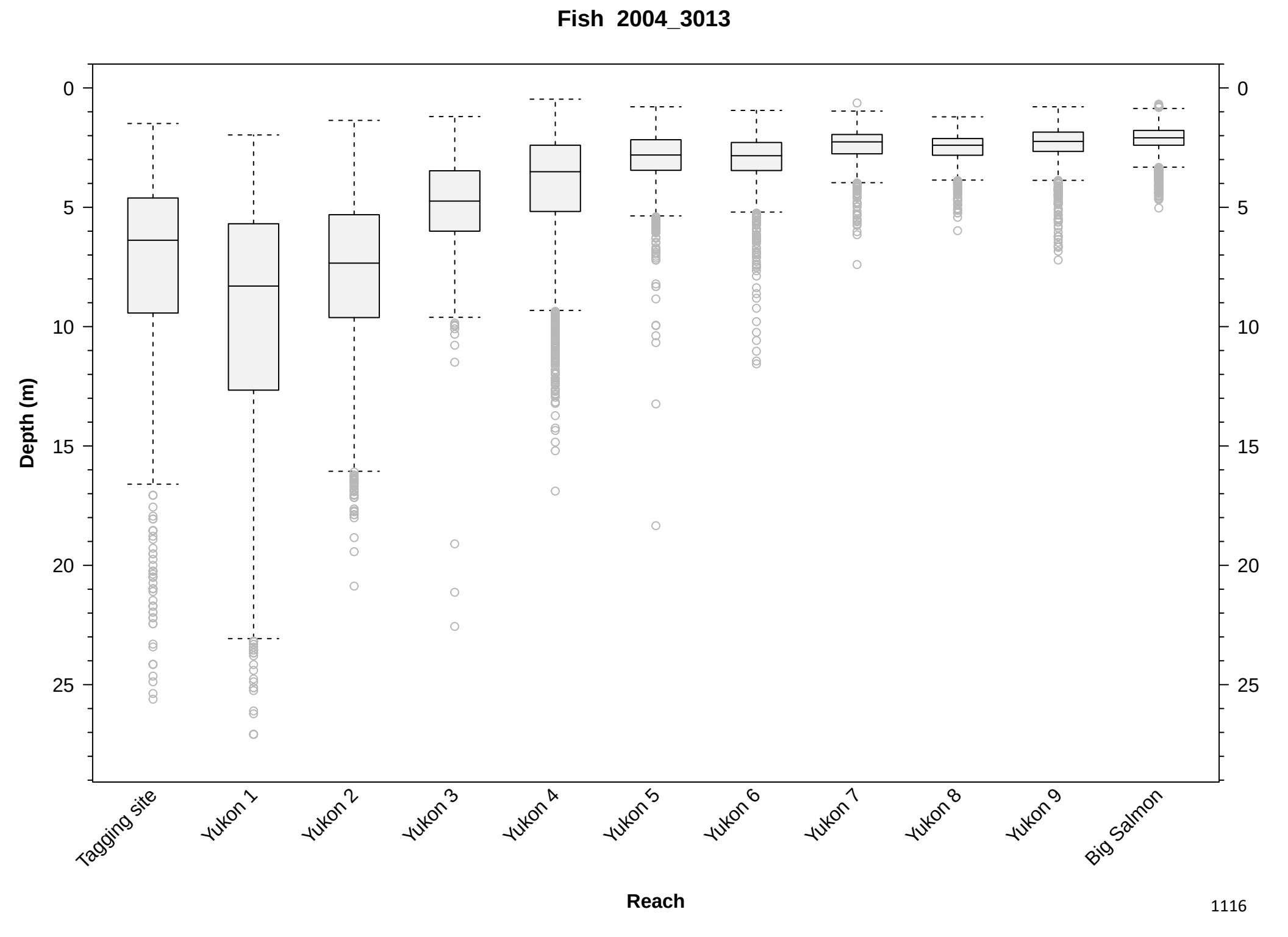

Fish 2003_3103
Temperature (C)
18
16
14
12
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Reach
1111

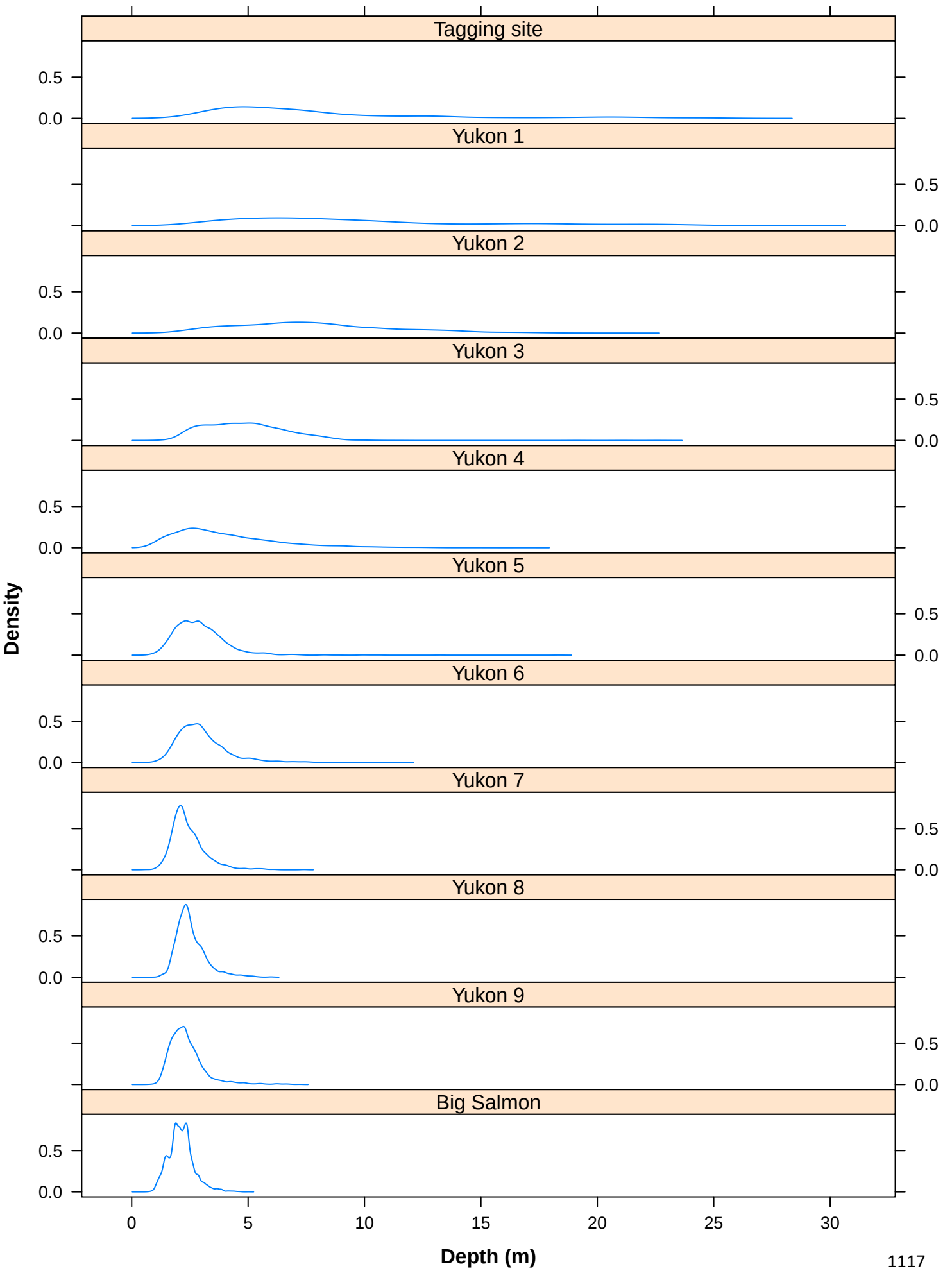

Fish 2003_3103
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Density
Temperature (C)
8
10
12
14
16
18
20
0
5
1112

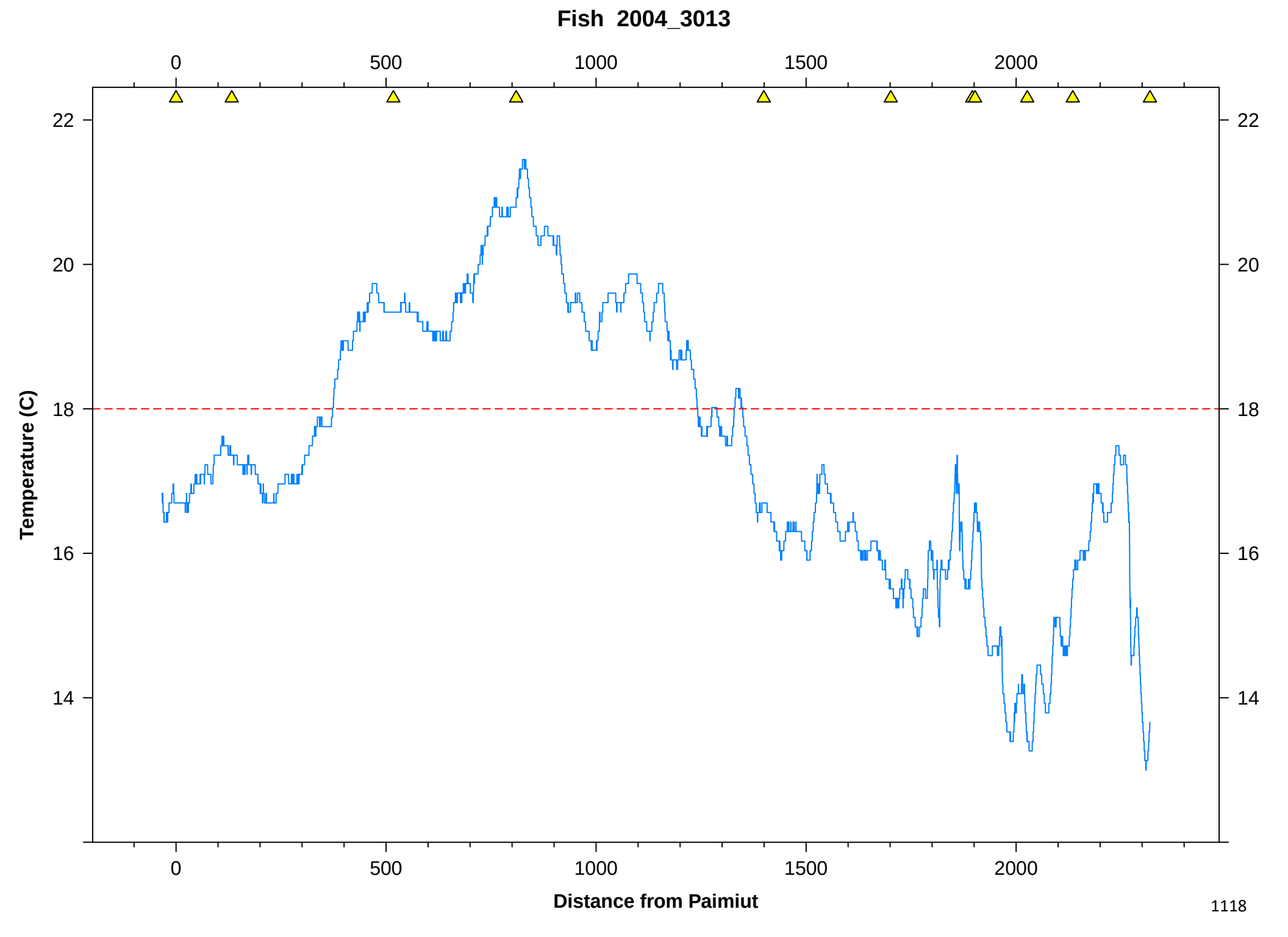

Fish 2003_3103
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Depth (m)
Temperature (C)
10
12
14
16
18
20
0
10
20

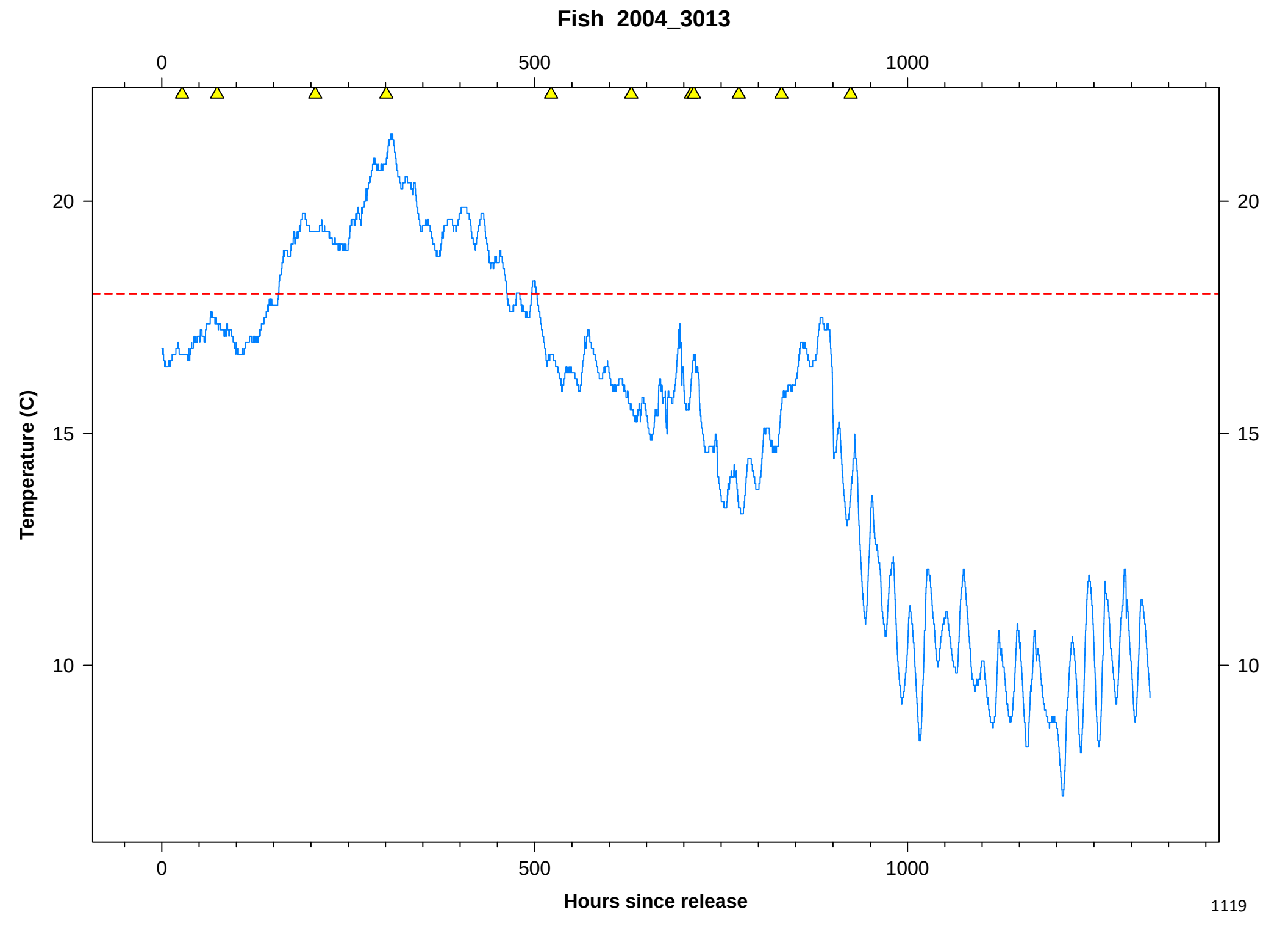

Fish 2004_3013
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
1114

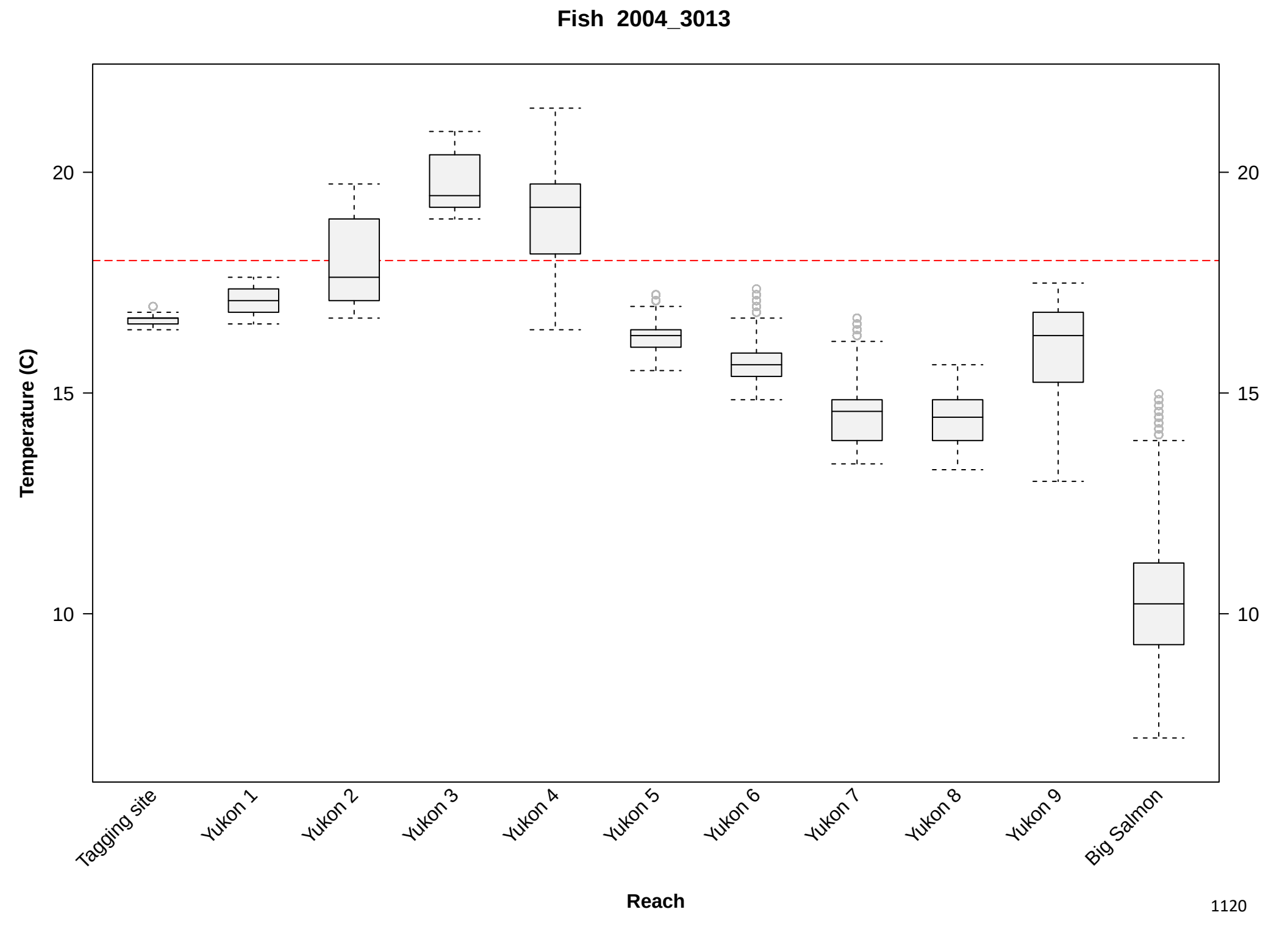

Fish 2004_3013
0
500
1000
0
5
10
15
20
25
Depth (m)
Hours since release
1115

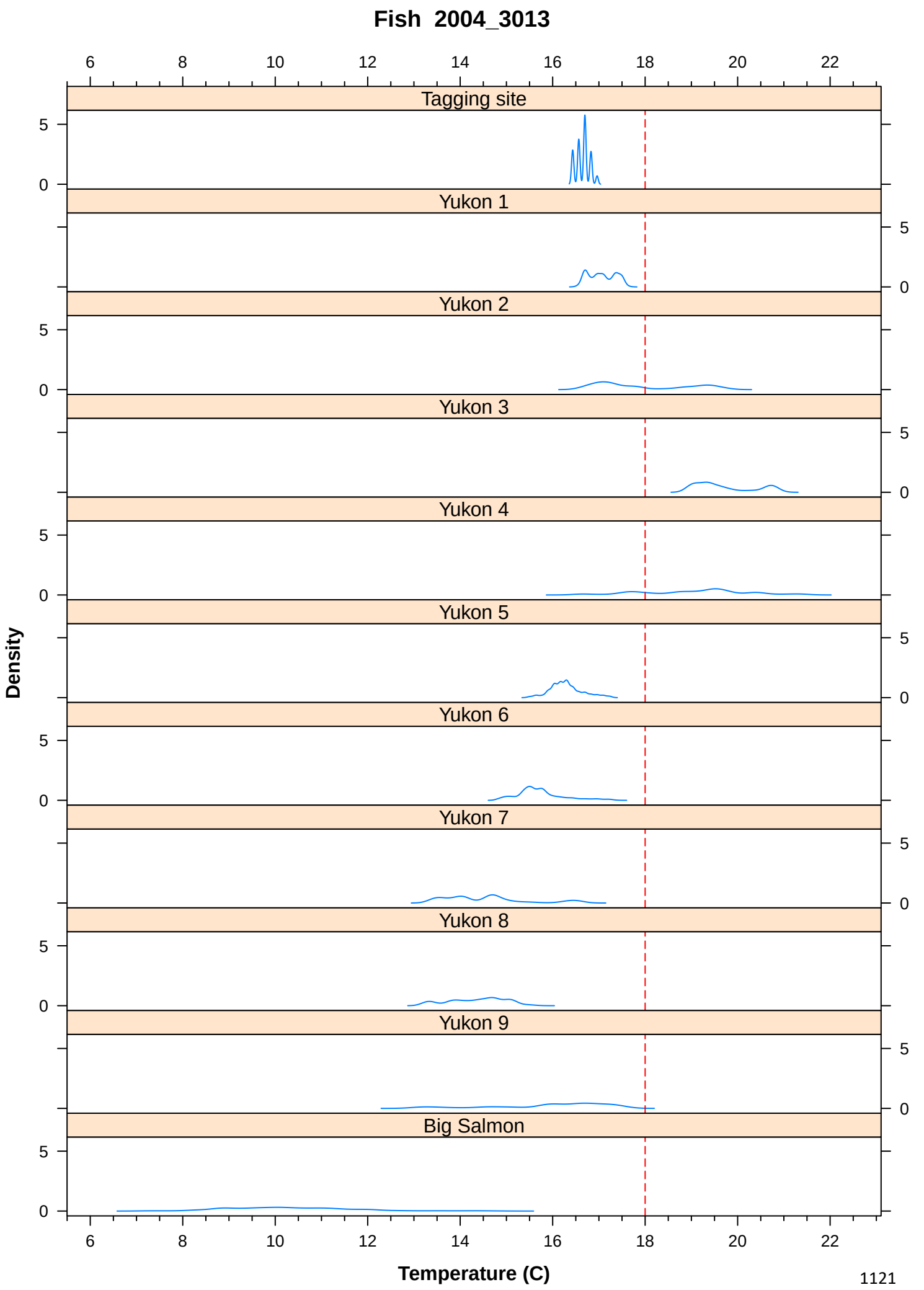

Fish 2004_3013
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Reach
1116

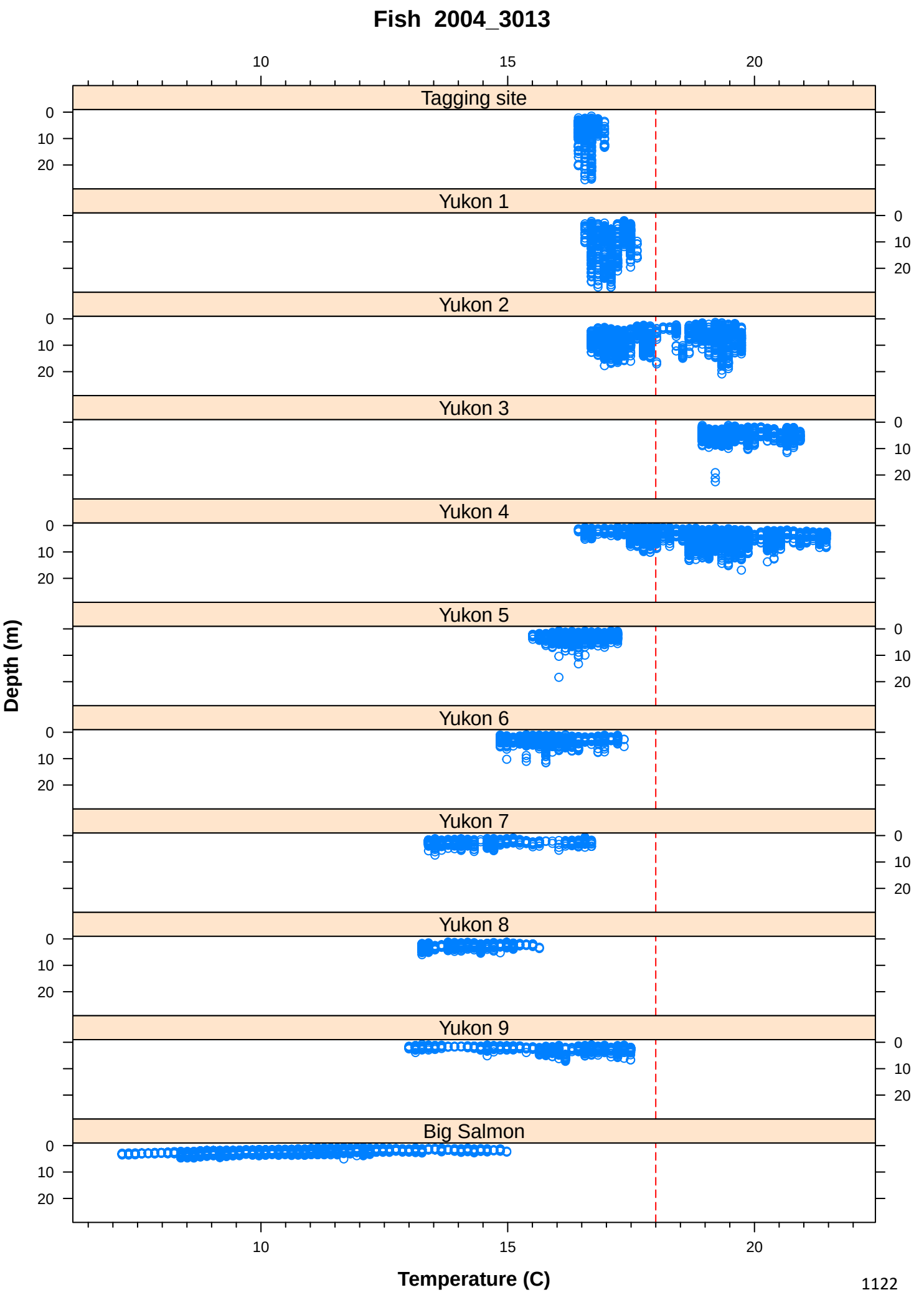

Fish 2004_3013
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Density
0.5
0.0
0
5
10
15
20
25
30
Depth (m)
1117

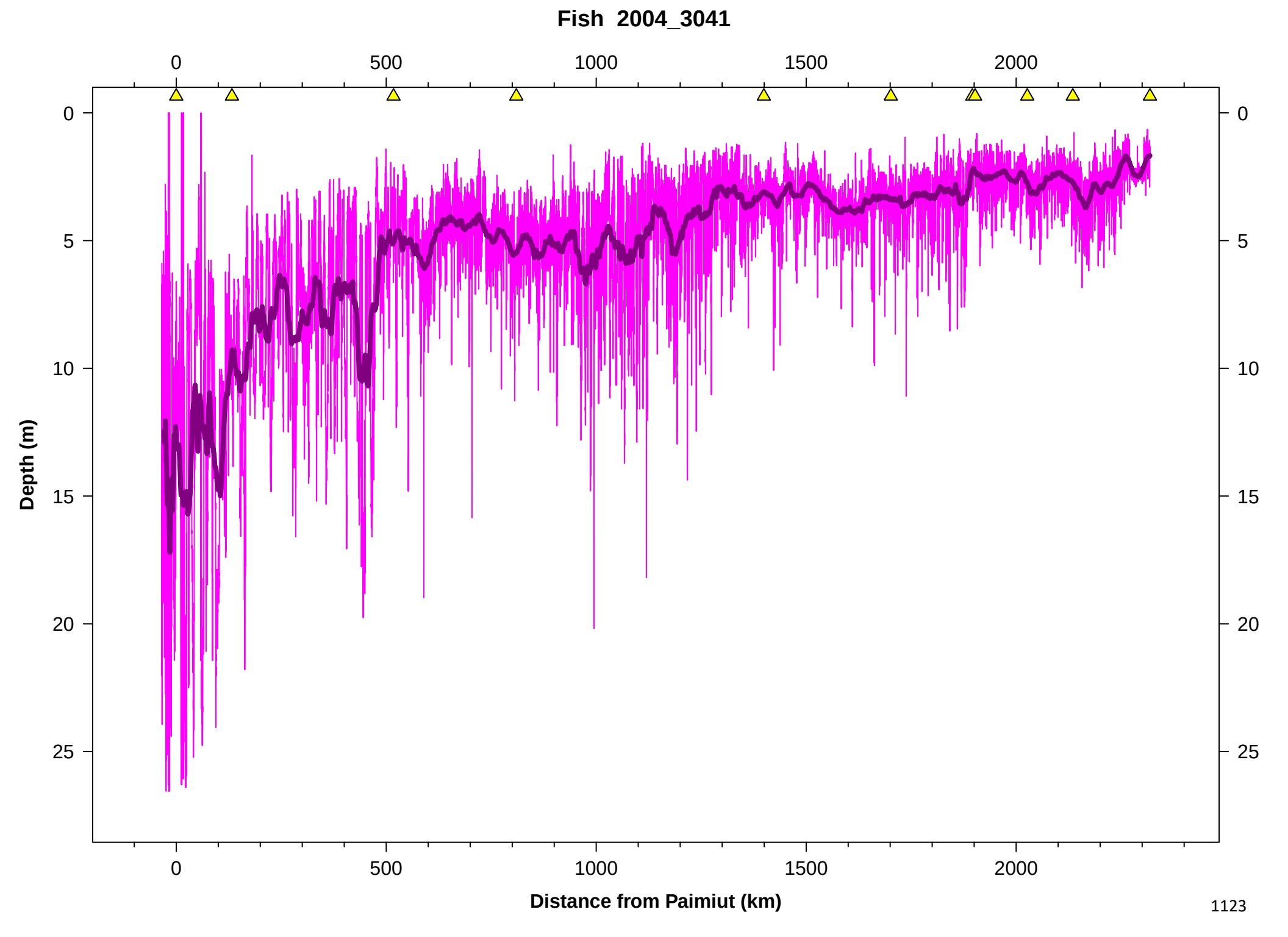

Fish 2004_3013
0
500
1000
1500
2000
22
20
18
16
14
Temperature (C)
Distance from Paimiut
1118

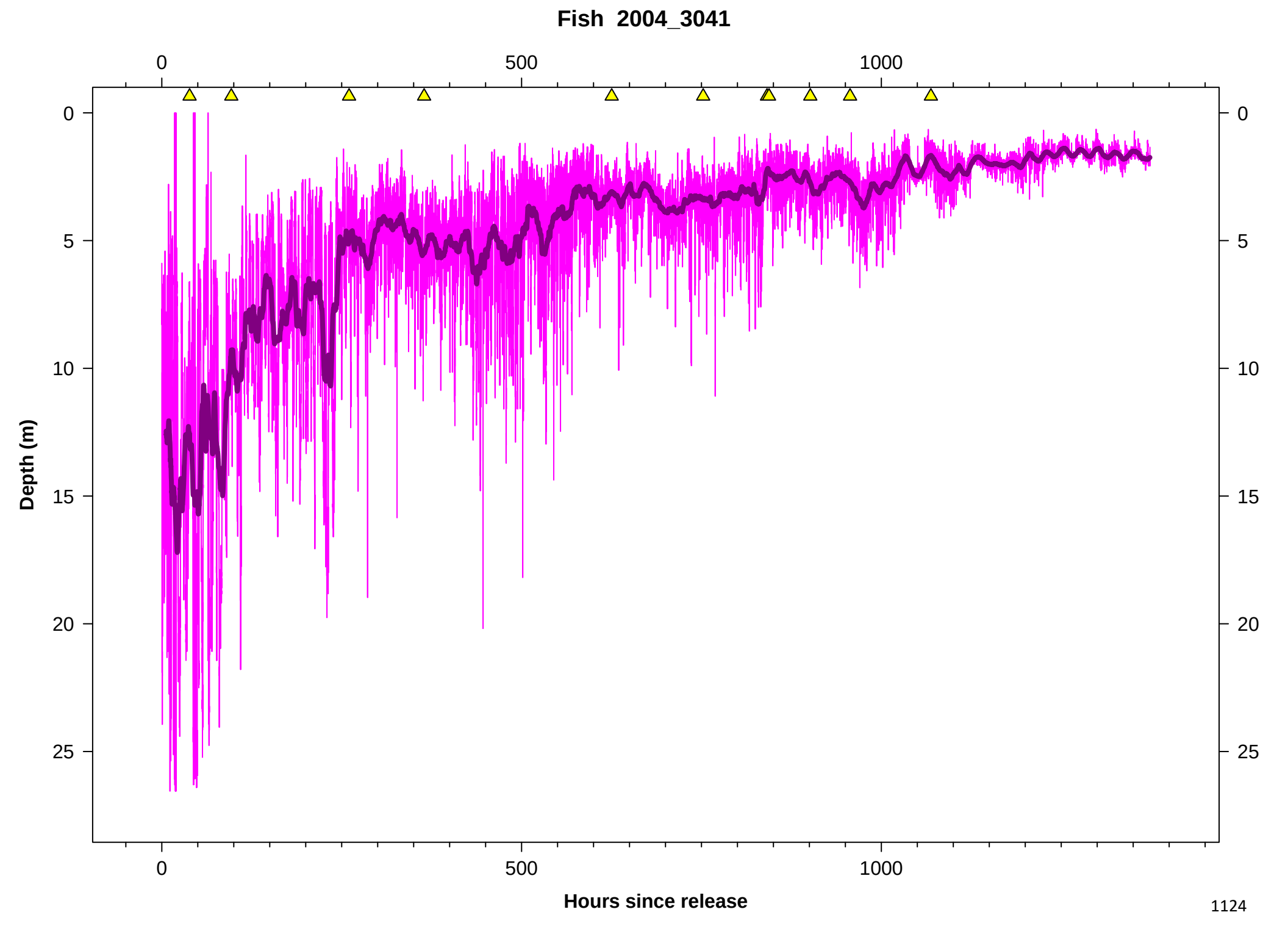

Fish 2004_3013
0
500
1000
20
15
10
Temperature (C)
Hours since release
1119

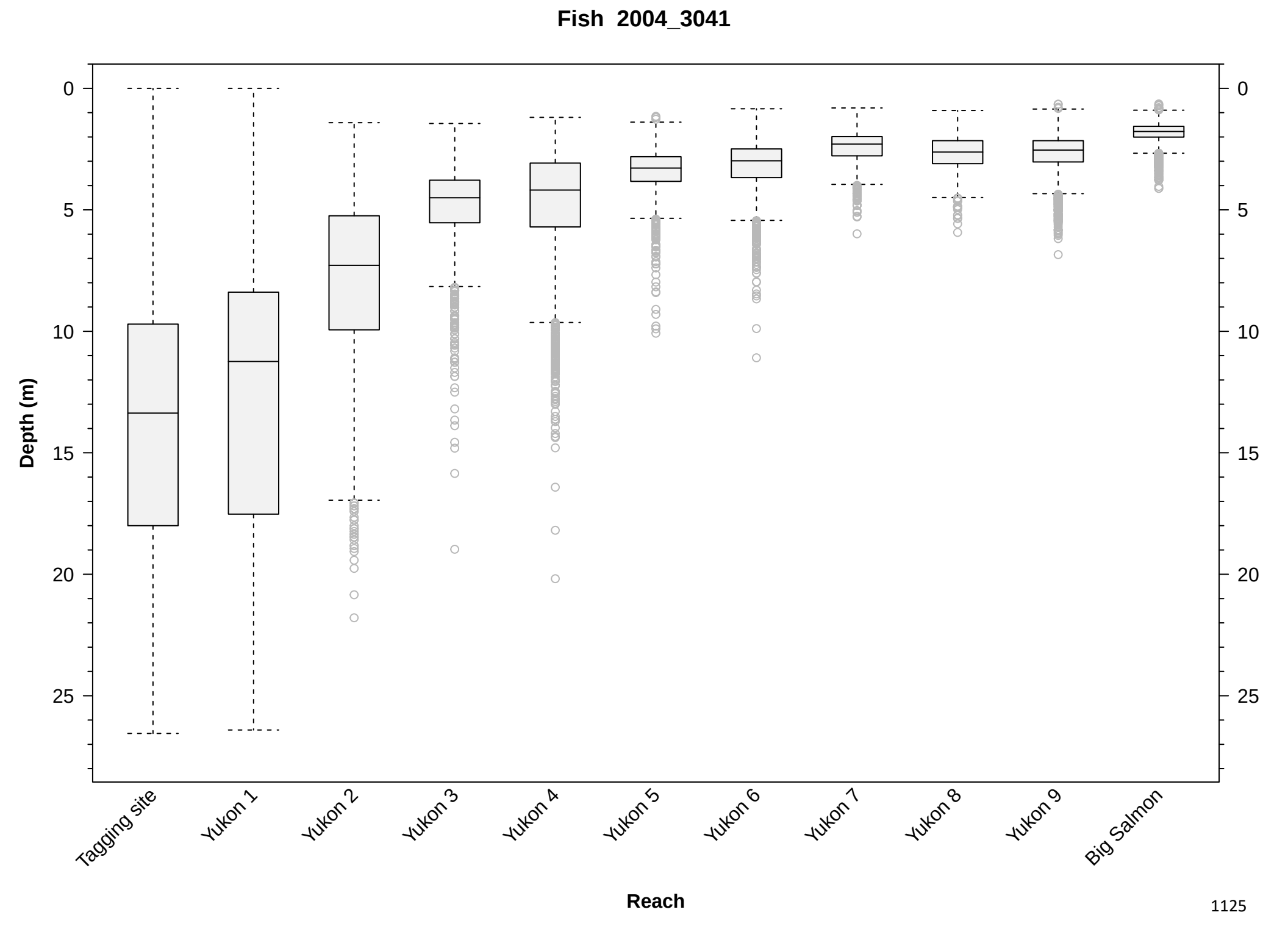

Fish 2004_3013
Temperature (C)
20
15
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Reach
1120

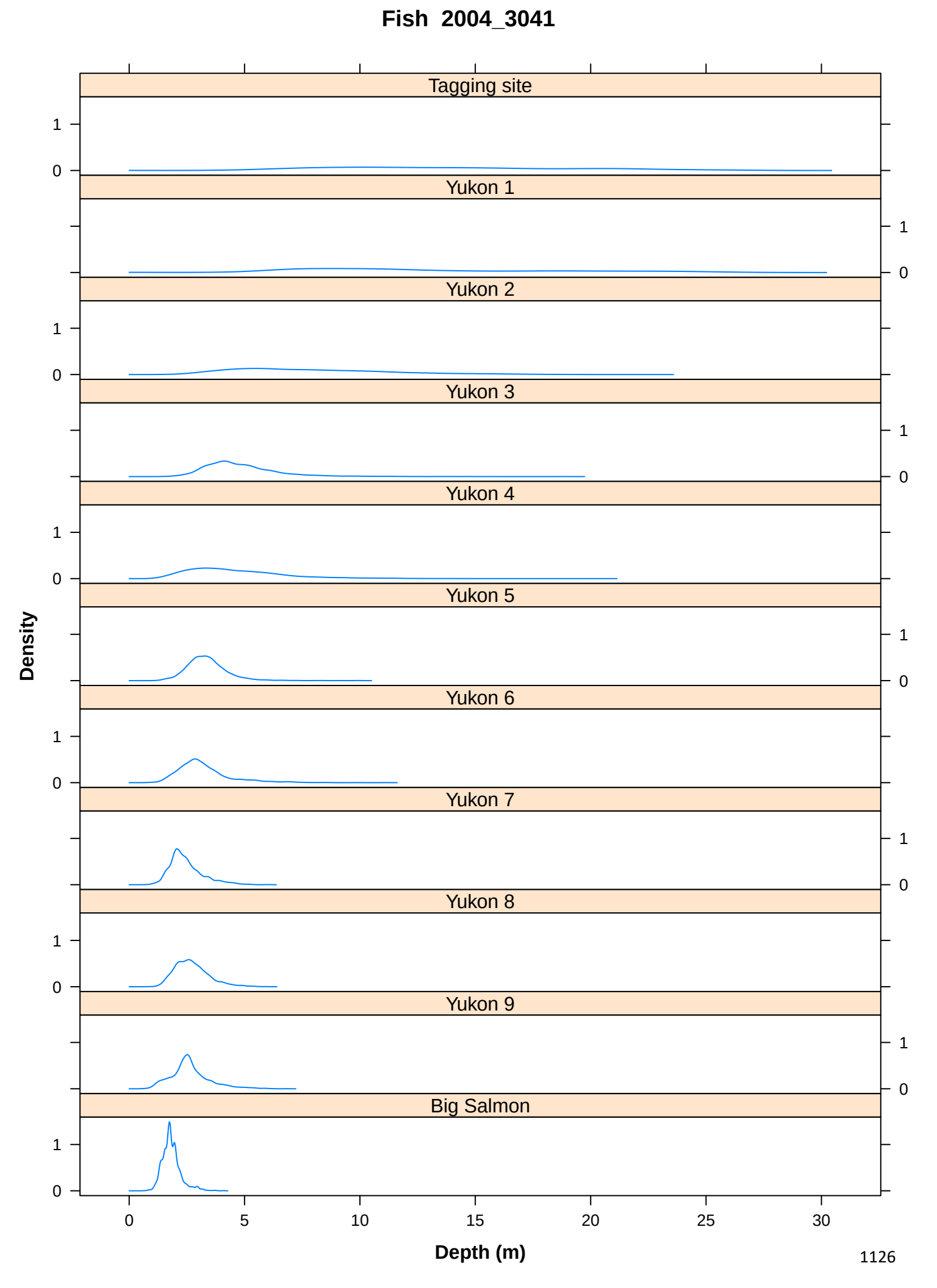

Fish 2004_3013
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Density
Temperature (C)
6
8
10
12
14
16
18
20
22
0
5
1121

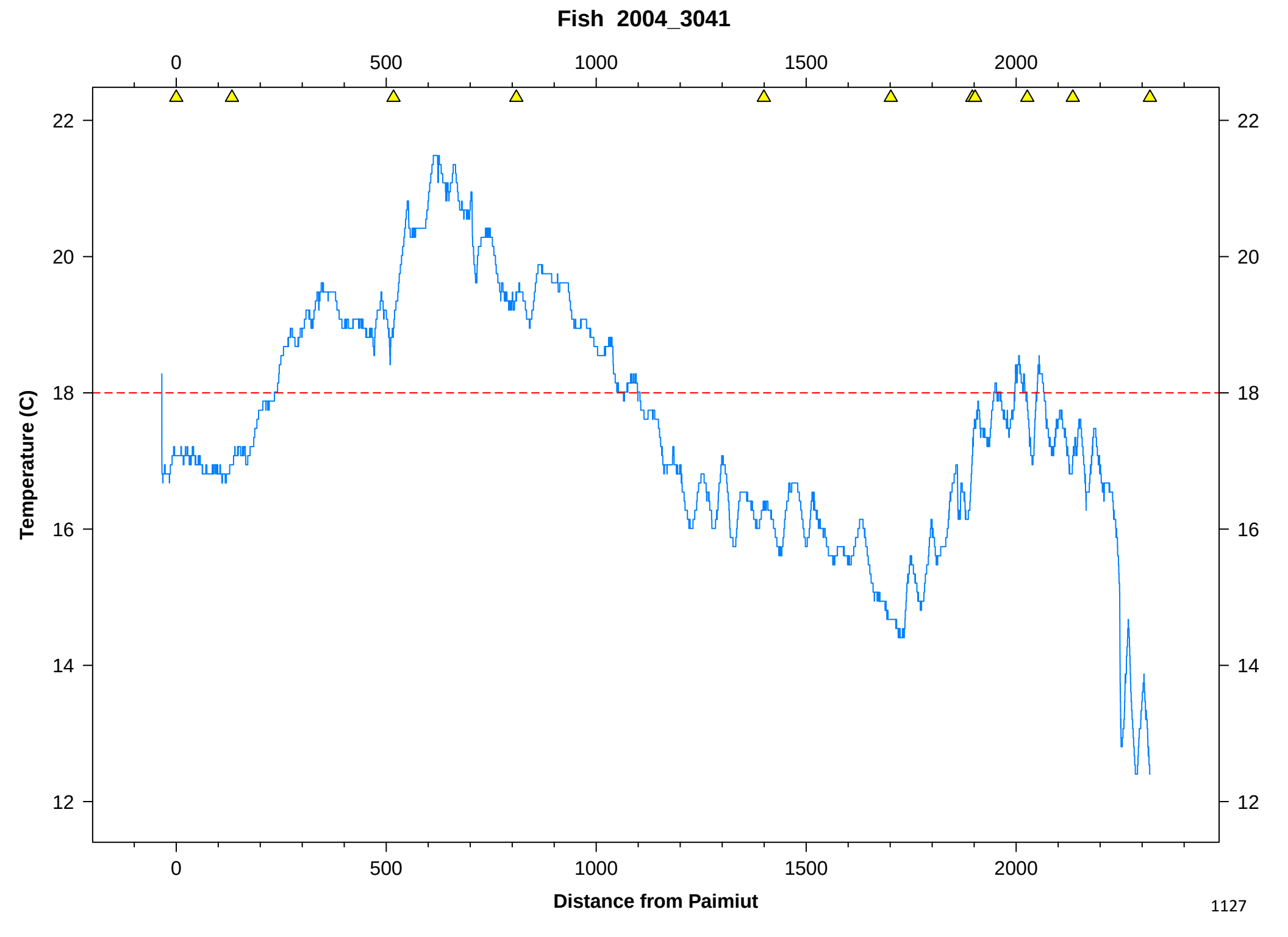

Fish 2004_3013
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Depth (m)
Temperature (C)
10
15
20
0
10
20
1122

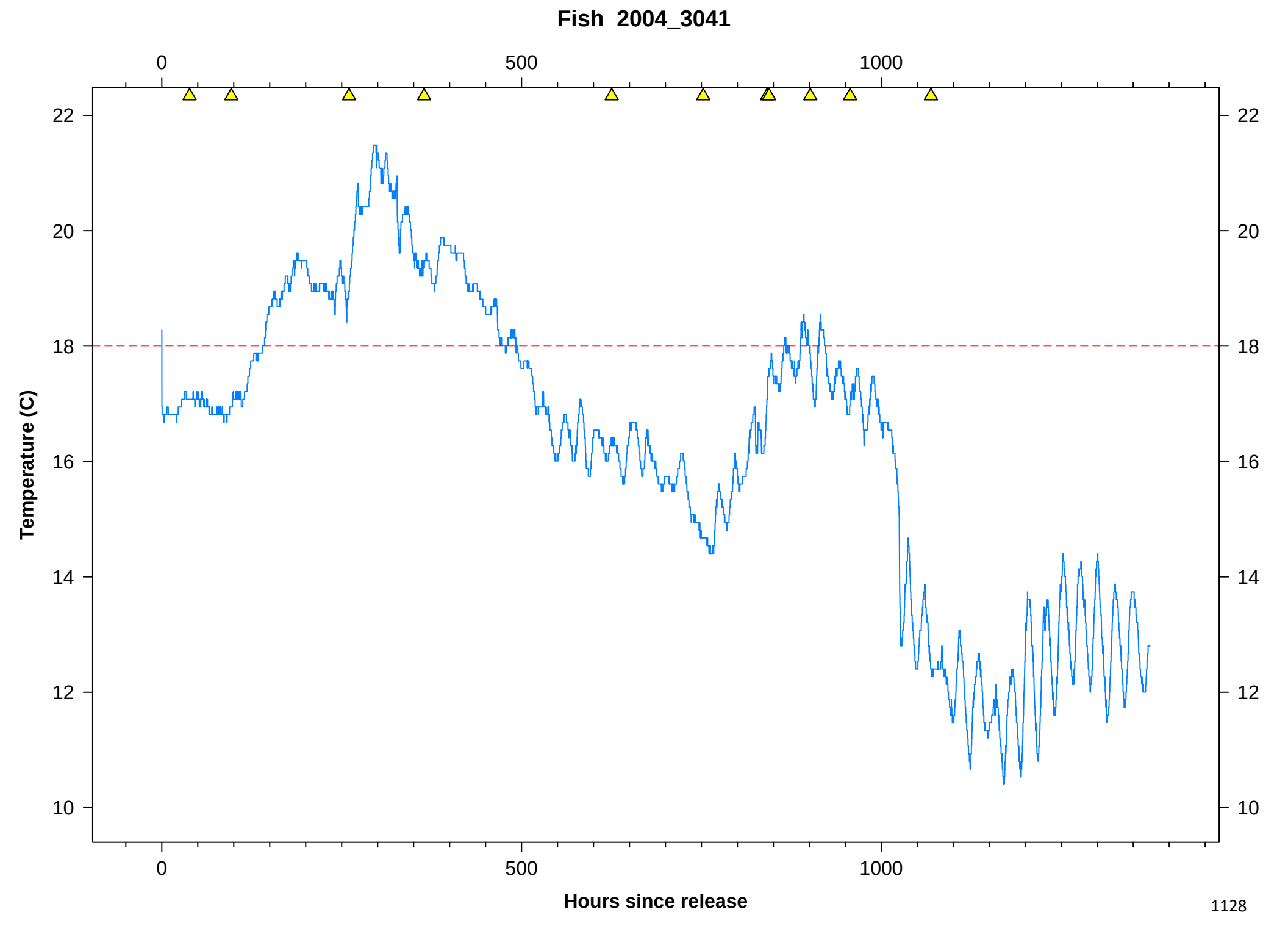

Fish 2004_3041
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
1123

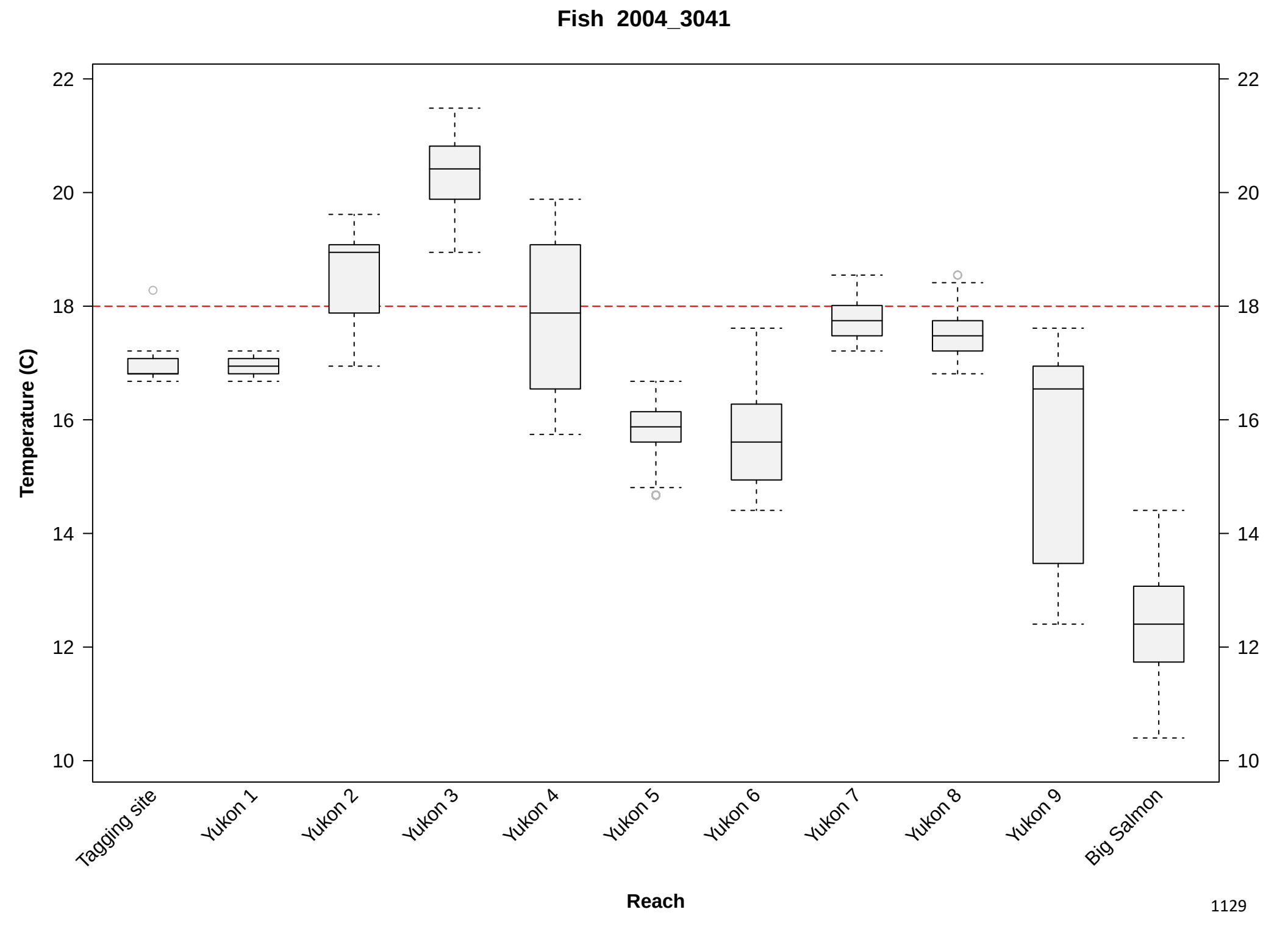

Fish 2004_3041
0
500
1000
0
5
10
15
20
25
Depth (m)
Hours since release
1124

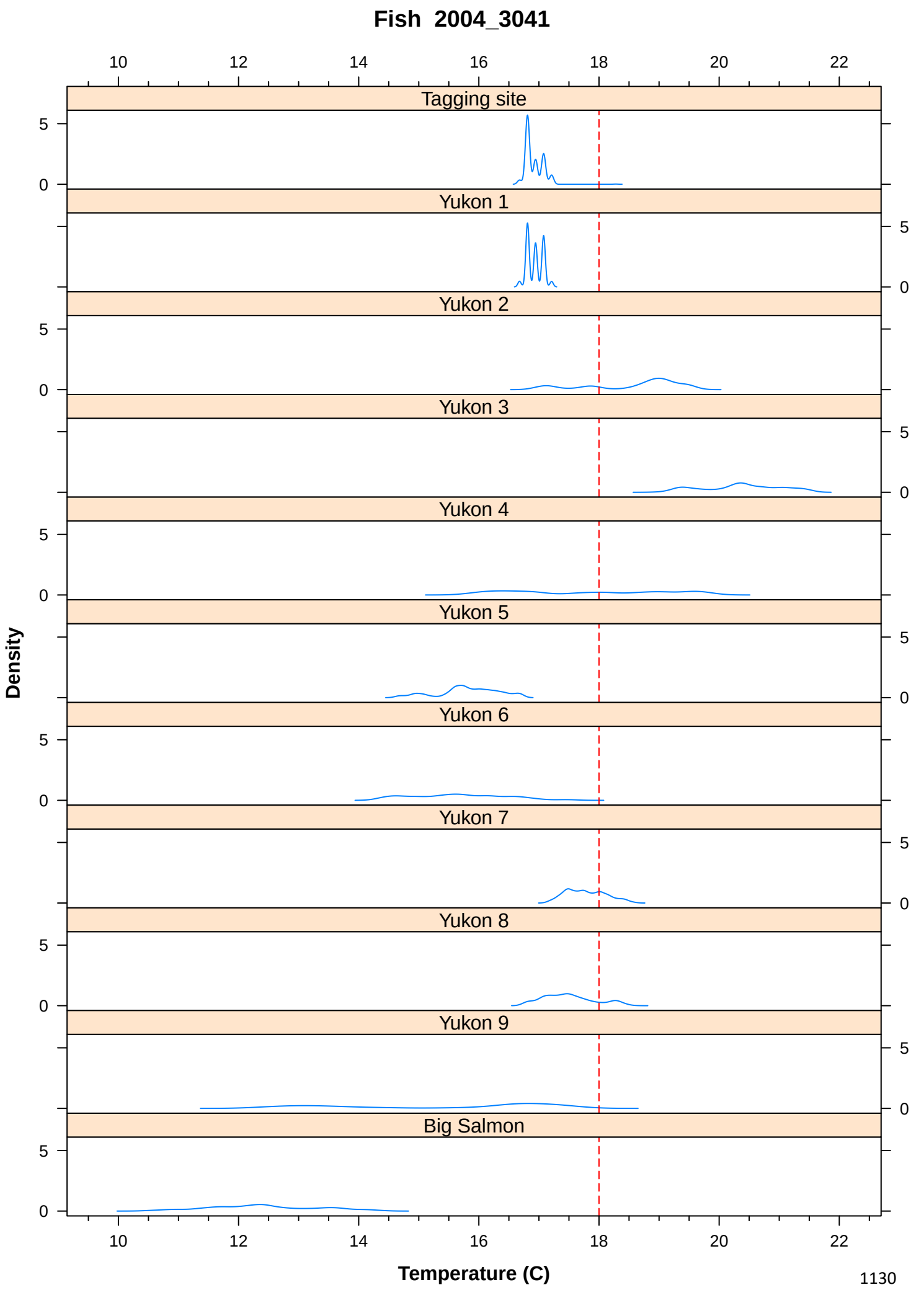

Fish 2004_3041
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Reach

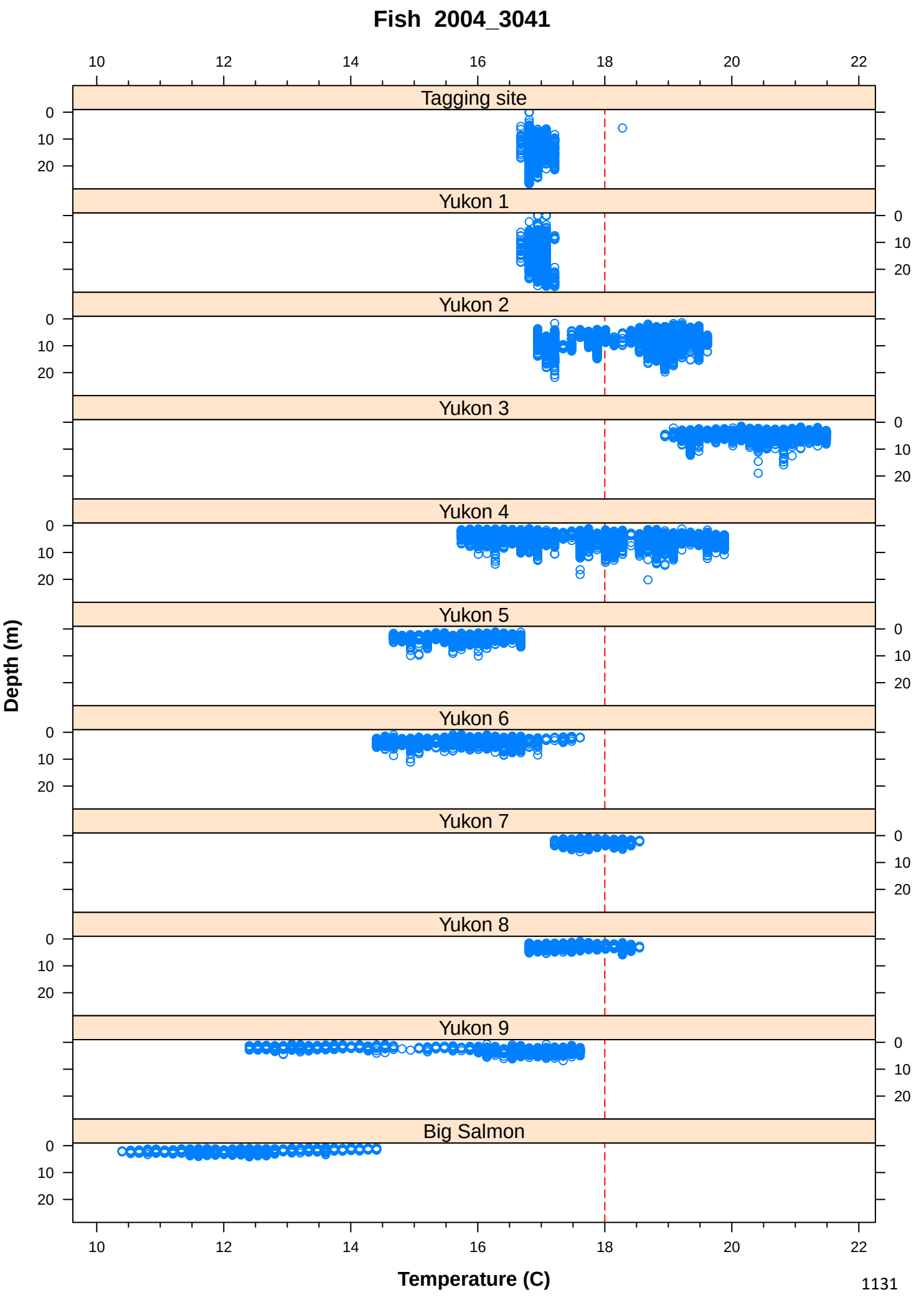

Fish 2004_3041
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Density
0
1
0
5
10
15
20
25
30
Depth (m)
1126


Fish 2004_3041
0
500
1000
1500
2000
22
20
18
16
14
12
Temperature (C)
Distance from Paimiut
1127

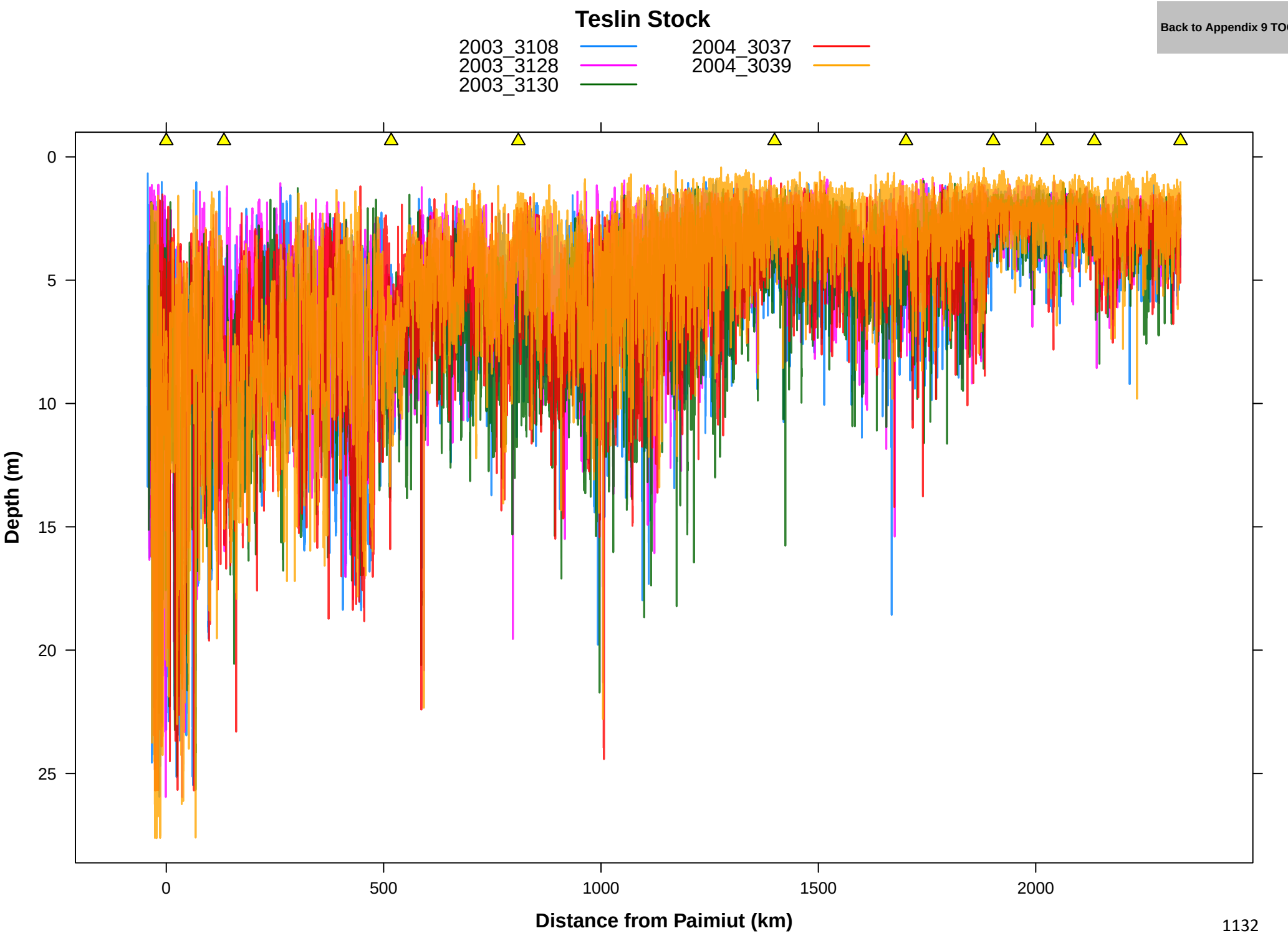

Fish 2004_3041
0
500
1000
22
20
18
16
14
12
10
Temperature (C)
Hours since release
1128

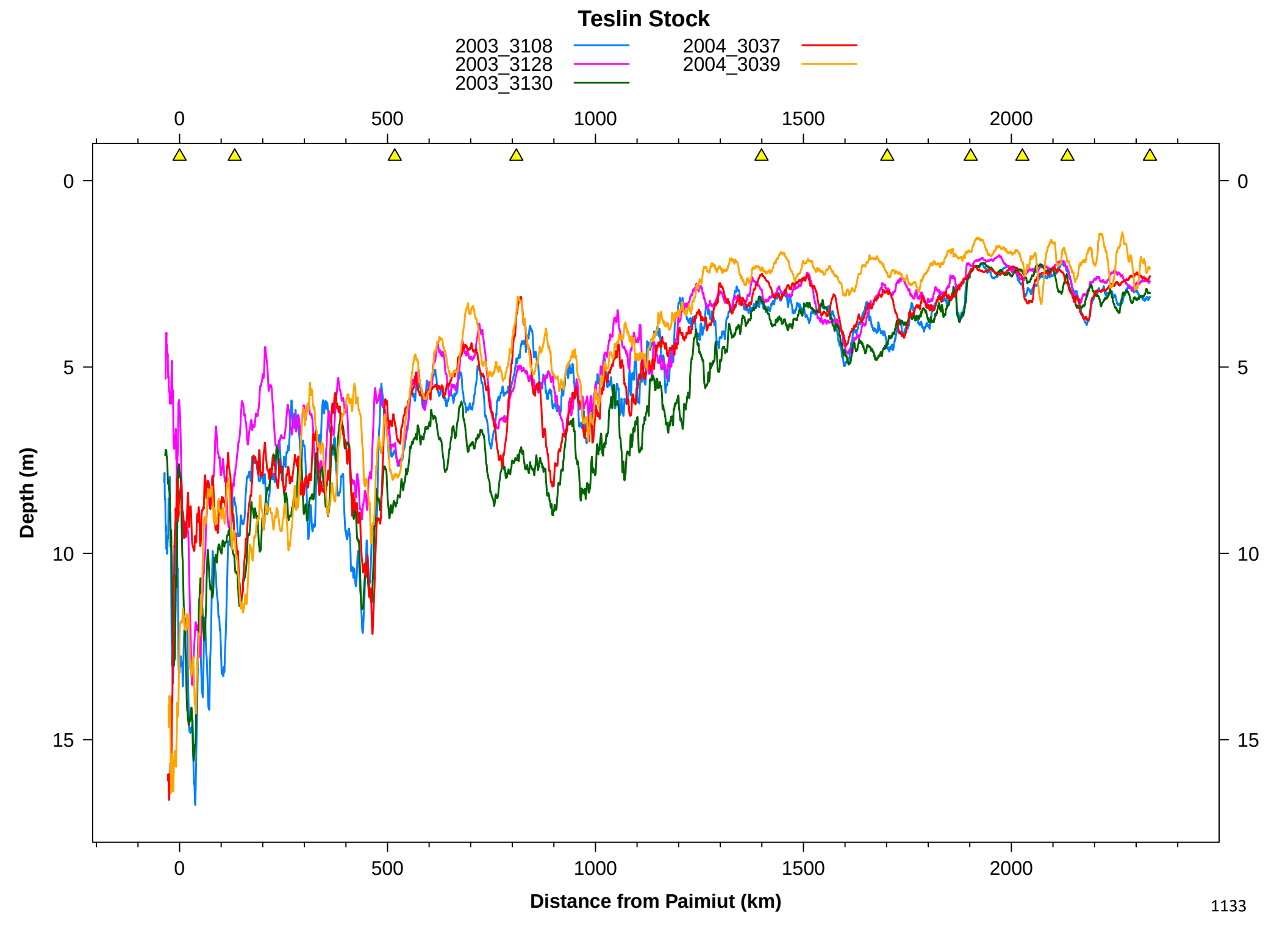

Fish 2004_3041
Temperature (C)
22
20
18
16
14
12
10
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Reach
1129

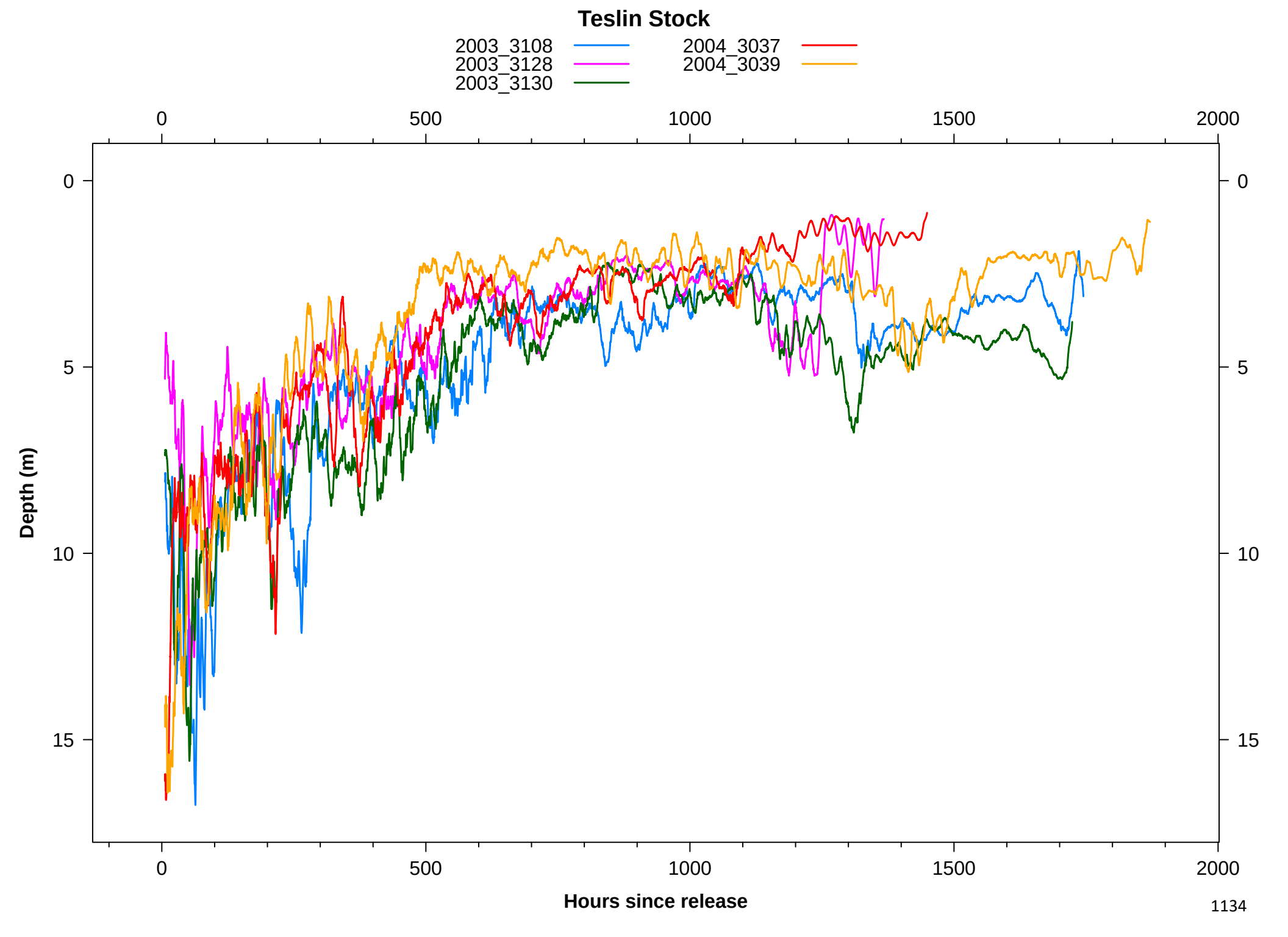

Fish 2004_3041
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Density
Temperature (C)
10
12
14
16
18
20
22
0
5
1130

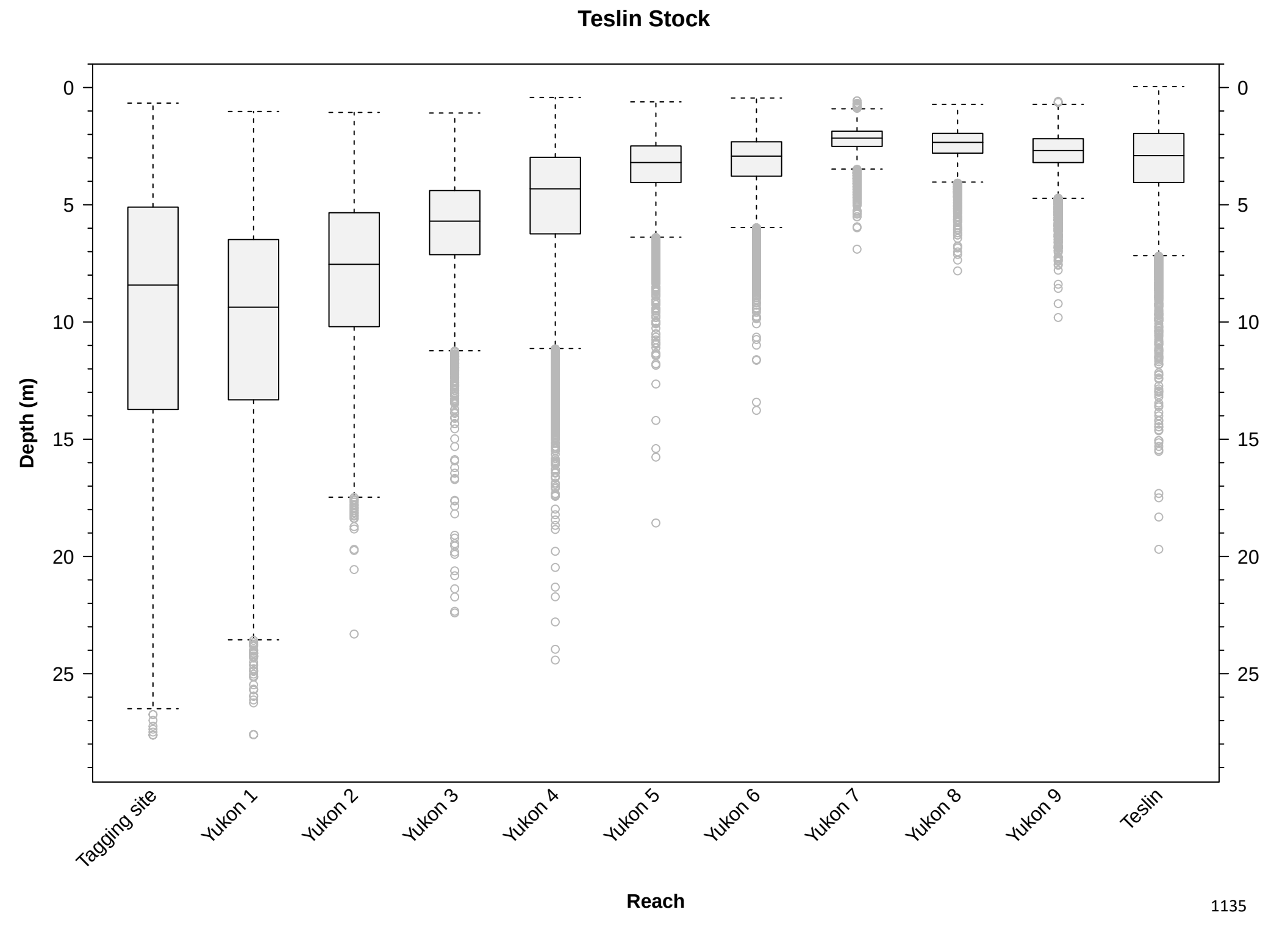

Fish 2004_3041
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Big Salmon
Depth (m)
Temperature (C)
10
12
14
16
18
20
22
0
10
20
1131

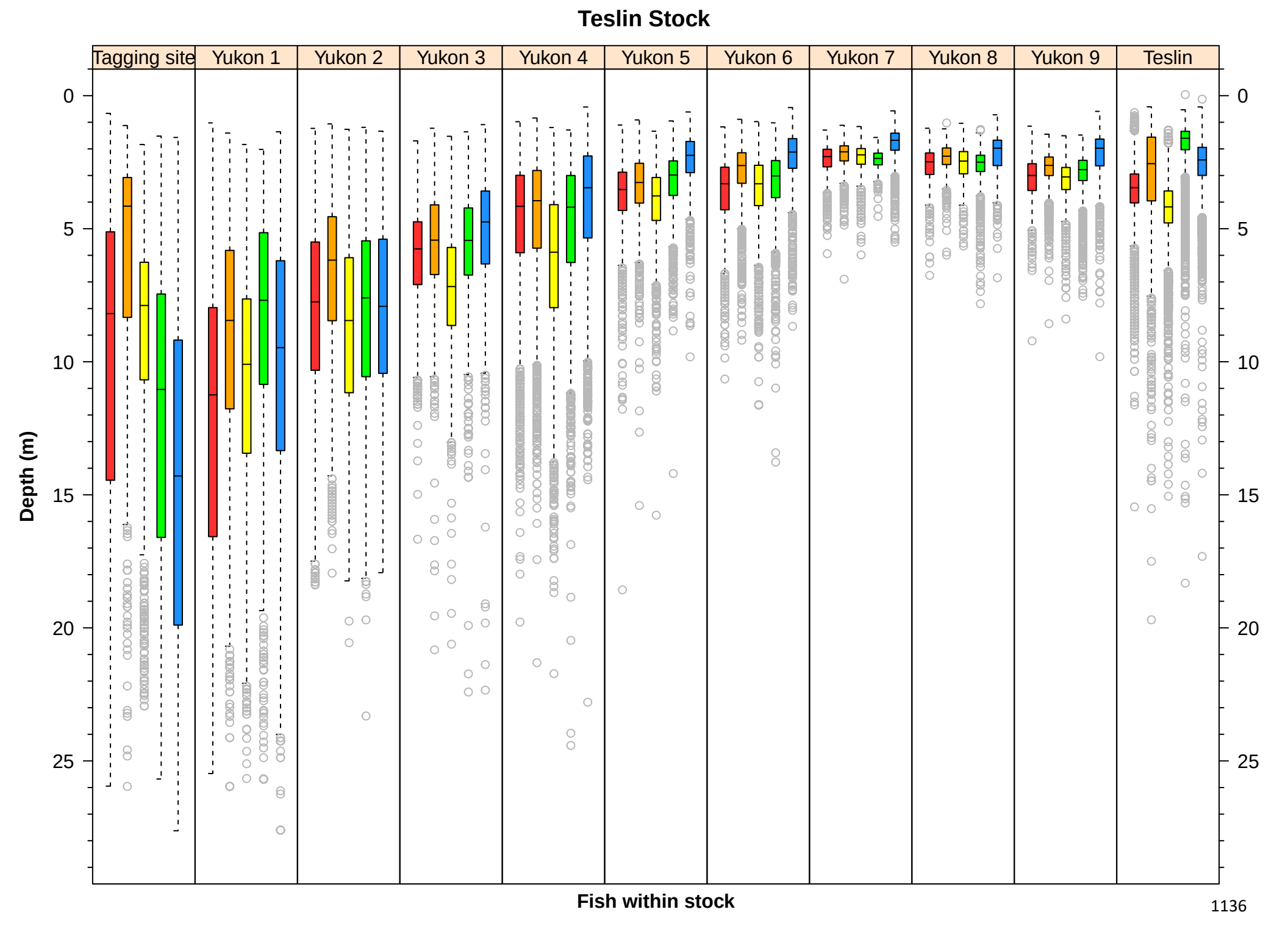
Back to Appendix 9 TOC

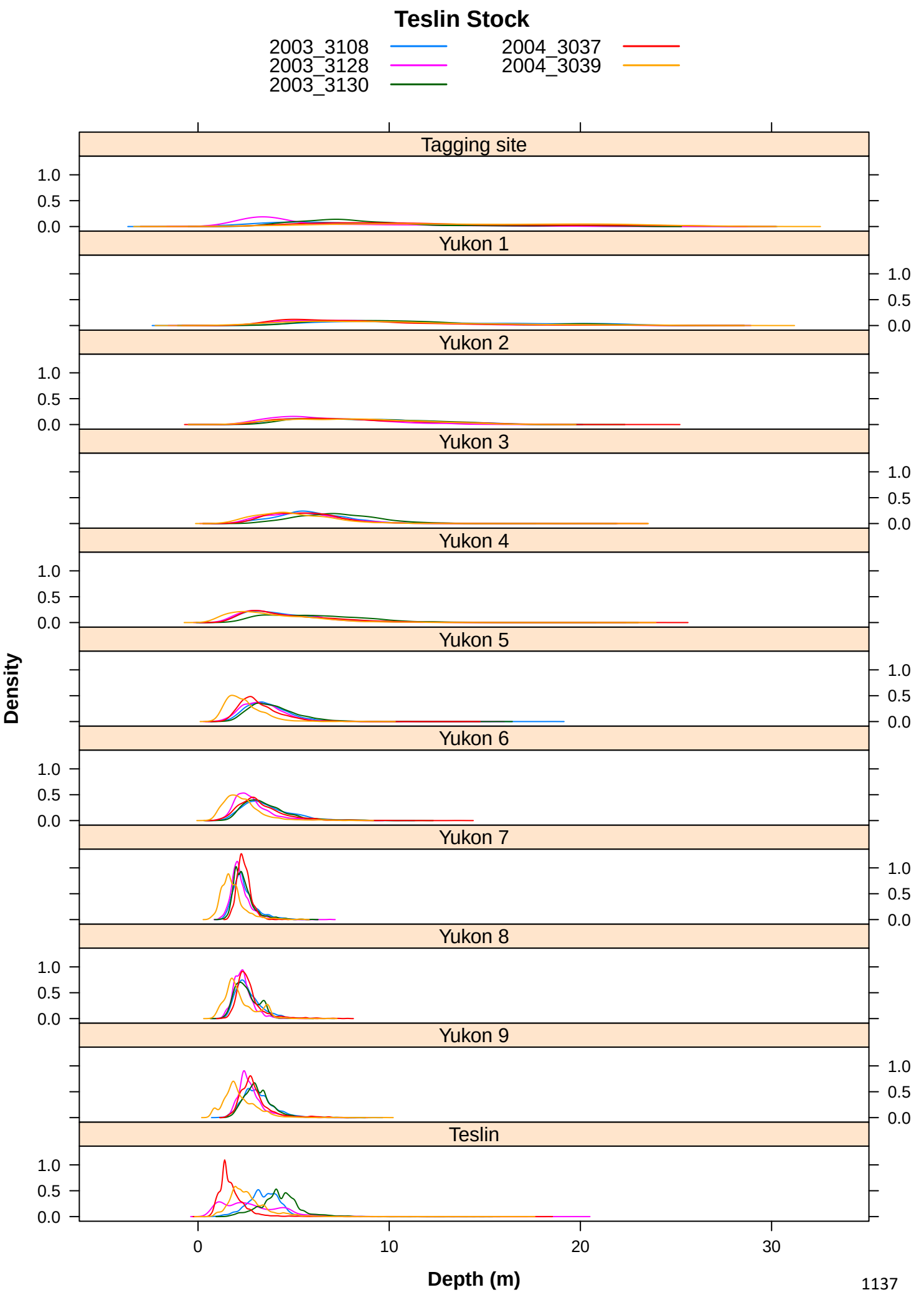


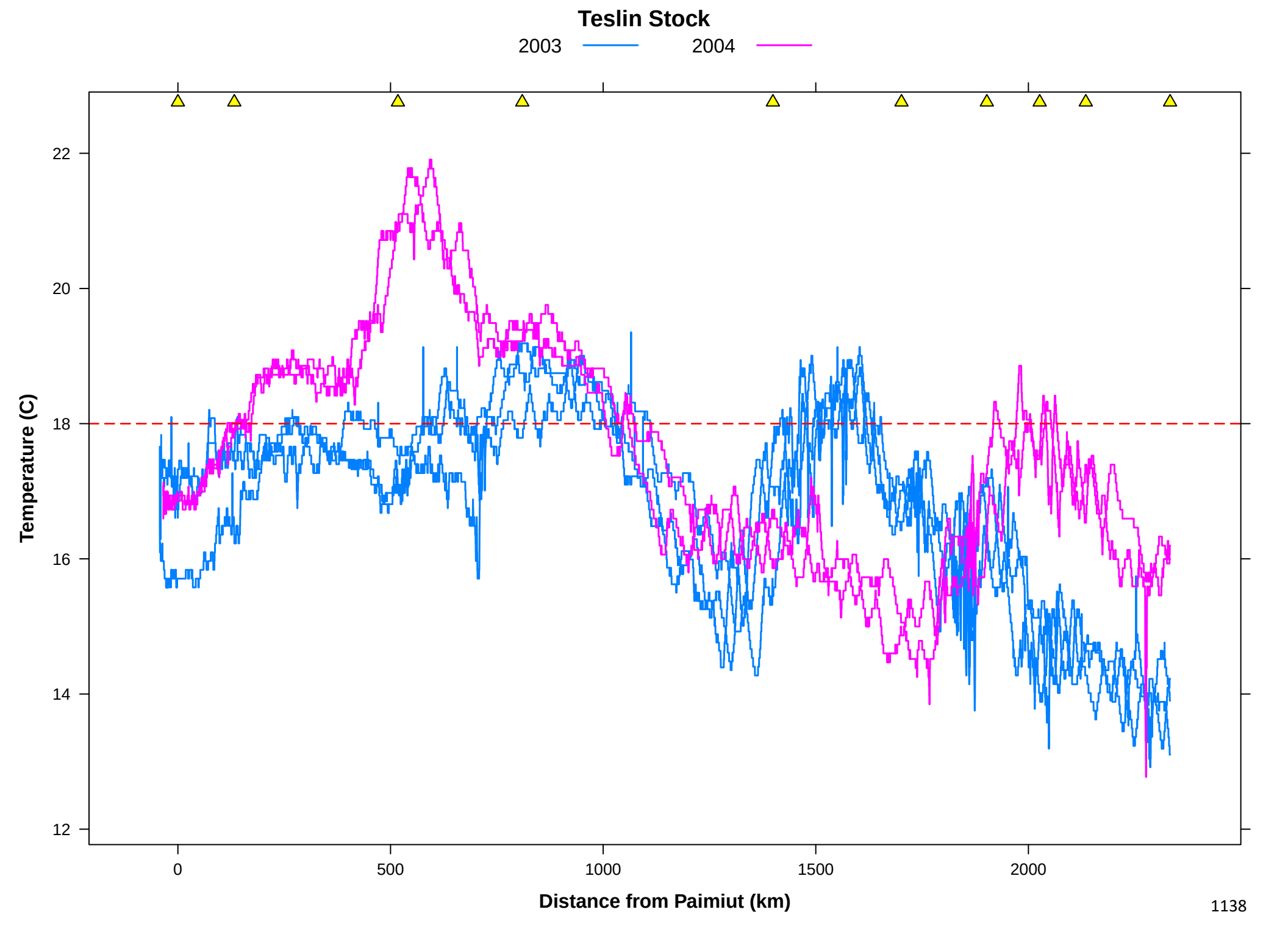

Teslin Stock
2003_3108
2003_3128
2003_3130
2004_3037
2004_3039
0
500
1000
1500
2000
0
5
10
15
Depth (m)
Distance from Paimiut (km)

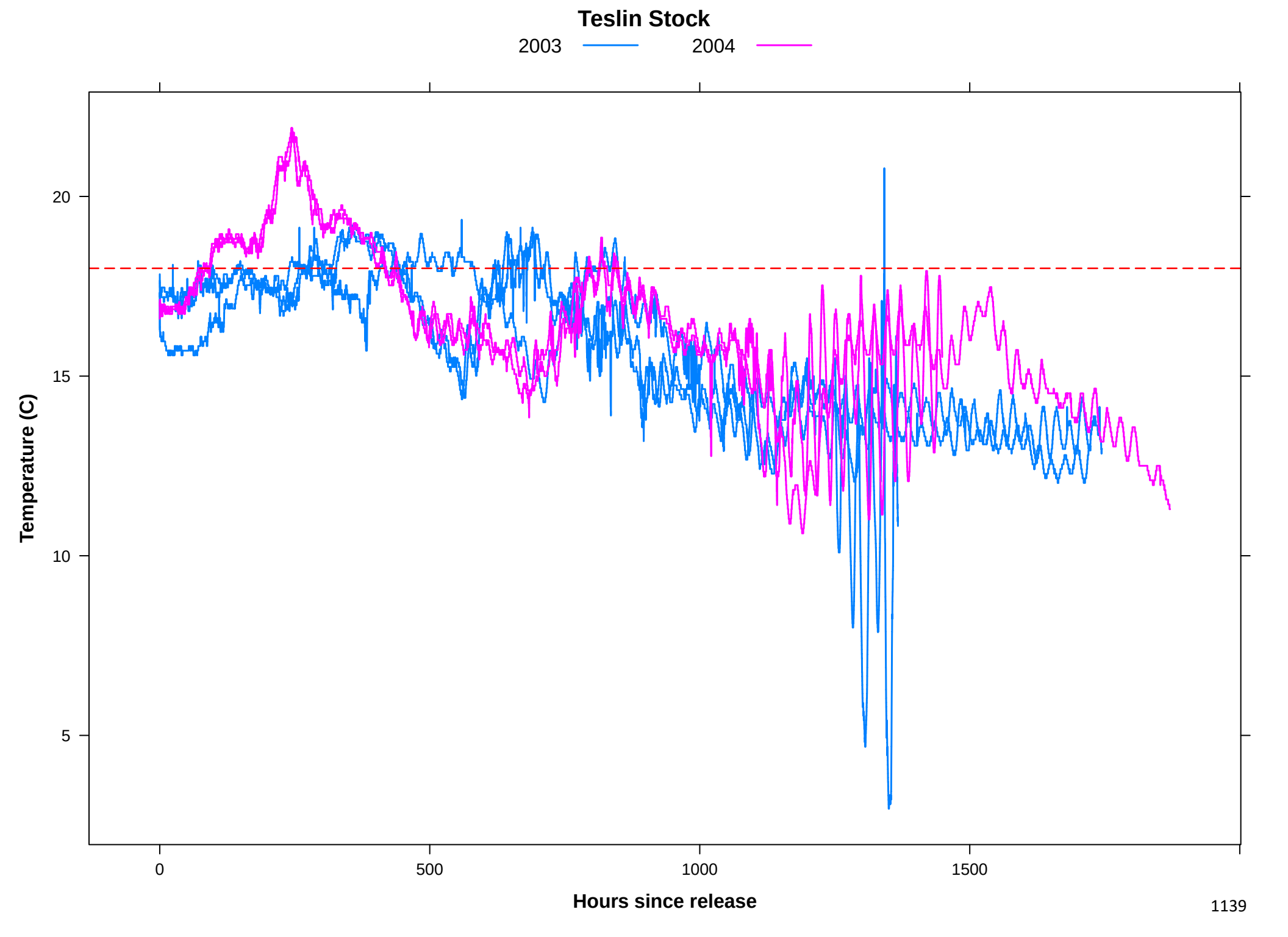

Teslin Stock
2003_3108
2003_3128
2003_3130
2004_3037
2004_3039
0
500
1000
1500
2000
0
5
10
15
Depth (m)
Hours since release

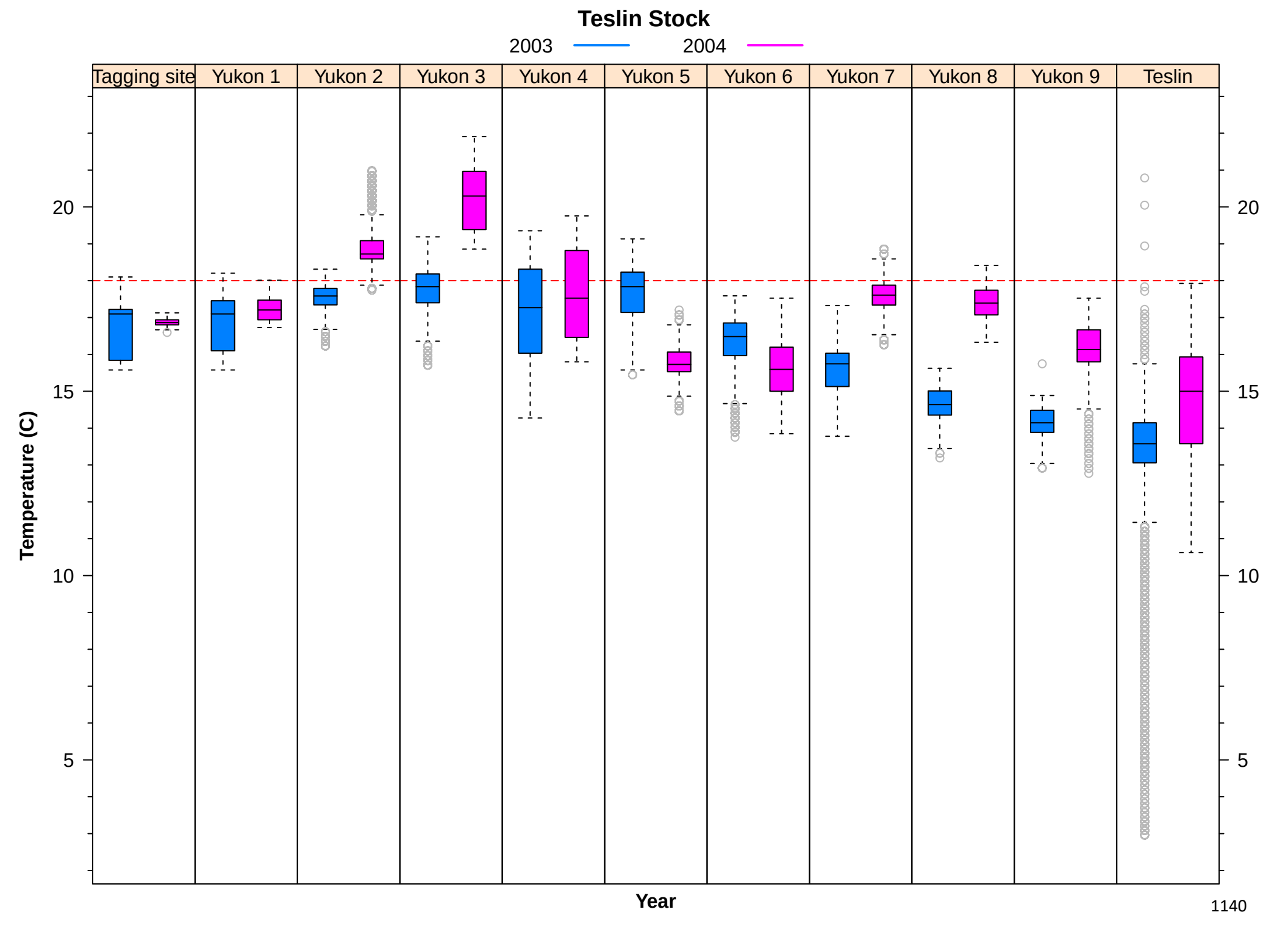

Teslin Stock
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Reach
1135

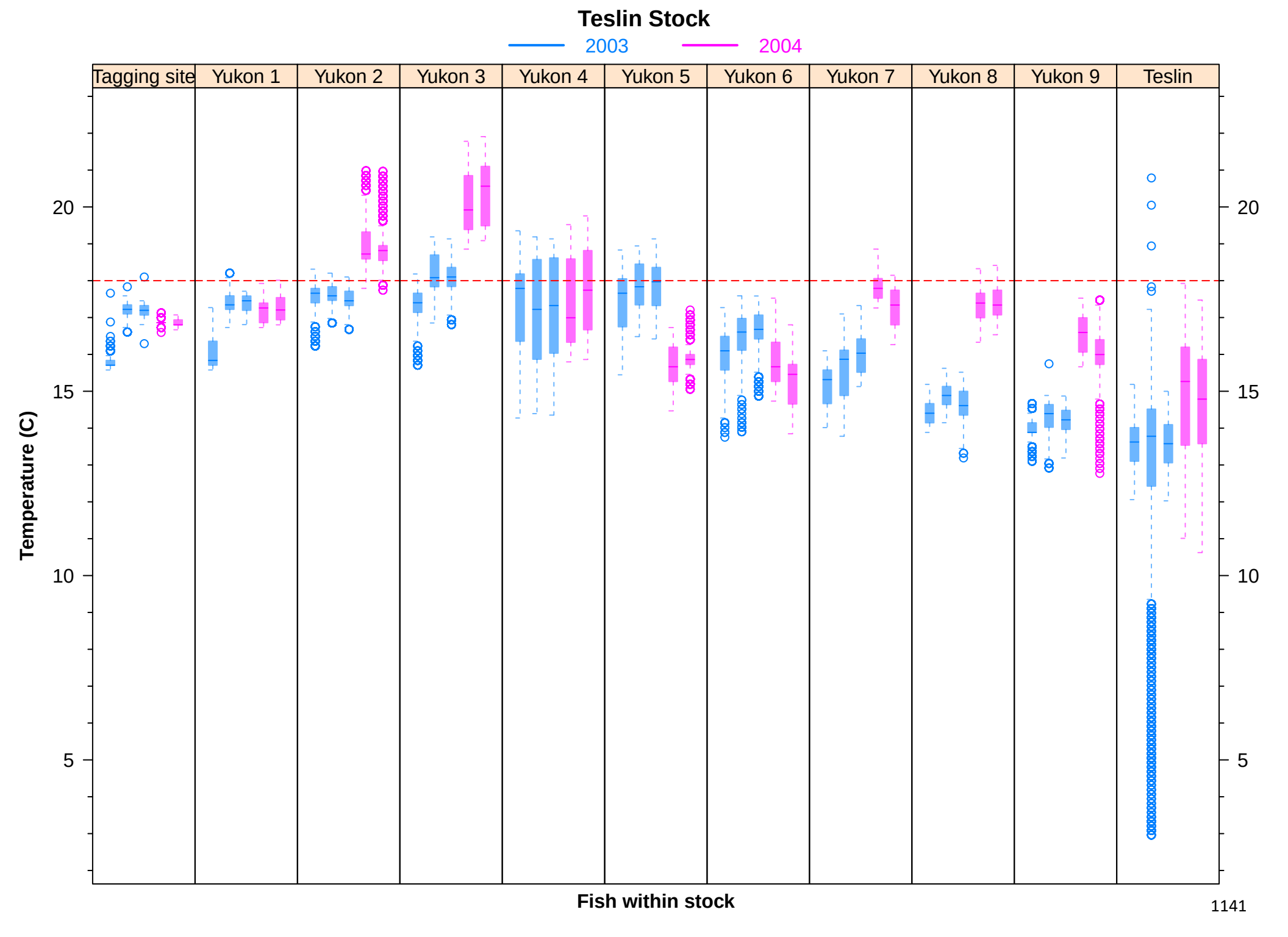

Teslin Stock
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Depth (m)
0
5
10
15
20
25
Fish within stock
1136

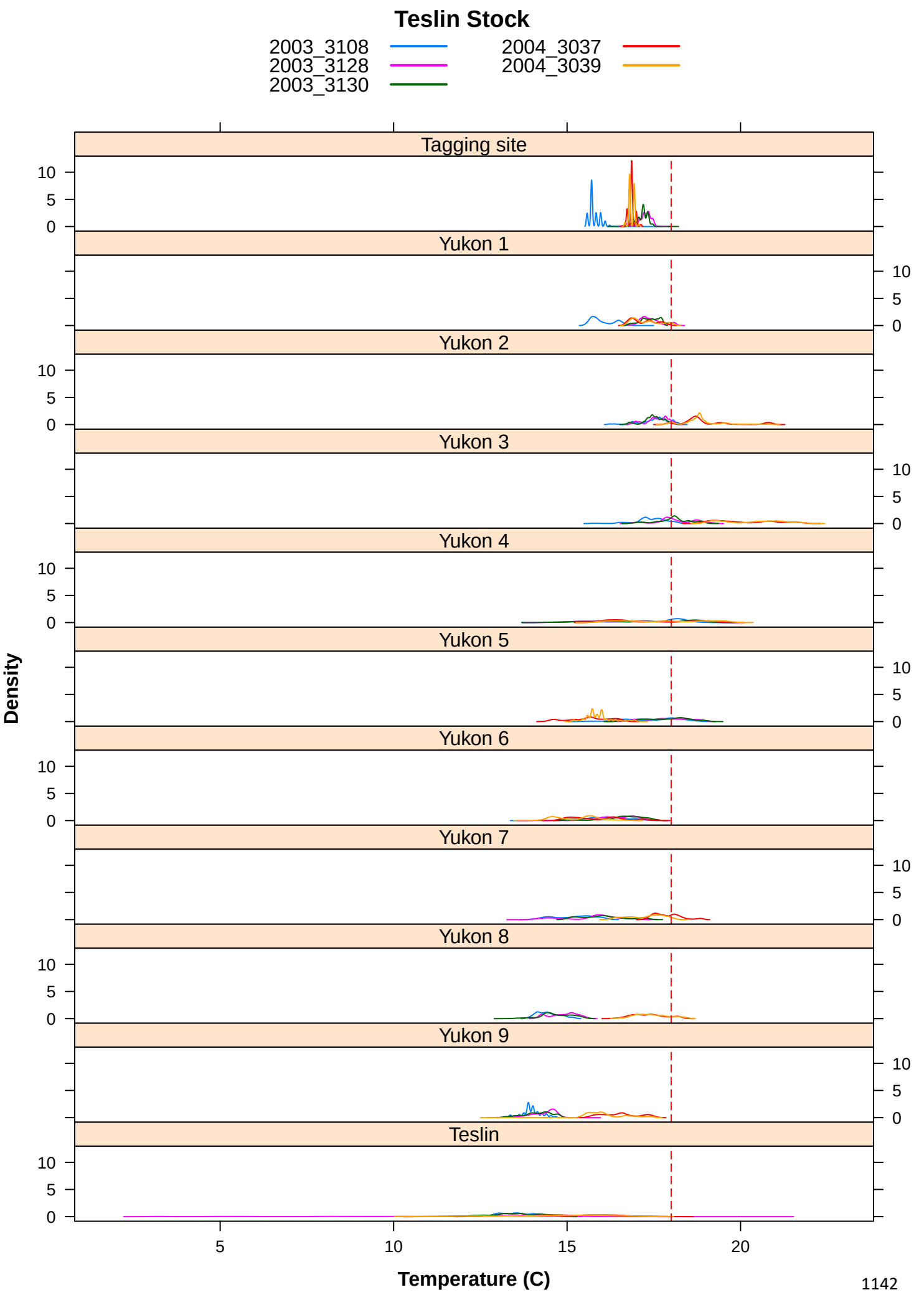

Teslin Stock
2003_3108
2003_3128
2003_3130
2004_3037
2004_3039
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Density
1.0
0.5
0.0
0
10
20
30
Depth (m)
1137

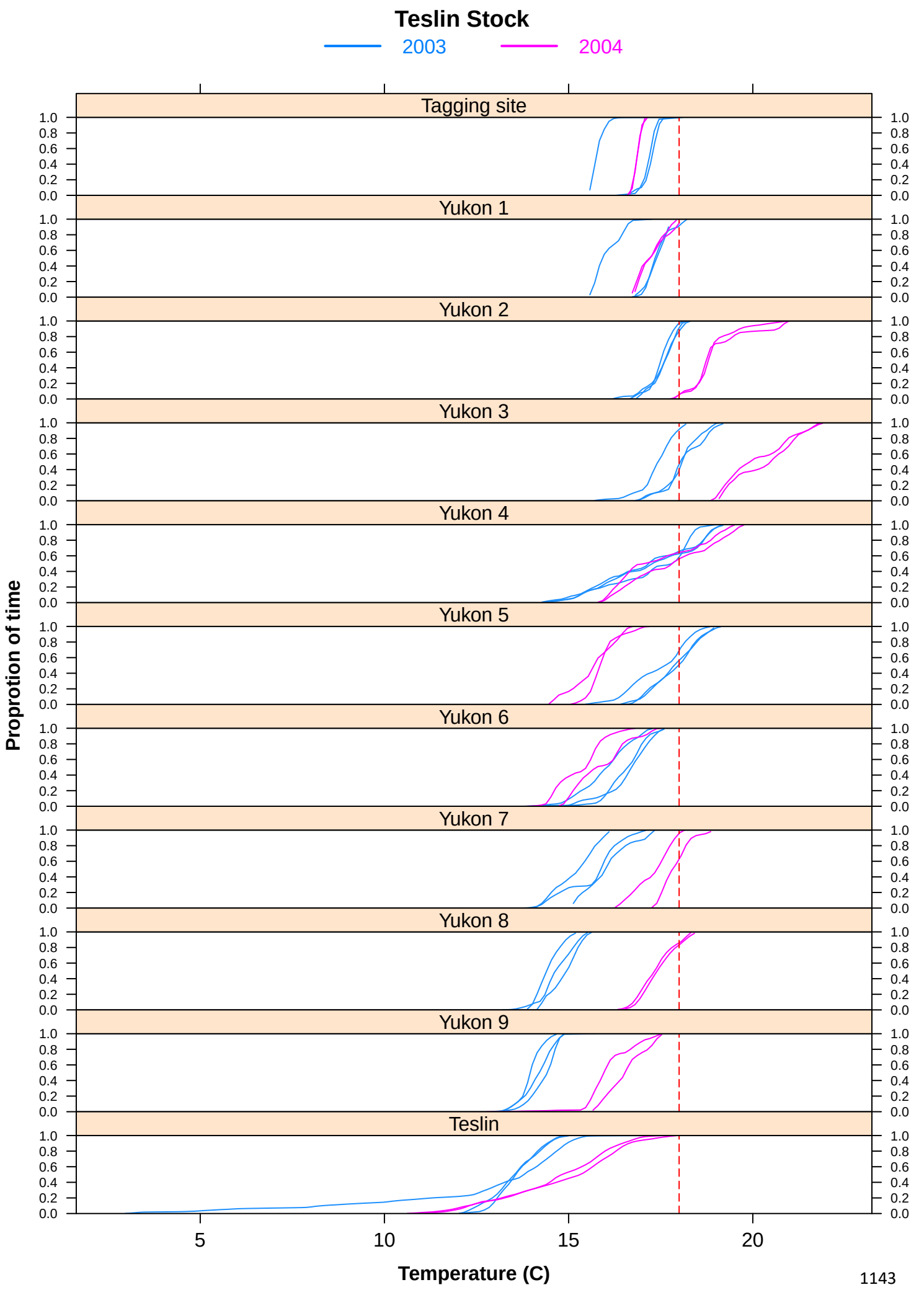

Teslin Stock
2003
2004
Temperature (C)
22
20
18
16
14
12
0
500
1000
1500
2000
Distance from Paimiut (km)
1138

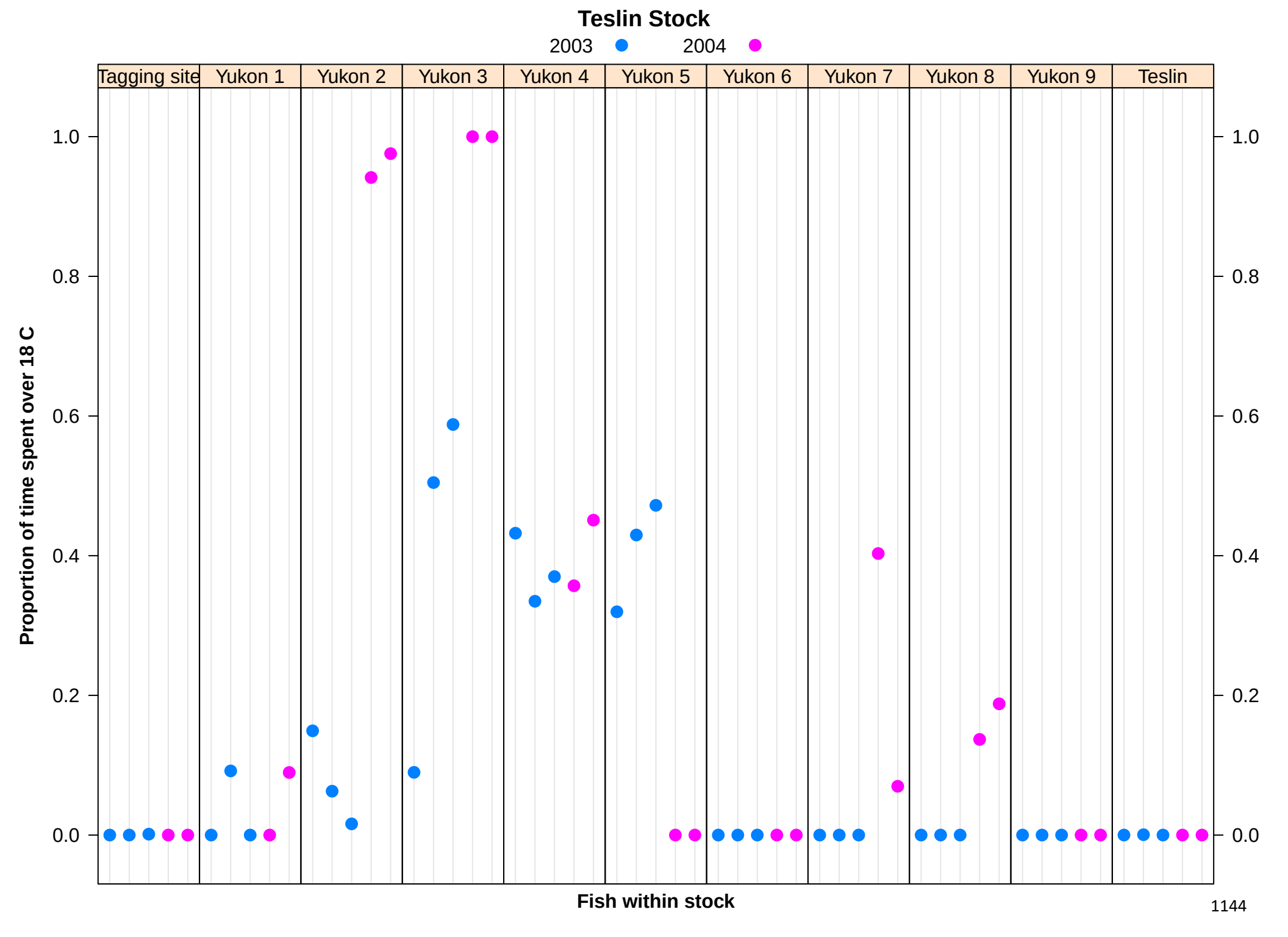

Teslin Stock
2003
2004
Temperature (C)
20
15
10
5
0
500
1000
1500
Hours since release

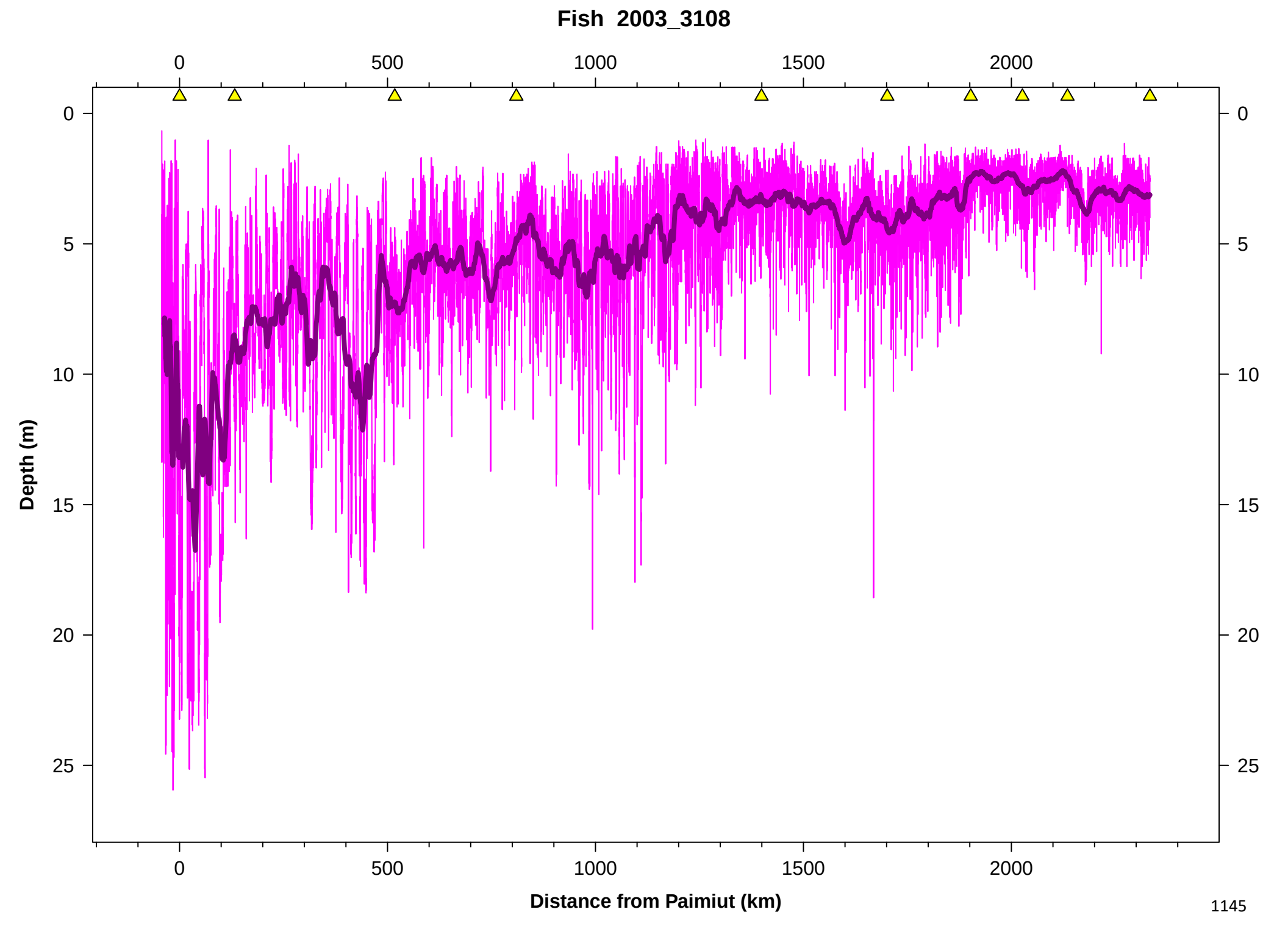

Teslin Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Temperature (C)
20
15
10
5
Year
1140

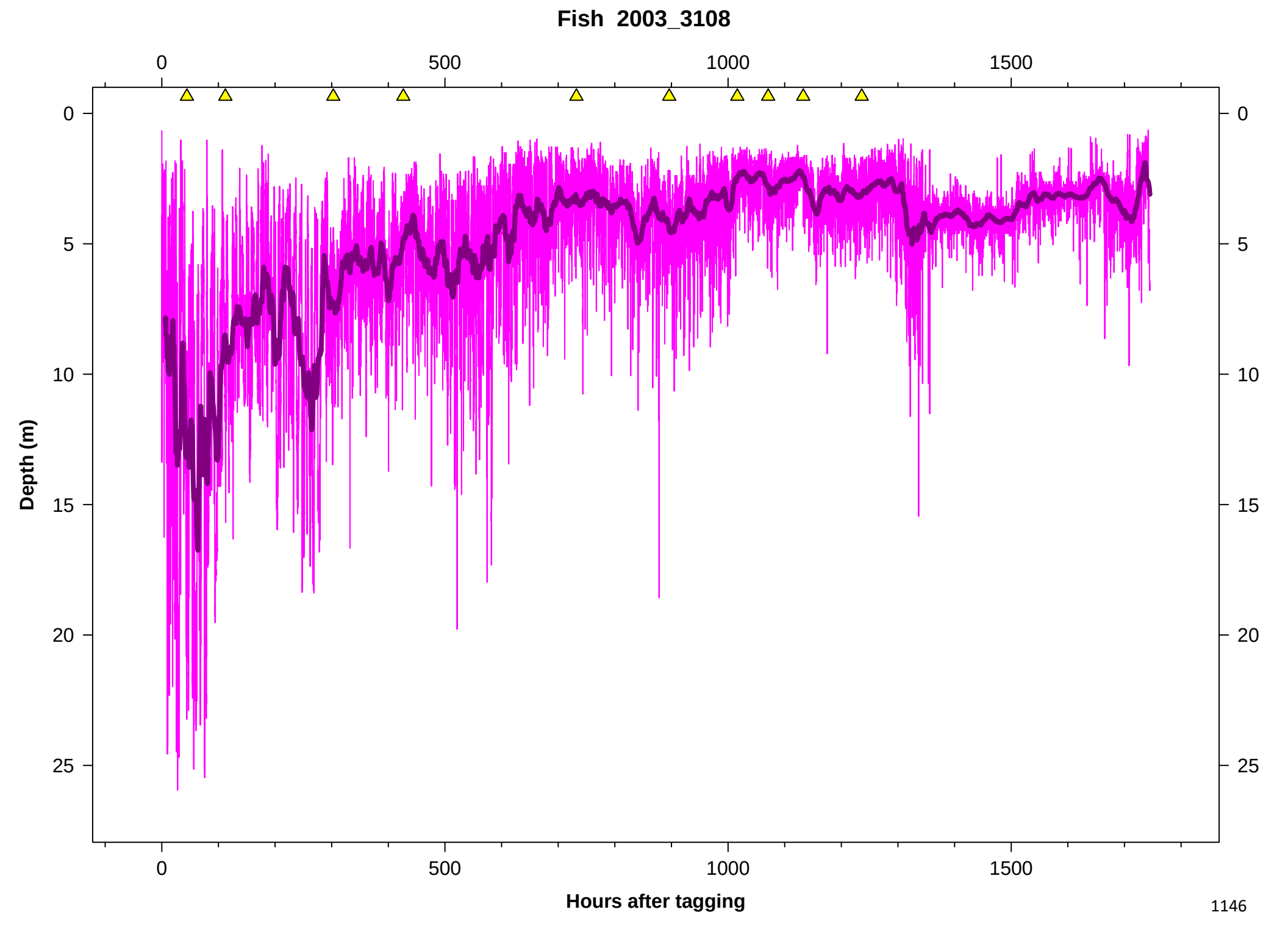

Teslin Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Temperature (C)
20
15
10
5
Fish within stock
1141

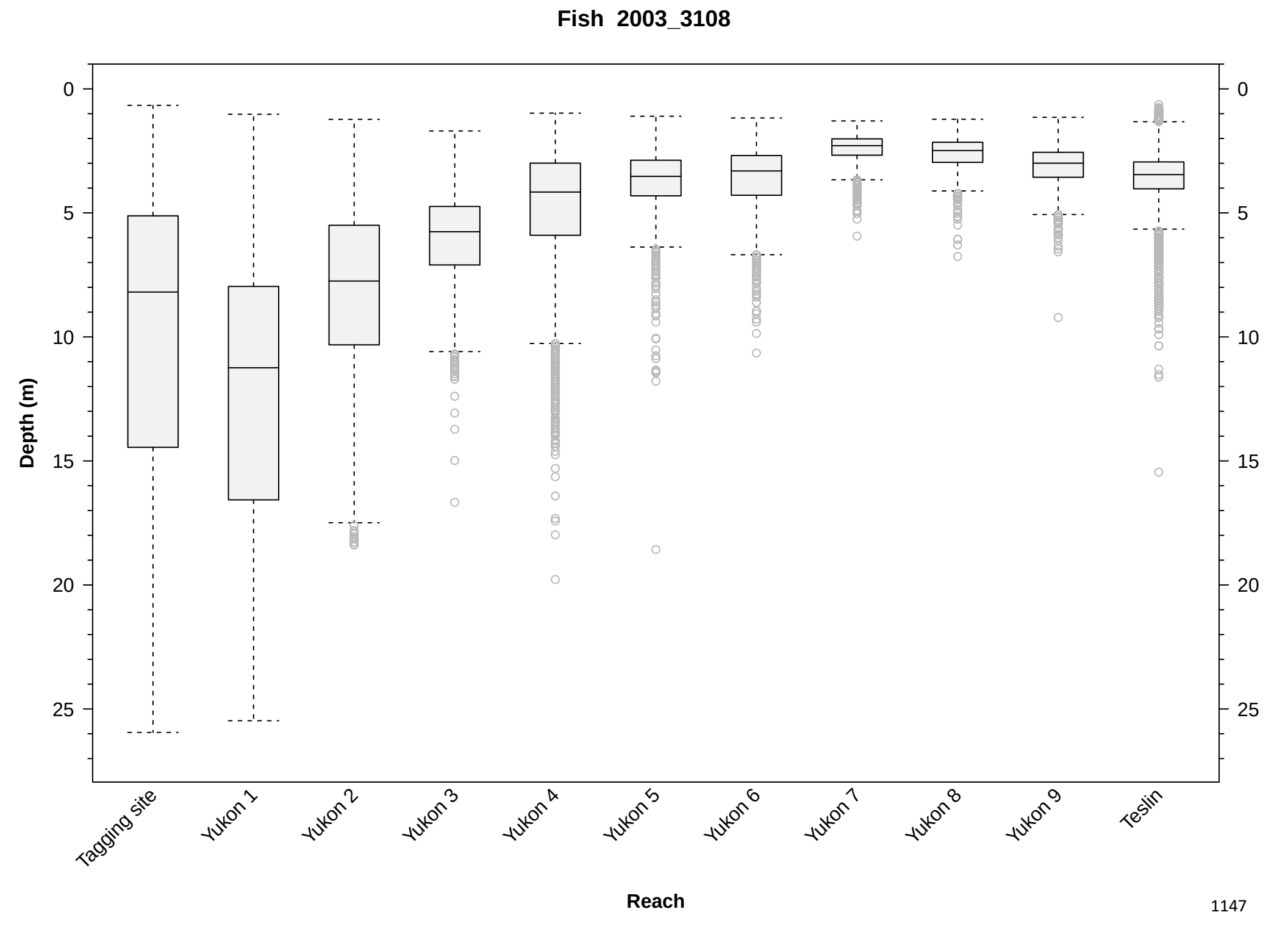

Teslin Stock
2003_3108
2003_3128
2003_3130
2004_3037
2004_3039
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Density
Temperature (C)
0
5
10
15
20

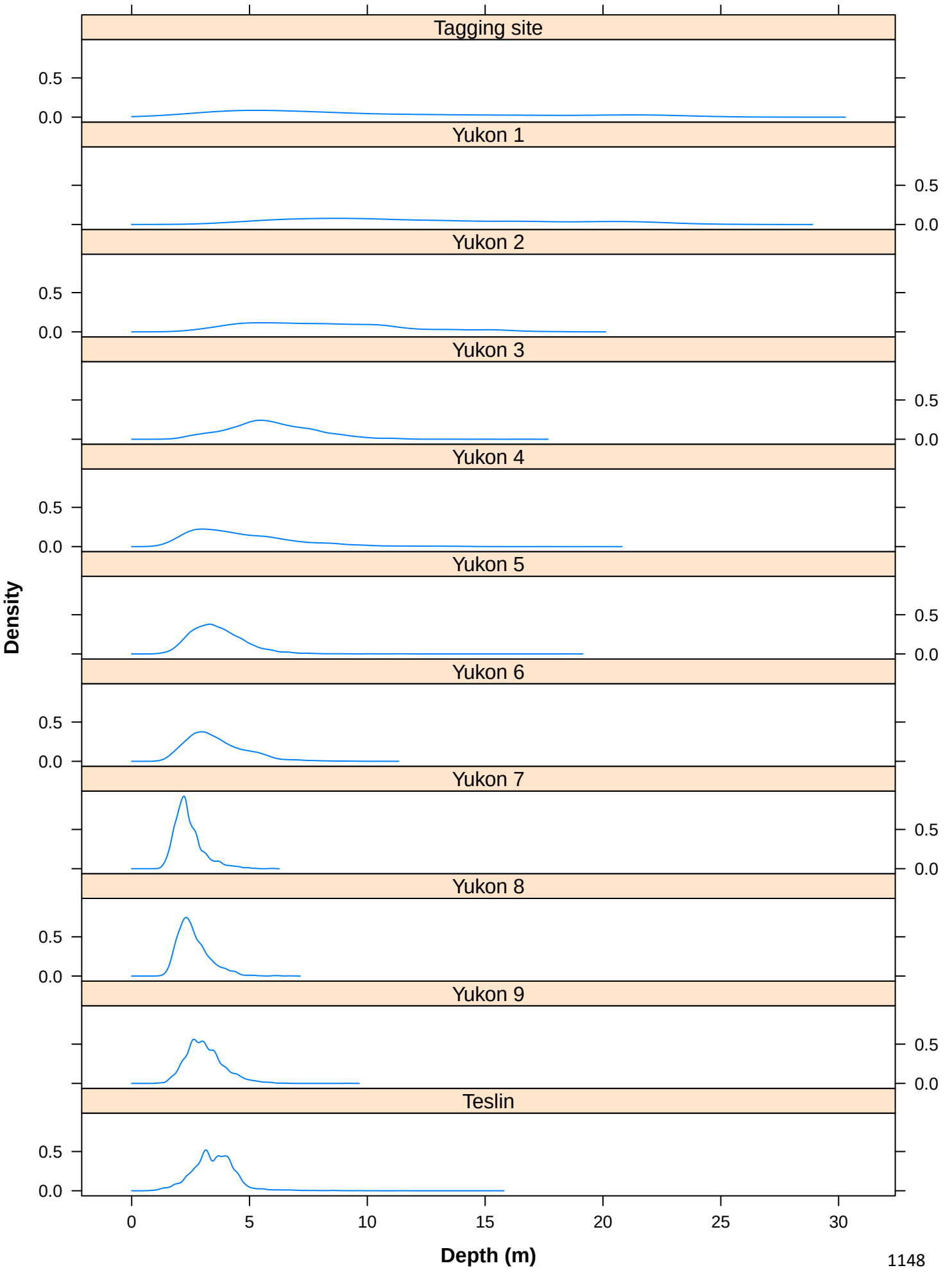

Teslin Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Proprotion of time
0.0
0.2
0.4
0.6
0.8
1.0
5
10
15
20
Temperature (C)

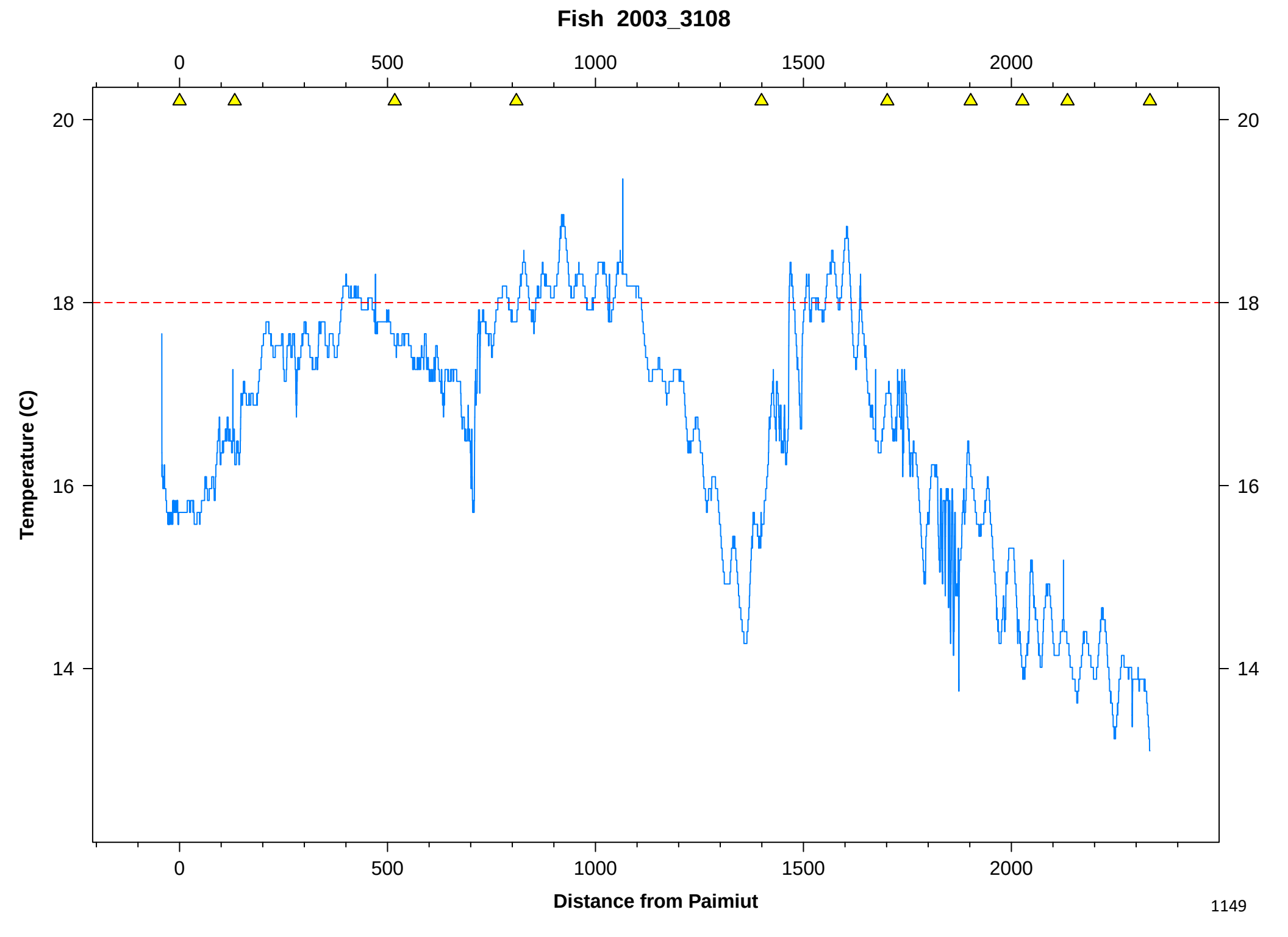

Teslin Stock
2003
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
1.0
0.8
0.6
0.4
0.2
0.0
Proportion of time spent over 18 C
Fish within stock
1144

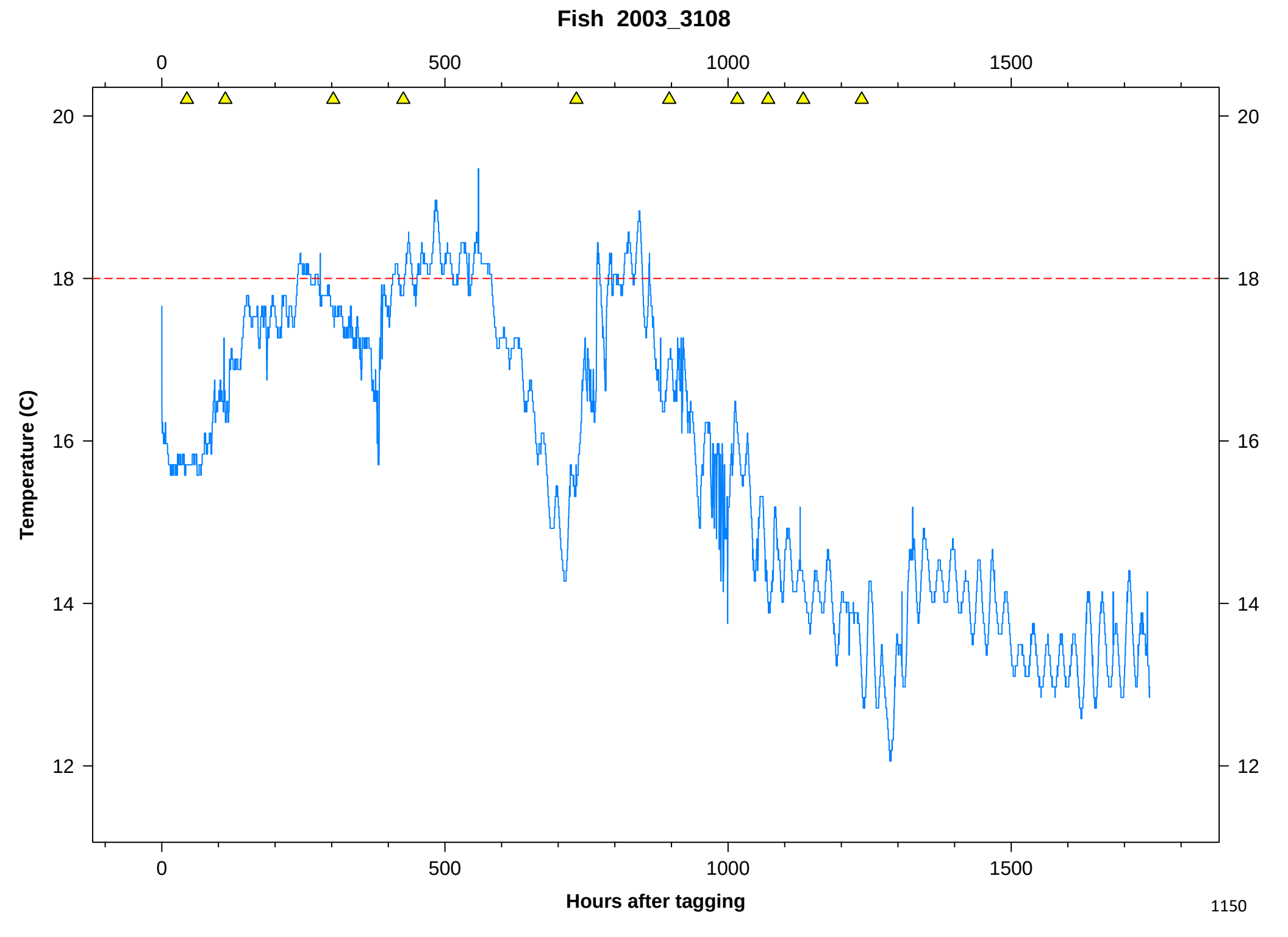

Fish 2003_3108
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)

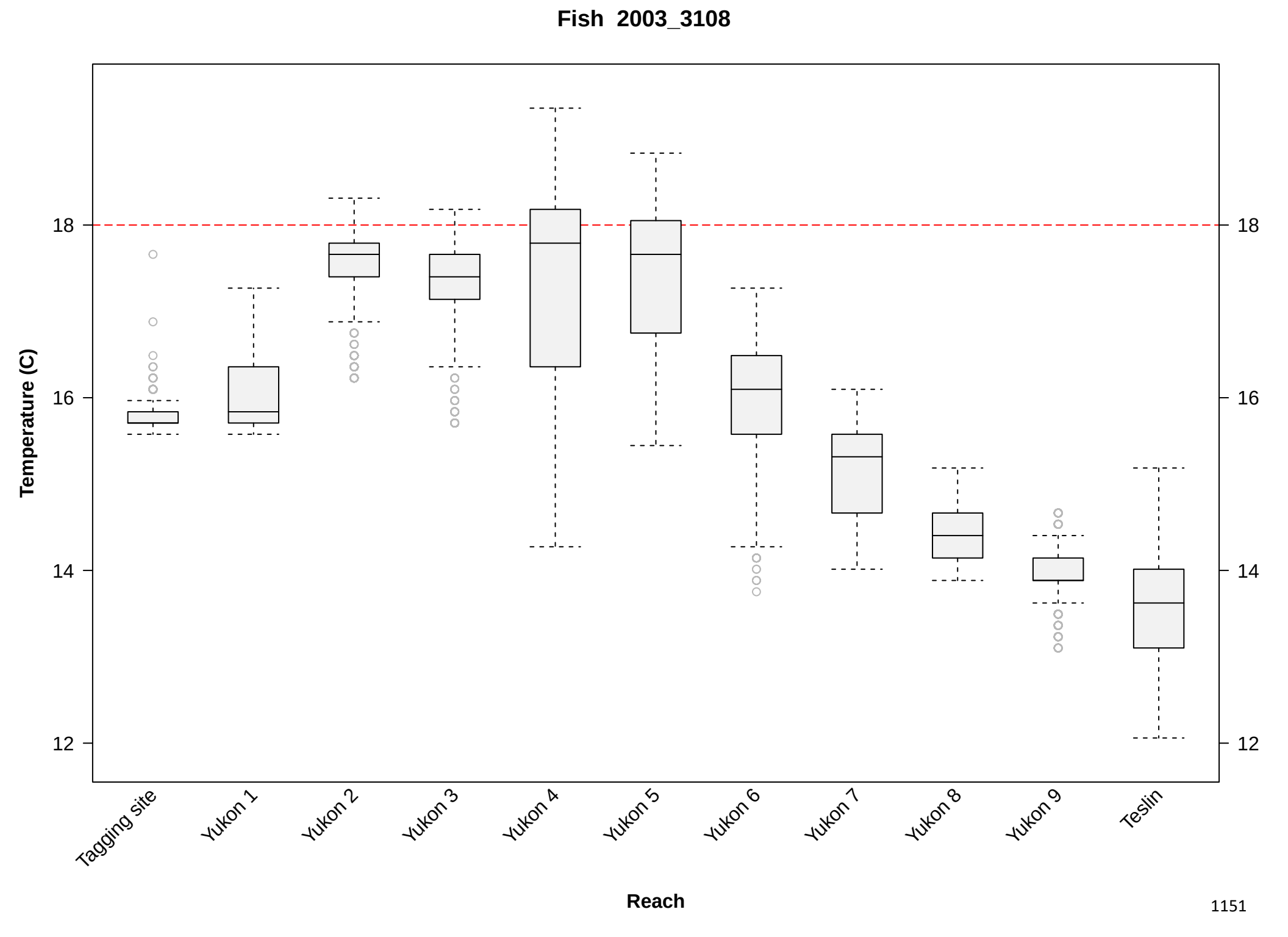

Fish 2003_3108
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Hours after tagging
1146

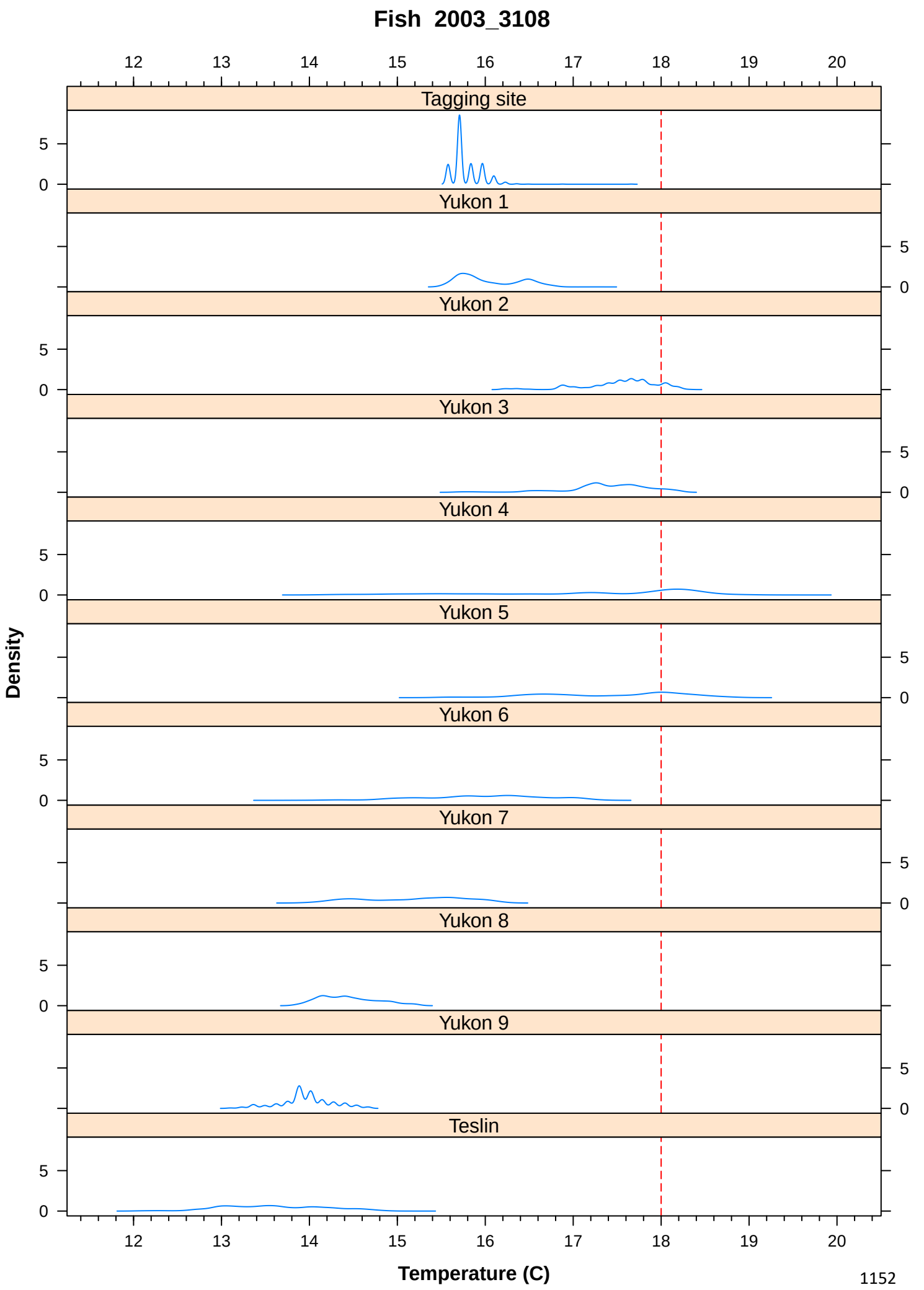

Fish 2003_3108
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Reach
1147

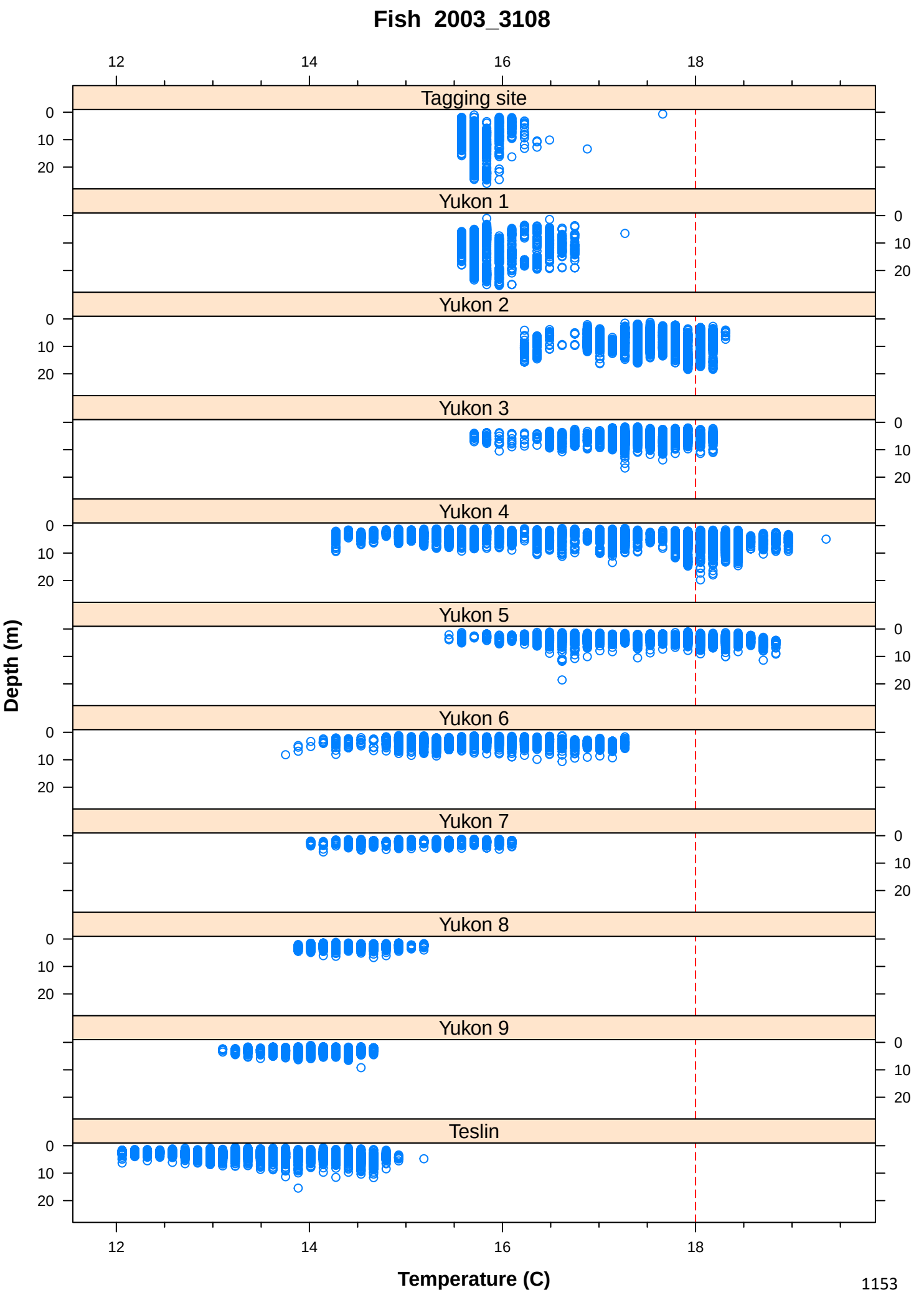

Fish 2003_3108
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Density
0.5
0.0
0
5
10
15
20
25
30
Depth (m)
1148

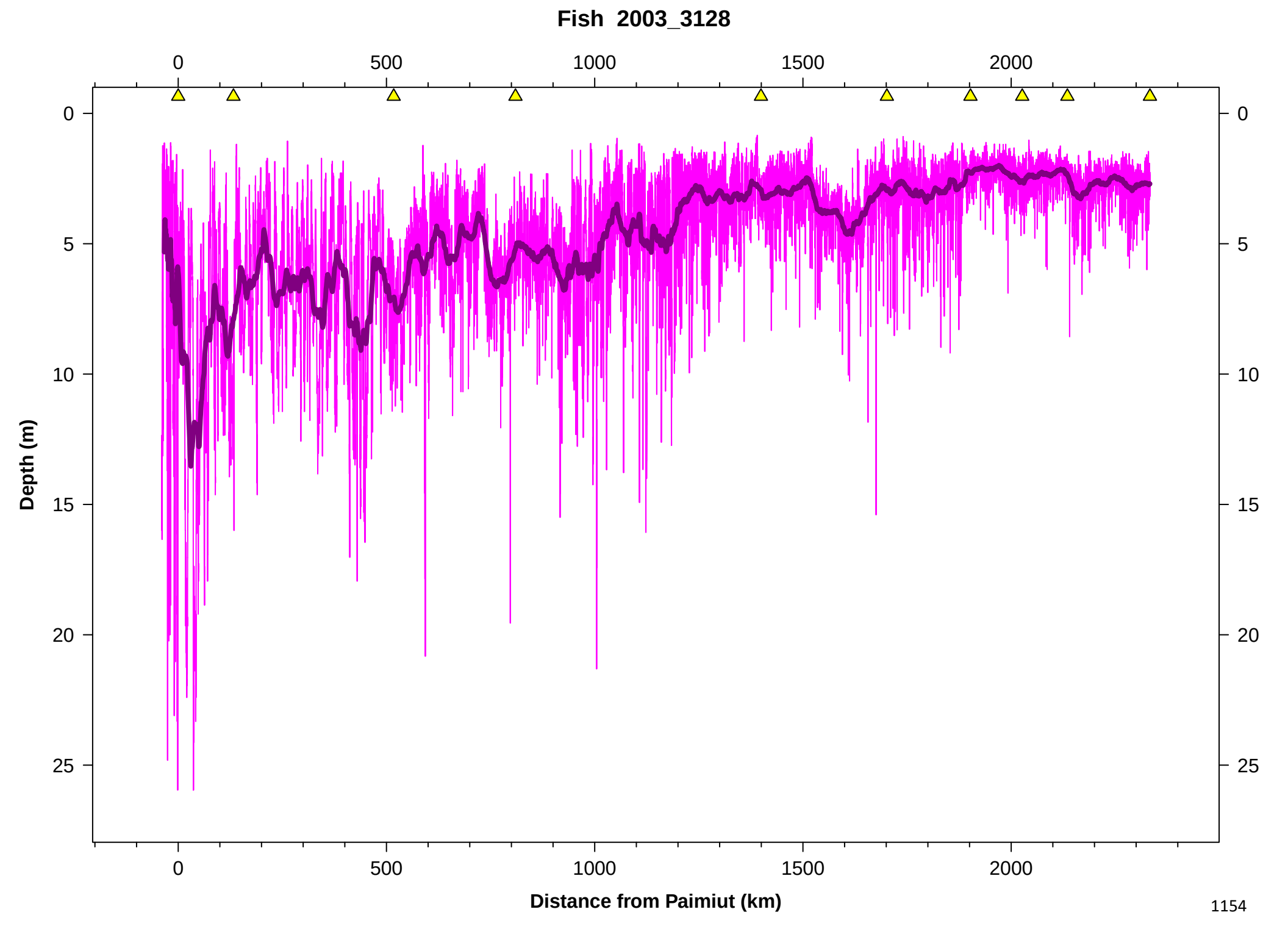

Fish 2003_3108
0
500
1000
1500
2000
20
18
16
14
Temperature (C)
Distance from Paimiut
1149

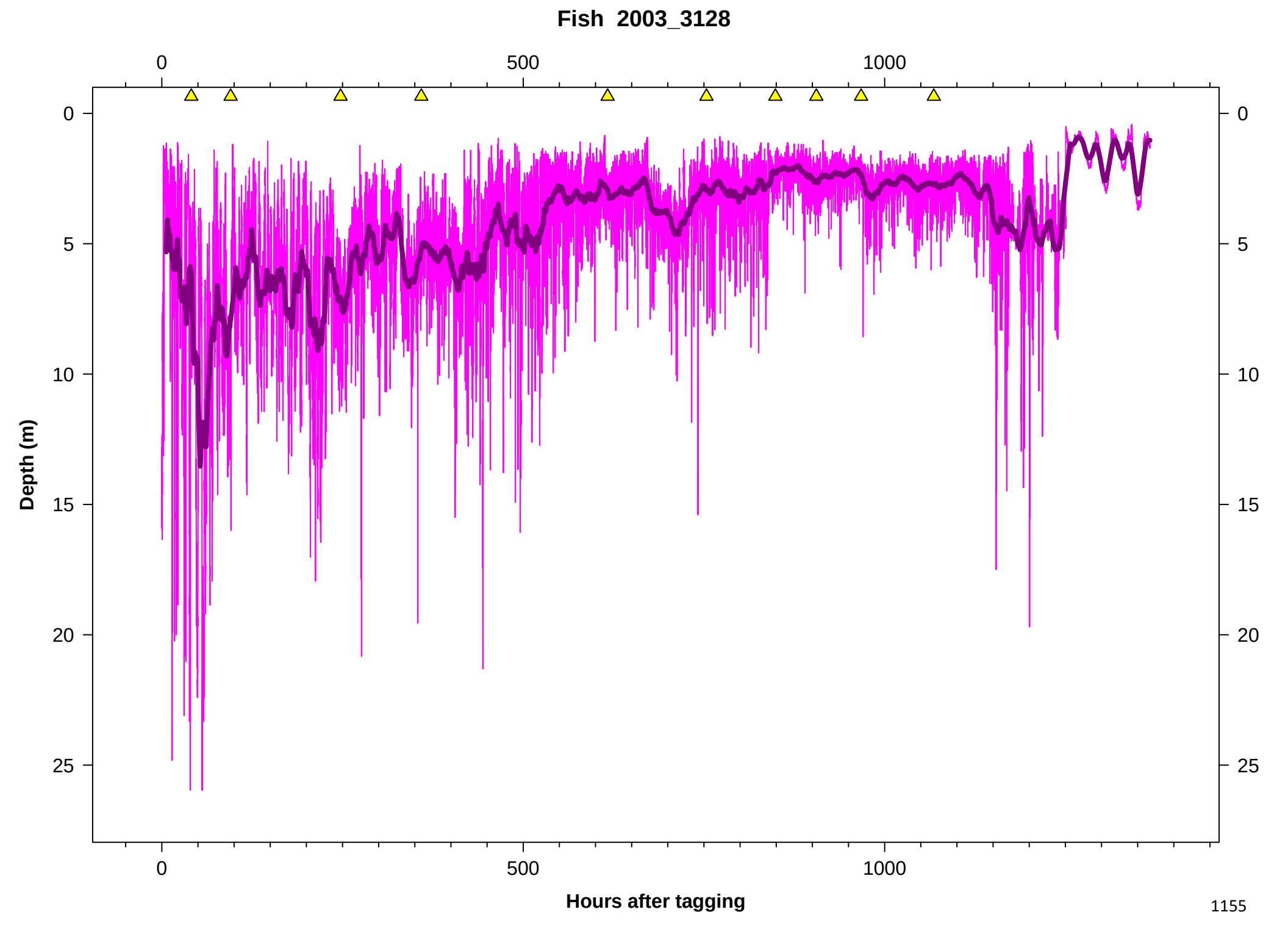

Fish 2003_3108
0
500
1000
1500
20
18
16
14
12
Temperature (C)
Hours after tagging

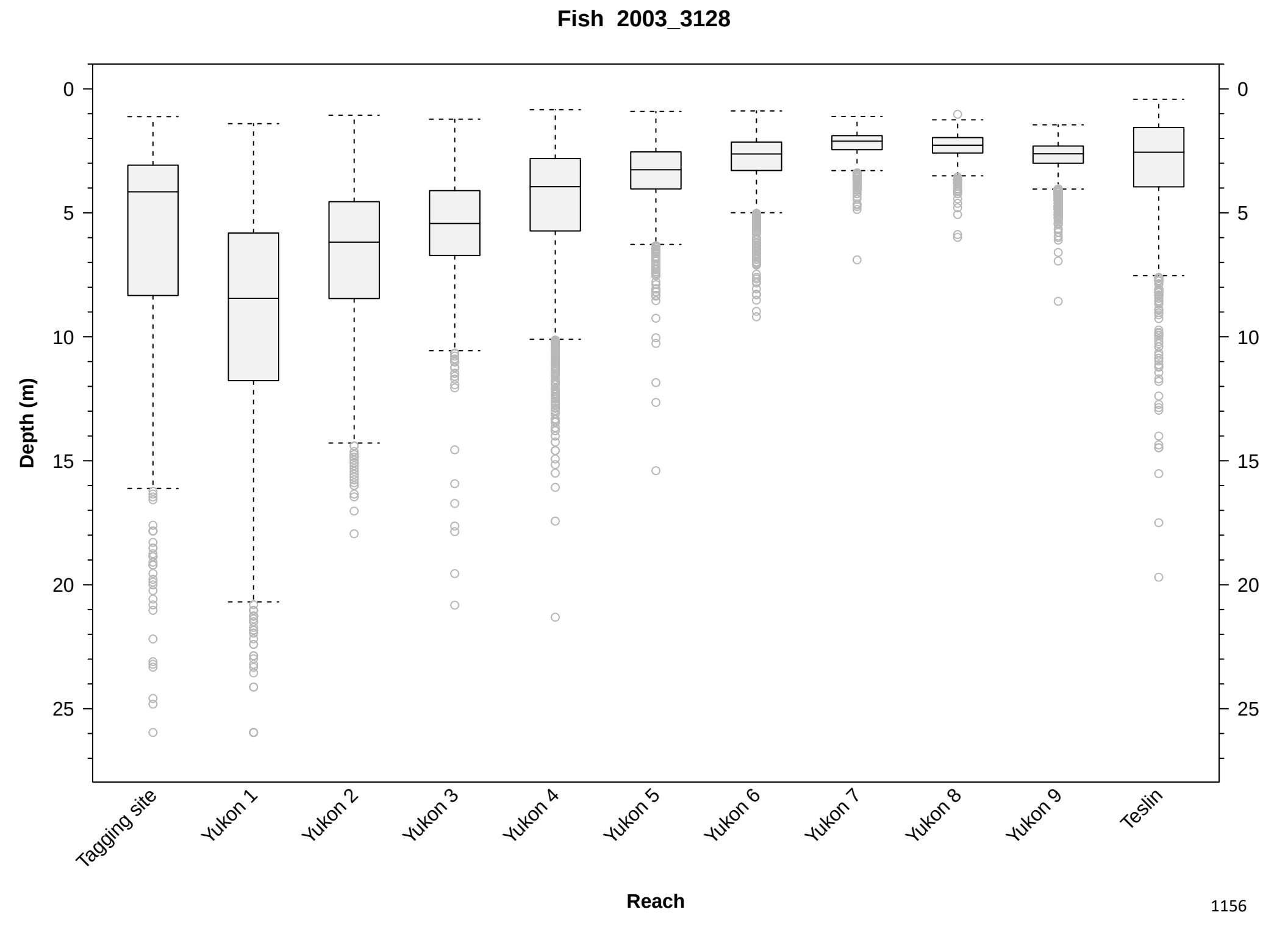

Fish 2003_3108
Temperature (C)
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Reach
1151

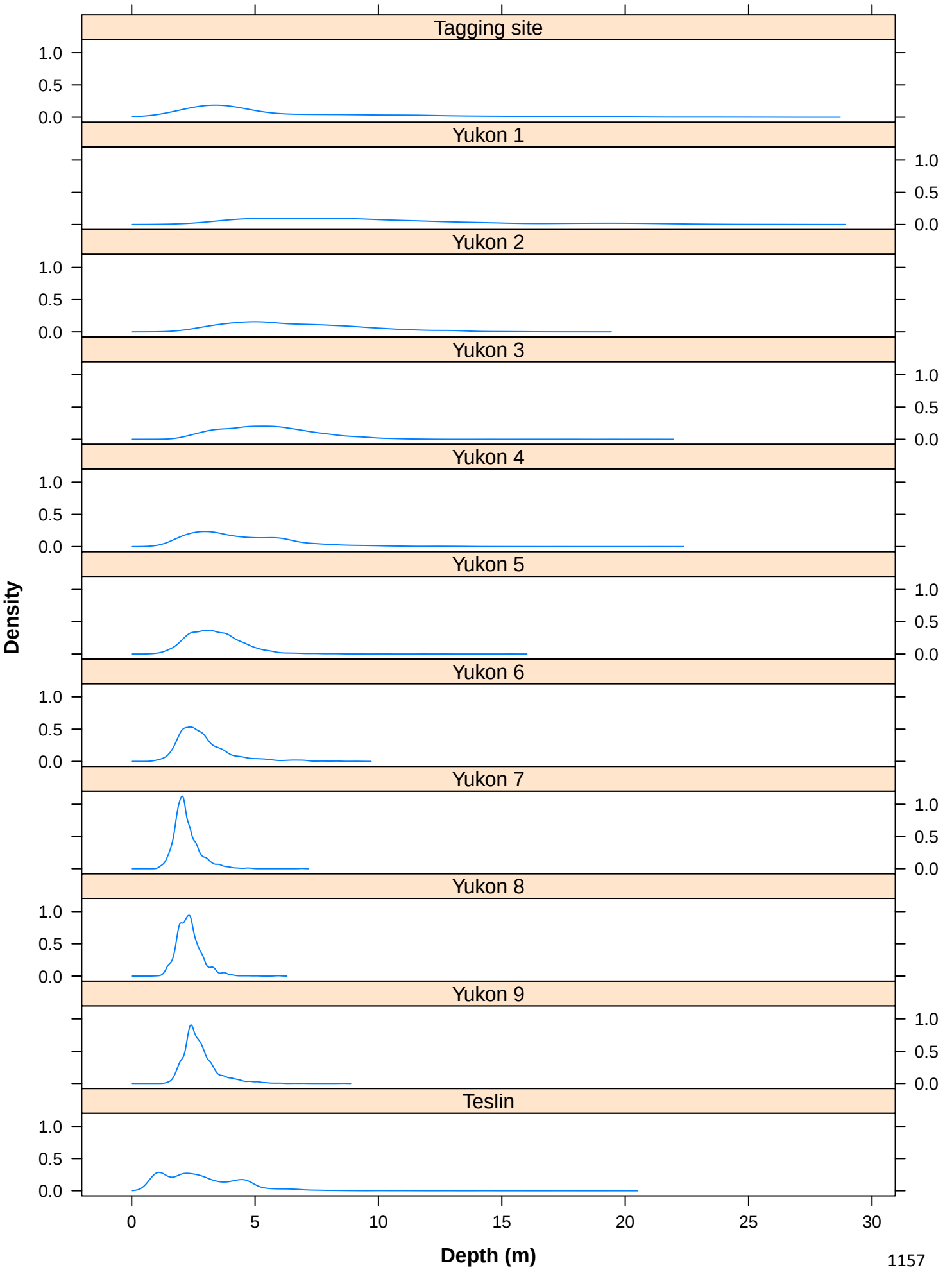

Fish 2003_3108
12
13
14
15
16
17
18
19
20
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
5
0
Density
Temperature (C)

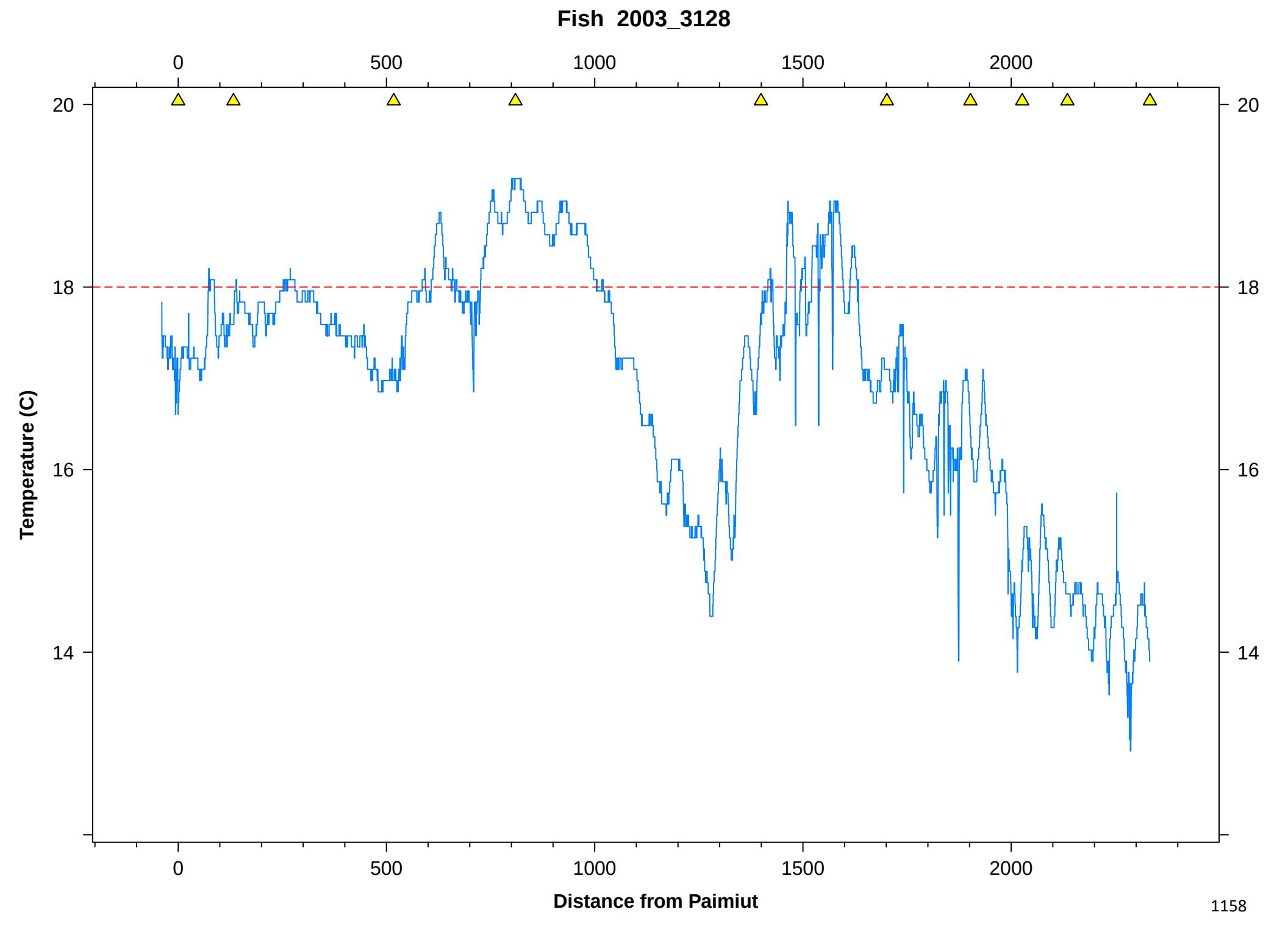

Fish 2003_3108
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Depth (m)
Temperature (C)
12
14
16
18
0
10
20
1153

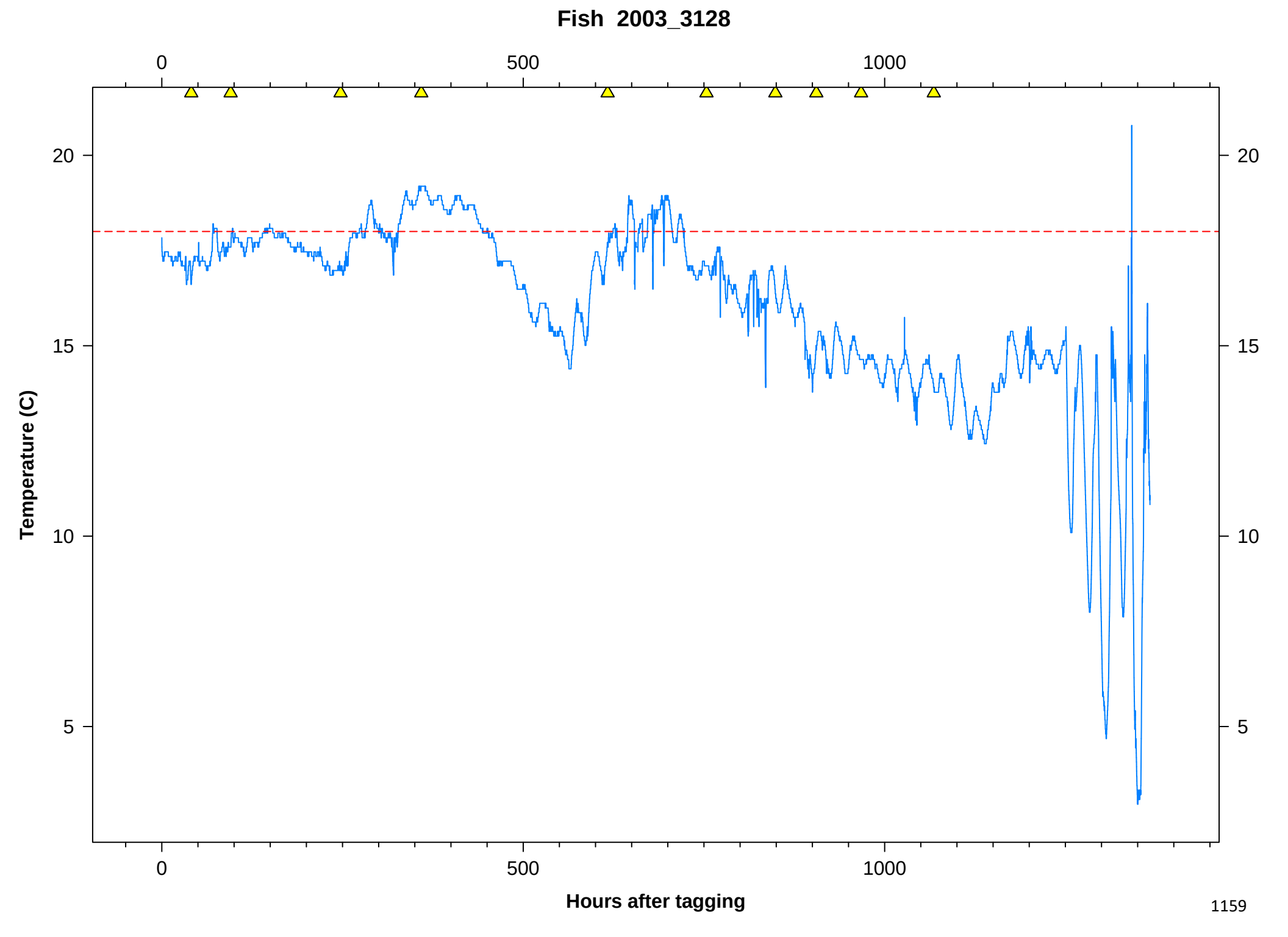

Fish 2003_3128
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
1154

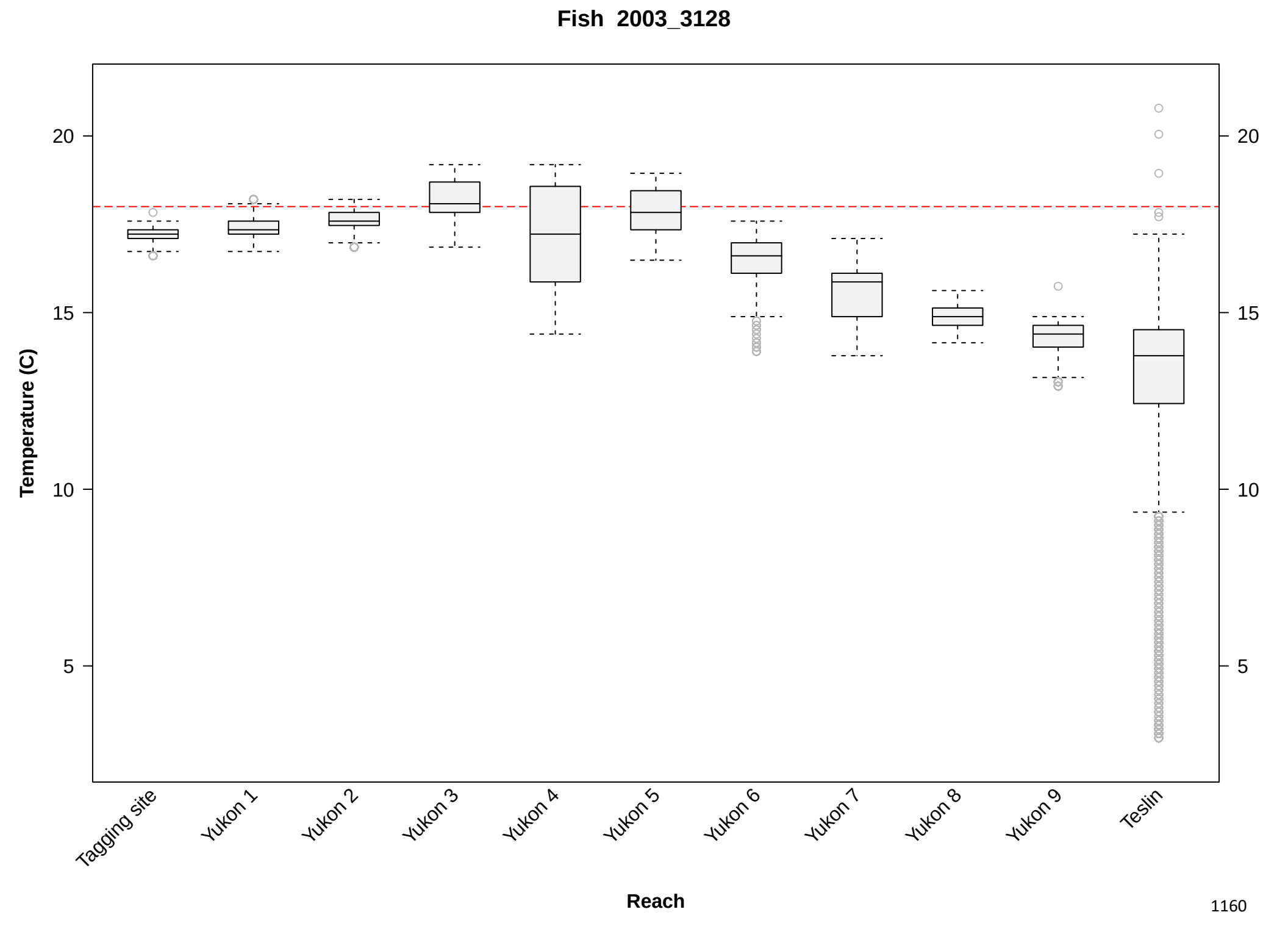

Fish 2003_3128
0
500
1000
0
5
10
15
20
25
Depth (m)
Hours after tagging
1155

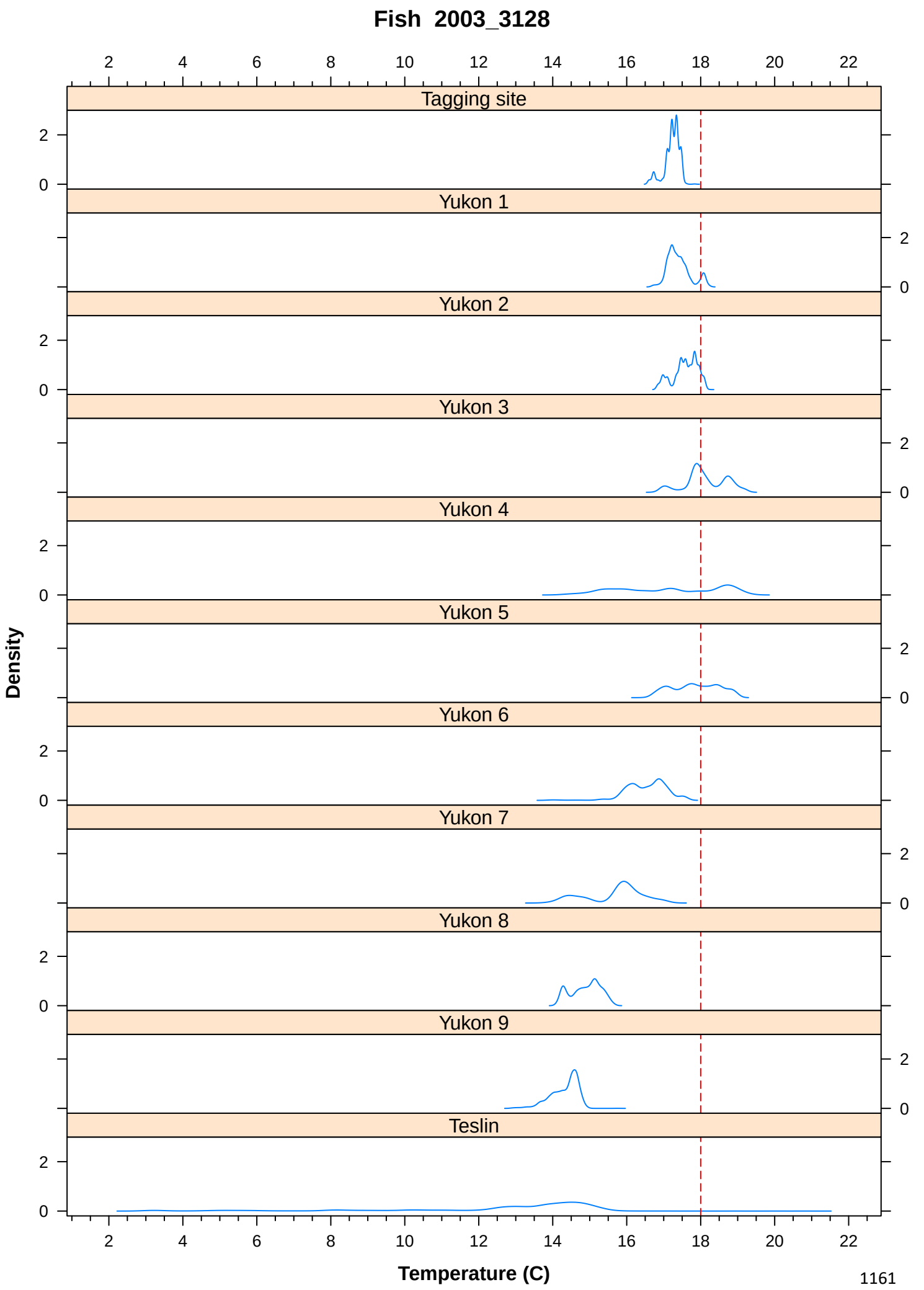

Fish 2003_3128
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Reach

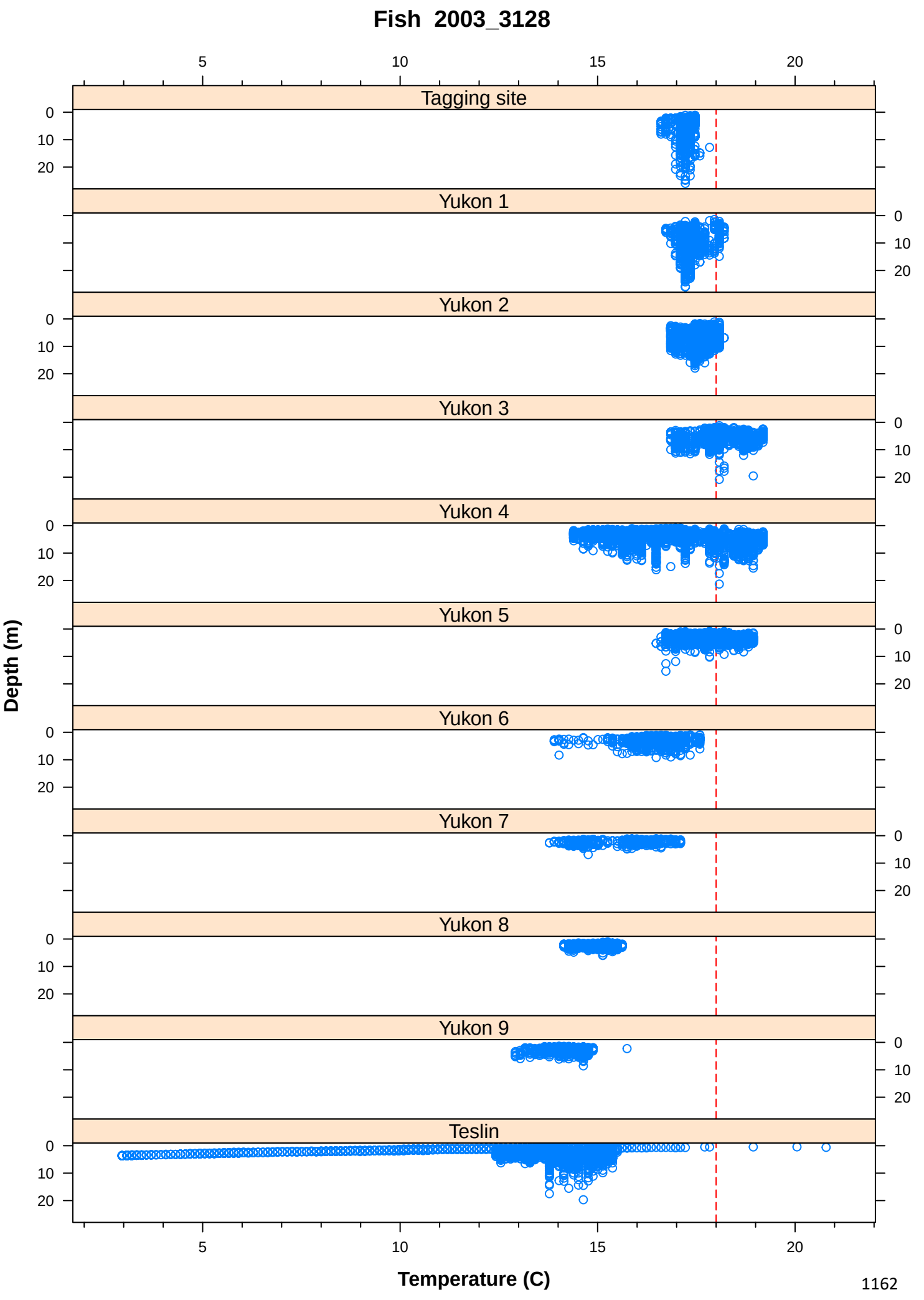

Fish 2003_3128
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Density
1.0
0.5
0.0
0
5
10
15
20
25
30
Depth (m)
1157

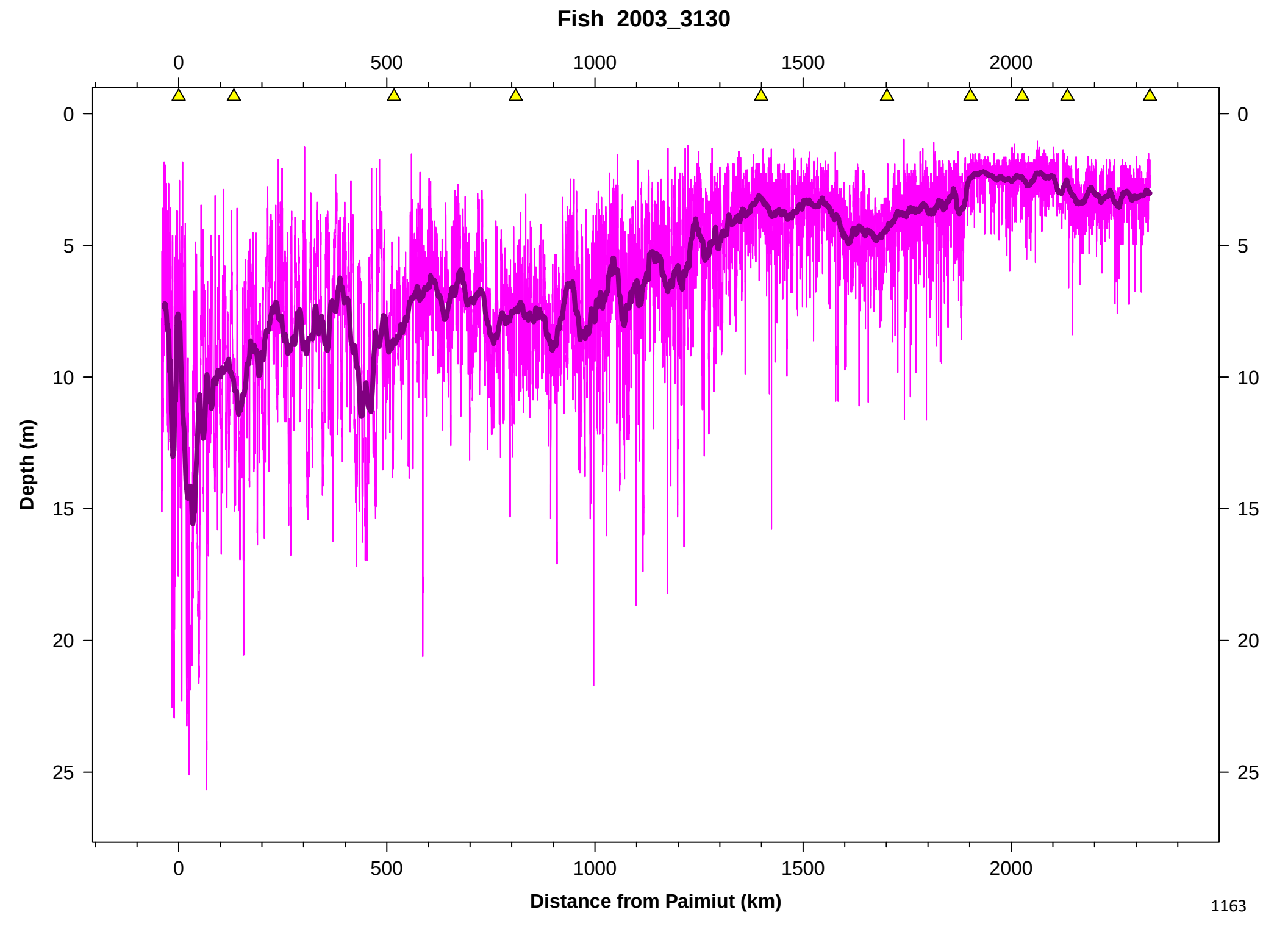

Fish 2003_3128
0
500
1000
1500
2000
20
18
16
14
Temperature (C)
Distance from Paimiut
1158

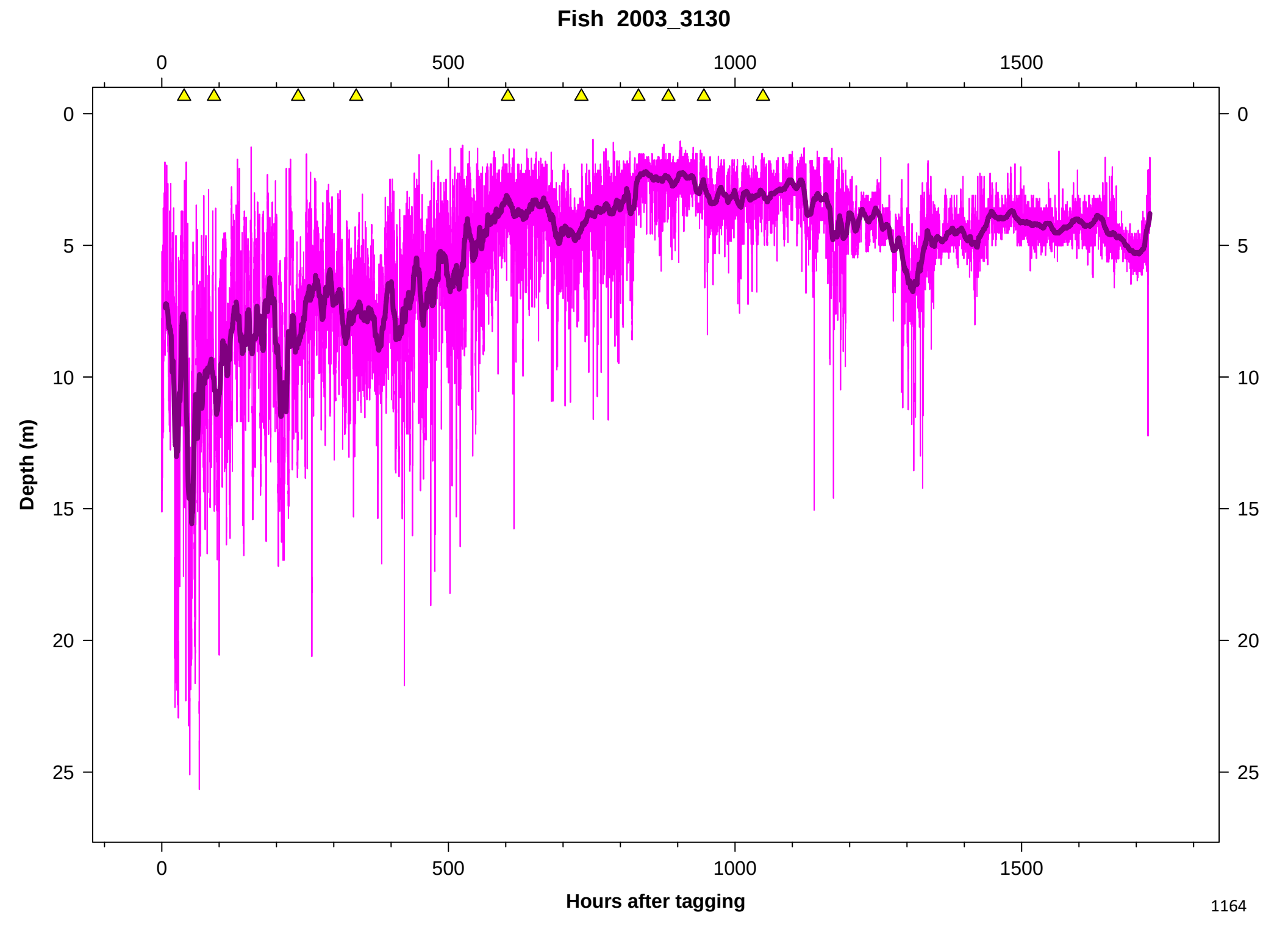

Fish 2003_3128
0
500
1000
20
15
10
5
Temperature (C)
Hours after tagging
1159

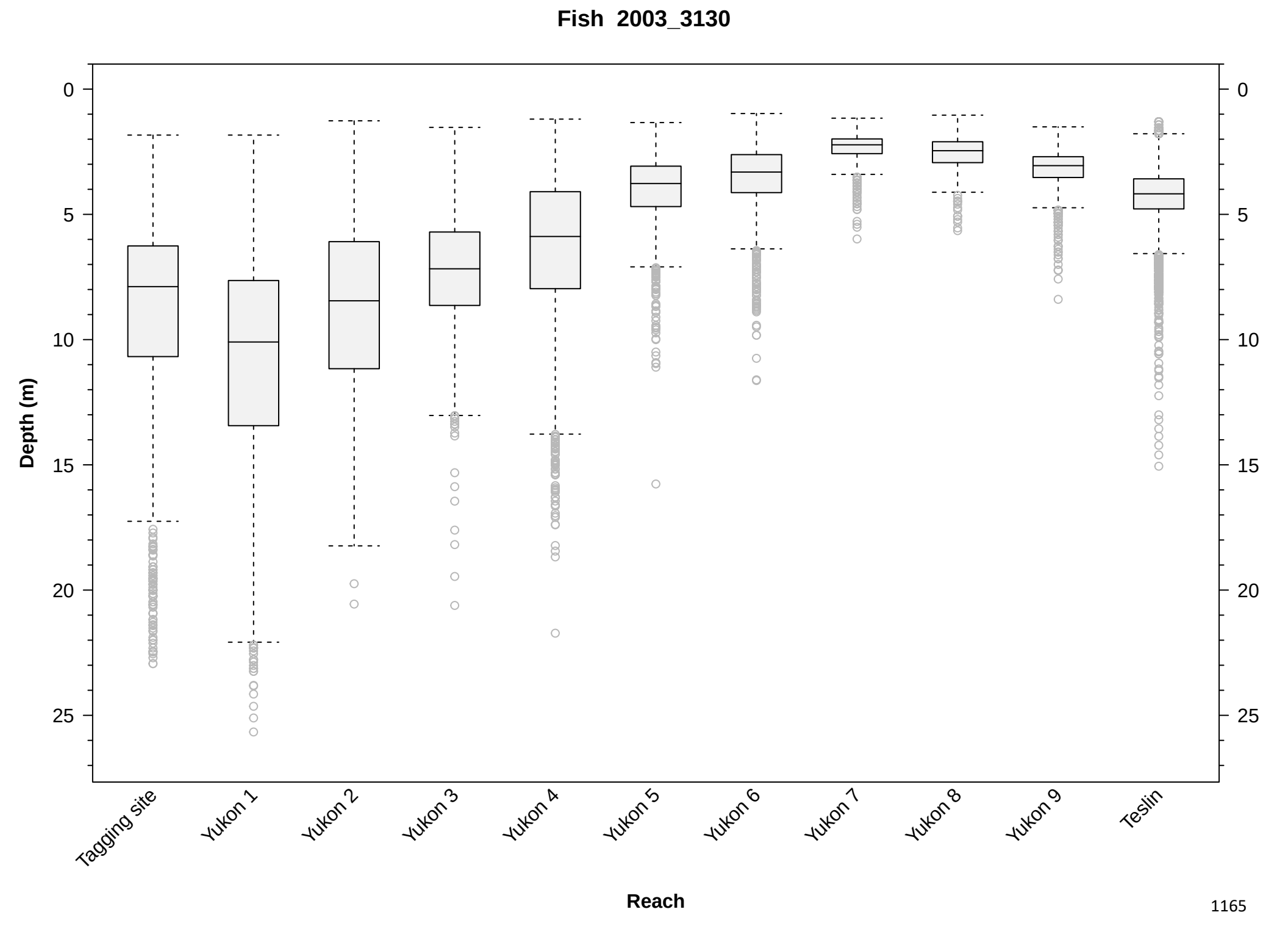

Fish 2003_3128
Temperature (C)
20
15
10
5
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Reach
1160

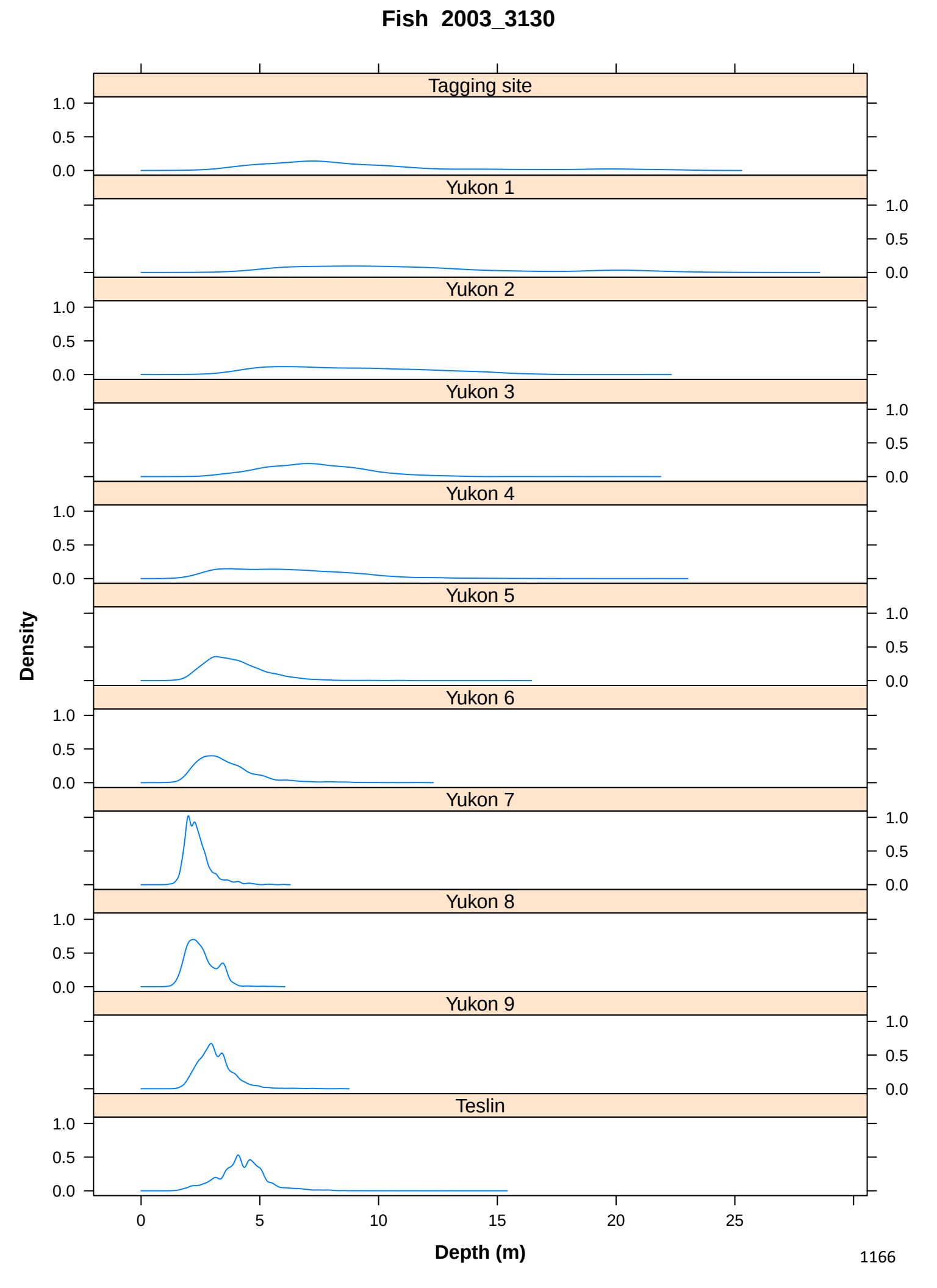

Fish 2003_3128
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Density
Temperature (C)
2
4
6
8
10
12
14
16
18
20
22
0
2

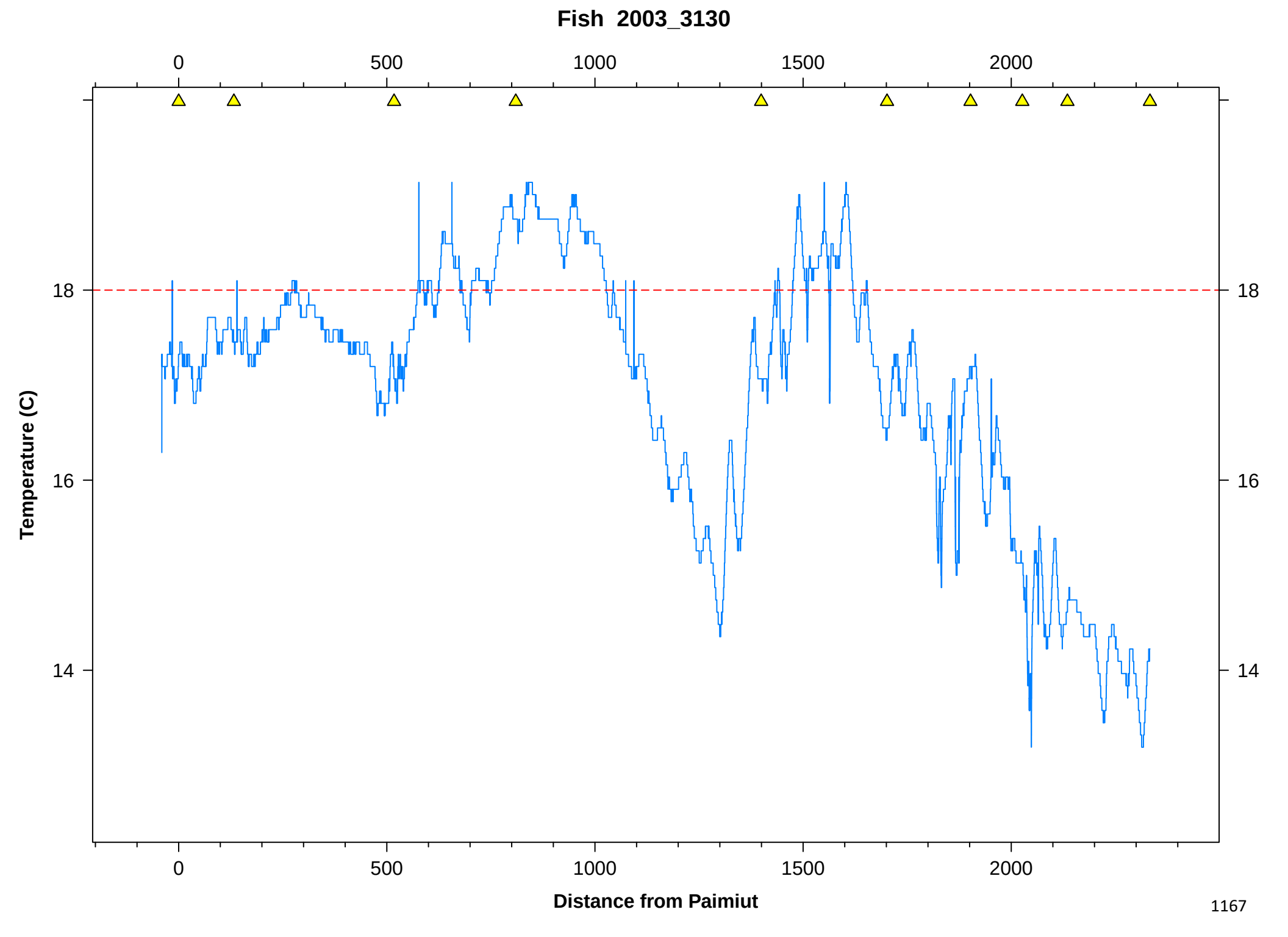

Fish 2003_3128
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Depth (m)
Temperature (C)
5
10
15
20
0
10
20
1162

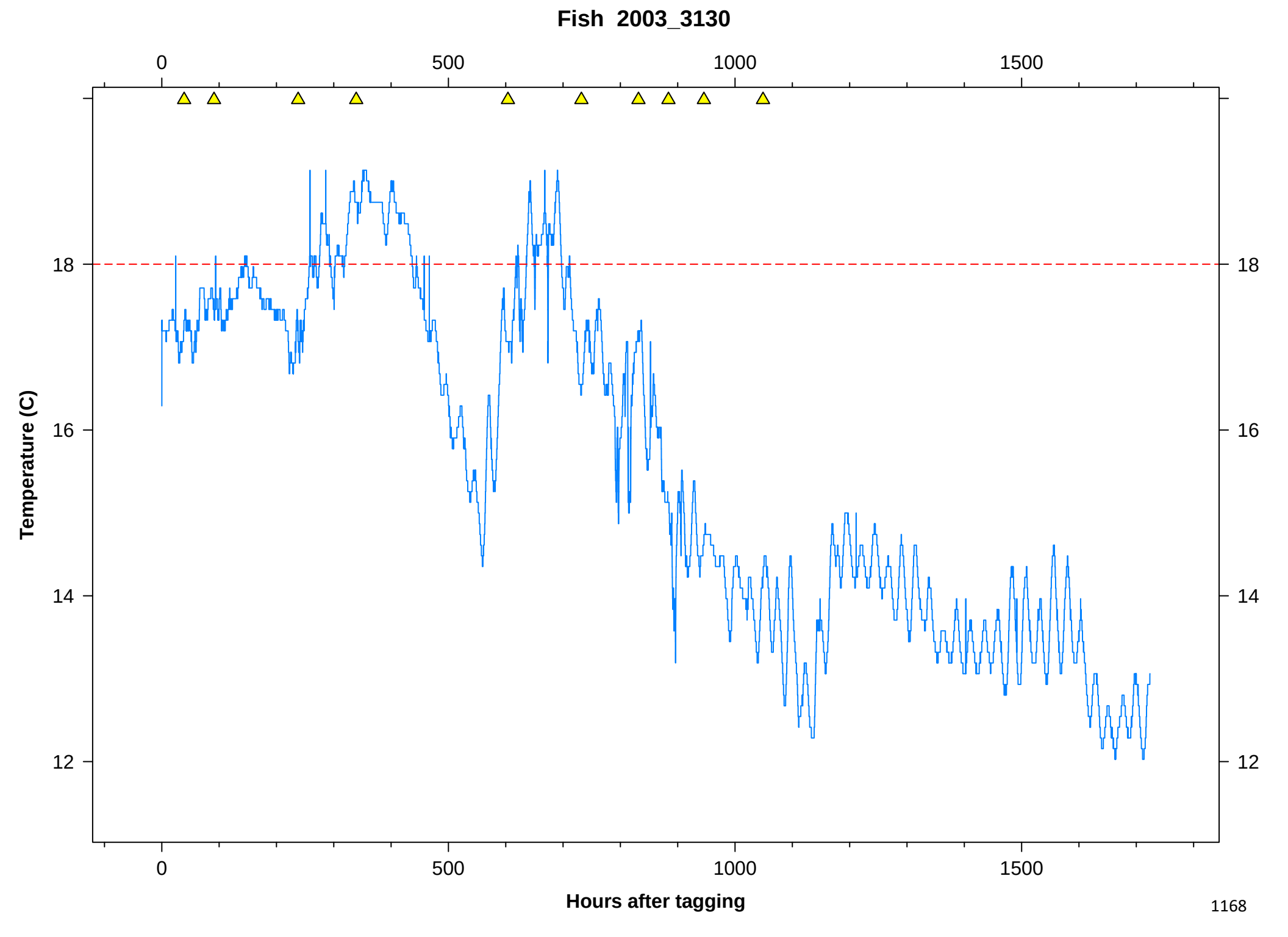

Fish 2003_3130
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
1163

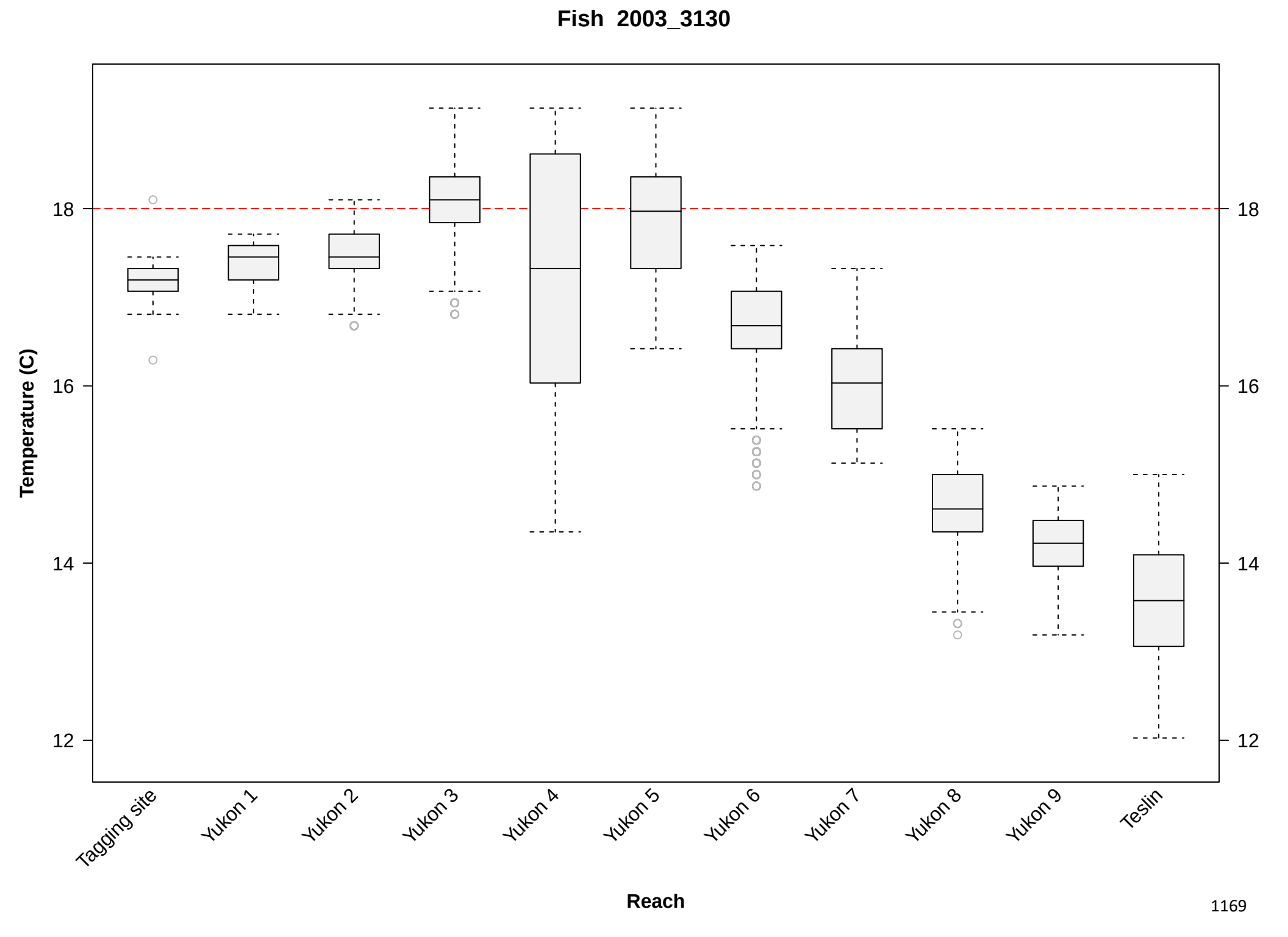

Fish 2003_3130
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Hours after tagging

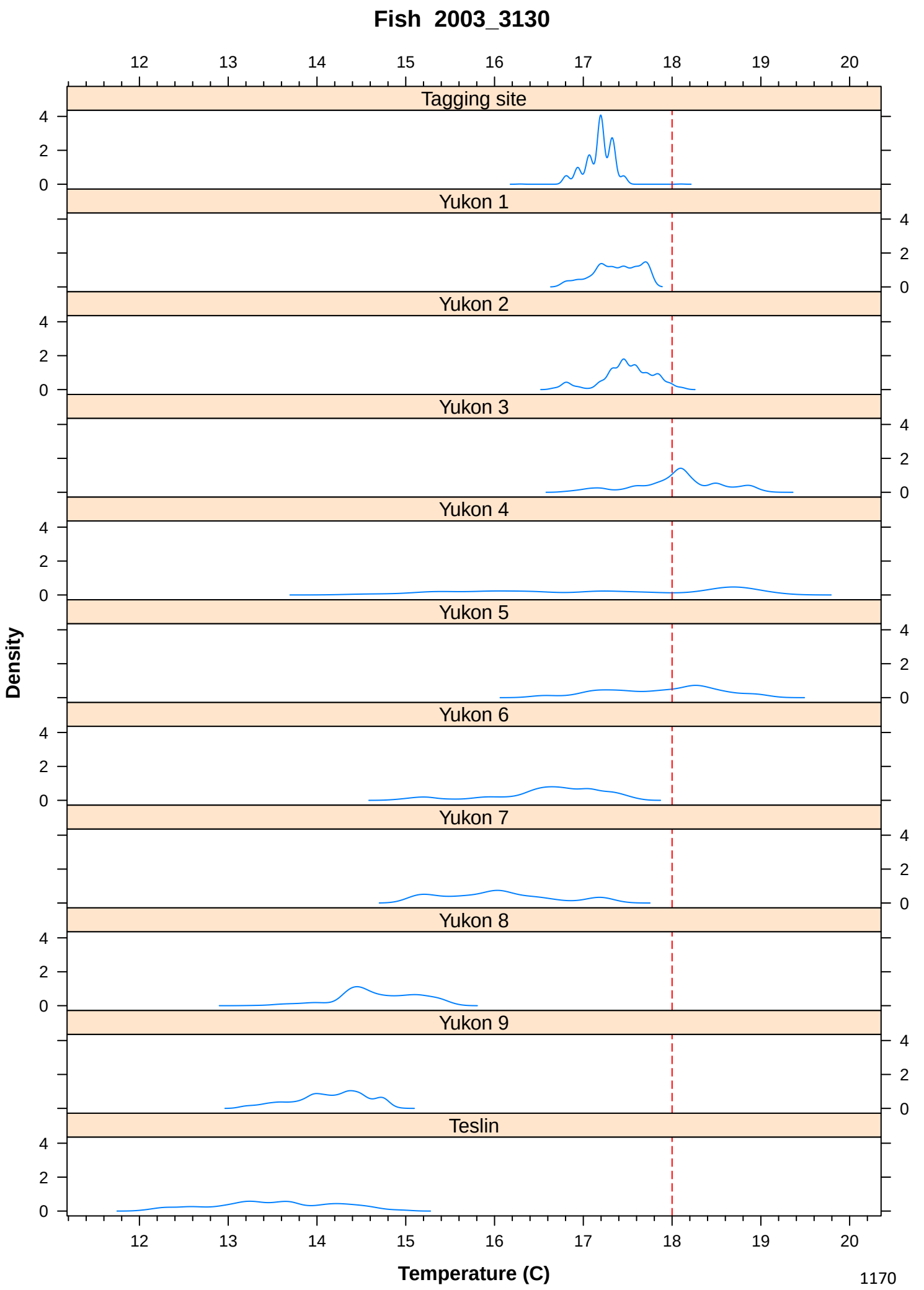

Fish 2003_3130
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Reach

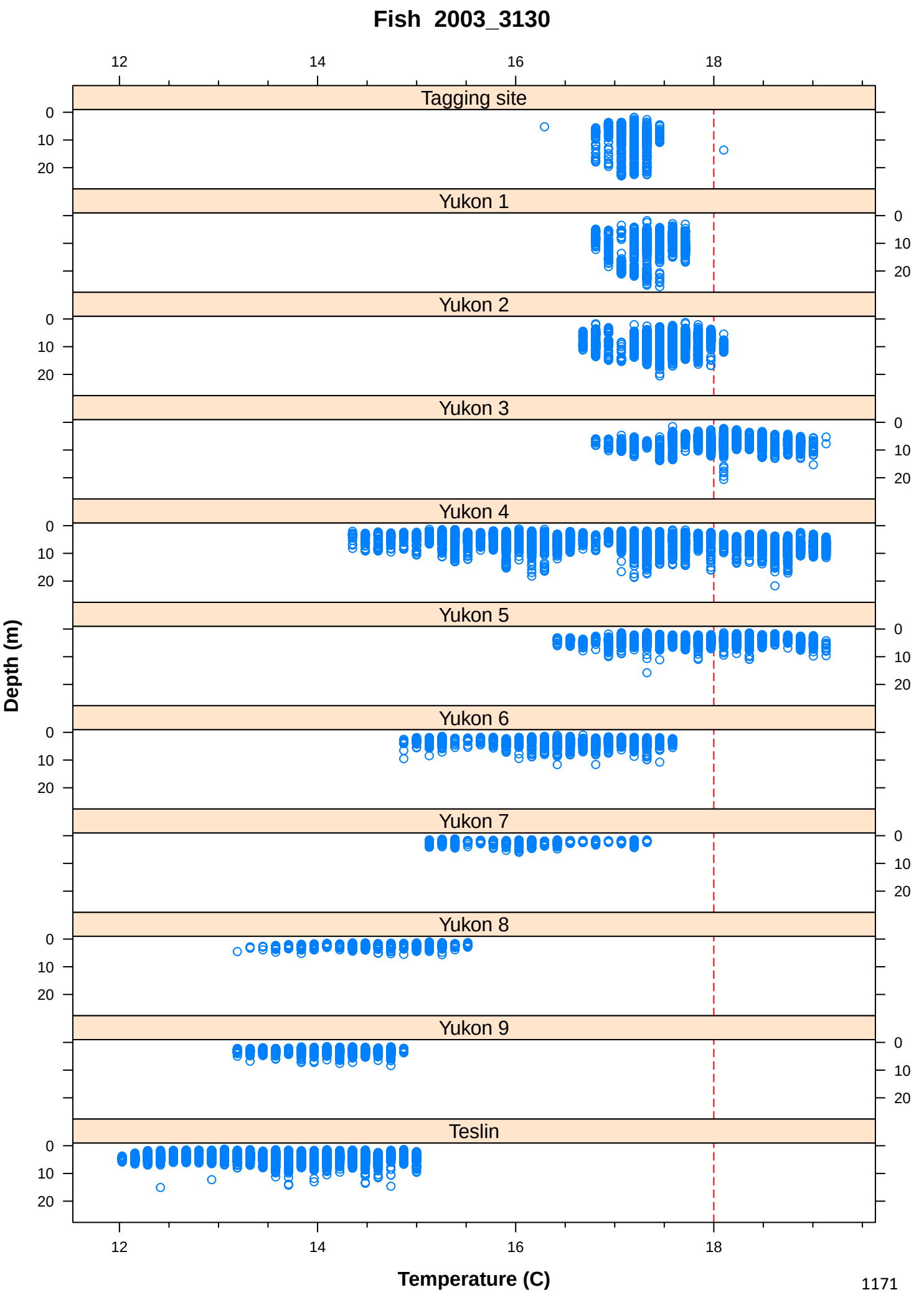

Fish 2003_3130
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Density
1.0
0.5
0.0
0
5
10
15
20
25
Depth (m)
1166

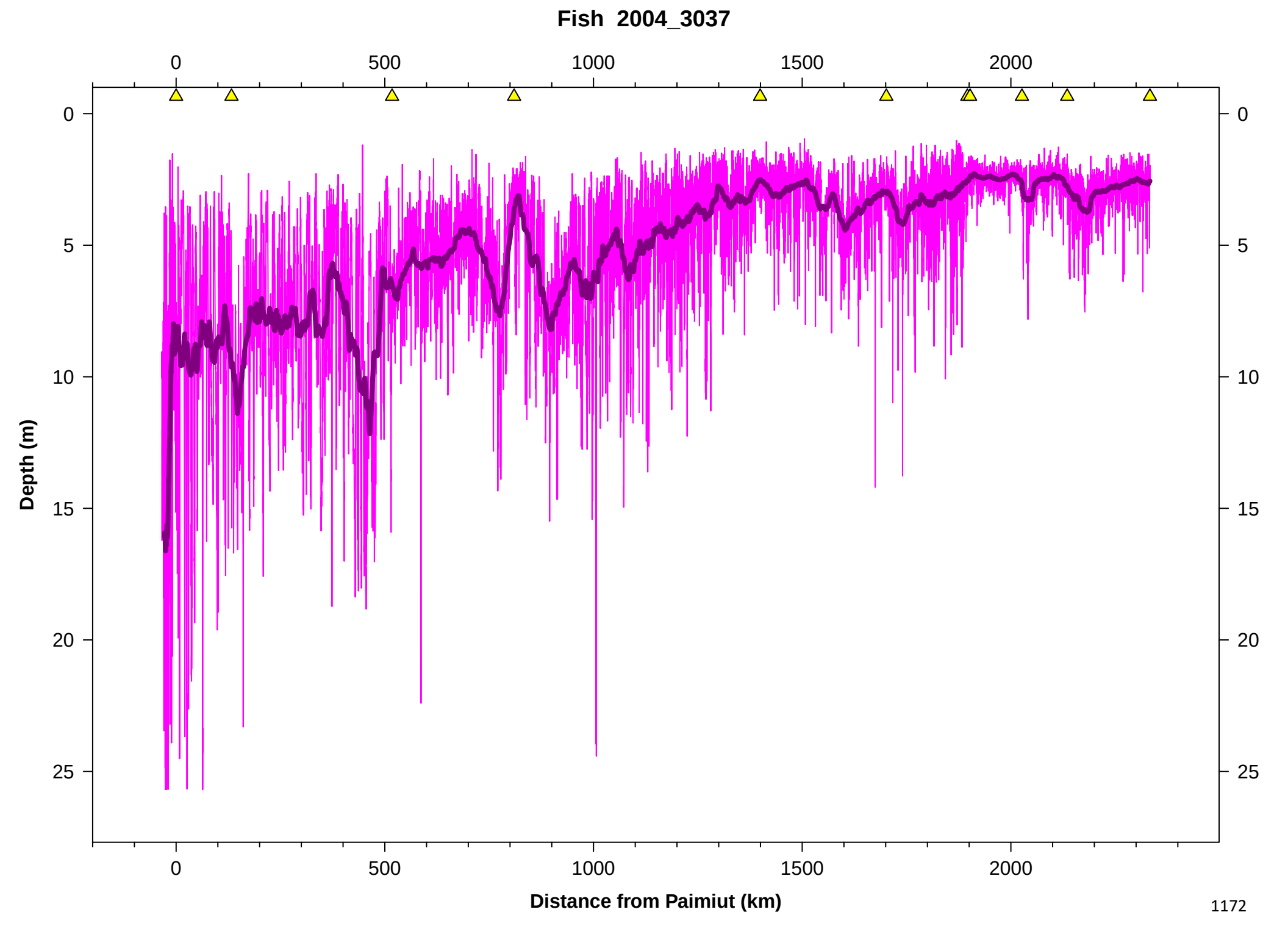

Fish 2003_3130
0
500
1000
1500
2000
18
16
14
Temperature (C)
Distance from Paimiut
1167

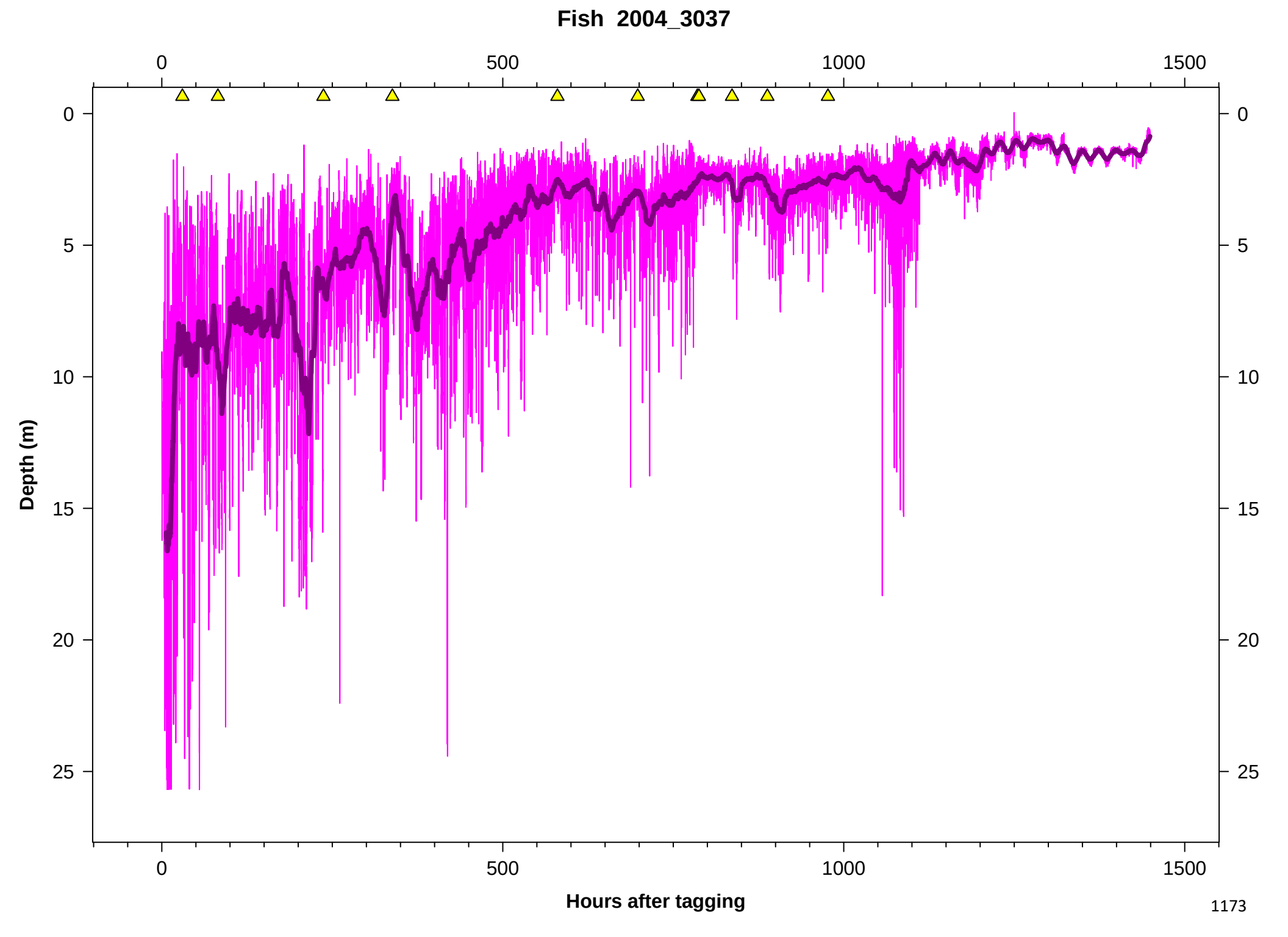

Fish 2003_3130
0
500
1000
1500
18
16
14
12
Temperature (C)
Hours after tagging
1168

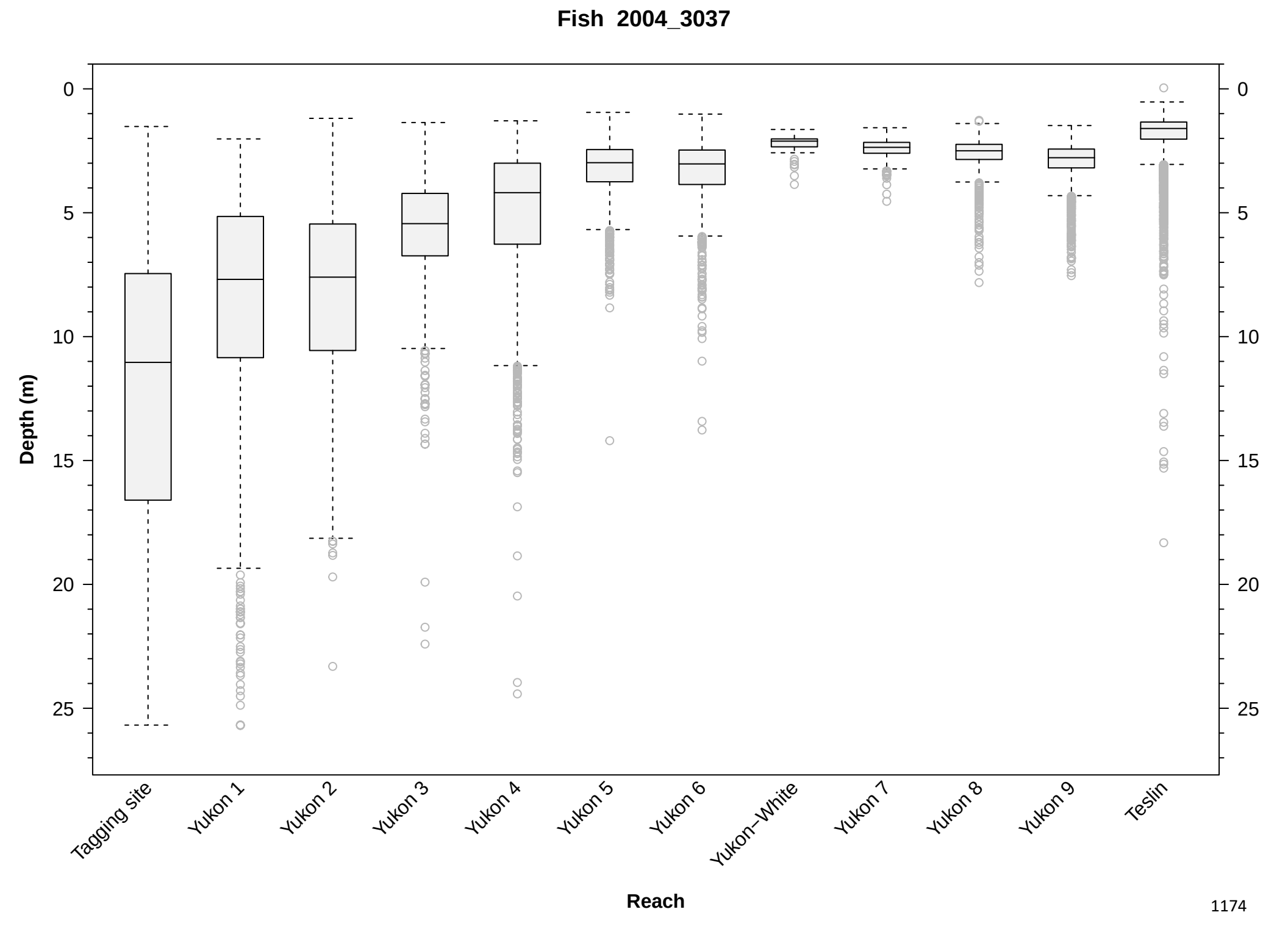

Fish 2003_3130
Temperature (C)
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Reach
1169

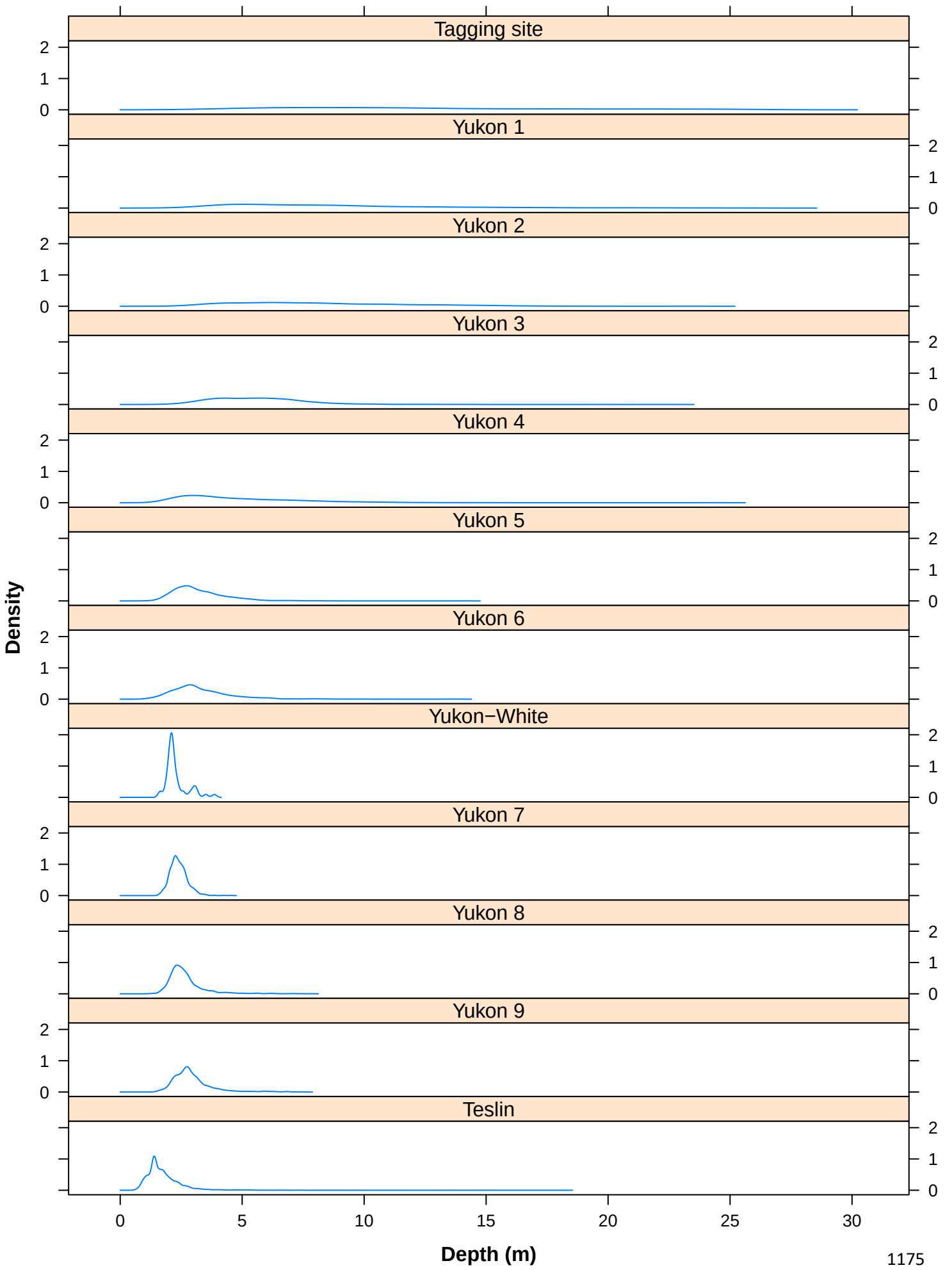

Fish 2003_3130
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Density
Temperature (C)
12
13
14
15
16
17
18
19
20
0
2
4
1170

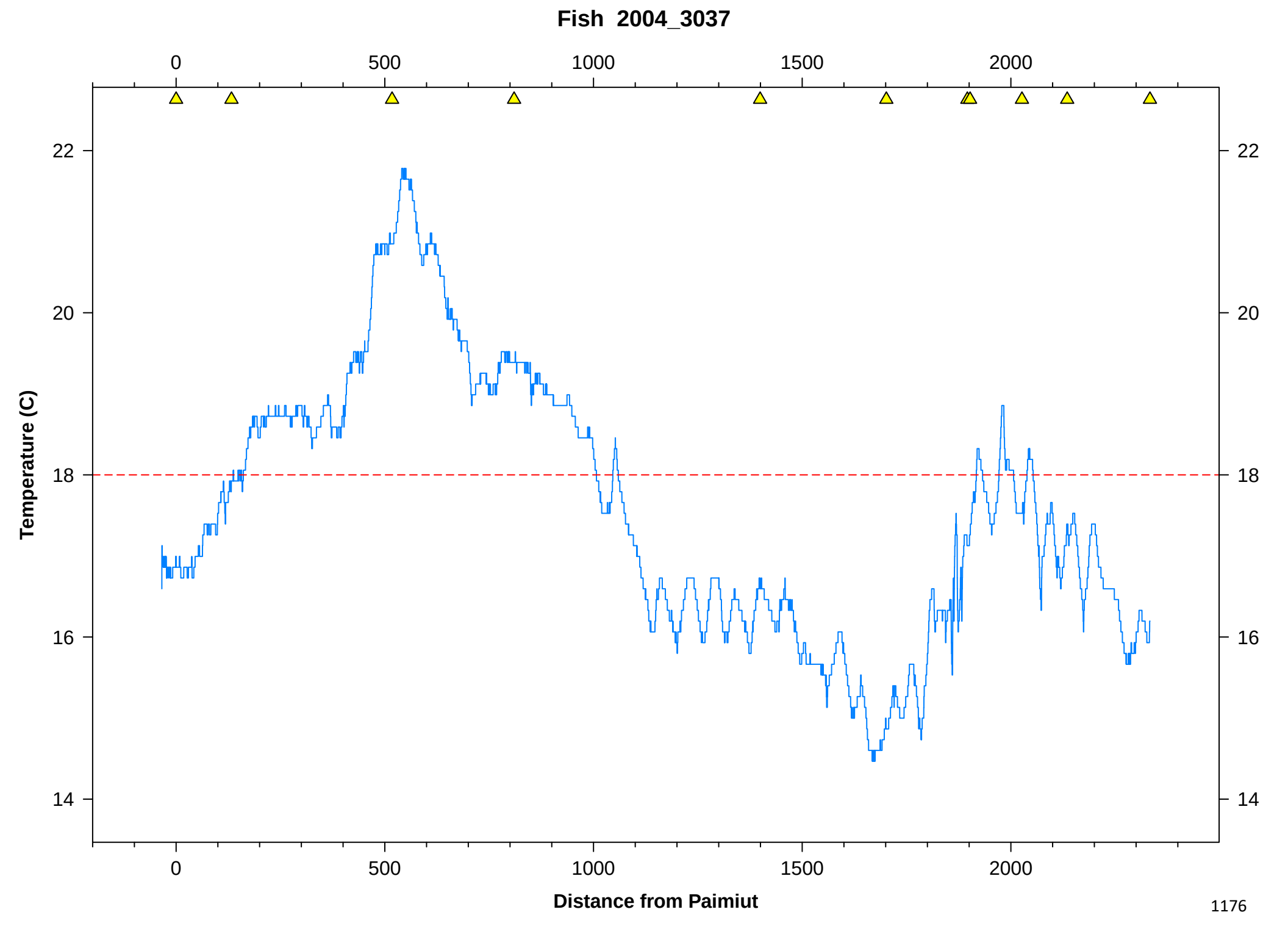

Fish 2003_3130
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon 7
Yukon 8
Yukon 9
Teslin
Depth (m)
Temperature (C)
12
14
16
18
0
10
20
1171

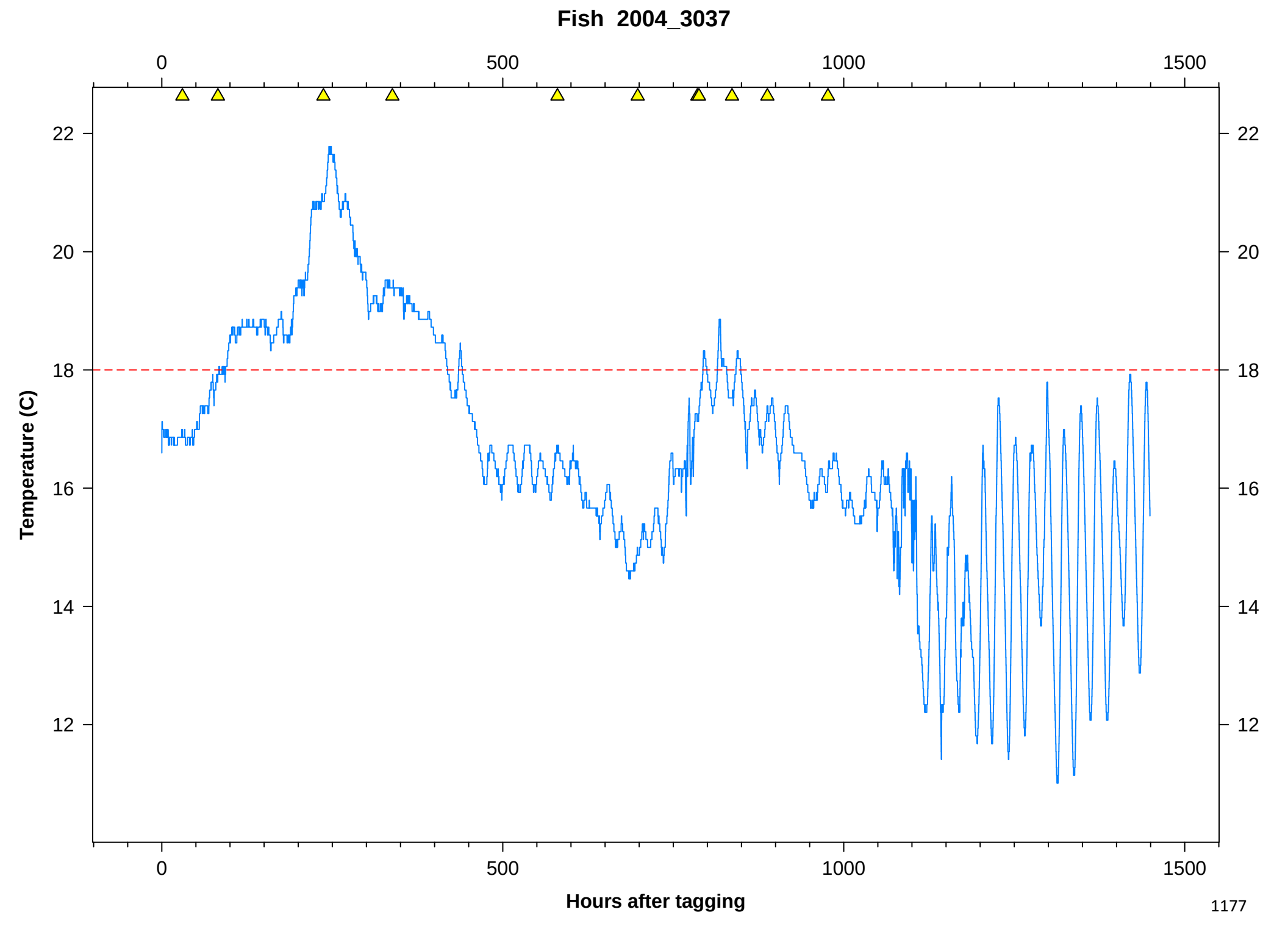

Fish 2004_3037
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
1172

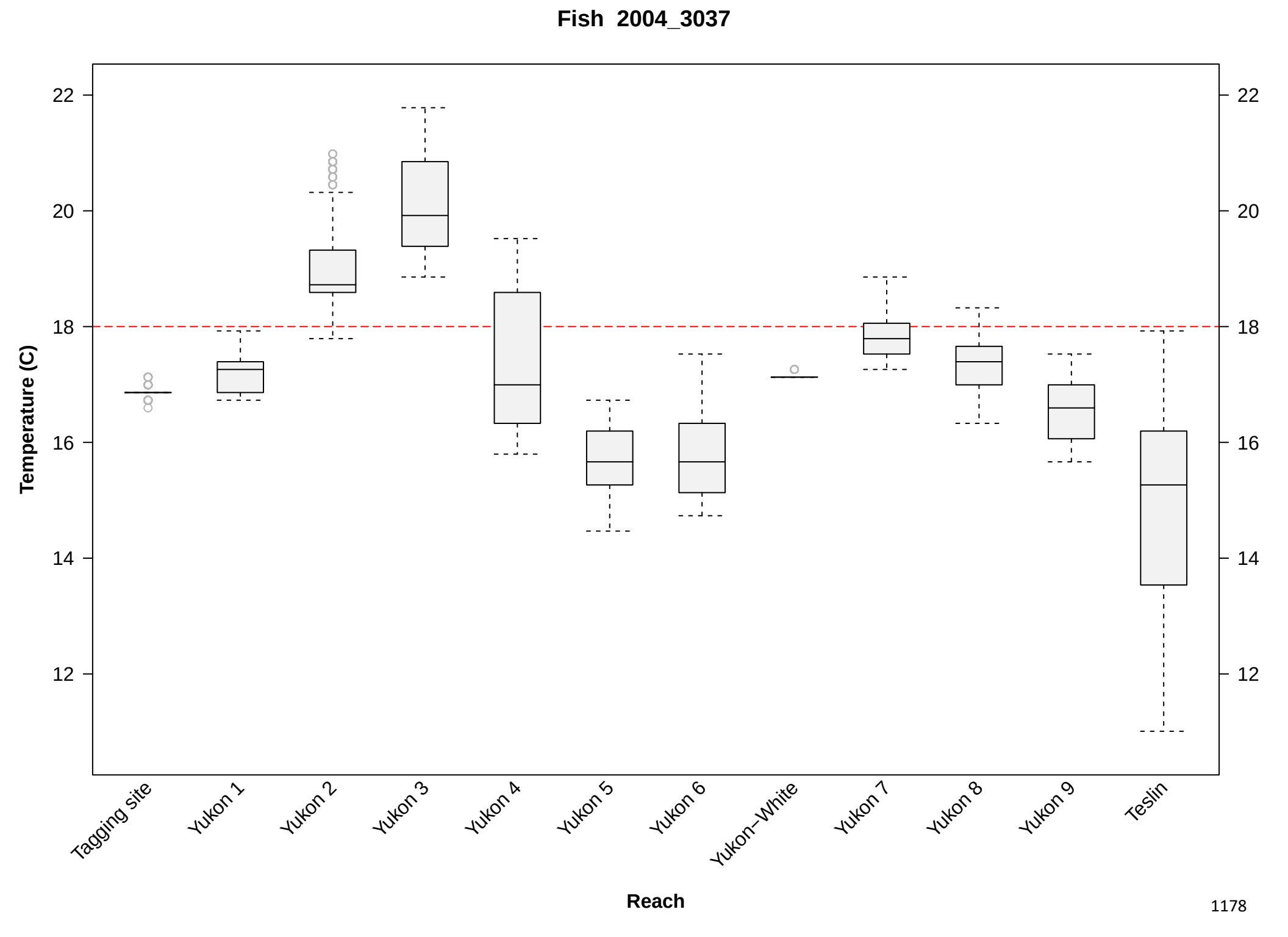

Fish 2004_3037
0
500
1000
1500
0
5
10
15
20
25
Depth (m)
Hours after tagging
1173

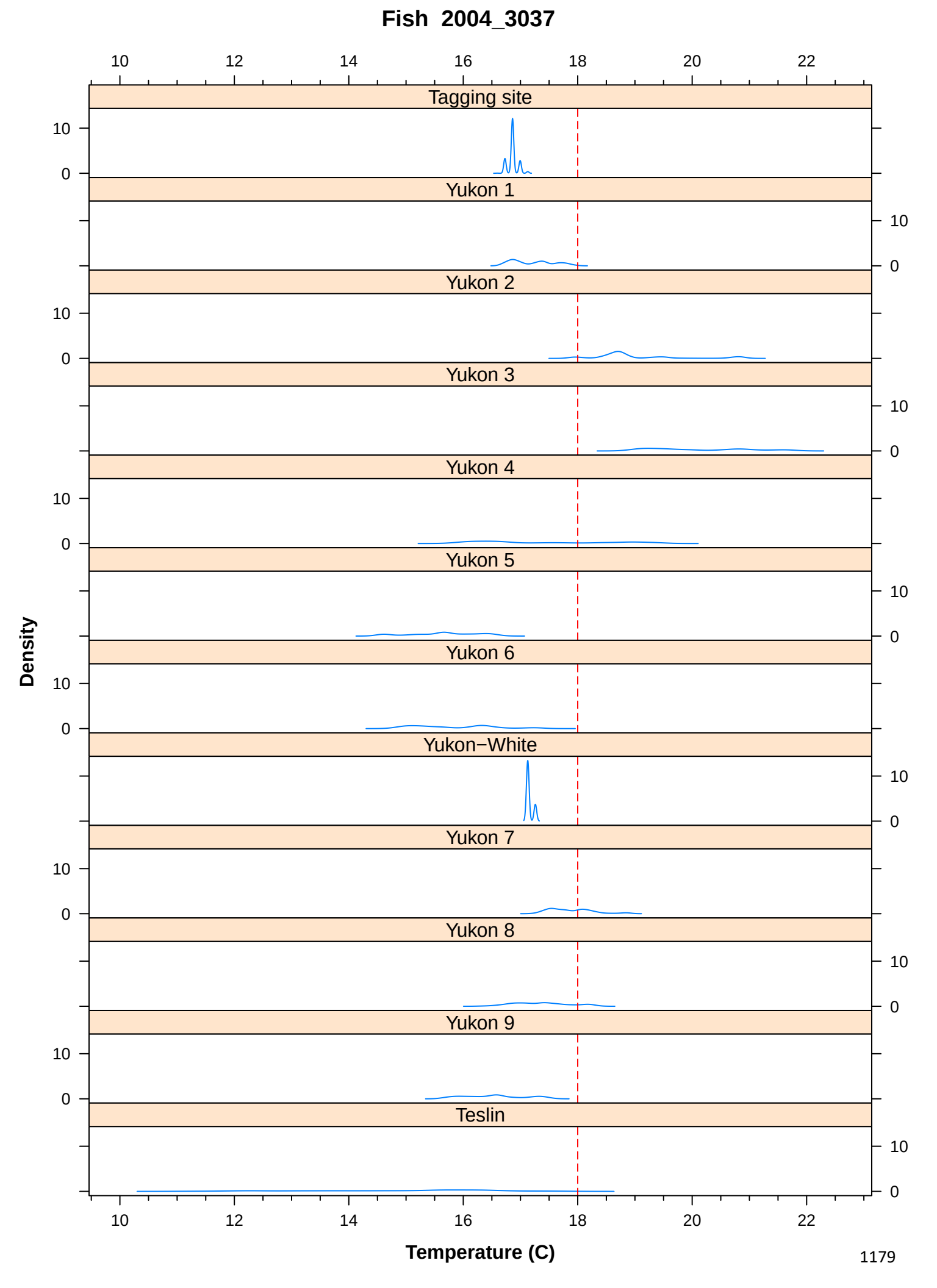

Fish 2004_3037
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon−White
Yukon 7
Yukon 8
Yukon 9
Teslin
Reach

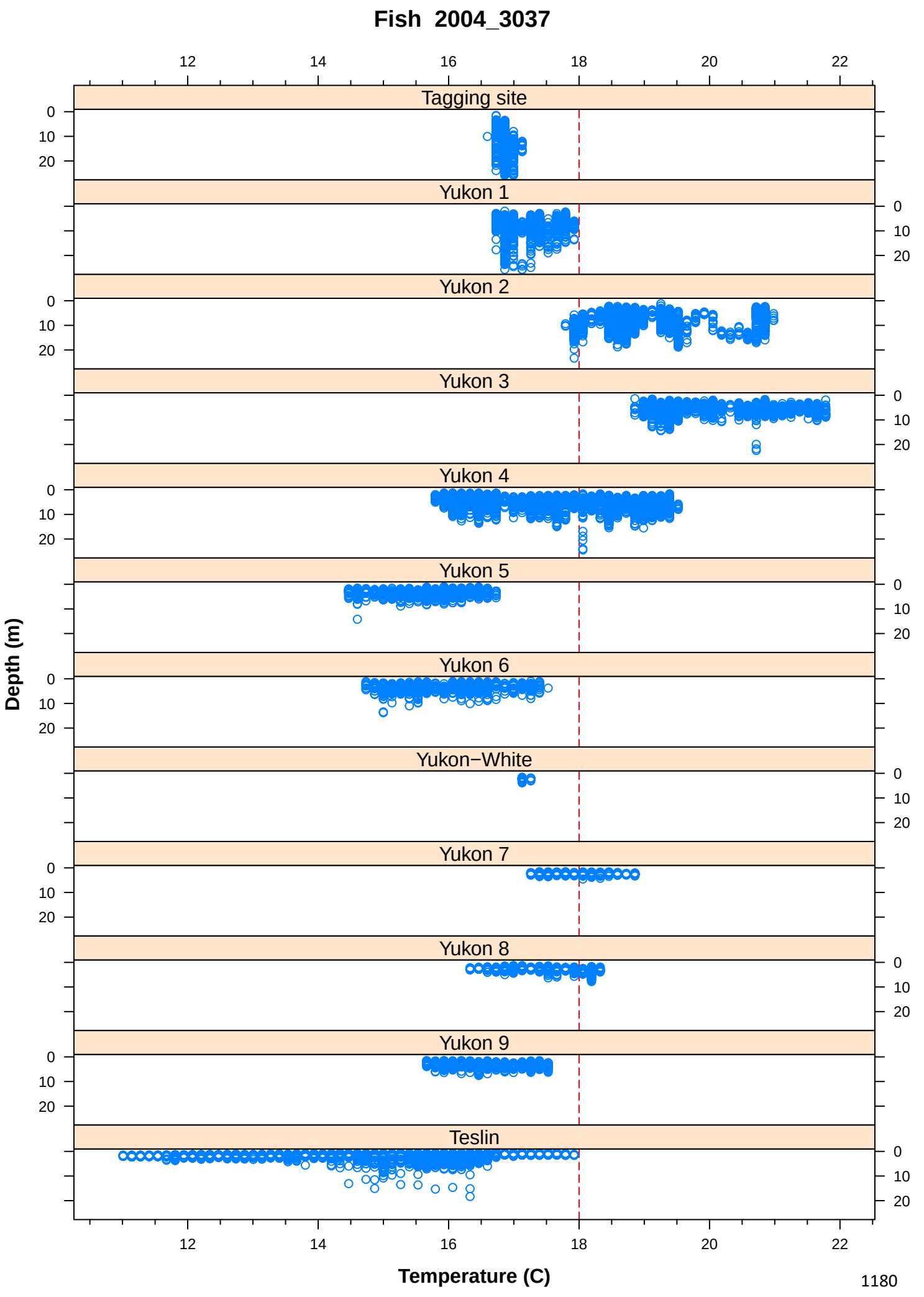

Fish 2004_3037
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon−White
Yukon 7
Yukon 8
Yukon 9
Teslin
Density
0
1
2
0
5
10
15
20
25
30
Depth (m)
1175

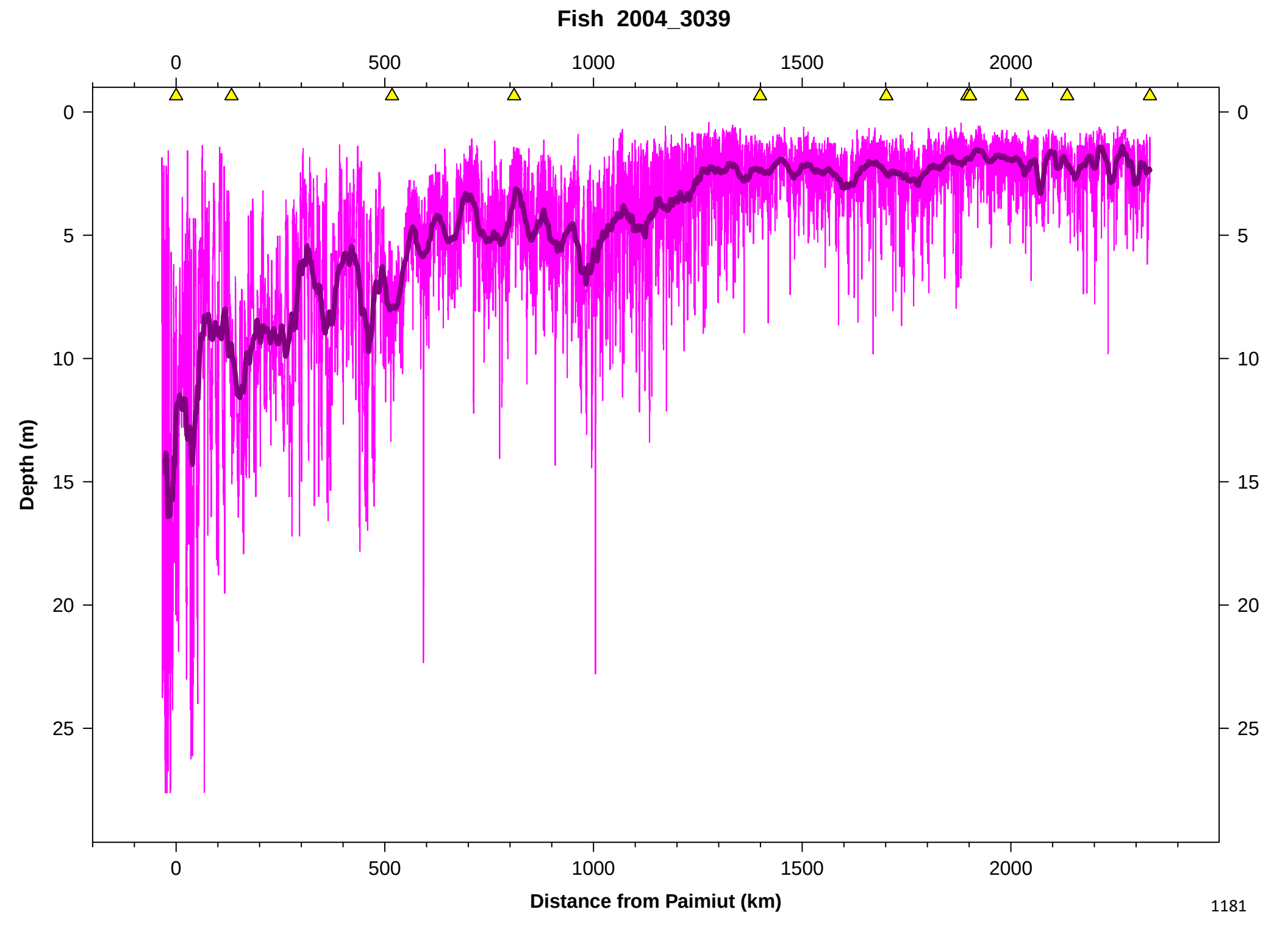

Fish 2004_3037
0
500
1000
1500
2000
22
20
18
16
14
Temperature (C)
Distance from Paimiut
1176

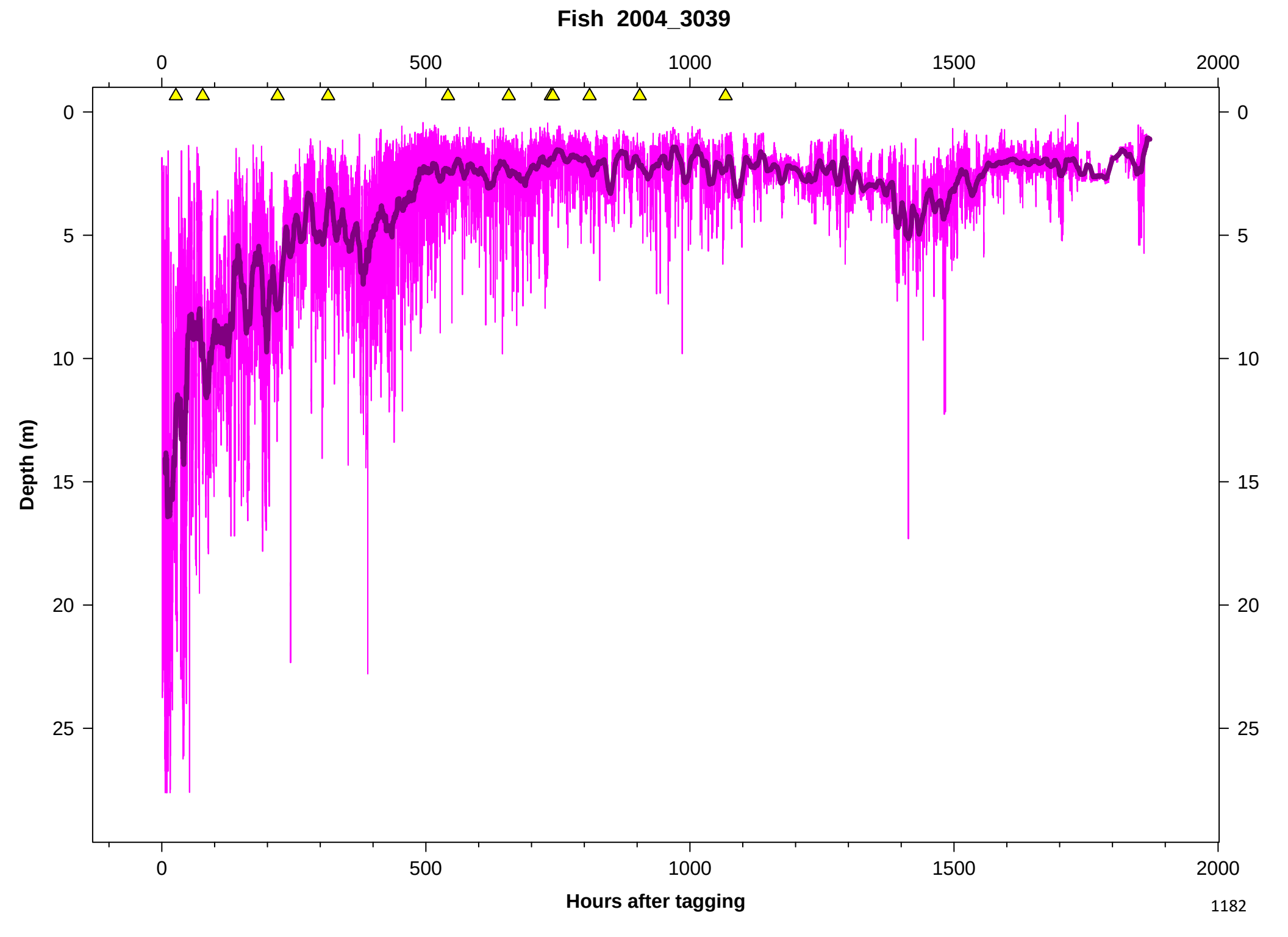

Fish 2004_3037
0
500
1000
1500
22
20
18
16
14
12
Temperature (C)
Hours after tagging
1177

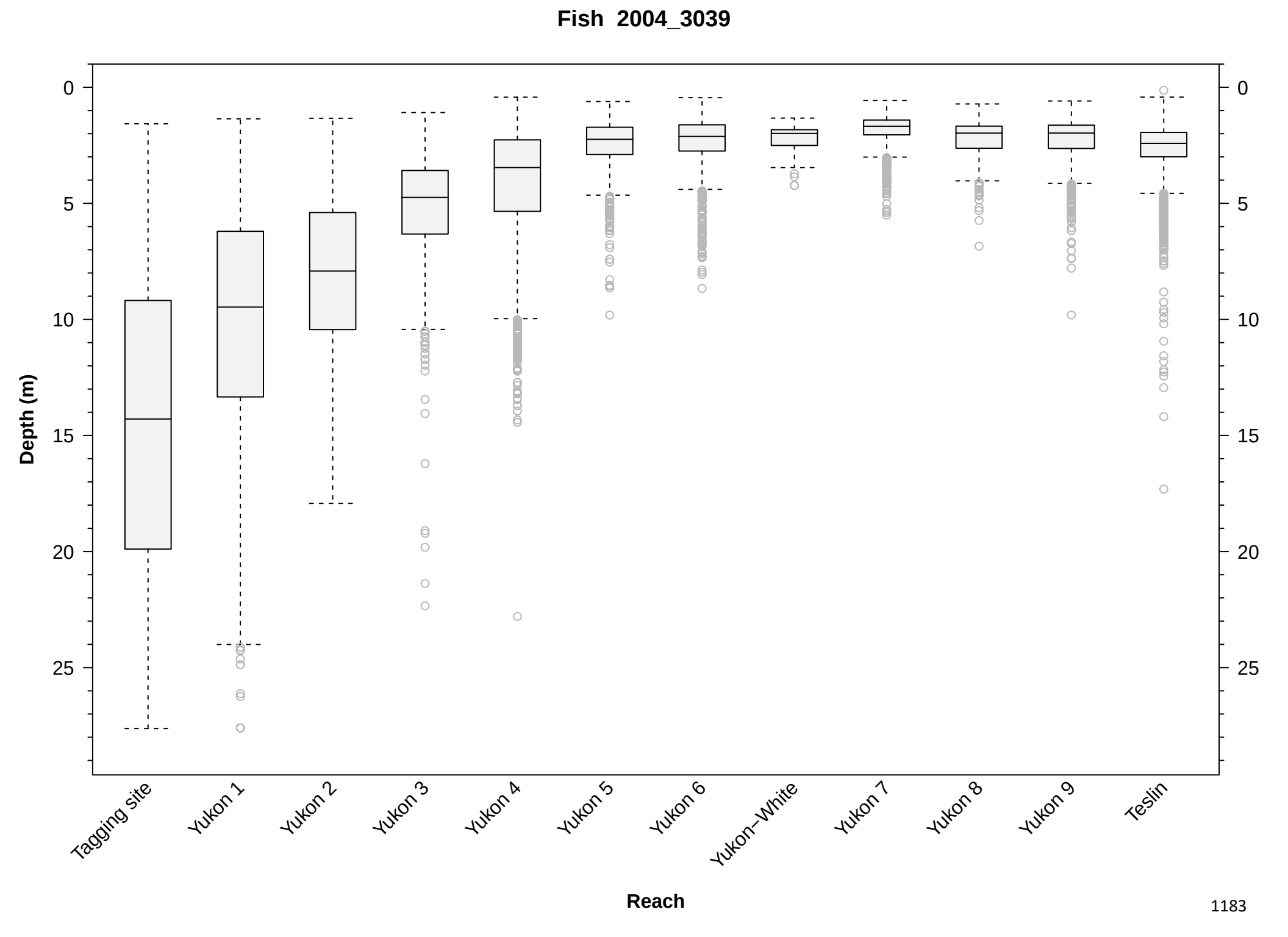

Fish 2004_3037
Temperature (C)
22
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon−White
Yukon 7
Yukon 8
Yukon 9
Teslin
Reach
1178

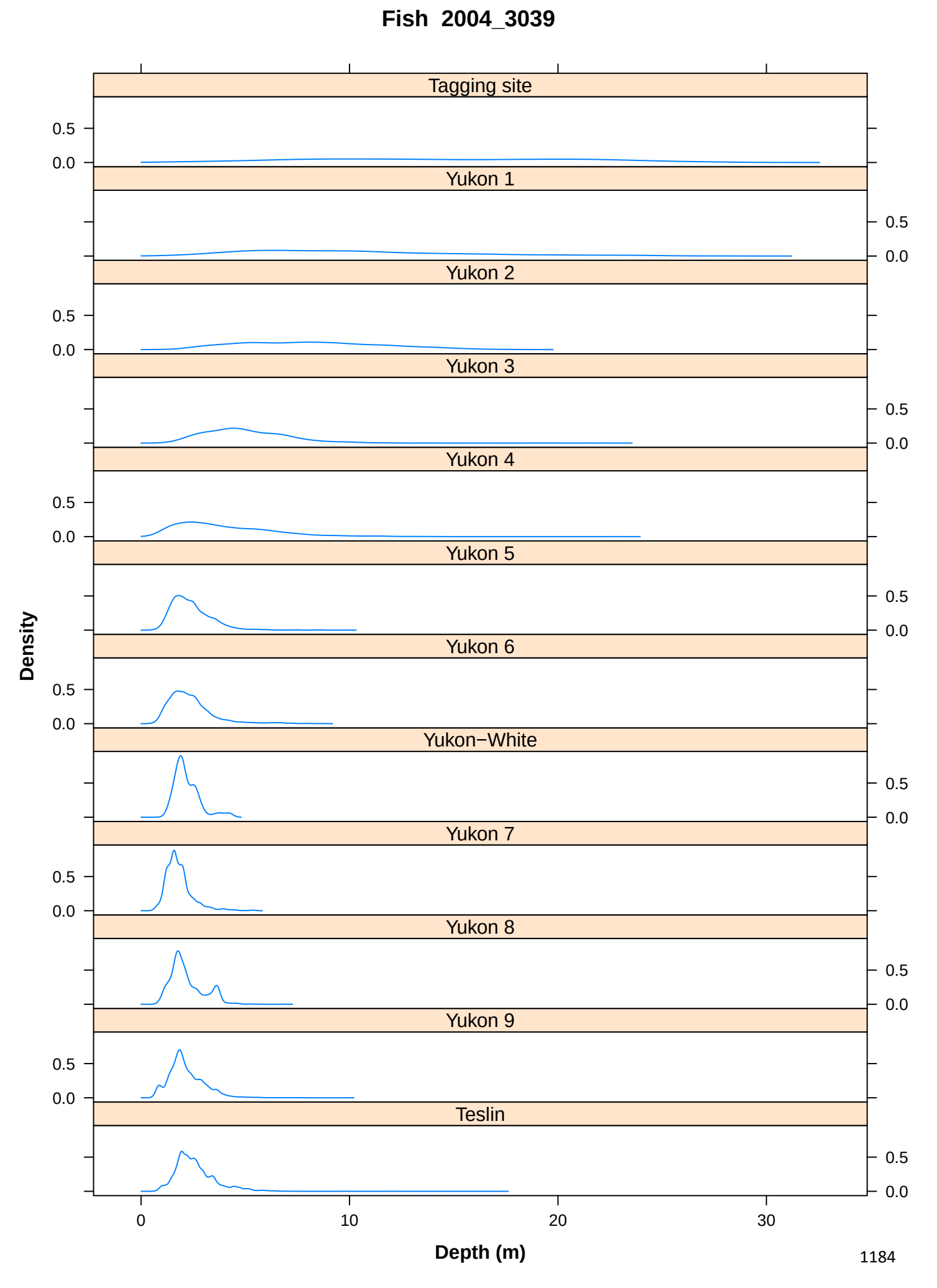

Fish 2004_3037
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon−White
Yukon 7
Yukon 8
Yukon 9
Teslin
Density
Temperature (C)
10
12
14
16
18
20
22
0
1179

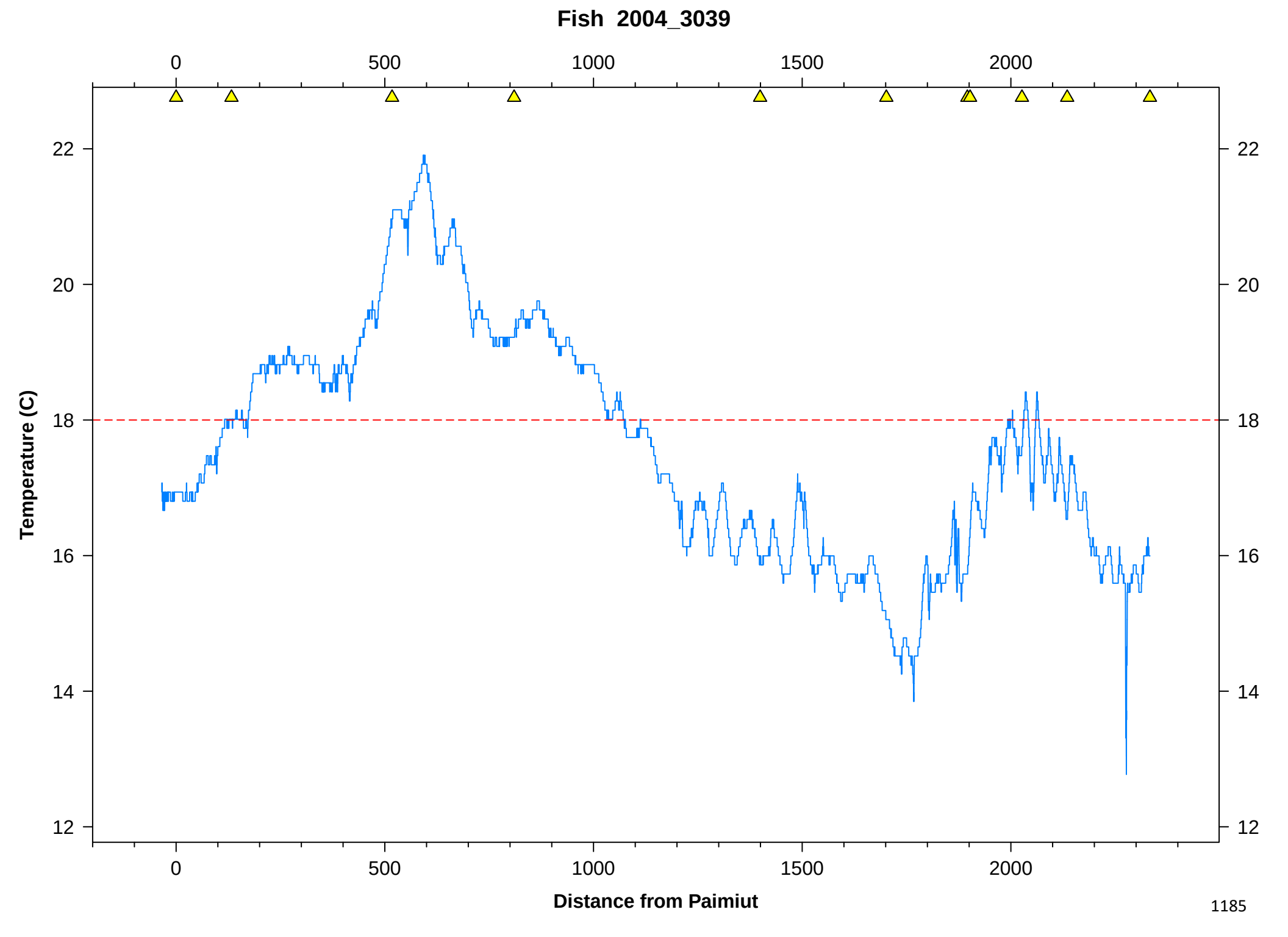

Fish 2004_3037
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon−White
Yukon 7
Yukon 8
Yukon 9
Teslin
Depth (m)
Temperature (C)
12
14
16
18
20
22
0
10
20
1180

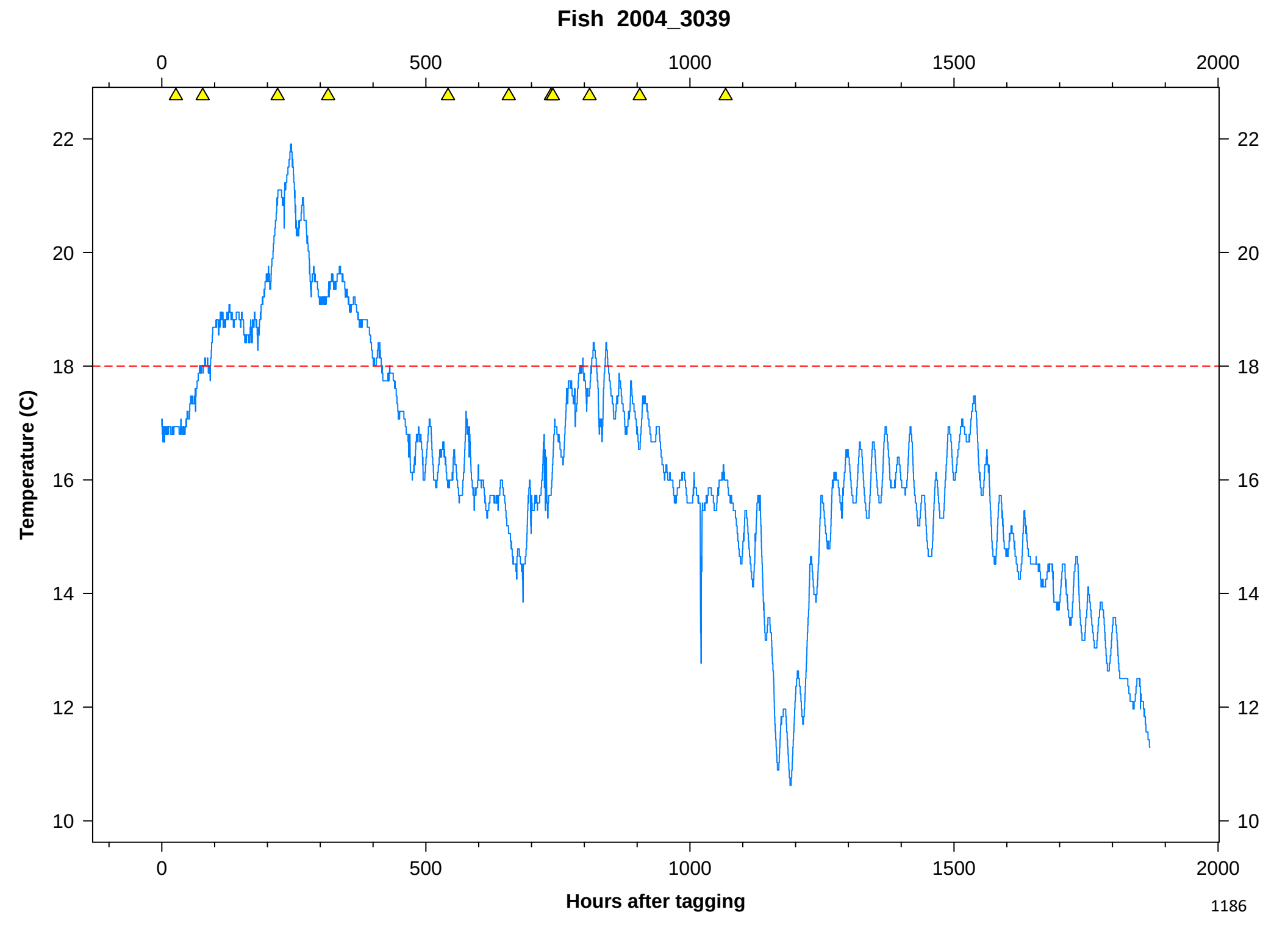

Fish 2004_3039
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Distance from Paimiut (km)
1181

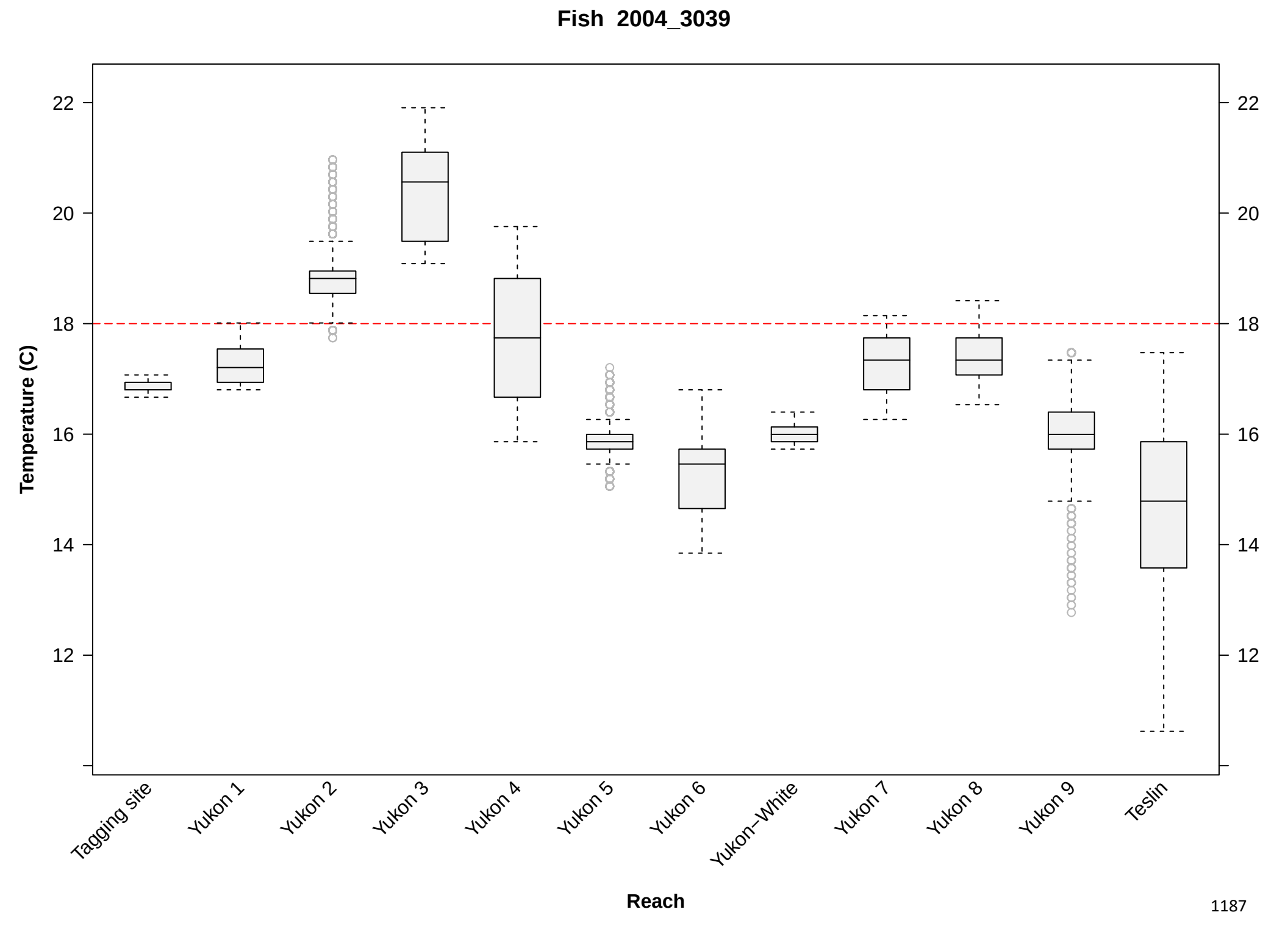

Fish 2004_3039
0
500
1000
1500
2000
0
5
10
15
20
25
Depth (m)
Hours after tagging
1182

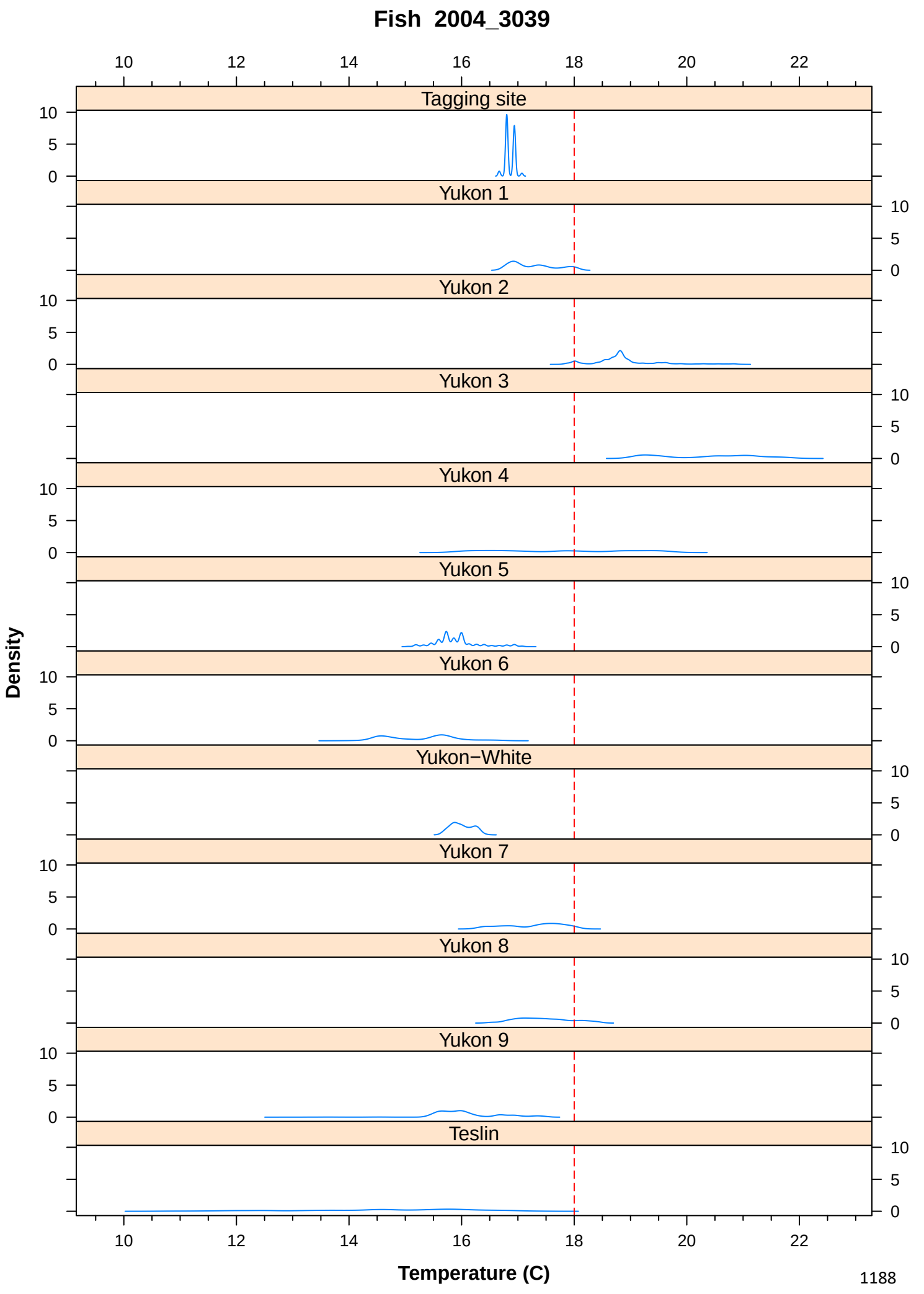

Fish 2004_3039
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon−White
Yukon 7
Yukon 8
Yukon 9
Teslin
Reach

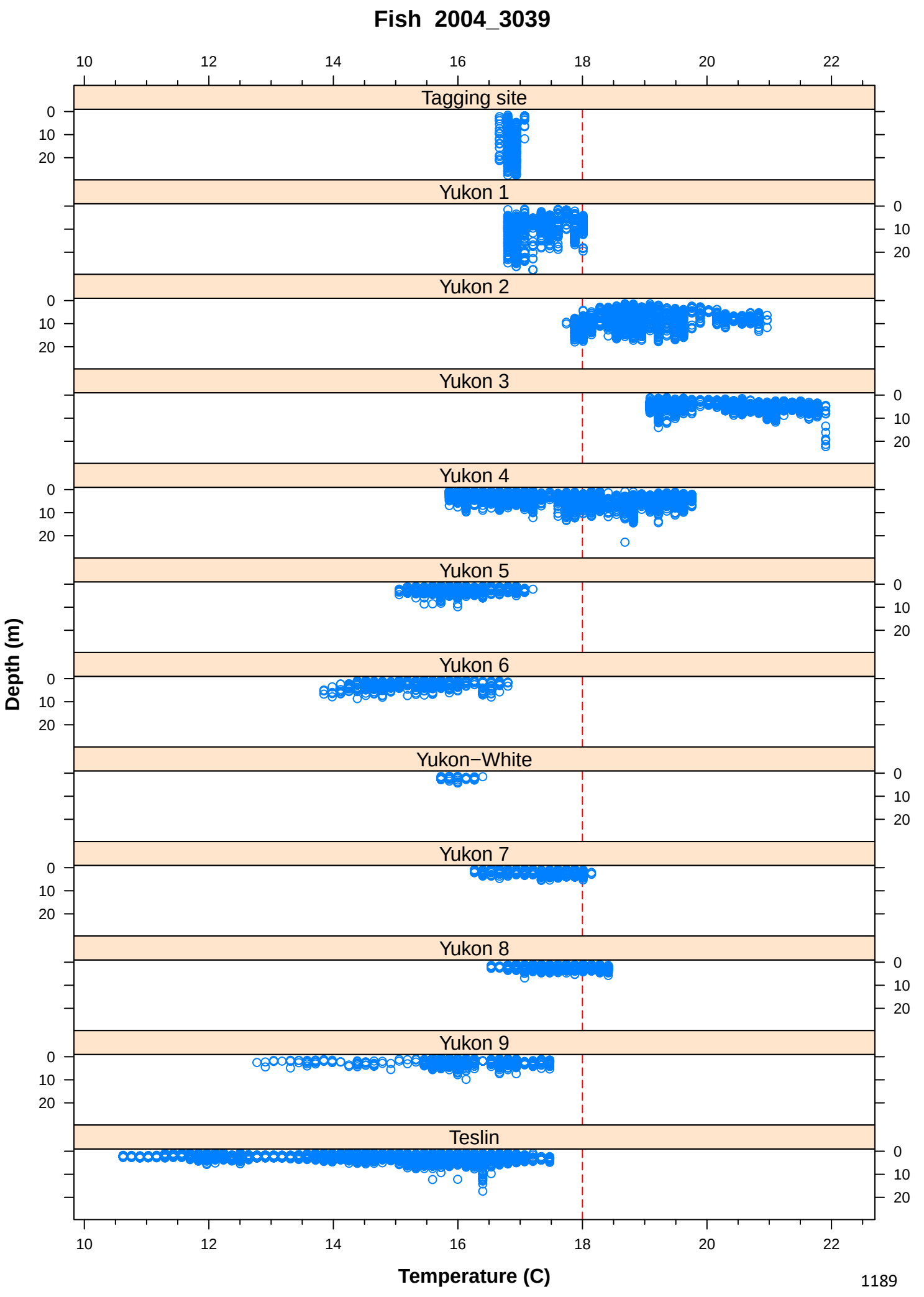

Fish 2004_3039
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon−White
Yukon 7
Yukon 8
Yukon 9
Teslin
Density
0.5
0.0
0
10
20
30
Depth (m)
1184


Fish 2004_3039
0
500
1000
1500
2000
22
20
18
16
14
12
Temperature (C)
Distance from Paimiut
1185


Fish 2004_3039
0
500
1000
1500
2000
22
20
18
16
14
12
10
Temperature (C)
Hours after tagging
1186

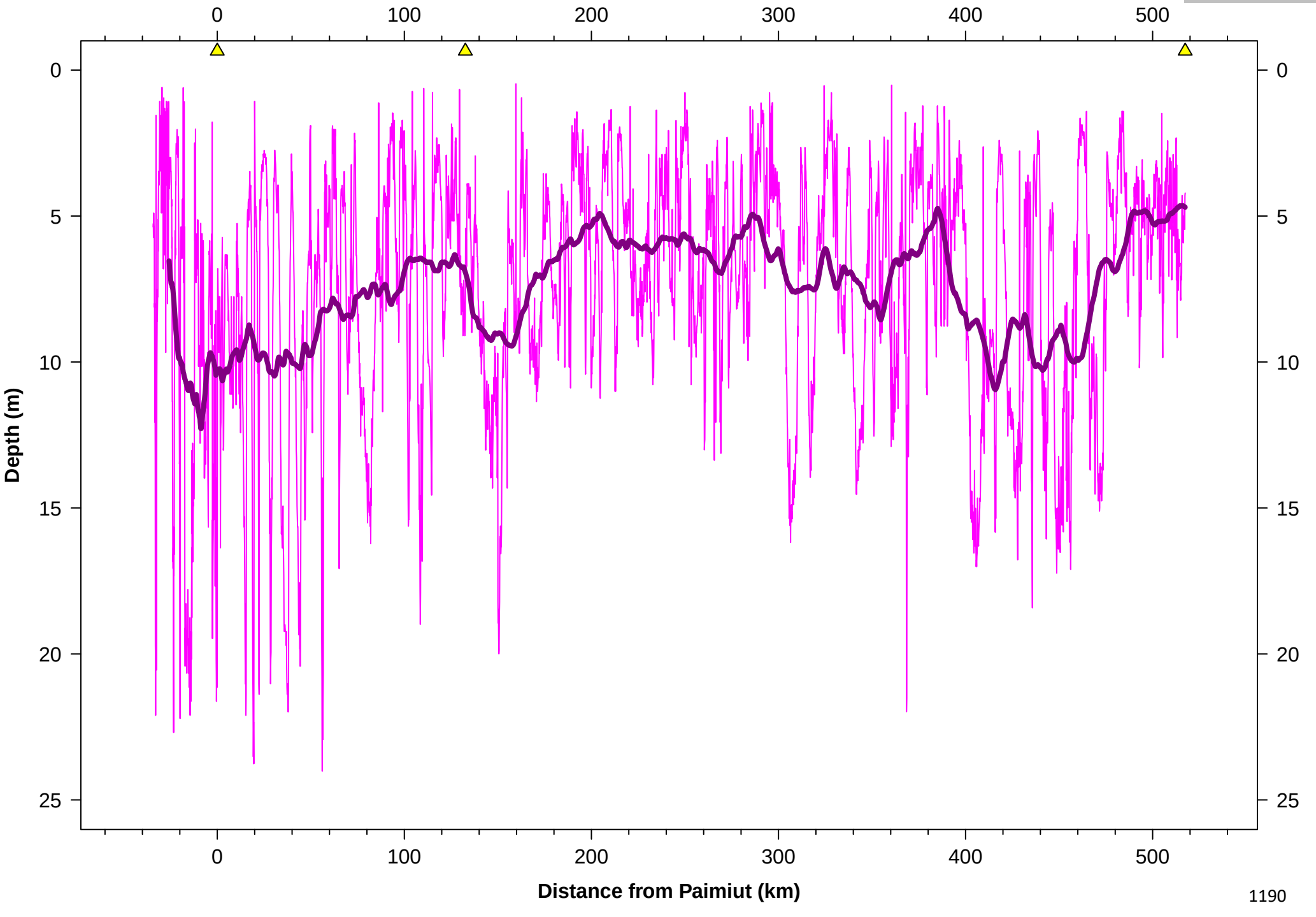

Fish 2004_3039
Temperature (C)
22
20
18
16
14
12
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon−White
Yukon 7
Yukon 8
Yukon 9
Teslin
Reach
1187

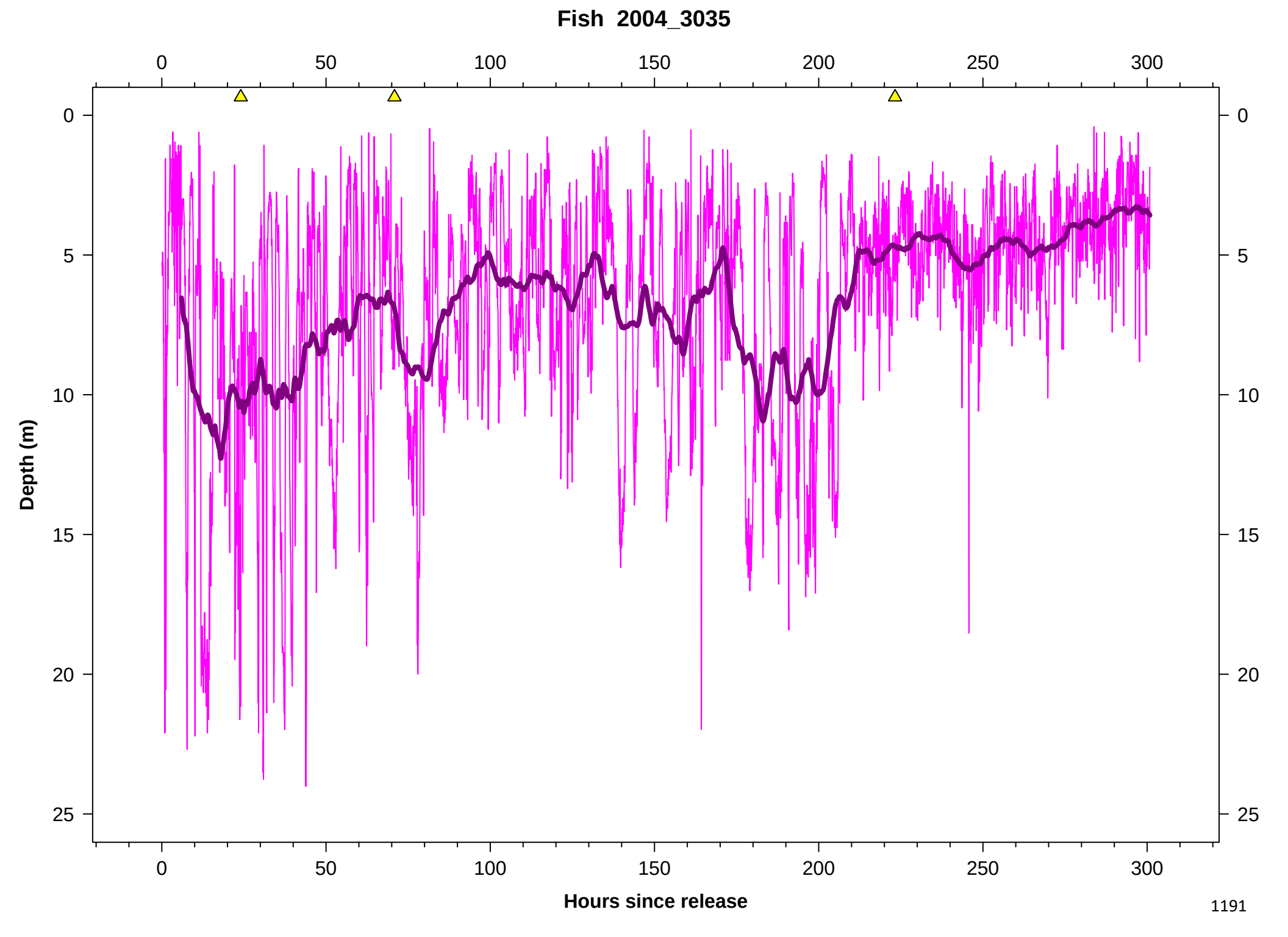

Fish 2004_3039
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon−White
Yukon 7
Yukon 8
Yukon 9
Teslin
Density
Temperature (C)
10
12
14
16
18
20
22
0
5
10
1188

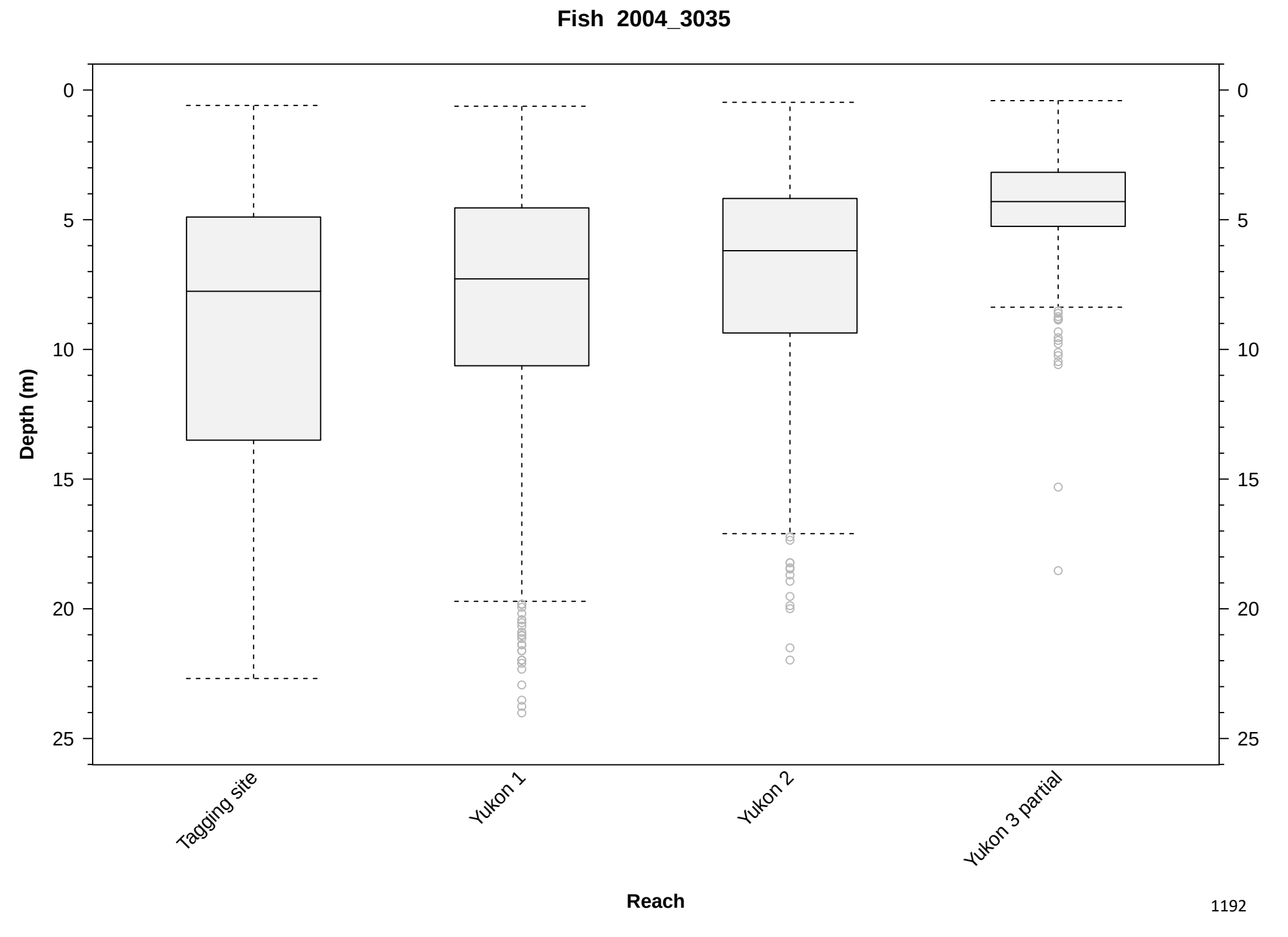

Fish 2004_3039
Tagging site
Yukon 1
Yukon 2
Yukon 3
Yukon 4
Yukon 5
Yukon 6
Yukon−White
Yukon 7
Yukon 8
Yukon 9
Teslin
Depth (m)
Temperature (C)
10
12
14
16
18
20
22
0
10
20
1189

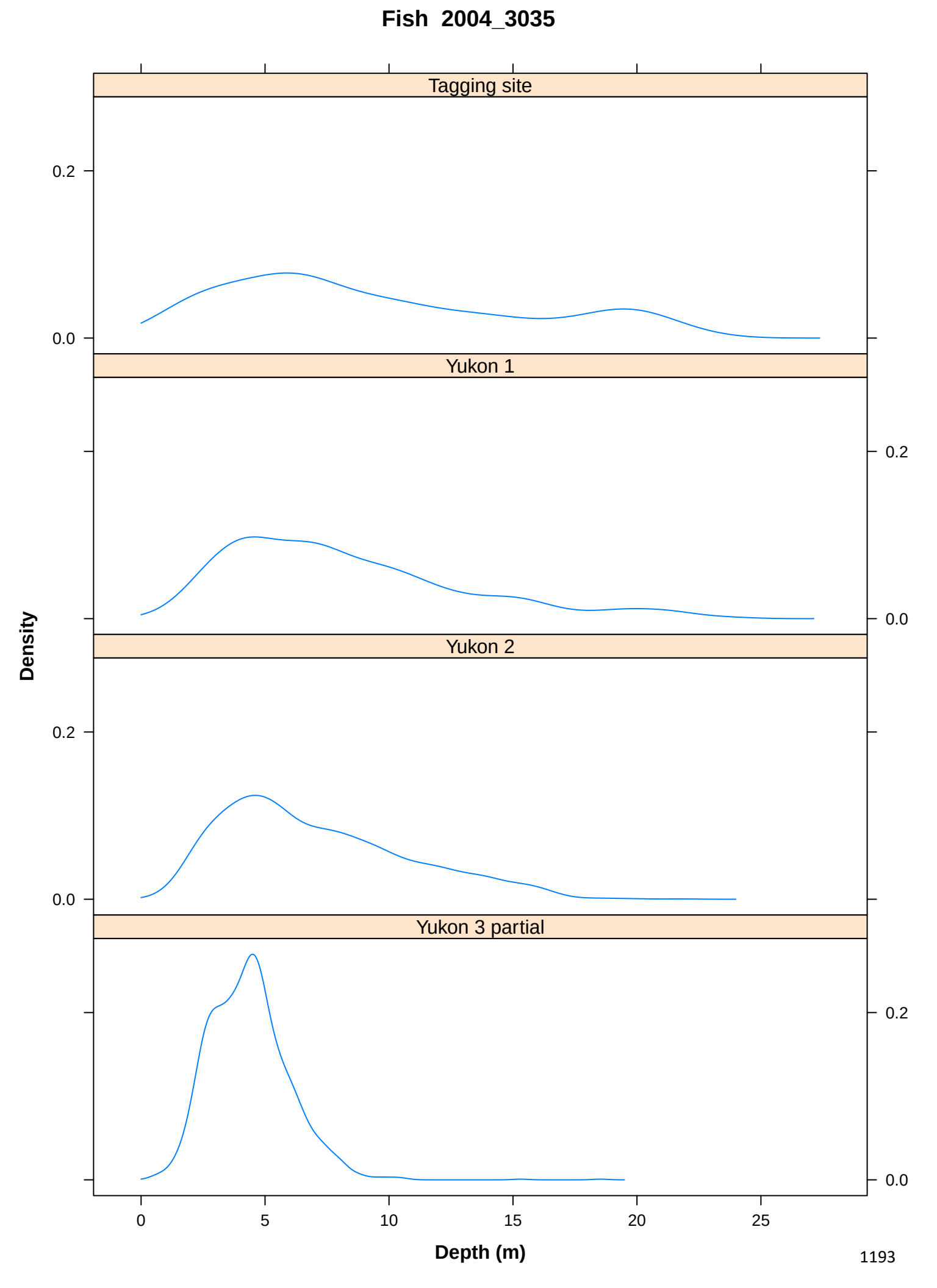
Back to Appendix 9 TOC

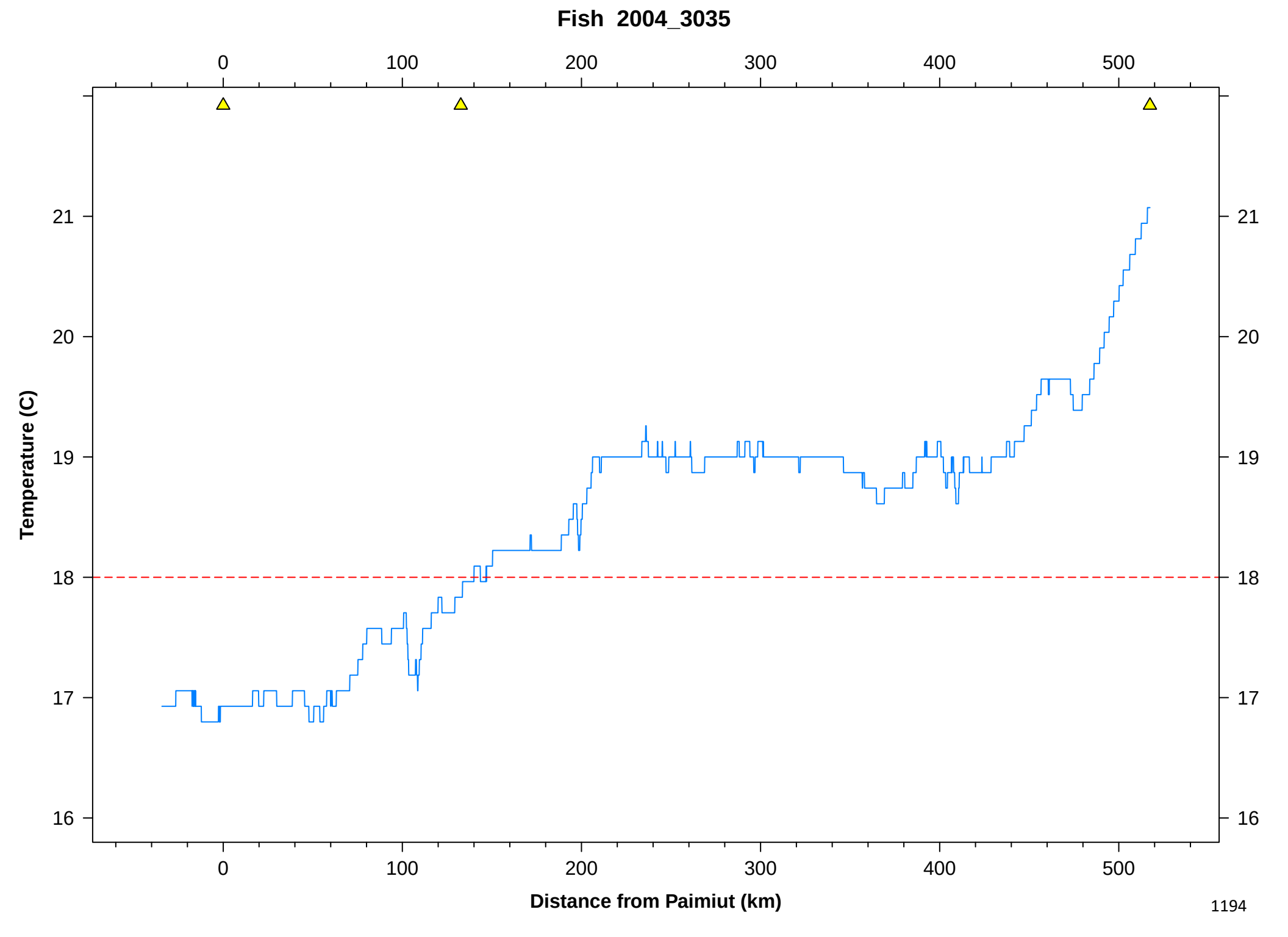
Headwaters Fish 2004_3035

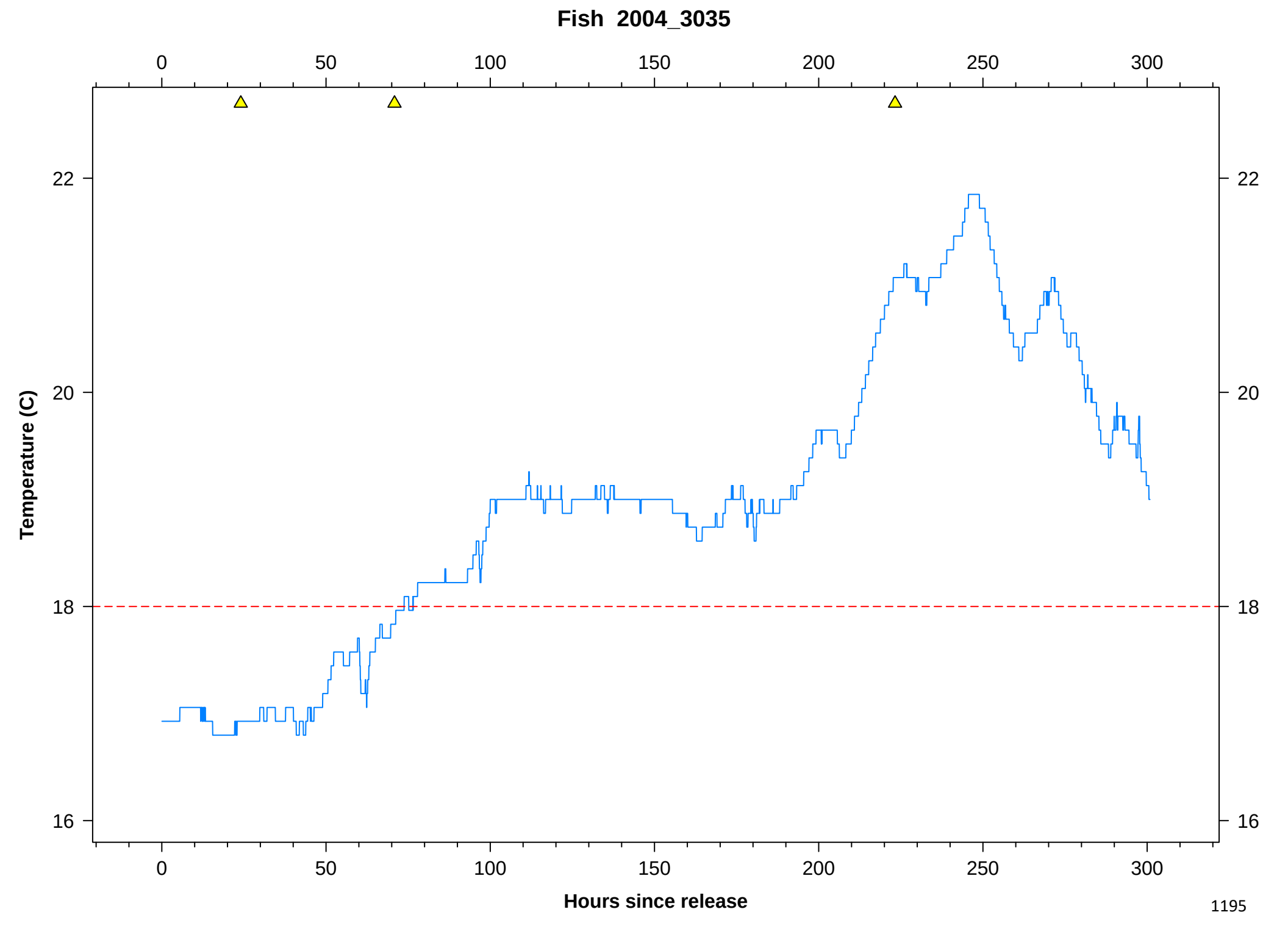


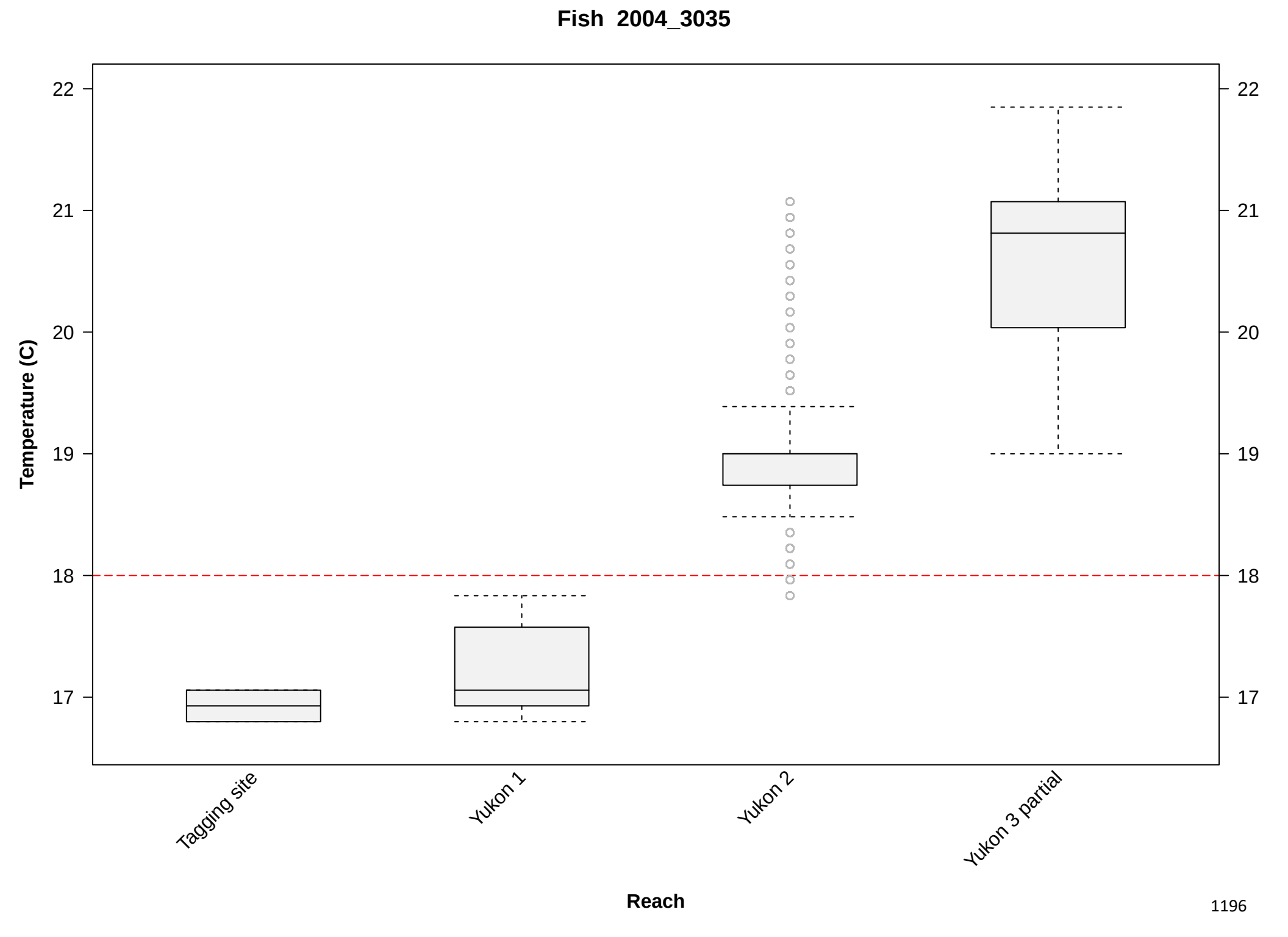

Fish 2004_3035
0
50
100
150
200
250
300
0
5
10
15
20
25
Depth (m)
Hours since release
1191

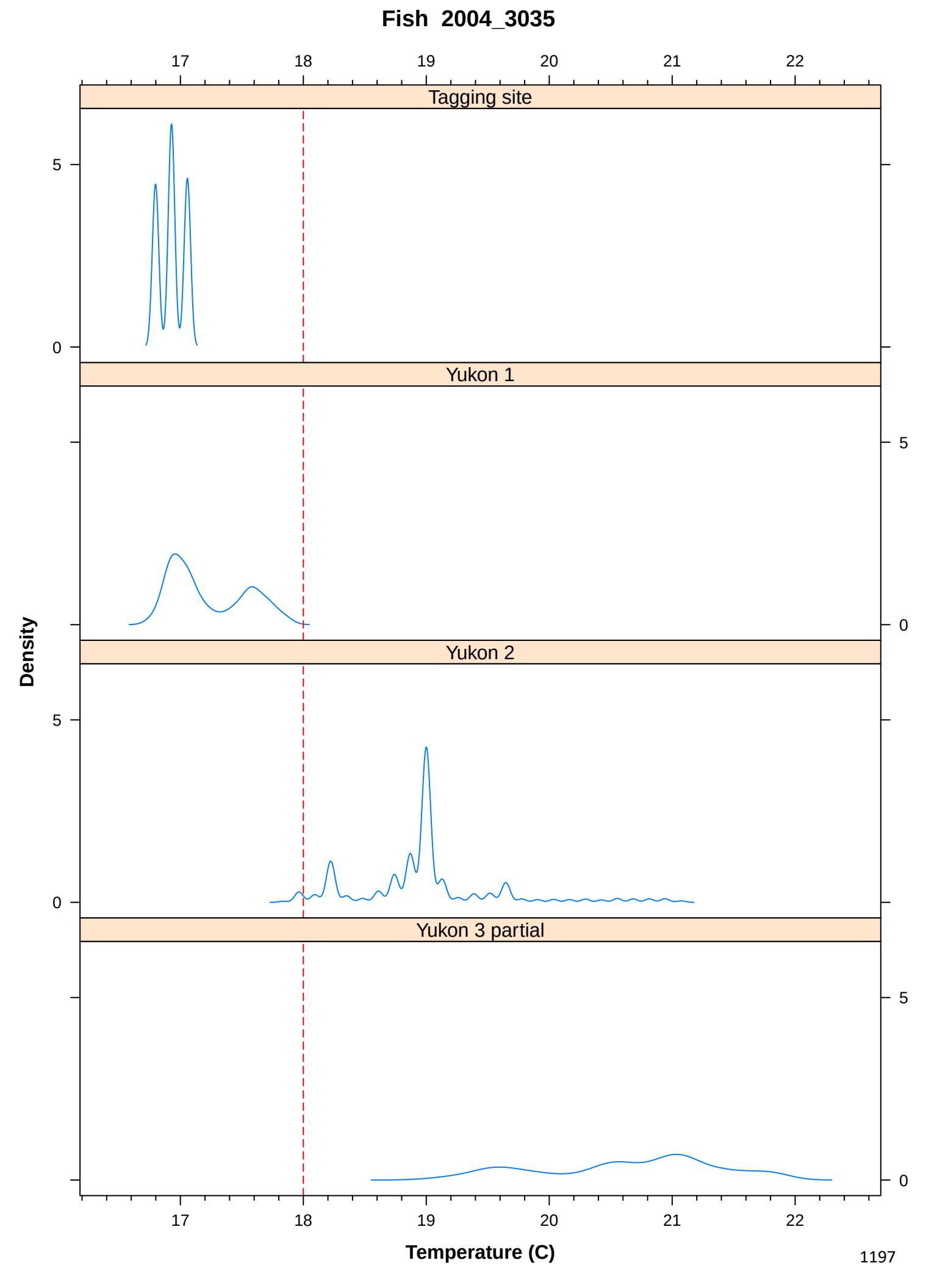

Fish 2004_3035
Depth (m)
0
5
10
15
20
25
Tagging site
Yukon 1
Yukon 2
Yukon 3 partial
Reach
1192

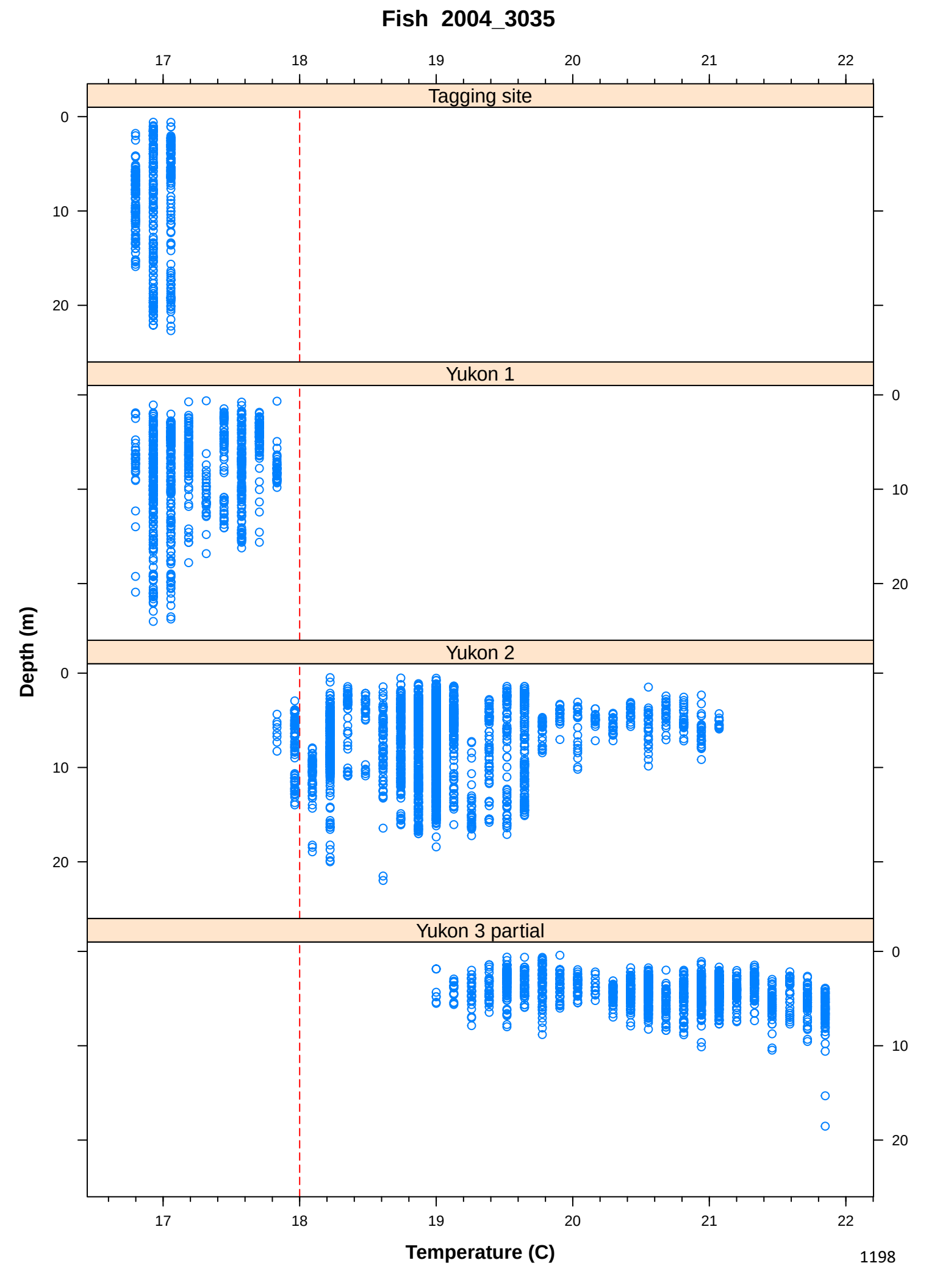

Fish 2004_3035
Tagging site
Yukon 1
Yukon 2
Yukon 3 partial
Density
0.2
0.0
0
5
10
15
20
25
Depth (m)
1193

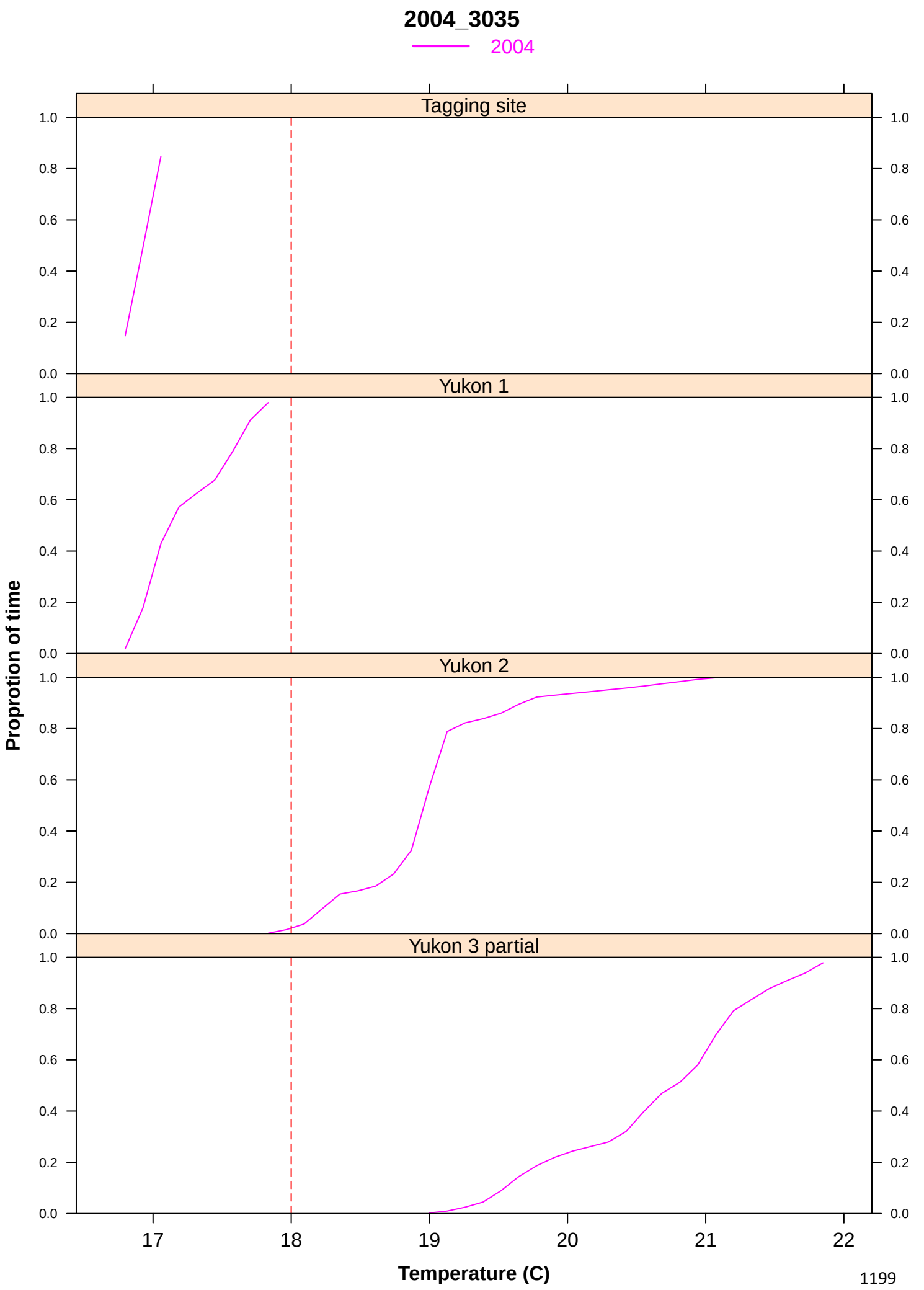

Fish 2004_3035
0
100
200
300
400
500
21
20
19
18
17
16
Temperature (C)
Distance from Paimiut (km)
1194

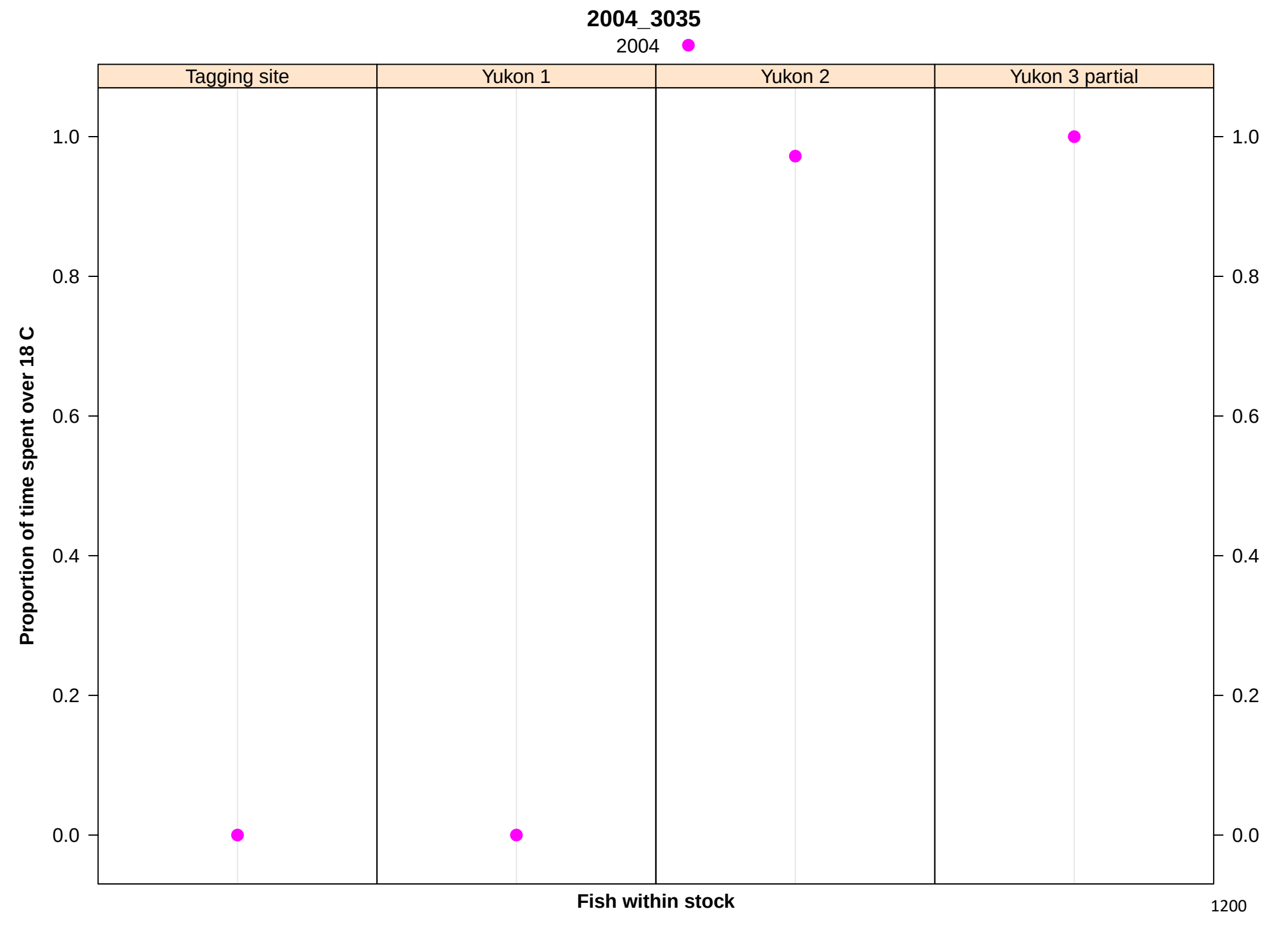

Fish 2004_3035
0
50
100
150
200
250
300
22
20
18
16
Temperature (C)
Hours since release
1195


Fish 2004_3035
Temperature (C)
22
21
20
19
18
17
Tagging site
Yukon 1
Yukon 2
Yukon 3 partial
Reach
1196


Fish 2004_3035
17
18
19
20
21
22
Tagging site
Yukon 1
Yukon 2
Yukon 3 partial
5
0
Density
Temperature (C)
1197


Fish 2004_3035
Tagging site
Yukon 1
Yukon 2
Yukon 3 partial
Depth (m)
Temperature (C)
17
18
19
20
21
22
0
10
20
1198


2004_3035
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3 partial
Proprotion of time
Temperature (C)
0.0
0.2
0.4
0.6
0.8
1.0
17
18
19
20
21
22
1199


2004_3035
2004
Tagging site
Yukon 1
Yukon 2
Yukon 3 partial
Proportion of time spent over 18 C
1.0
0.8
0.6
0.4
0.2
0.0
Fish within stock
1200

Appendix 10. – Average exposure (hours) to elevated water temperatures during the spawning migration for Yukon River Chinook salmon stocks.

Region	Stock	Year	Reach	Average Temp (°C)	Hours exposed (%)		
					< 18°C	18 to < 21°C	≥ 21°C
Lower Yukon	Innoko	2004	Y1	19.3	264 (30)	276 (62)	37 (8)
Lower Yukon	Anvik	2004	Y1	18.2	189 (37)	80 (63)	0 (0)
Non-terminal[1]	Lower Yukon Fishery	2002	Y1	18.1	14 (26)	20 (74)	0 (0)
Non-terminal[1]	Lower Yukon Fishery	2002	Y2	17.9	10 (94)	1 (6)	0 (0)
Non-terminal[1]	Lower Yukon Fishery	2004	Y1	18.1	24 (41)	33 (59)	0 (0)
Koyukuk	Koyukuk	2004	Y1	17.1	48 (100)	0 (0)	0 (0)
Koyukuk	Koyukuk	2004	Y2	17.7	63 (56)	49 (44)	0 (0)
Koyukuk	Koyukuk	2004	K1	18.5	38 (25)	112 (75)	0 (0)
Middle Yukon	Melozitna	2004	Y1	20.4	0 (0)	61 (100)	0 (0)
Middle Yukon	Melozitna	2004	Y2	18.5	36 (17)	170 (83)	0 (0)
Middle Yukon	Melozitna	2004	Y3	19.3	7 (24)	21 (68)	3 (8)
Middle Yukon	Tozitna	2003	Y1	16.5	57 (100)	0 (0)	0 (0)
Middle Yukon	Tozitna	2003	Y2	17.9	106 (61)	68 (39)	0 (0)
Middle Yukon	Tozitna	2003	Y3	17.5	66 (85)	12 (15)	0 (0)
Non-terminal[1]	Middle Yukon Fishery	2002	Y1	17.8	133 (80)	11 (20)	0 (0)
Non-terminal[1]	Middle Yukon Fishery	2002	Y2	16	323 (100)	0 (0)	0 (0)
Non-terminal[1]	Middle Yukon Fishery	2003	Y1	17.2	100 (100)	0 (0)	0 (0)
Non-terminal[1]	Middle Yukon Fishery	2003	Y2	17.2	281 (100)	0 (0)	0 (0)
Non-terminal[1]	Middle Yukon Fishery	2003	Y3	17.6	68 (69)	15 (31)	0 (0)
Non-terminal[1]	Middle Yukon Fishery	2004	Y1	17.2	289 (100)	0 (0)	0 (0)
Non-terminal[1]	Middle Yukon Fishery	2004	Y2	18.4	287 (37)	83 (63)	0 (0)
Non-terminal[1]	Middle Yukon Fishery	2004	Y3	19.6	0 (0)	13 (100)	0 (0)
Tanana	Kantishna	2004	Y1	18.5	103 (59)	23 (40)	1 (2)
Tanana	Kantishna	2004	Y2	19.4	86 (16)	143 (78)	12 (7)
Tanana	Kantishna	2004	Y3	18.2	310 (59)	54 (31)	19 (11)
Tanana	Tolovana	2002	Y1	16.9	121 (92)	11 (8)	0 (0)
Tanana	Tolovana	2002	Y2	15.3	122 (100)	0 (0)	0 (0)
Tanana	Tolovana	2002	Y3	15.6	121 (100)	0 (0)	0 (0)
Tanana	Tolovana	2004	Y1	17	48 (100)	0 (0)	0 (0)
Tanana	Tolovana	2004	Y2	18.3	49 (34)	96 (66)	0 (0)
Tanana	Tolovana	2004	Y3	20.1	12 (9)	110 (82)	12 (9)
Tanana	Nenana	2003	Y1	16.2	110 (100)	0 (0)	0 (0)
Tanana	Nenana	2003	Y2	17.2	313 (97)	6 (3)	0 (0)
Tanana	Nenana	2003	Y3	17.5	216 (84)	21 (16)	0 (0)
Tanana	Clear	2004	Y1	20.5	0 (0)	59 (100)	0 (0)
Tanana	Clear	2004	Y2	19.2	33 (19)	136 (81)	0 (0)

Tanana	Clear	2004	Y3	17.8	97 (69)	44 (31)	0 (0)
Tanana	Clear	2004	T1	17.7	58 (58)	42 (42)	0 (0)
Tanana	Chena	2003	Y1	17.7	22 (83)	5 (17)	0 (0)
Tanana	Chena	2003	Y2	17.9	88 (58)	63 (42)	0 (0)
Tanana	Chena	2003	Y3	16.7	132 (100)	0 (0)	0 (0)
Tanana	Chena	2003	T1	16.5	89 (100)	0 (0)	0 (0)
Tanana	Chena	2003	T2	10.3	146 (100)	0 (0)	0 (0)
Tanana	Chena	2004	Y1	17.3	222 (87)	7 (13)	0 (0)
Tanana	Chena	2004	Y2	18.8	205 (26)	111 (69)	9 (5)
Tanana	Chena	2004	Y3	19.5	239 (31)	84 (54)	23 (15)
Tanana	Chena	2004	T1	15.4	451 (90)	10 (10)	0 (0)
Tanana	Chena	2004	T2	14.4	546 (100)	0 (0)	0 (0)
Tanana	Salcha	2003	Y1	17.2	68 (100)	0 (0)	0 (0)
Tanana	Salcha	2003	Y2	17.5	284 (96)	6 (4)	0 (0)
Tanana	Salcha	2003	Y3	17.5	193 (79)	25 (21)	0 (0)
Tanana	Salcha	2003	T1	17.1	176 (100)	0 (0)	0 (0)
Tanana	Salcha	2003	T2	12.1	363 (100)	0 (0)	0 (0)
Tanana	Salcha	2004	Y1	18.4	188 (59)	26 (41)	0 (0)
Tanana	Salcha	2004	Y2	18.8	242 (25)	138 (71)	7 (4)
Tanana	Salcha	2004	Y3	18.9	252 (30)	103 (61)	14 (9)
Tanana	Salcha	2004	T1	16	469 (87)	15 (13)	0 (0)
Tanana	Salcha	2004	T2	14.8	824 (99)	2 (1)	0 (0)
Tanana	Goodpaster	2002	Y1	18	21 (41)	30 (59)	0 (0)
Tanana	Goodpaster	2002	Y2	15.7	170 (100)	0 (0)	0 (0)
Tanana	Goodpaster	2002	Y3	16.6	108 (100)	0 (0)	0 (0)
Tanana	Goodpaster	2002	T1	12.6	113 (100)	0 (0)	0 (0)
Tanana	Goodpaster	2002	T2	15.3	176 (100)	0 (0)	0 (0)
Tanana	Goodpaster	2003	T1	16.6	191 (100)	0 (0)	0 (0)
Tanana	Goodpaster	2003	T2	13.9	452 (100)	0 (0)	0 (0)
Tanana	Goodpaster	2003	Y1	16.6	98 (100)	0 (0)	0 (0)
Tanana	Goodpaster	2003	Y2	17.6	297 (92)	14 (8)	0 (0)
Tanana	Goodpaster	2003	Y3	17.3	265 (96)	6 (4)	0 (0)
Tanana	Goodpaster	2004	Y1	17.4	40 (88)	5 (12)	0 (0)
Tanana	Goodpaster	2004	Y2	18.9	3 (2)	131 (98)	0 (0)
Tanana	Goodpaster	2004	Y3	19.9	55 (36)	62 (40)	37 (24)
Tanana	Goodpaster	2004	T1	14.8	83 (100)	0 (0)	0 (0)
Tanana	Goodpaster	2004	T2	14.1	275 (96)	11 (4)	0 (0)
Tanana	Tanana Fishery	2004	Y1	18.8	50 (49)	26 (51)	0 (0)
Tanana	Tanana Fishery	2004	Y2	18.9	74 (25)	112 (75)	0 (0)
Tanana	Tanana Fishery	2004	Y3	18.8	167 (55)	51 (34)	17 (11)
Tanana	Tanana Fishery	2004	T1	16.6	149 (69)	34 (31)	0 (0)
Tanana	Tanana Fishery	2004	T2	15.1	224 (100)	0 (0)	0 (0)
Yukon Flats	Chandalar	2002	Y1	17.5	151 (85)	14 (15)	0 (0)
Yukon Flats	Chandalar	2002	Y2	15.2	277 (100)	0 (0)	0 (0)
Yukon Flats	Chandalar	2002	Y3	15.6	232 (100)	0 (0)	0 (0)

Yukon Flats	Chandalar	2002	Y4	15	373 (100)	0 (0)	0 (0)
Yukon Flats	Chandalar	2003	Y1	17.3	45 (100)	0 (0)	0 (0)
Yukon Flats	Chandalar	2003	Y2	17.4	151 (92)	14 (8)	0 (0)
Yukon Flats	Chandalar	2003	Y3	18.5	20 (18)	91 (82)	0 (0)
Yukon Flats	Chandalar	2003	Y4	16.3	135 (72)	52 (28)	0 (0)
Yukon Flats	Sheenjek	2002	Y1	17.8	51 (80)	7 (20)	0 (0)
Yukon Flats	Sheenjek	2002	Y2	15.7	307 (100)	0 (0)	0 (0)
Yukon Flats	Sheenjek	2002	Y3	15.6	185 (100)	0 (0)	0 (0)
Yukon Flats	Sheenjek	2002	Y4	14.5	405 (100)	0 (0)	0 (0)
Non-terminal[1]	Yukon Flats Fishery	2002	Y1	16	61 (100)	0 (0)	0 (0)
Non-terminal[1]	Yukon Flats Fishery	2002	Y2	14	174 (100)	0 (0)	0 (0)
Non-terminal[1]	Yukon Flats Fishery	2002	Y3	14.2	113 (100)	0 (0)	0 (0)
Non-terminal[1]	Yukon Flats Fishery	2002	Y4	13.3	25 (100)	0 (0)	0 (0)
Non-terminal[1]	Yukon Flats Fishery	2003	Y1	17.2	250 (99)	1 (1)	0 (0)
Non-terminal[1]	Yukon Flats Fishery	2003	Y2	17.9	315 (59)	73 (41)	0 (0)
Non-terminal[1]	Yukon Flats Fishery	2003	Y3	16.8	408 (89)	17 (11)	0 (0)
Non-terminal[1]	Yukon Flats Fishery	2003	Y4	18.3	10 (16)	26 (84)	0 (0)
Non-terminal[1]	Yukon Flats Fishery	2004	Y1	17.7	251 (80)	10 (20)	0 (0)
Non-terminal[1]	Yukon Flats Fishery	2004	Y2	18.5	274 (30)	108 (70)	0 (0)
Non-terminal[1]	Yukon Flats Fishery	2004	Y3	19.8	155 (25)	64 (62)	13 (13)
Non-terminal[1]	Yukon Flats Fishery	2004	Y4	19.7	7 (5)	60 (89)	4 (5)
Porcupine	Porcupine	2003	Y1	17.2	51 (100)	0 (0)	0 (0)
Porcupine	Porcupine	2003	Y2	17.1	148 (100)	0 (0)	0 (0)
Porcupine	Porcupine	2003	Y3	17.7	71 (68)	33 (32)	0 (0)
Porcupine	Porcupine	2003	Y4	17.2	106 (56)	82 (44)	0 (0)
Porcupine	Porcupine	2004	P1	17.2	39 (84)	7 (16)	0 (0)
Porcupine	Porcupine	2004	P2	17.2	72 (93)	6 (7)	0 (0)
Porcupine	Porcupine	2004	Y1	16.9	55 (100)	0 (0)	0 (0)
Porcupine	Porcupine	2004	Y2	18.4	54 (34)	105 (66)	0 (0)
Porcupine	Porcupine	2004	Y3	20.1	15 (10)	113 (79)	15 (10)
Porcupine	Porcupine	2004	Y4	17.8	173 (57)	131 (43)	0 (0)
Upper Yukon	Charley	2004	Y1	18.2	51 (39)	79 (61)	0 (0)
Upper Yukon	Charley	2004	Y2	19.9	34 (13)	192 (74)	34 (13)
Upper Yukon	Charley	2004	Y3	17.7	106 (67)	53 (33)	0 (0)
Upper Yukon	Charley	2004	Y4	17.5	303 (83)	62 (17)	0 (0)
Upper Yukon	Klondike	2004	Y1	17.2	136 (96)	2 (4)	0 (0)
Upper Yukon	Klondike	2004	Y2	18.8	71 (17)	118 (83)	0 (0)
Upper Yukon	Klondike	2004	Y3	20.4	64 (18)	76 (64)	21 (18)
Upper Yukon	Klondike	2004	Y4	18.2	282 (42)	130 (58)	0 (0)
Upper Yukon	Klondike	2004	Y5	15.9	391 (100)	0 (0)	0 (0)
Upper Yukon	Stewart	2002	Y1	18	29 (48)	31 (52)	0 (0)
Upper Yukon	Stewart	2002	Y2	15.7	138 (100)	0 (0)	0 (0)
Upper Yukon	Stewart	2002	Y3	15.5	96 (100)	0 (0)	0 (0)
Upper Yukon	Stewart	2002	Y4	15.5	241 (100)	0 (0)	0 (0)
Upper Yukon	Stewart	2002	Y5	17	114 (99)	1 (1)	0 (0)

Upper Yukon	Stewart	2002	Y6	17.6	67 (78)	19 (22)	0 (0)
Upper Yukon	White	2004	Y1	15.5	56 (100)	0 (0)	0 (0)
Upper Yukon	White	2004	Y2	16.9	158 (100)	0 (0)	0 (0)
Upper Yukon	White	2004	Y3	18.7	12 (12)	91 (88)	0 (0)
Upper Yukon	White	2004	Y4	19.4	36 (14)	220 (84)	6 (2)
Upper Yukon	White	2004	Y5	16.5	131 (100)	0 (0)	0 (0)
Upper Yukon	White	2004	Y6	15.3	94 (100)	0 (0)	0 (0)
Upper Yukon	Pelly	2003	Y1	16.7	168 (100)	0 (0)	0 (0)
Upper Yukon	Pelly	2003	Y2	17.4	395 (84)	26 (16)	0 (0)
Upper Yukon	Pelly	2003	Y3	17.9	189 (60)	42 (40)	0 (0)
Upper Yukon	Pelly	2003	Y4	17.4	532 (64)	98 (36)	0 (0)
Upper Yukon	Pelly	2003	Y5	16.7	341 (82)	25 (18)	0 (0)
Upper Yukon	Pelly	2003	Y6	16.5	232 (74)	28 (26)	0 (0)
Upper Yukon	Pelly	2003	Y7	16.4	135 (85)	8 (15)	0 (0)
Upper Yukon	Pelly	2003	Y8	16.5	35 (74)	4 (26)	0 (0)
Upper Yukon	Pelly	2004	P1[2]	17.6	41 (96)	2 (4)	0 (0)
Upper Yukon	Pelly	2004	P2[2]	16.9	55 (100)	0 (0)	0 (0)
Upper Yukon	Pelly	2004	Y1	16.9	229 (100)	0 (0)	0 (0)
Upper Yukon	Pelly	2004	Y2	18.5	183 (33)	117 (64)	4 (2)
Upper Yukon	Pelly	2004	Y3	19.9	30 (9)	96 (83)	10 (9)
Upper Yukon	Pelly	2004	Y4	18.1	349 (47)	129 (53)	0 (0)
Upper Yukon	Pelly	2004	Y5	15.9	372 (100)	0 (0)	0 (0)
Upper Yukon	Pelly	2004	Y6	15.3	279 (100)	0 (0)	0 (0)
Upper Yukon	Pelly	2004	Y7	15.7	175 (100)	0 (0)	0 (0)
Upper Yukon	Pelly	2004	Y8	16.9	54 (100)	0 (0)	0 (0)
Upper Yukon	Tatchun	2002	Y1	17.6	61 (100)	0 (0)	0 (0)
Upper Yukon	Tatchun	2002	Y2	15.3	181 (100)	0 (0)	0 (0)
Upper Yukon	Tatchun	2002	Y3	15.4	128 (100)	0 (0)	0 (0)
Upper Yukon	Tatchun	2002	Y4	16.4	272 (83)	54 (17)	0 (0)
Upper Yukon	Tatchun	2002	Y5	17.8	77 (59)	53 (41)	0 (0)
Upper Yukon	Tatchun	2002	Y6	16.9	75 (82)	16 (18)	0 (0)
Upper Yukon	Tatchun	2002	Y7	14.4	56 (100)	0 (0)	0 (0)
Upper Yukon	Tatchun	2002	Y8	14.1	72 (100)	0 (0)	0 (0)
Upper Yukon	Tatchun	2002	Y9	14.1	1 (100)	0 (0)	0 (0)
Upper Yukon	Upper Main Stem	2003	Y1	16.2	64 (100)	0 (0)	0 (0)
Upper Yukon	Upper Main Stem	2003	Y2	17.4	155 (83)	31 (17)	0 (0)
Upper Yukon	Upper Main Stem	2003	Y3	17.5	115 (90)	12 (10)	0 (0)
Upper Yukon	Upper Main Stem	2003	Y4	17.3	175 (56)	136 (44)	0 (0)
Upper Yukon	Upper Main Stem	2003	Y5	17.6	107 (73)	40 (27)	0 (0)
Upper Yukon	Upper Main Stem	2003	Y6	16.5	105 (100)	0 (0)	0 (0)
Upper Yukon	Upper Main Stem	2003	Y7	15.7	62 (100)	0 (0)	0 (0)
Upper Yukon	Upper Main Stem	2003	Y8	14.6	183 (100)	0 (0)	0 (0)
Upper Yukon	Upper Yukon Fishery	2002	Y1	17.8	155 (72)	15 (28)	0 (0)
Upper Yukon	Upper Yukon Fishery	2002	Y2	15.6	600 (100)	0 (0)	0 (0)
Upper Yukon	Upper Yukon Fishery	2002	Y3	15.7	436 (100)	0 (0)	0 (0)

Upper Yukon	Upper Yukon Fishery	2002	Y4	16	949 (92)	20 (8)	0 (0)
Upper Yukon	Upper Yukon Fishery	2002	Y5	17.6	329 (71)	33 (29)	0 (0)
Upper Yukon	Upper Yukon Fishery	2002	Y6	17.8	135 (58)	32 (42)	0 (0)
Upper Yukon	Upper Yukon Fishery	2002	Y7	16.6	77 (75)	13 (25)	0 (0)
Upper Yukon	Upper Yukon Fishery	2002	Y8	15	102 (100)	0 (0)	0 (0)
Upper Yukon	Upper Yukon Fishery	2002	Y9	14.8	43 (100)	0 (0)	0 (0)
Upper Yukon	Upper Yukon Fishery	2004	Y1	16.5	48 (100)	0 (0)	0 (0)
Upper Yukon	Upper Yukon Fishery	2004	Y2	17.4	125 (91)	12 (9)	0 (0)
Upper Yukon	Upper Yukon Fishery	2004	Y3	19.3	0 (0)	93 (100)	0 (0)
Upper Yukon	Upper Yukon Fishery	2004	Y4	19.6	37 (15)	193 (79)	13 (5)
Upper Yukon	Upper Yukon Fishery	2004	Y5	16.6	100 (96)	4 (4)	0 (0)
Upper Yukon	Upper Yukon Fishery	2004	Y6	15.8	36 (100)	0 (0)	0 (0)
Upper Yukon	Big Salmon	2003	Y1	16.1	46 (100)	0 (0)	0 (0)
Upper Yukon	Big Salmon	2003	Y2	17.4	124 (96)	6 (4)	0 (0)
Upper Yukon	Big Salmon	2003	Y3	17.8	97 (77)	28 (23)	0 (0)
Upper Yukon	Big Salmon	2003	Y4	17.7	179 (72)	71 (28)	0 (0)
Upper Yukon	Big Salmon	2003	Y5	16.4	120 (100)	0 (0)	0 (0)
Upper Yukon	Big Salmon	2003	Y6	17.9	37 (42)	52 (58)	0 (0)
Upper Yukon	Big Salmon	2003	Y7	17.9	26 (54)	22 (46)	0 (0)
Upper Yukon	Big Salmon	2003	Y8	17.1	44 (86)	7 (14)	0 (0)
Upper Yukon	Big Salmon	2003	Y9	14.8	109 (100)	0 (0)	0 (0)
Upper Yukon	Big Salmon	2004	Y1	17	105 (100)	0 (0)	0 (0)
Upper Yukon	Big Salmon	2004	Y2	18.3	125 (42)	85 (58)	0 (0)
Upper Yukon	Big Salmon	2004	Y3	20.1	20 (9)	90 (81)	10 (9)
Upper Yukon	Big Salmon	2004	Y4	18.4	189 (38)	147 (60)	5 (2)
Upper Yukon	Big Salmon	2004	Y5	16	235 (100)	0 (0)	0 (0)
Upper Yukon	Big Salmon	2004	Y6	15.7	176 (100)	0 (0)	0 (0)
Upper Yukon	Big Salmon	2004	Y7	16.1	98 (83)	10 (17)	0 (0)
Upper Yukon	Big Salmon	2004	Y8	15.9	103 (92)	5 (8)	0 (0)
Upper Yukon	Big Salmon	2004	Y9	15.7	205 (100)	0 (0)	0 (0)
Upper Yukon	Teslin	2003	Y1	16.9	169 (97)	2 (3)	0 (0)
Upper Yukon	Teslin	2003	Y2	17.5	449 (92)	13 (8)	0 (0)
Upper Yukon	Teslin	2003	Y3	17.8	210 (62)	42 (38)	0 (0)
Upper Yukon	Teslin	2003	Y4	17.2	512 (62)	105 (38)	0 (0)
Upper Yukon	Teslin	2003	Y5	17.7	257 (60)	57 (40)	0 (0)
Upper Yukon	Teslin	2003	Y6	16.4	315 (100)	0 (0)	0 (0)
Upper Yukon	Teslin	2003	Y7	15.6	163 (100)	0 (0)	0 (0)
Upper Yukon	Teslin	2003	Y8	14.7	186 (100)	0 (0)	0 (0)
Upper Yukon	Teslin	2003	Y9	14.1	307 (100)	0 (0)	0 (0)
Upper Yukon	Teslin	2004	Y1	17.2	98 (96)	2 (4)	0 (0)
Upper Yukon	Teslin	2004	Y2	18.9	13 (4)	142 (96)	0 (0)
Upper Yukon	Teslin	2004	Y3	20.2	44 (18)	77 (64)	22 (18)
Upper Yukon	Teslin	2004	Y4	17.6	280 (60)	94 (40)	0 (0)
Upper Yukon	Teslin	2004	Y5	15.8	233 (100)	0 (0)	0 (0)
Upper Yukon	Teslin	2004	Y6	15.6	167 (100)	0 (0)	0 (0)

Upper Yukon	Teslin	2004	Y7	17.5	94 (79)	12 (21)	0 (0)
Upper Yukon	Teslin	2004	Y8	17.4	122 (83)	13 (17)	0 (0)
Upper Yukon	Teslin	2004	Y9	16.2	251 (100)	0 (0)	0 (0)
Upper Yukon	Whitehorse	2004	Y1	17.2	47 (100)	0 (0)	0 (0)
Upper Yukon	Whitehorse	2004	Y2	19	5 (3)	148 (96)	1 (0)
Upper Yukon	Whitehorse	2004	Y3[3]	20.6	29 (27)	49 (45)	29 (27)

[1]Likely in transit to areas farther upriver; final destination not determined.
[2]Atypical movements exhibited, with fish diverting from typical migratory route for this stock.
[3]Partial information due to tag malfunction.

Appendix 11. – Average exposure (hours) to water temperature ranges in terminal spawning tributaries for Yukon River Chinook salmon stocks.

Region	Stock	Year	Average Temperature	Total hours	Hours (%)	
					< 13°C	≥ 13°C
Lower Yukon	Innoko	2004	14.1	481	160 (33)	321 (67)
	Anvik	2004	15.8	548	24 (4)	524 (96)
Koyukuk	South Fork	2004	14.6	662	226 (34)	435 (66)
Middle Yukon	Melozitna	2004	17.1	579	13 (2)	566 (98)
	Tozitna	2003	9.8	752	688 (91)	65 (9)
Tanana	Kantishna	2004	13.2	350	186 (53)	163 (47)
	Tolovana	2002	12.9	103	55 (53)	48 (47)
		2004	14.4	514	174 (34)	339 (66)
	Nenana	2003	10.7	440	270 (61)	170 (39)
	Clear	2004	13.4	232	149 (64)	83 (36)
	Chena	2003	8.2	515	515 (100)	0 (0)
	Chena	2004	12.3	241	160 (66)	82 (34)
	Salcha	2003	10.1	290	253 (87)	37 (13)
	Salcha	2004	13.7	164	54 (33)	110 (67)
	Goodpaster	2002	12.1	446	295 (66)	151 (34)
		2003	9.5	388	346 (89)	43 (11)
		2004	11.3	314	280 (89)	34 (11)
Yukon Flats	Chandalar	2002	15.9	383	5 (1)	378 (99)
		2003	12.5	468	284 (61)	185 (39)
	Sheenjek	2002	13.8	425	128 (30)	297 (70)
Upper Yukon	Charley	2004	12.9	245	150 (61)	95 (39)
	Klondike	2004	10.6	394	355 (90)	40 (10)
	Stewart	2002	10.3	635	528 (83)	107 (17)
	White	2004	13.8	366	57 (16)	309 (84)
	Pelly	2003	12.4	472	248 (52)	225 (48)
		2004	14.8	391	81 (21)	309 (79)
	Main stem	2003	13.8	425	11 (23)	35 (77)
	Tatchun	2002	14.1	46	325 (87)	48 (13)
	Big Salmon	2003	11.9	372	304 (86)	49 (14)
		2004	11.2	353	115 (23)	379 (77)
	Teslin	2003	13.4	494	109 (17)	529 (83)
		2004	14.7	638	68 (16)	357 (84)

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