

Kolarctic CBC – Project KO4178; Conserving our Atlantic salmon as a sustainable resource for people in the North; fisheries and conservation in the context of growing threats and a changing environment.

REPORT IV. The development of water temperatures throughout the summer in the coastal rivers in Northern Norway and in the River Tana watershed (Norway and Finland); daily and hourly variations

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<p>REPORT IV. The development of water temperatures throughout the summer in the coastal rivers in Northern Norway and in the River Tana watershed (Norway and Finland); daily and hourly variations</p> <p>Niemelä ^{1,2}, E., Hassinen^{1,2}, E., Kuusela³, J., Kalske⁴, T.H., Høstmark⁴, M.S.</p> <p><i>¹⁾ University of Turku, Finland</i> <i>²⁾ Firm Olli van der Meer, Oulu; Finland</i> <i>³⁾ Natural Resource Institute Finland (Luke), 99980 Utsjoki, Finland</i> <i>⁴⁾ County Governor of Troms and Finnmark; Vadsø, Norway</i></p>	
<p>Abstract</p> <p>Mean hourly and daily water temperatures are fluctuating in the same way in the summer months June, July, August and September in all large, medium and small size salmon rivers in eastern Finnmark, as well as in small brooks in the River Tana watershed. The reasons for these fluctuations are simultaneous changes in the climate, like air temperature and precipitation, which are affecting at the same time and on the same way in larger geographical areas. Rivers in eastern Finnmark do not have large enough lakes that could equalize water temperatures in running waters below the lakes. In the River Neidenelv there are more lakes which stabilize temperatures in running water than for example in the neighboring rivers Karpelv, Sandneselv, Munkelv, Klokkerelv and Nyelv. Water temperature in the lower area of the River Utsjoki has not remarkable mean hourly and daily fluctuations because above that river stretch, the large and deep lake Mantojärvi equalizes the water temperatures. In the lake Mantojärvi water does not cool down so fast in autumn and therefore running water below that lake is clearly warmer in autumn than in neighboring rivers. The same kind of simultaneous water temperature fluctuations in all northern rivers and brooks are reflecting also into the same kind of ecological parameters in juvenile salmon, like same growth rhythm and timing of smolt migrations from rivers to sea.</p>	
<p>Key words:</p> <p>Water temperatures, Northern Norway, Tana, climate change, juveniles, Atlantic salmon, salmo salar</p>	
<p>Front page photo:</p> <p>Eero Niemelä</p>	

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1. Annual differences in the summer months in the daily mean water temperatures between the rivers and between the brooks within the River Tana watershed

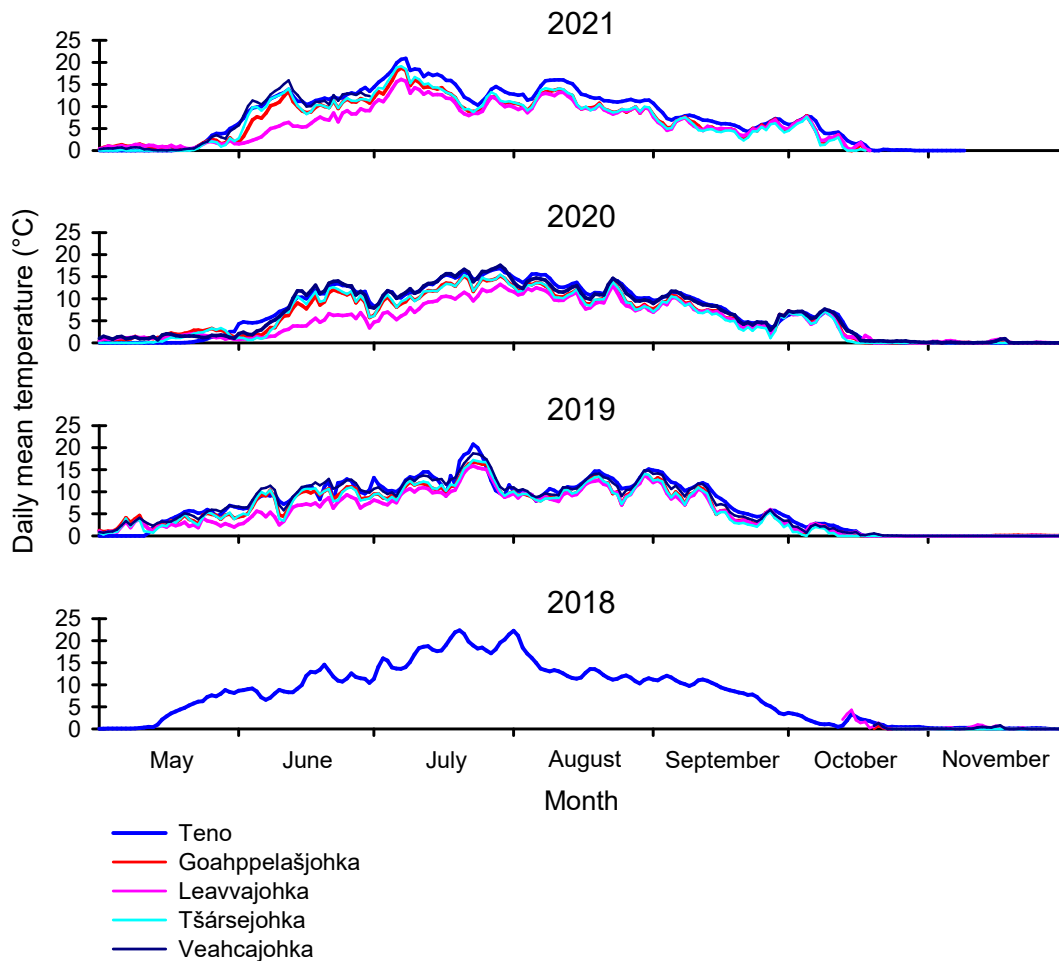


Figure 1. Annual daily mean water temperatures between the rivers in the River Tana watershed. Source; NVE (Norway), County Governor in Troms and Finnmark (Norway), Luke (Finland).

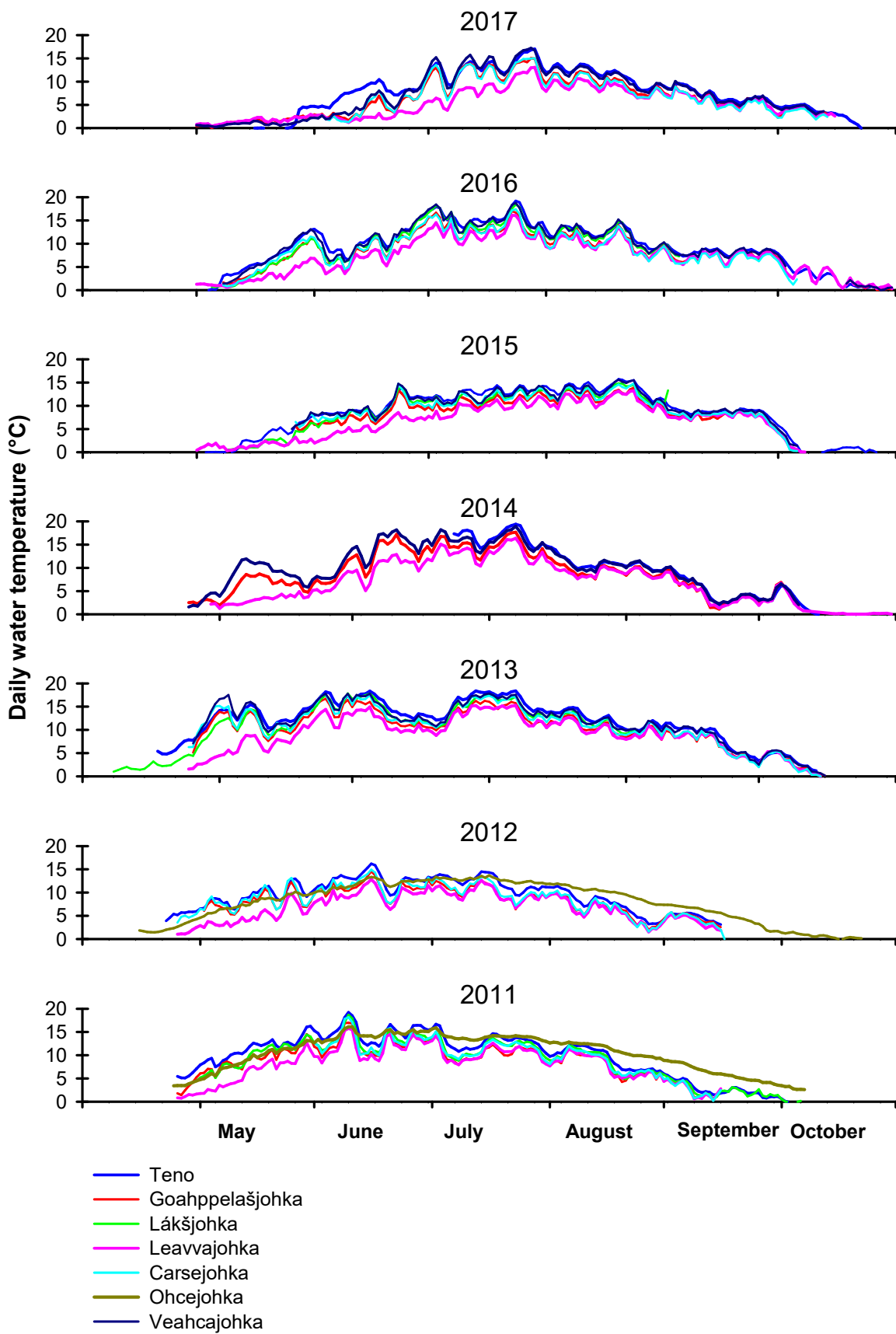


Figure 2. Annual daily mean water temperatures between the rivers in the river Tana watershed. Source; NVE (Norway), County Governor in Troms and Finnmark (Norway), Luke (Finland).

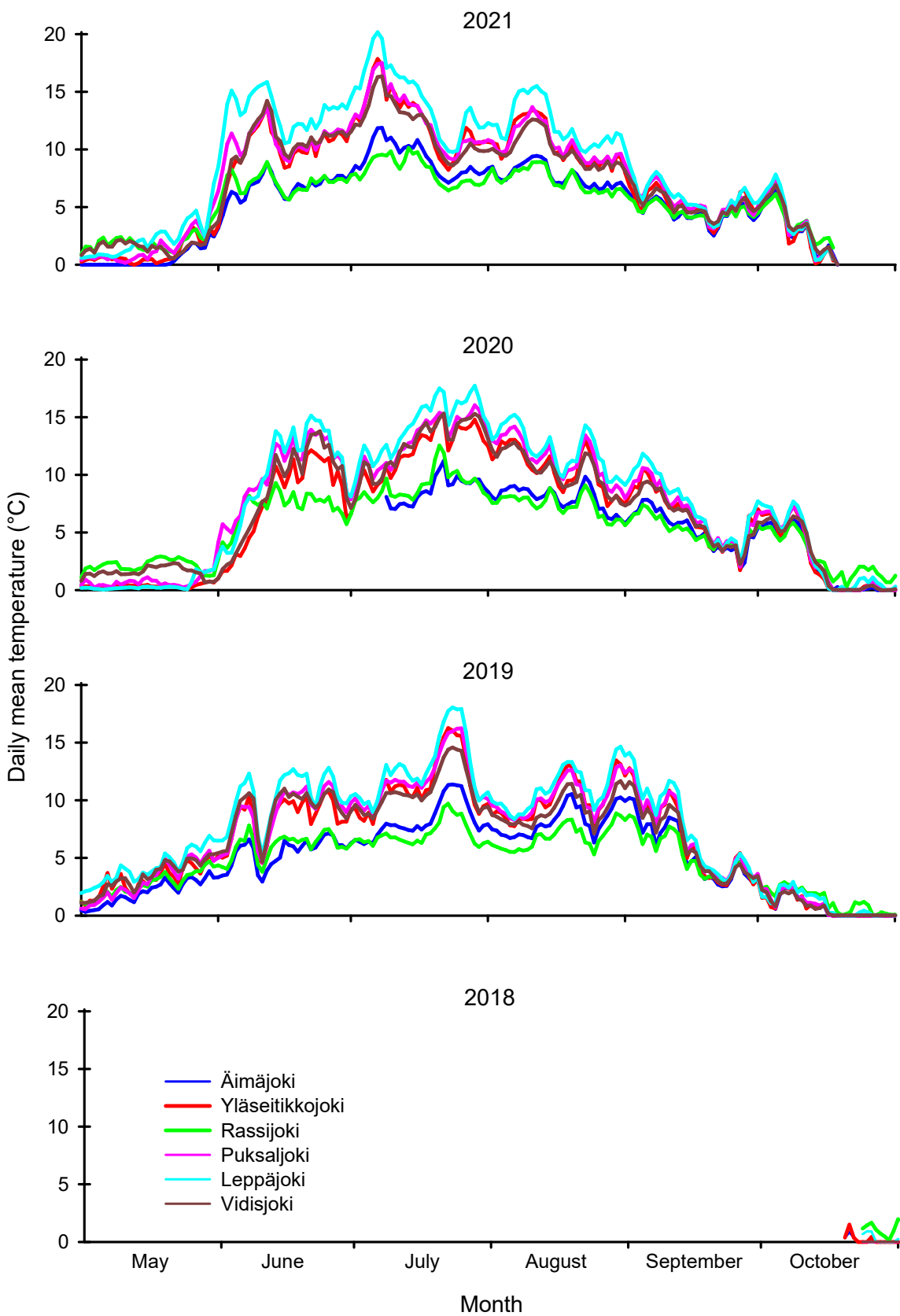


Figure 3. Annual daily mean water temperatures between the brooks in the river Tana watershed. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

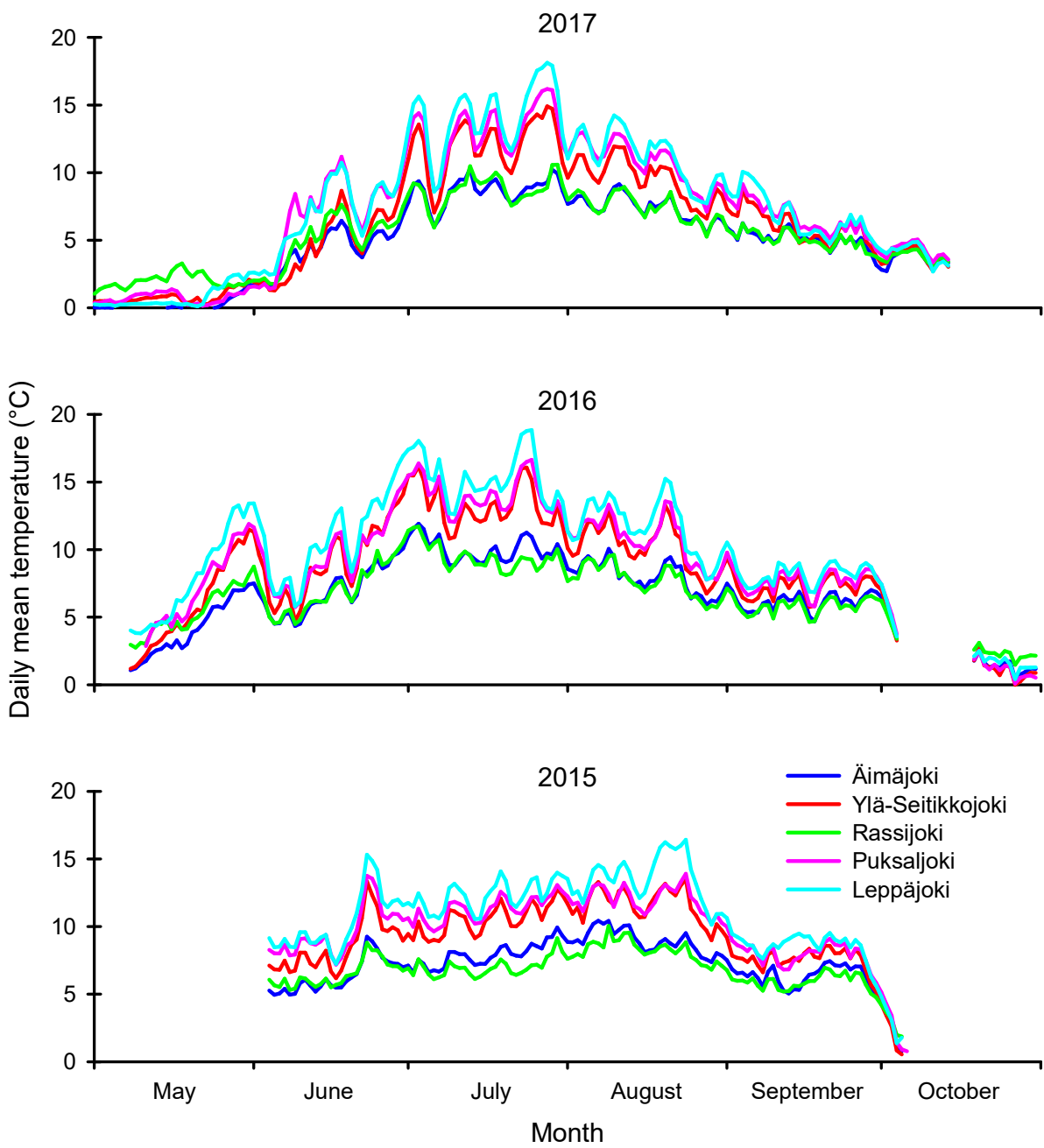


Figure 4. Annual daily mean water temperatures between the brooks in the river Tana watershed. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

2. Annual differences in the summer months in the daily mean water temperatures between the rivers within the rivers in Northern Norway

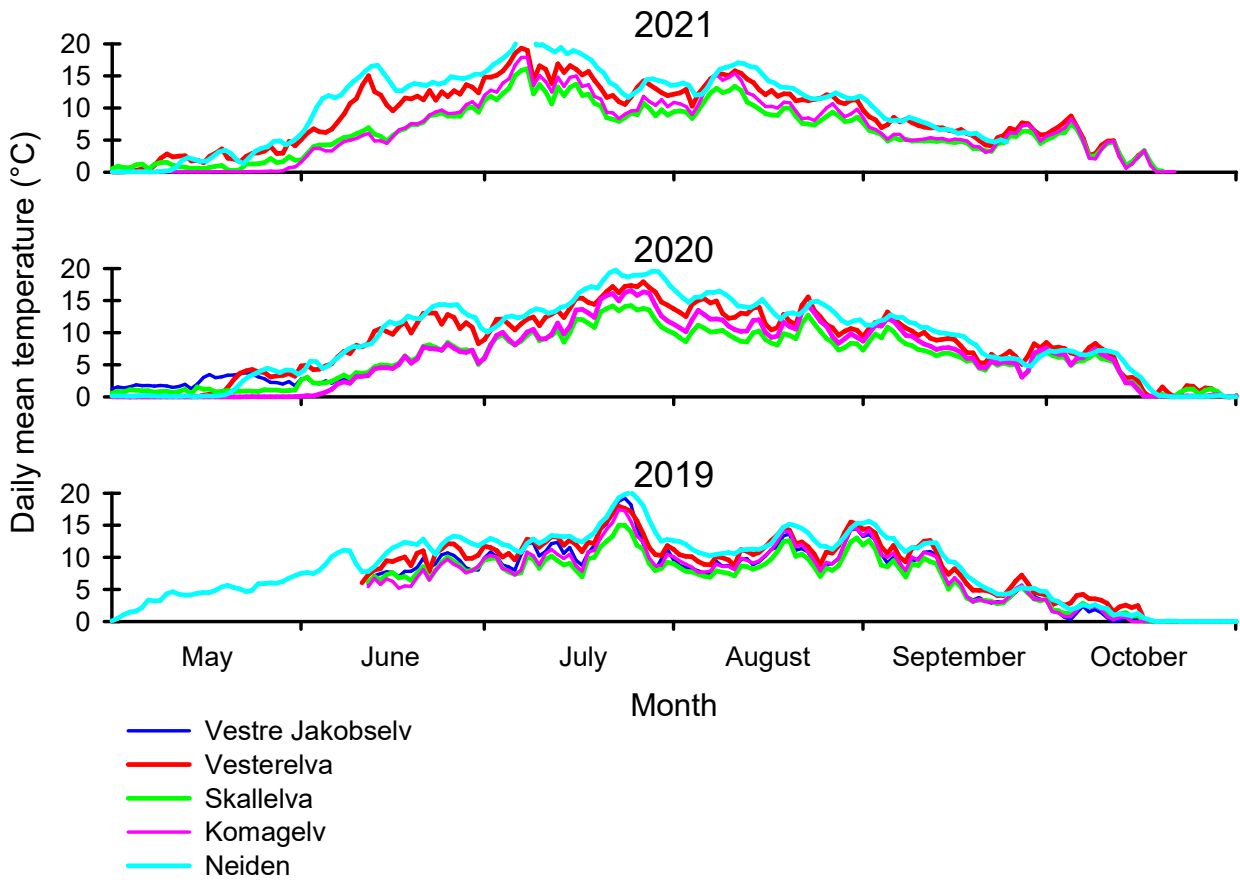


Figure 5. Daily mean water temperatures in the rivers in Finnmark. Source; NVE (Norway), County Governor in Troms and Finnmark (Norway).

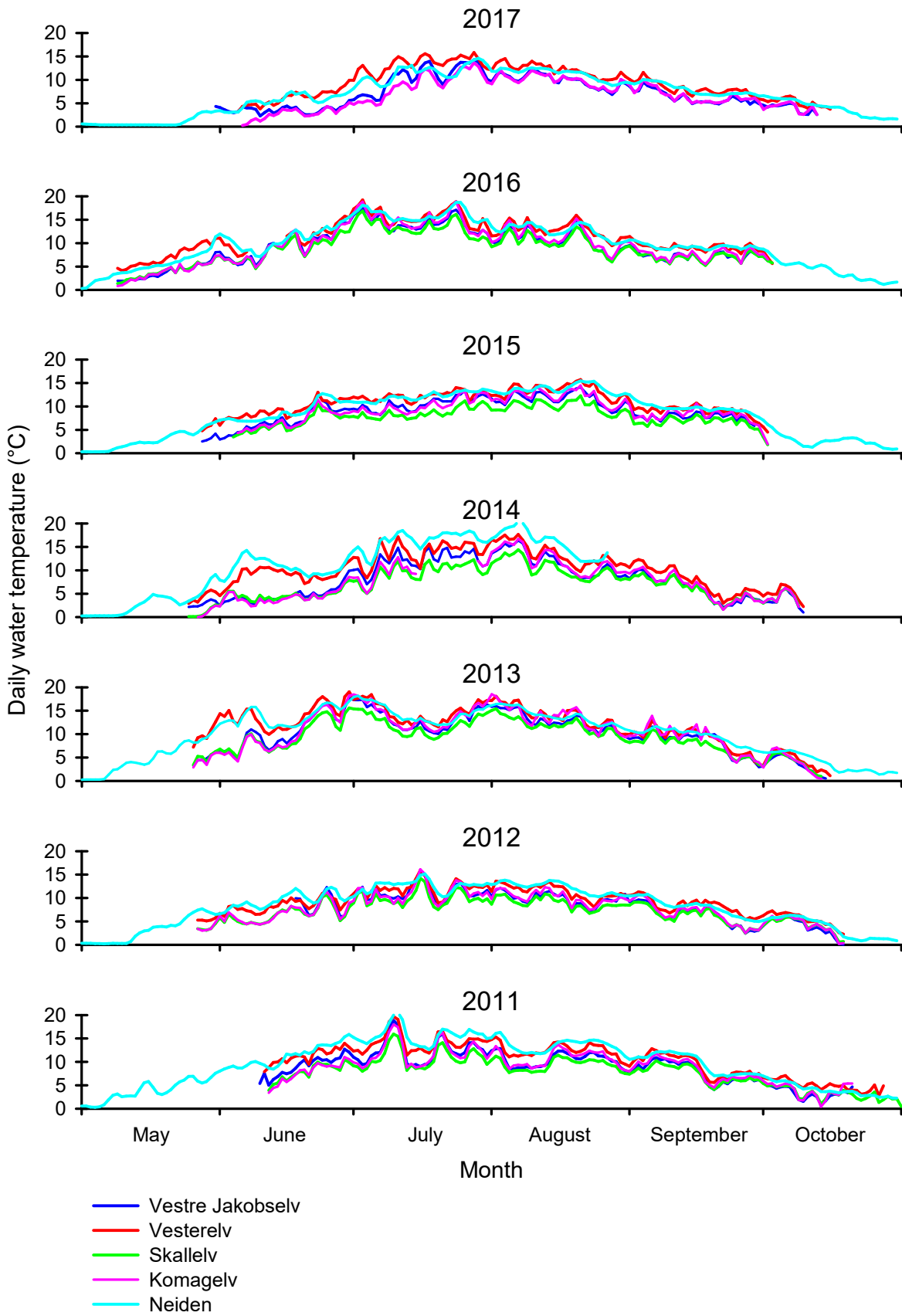


Figure 6. Daily mean water temperatures in the rivers in Finnmark. Source; NVE (Norway), County Governor in Troms and Finnmark (Norway).

3. Hourly and mean daily water temperatures in the years 2006-2021 in Atlantic salmon rivers in northern Finnmark

3.1 Water temperatures in the River Grense Jakobselv

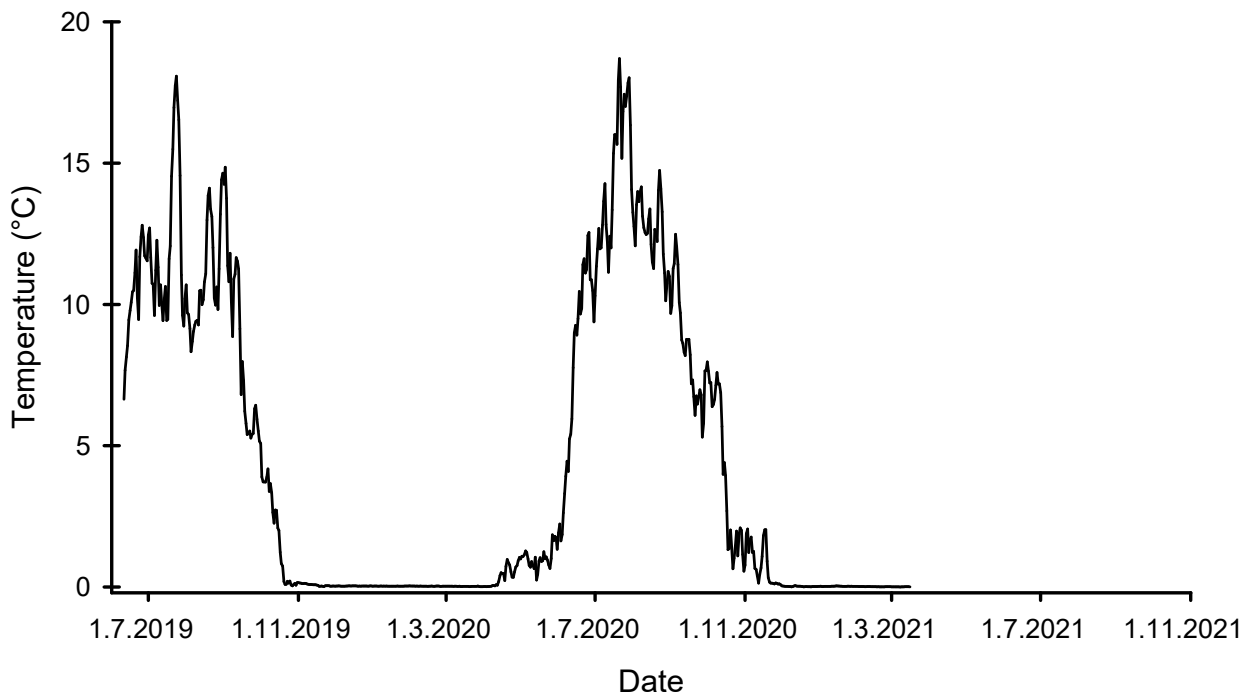


Figure 7. Daily mean water temperatures throughout two years in the River Grense Jakobselv in the years 2019-2020. Source; County Governor in Troms and Finnmark (Norway).

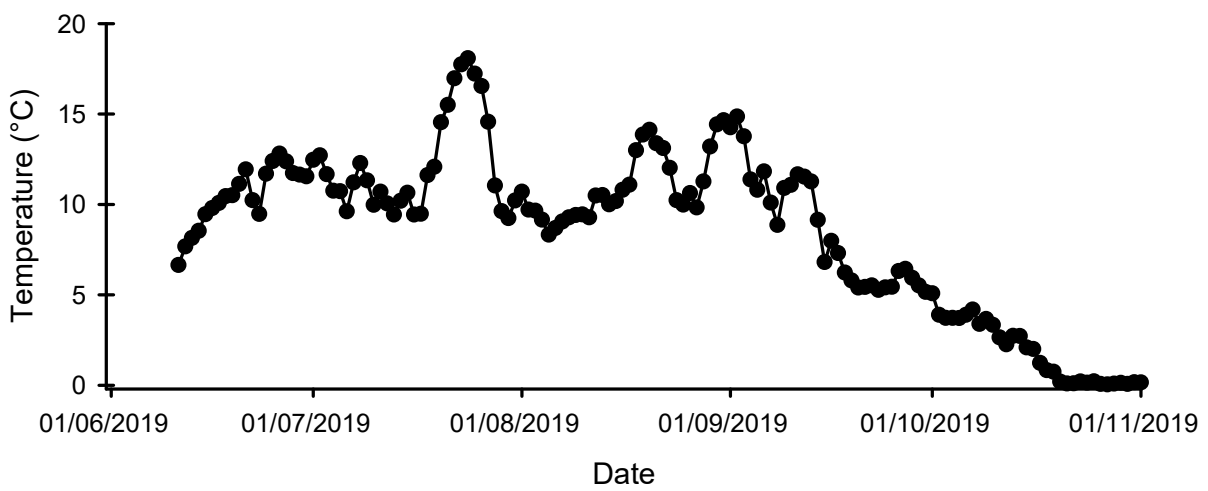
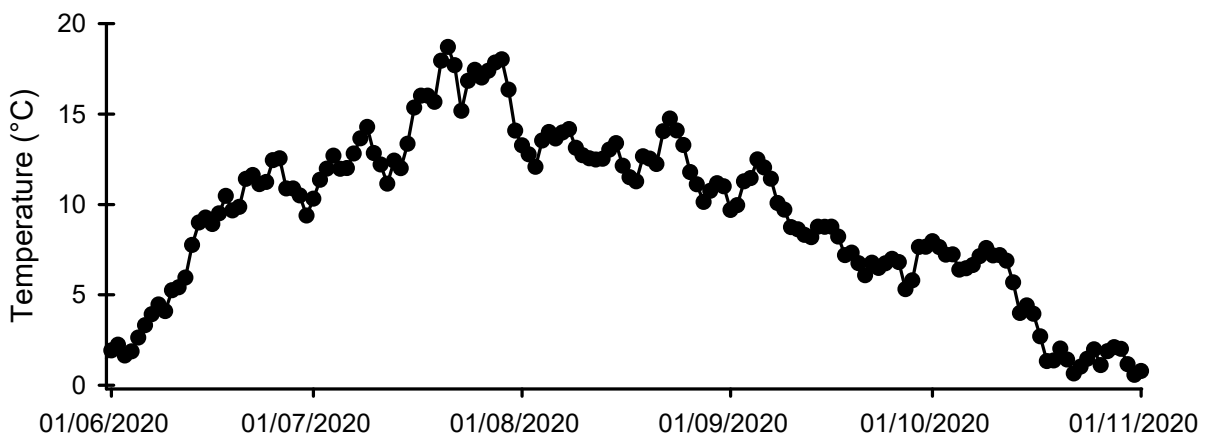


Figure 8. Fluctuations in the daily mean water temperatures from June to October in the River Gense Jakobselv in the years 2019-2020. Source; County Governor in Troms and Finnmark (Norway).

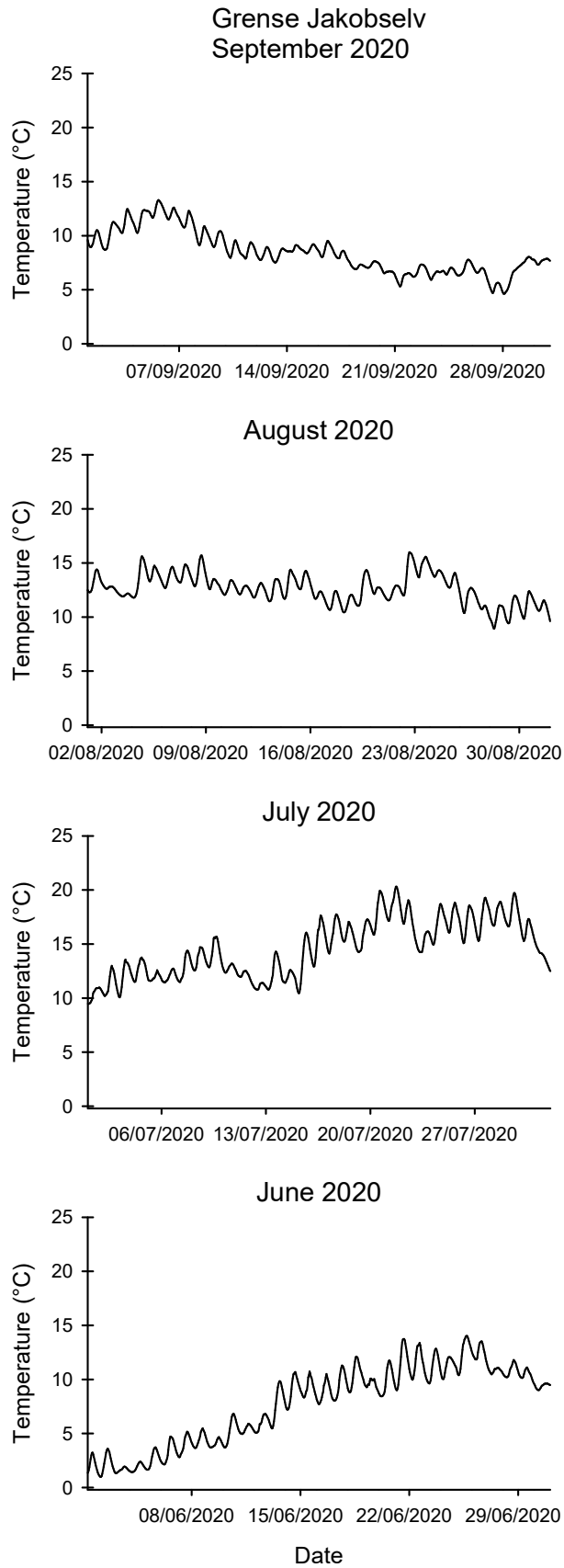


Figure 9. Hourly changes in the water temperatures in the River Grense Jakobselv for the summer months in the year 2020. Source; County Governor in Troms and Finnmark (Norway).

3.2 Water temperatures in the River Karpelv

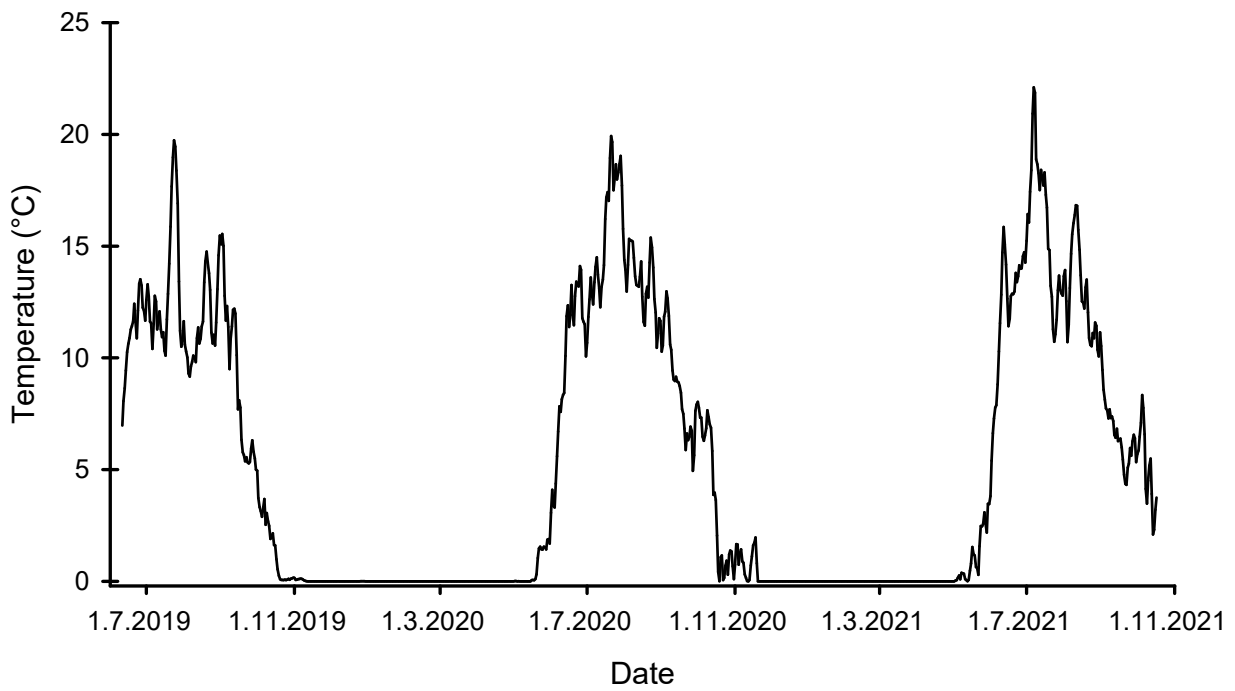


Figure 10. Daily mean water temperatures throughout three years in the River Karpelv in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

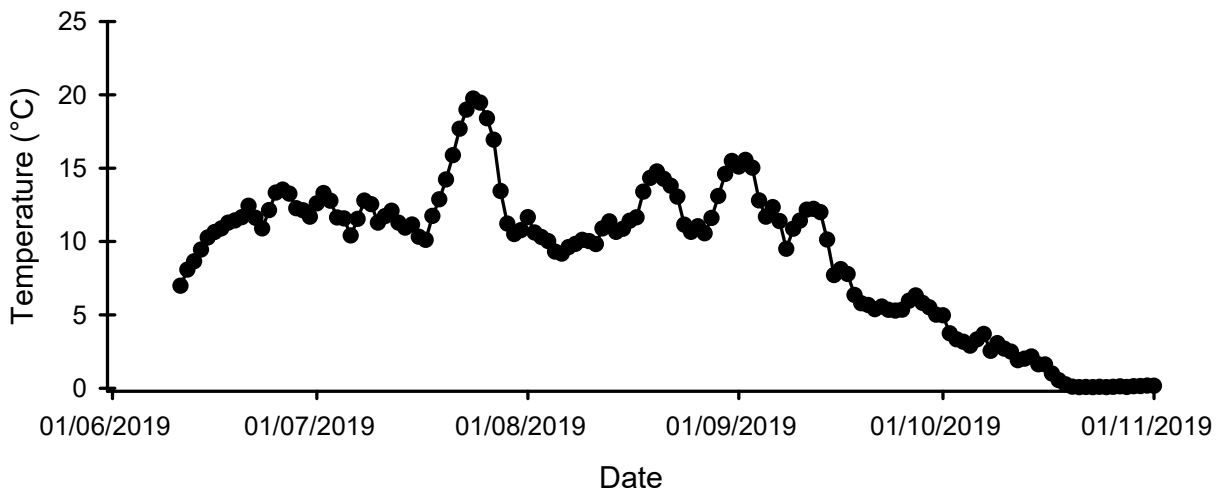
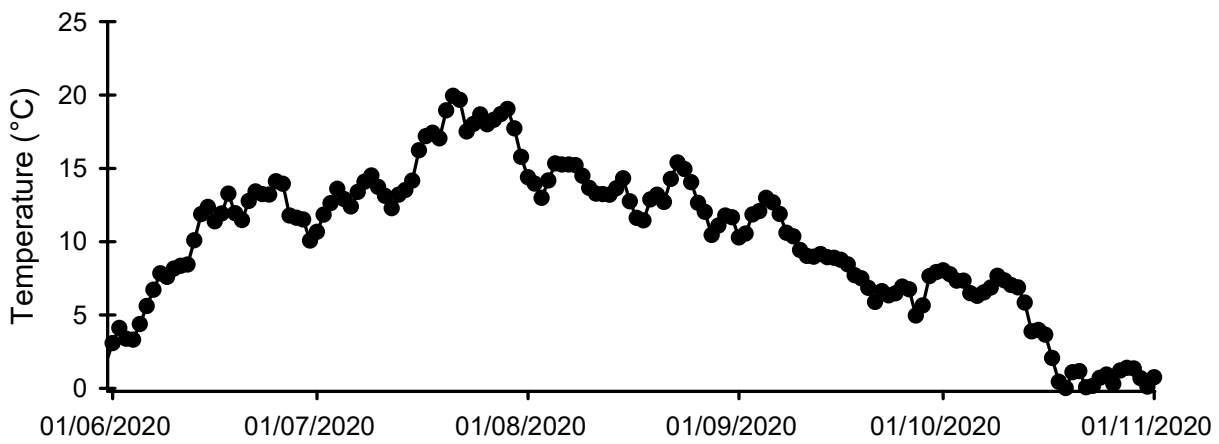
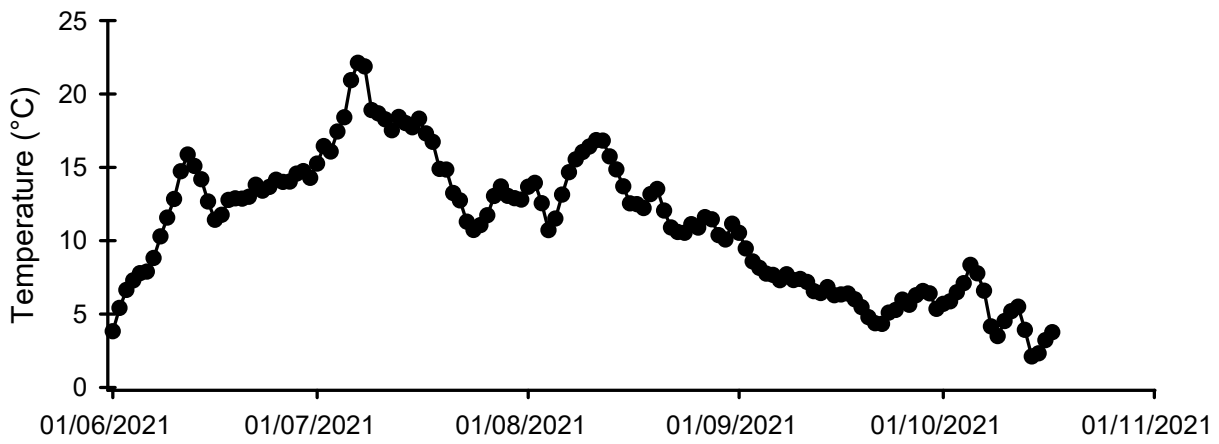


Figure 11. Fluctuations in the daily mean water temperatures from June to October in the River Karpelv in the years 2019-2020. Source; County Governor in Troms and Finnmark (Norway).

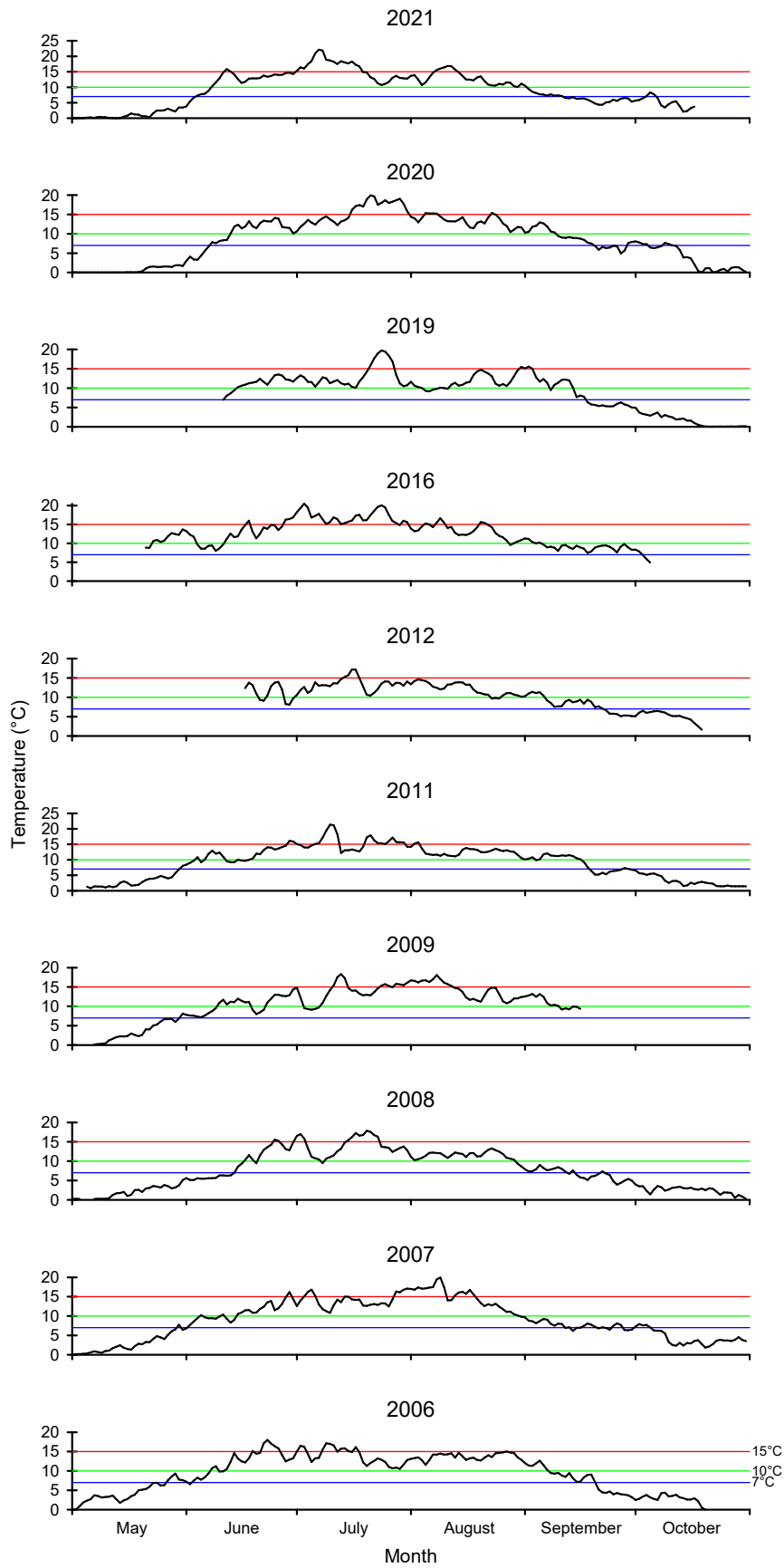


Figure 12. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the River Karpelv. Source; NVE (Norway), County Governor in Troms and Finnmark (Norway).

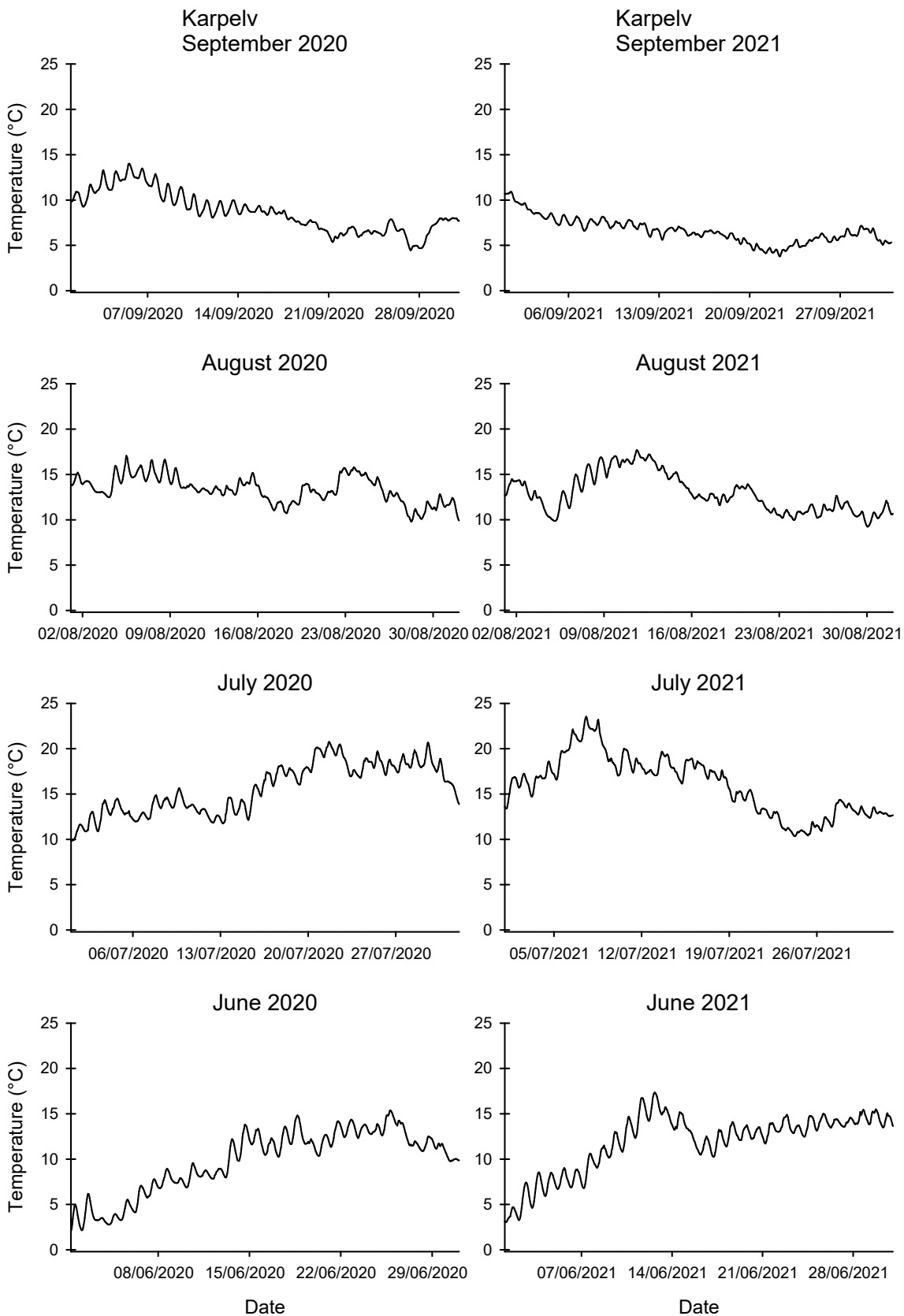


Figure 13. Hourly changes in the water temperatures in the River Karpelv for the summer months in the years 2020-2021. Source; County Governor in Troms and Finnmark (Norway).

3.3 Water temperatures in the River Sandneselv

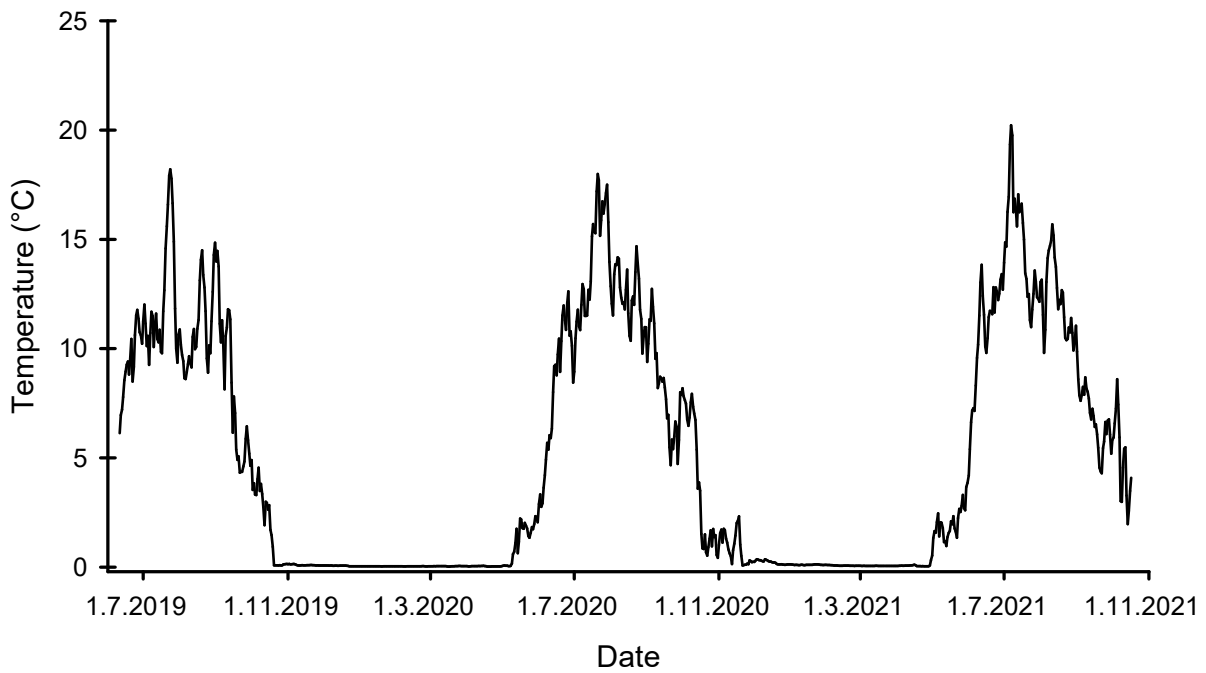


Figure 14. Daily mean water temperatures throughout three years in the River Sandneselv in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

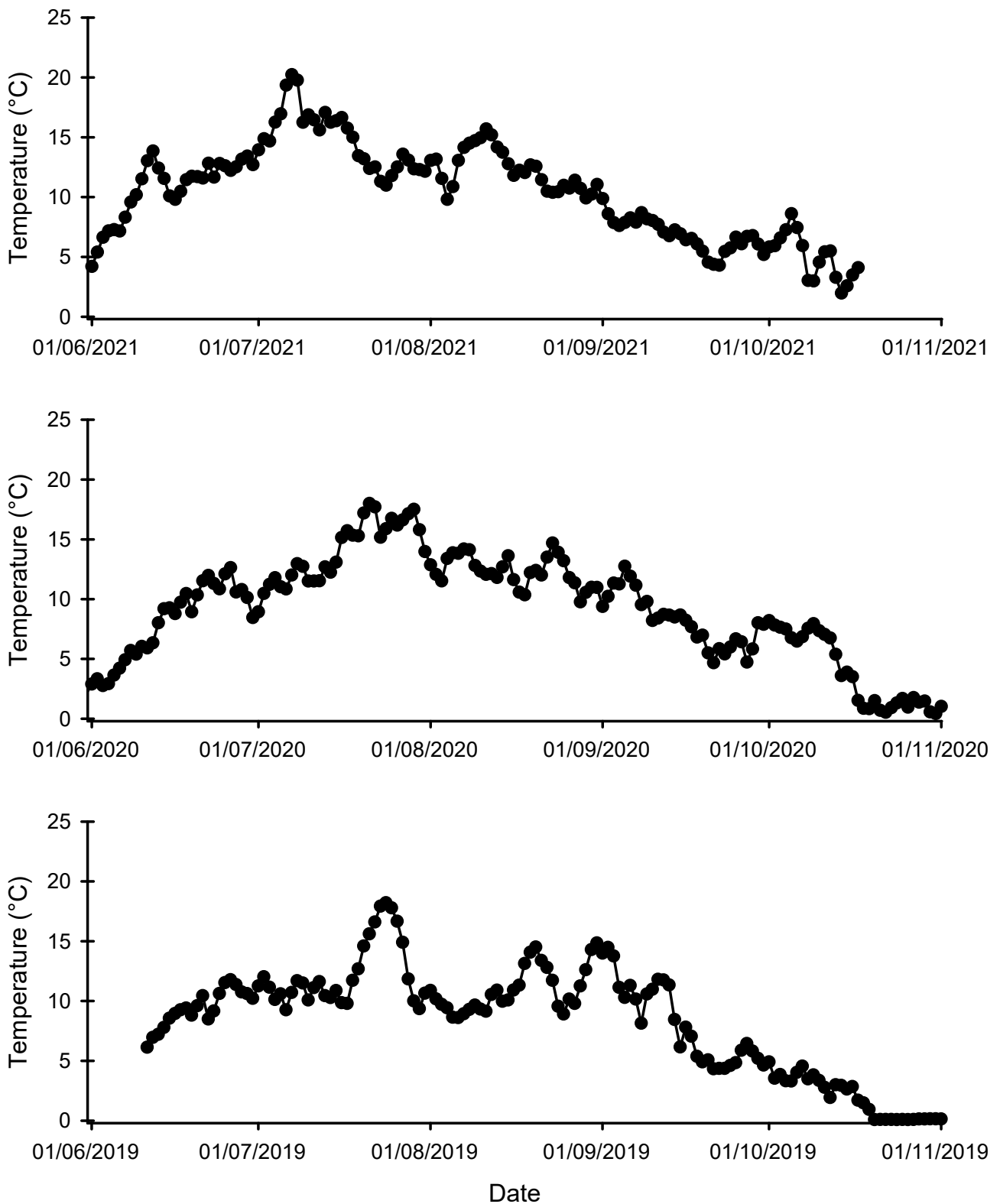


Figure 15. Fluctuations in the daily mean water temperatures from June to October in the River Sandneselv in the years 2019-2020. Source; County Governor in Troms and Finnmark (Norway).

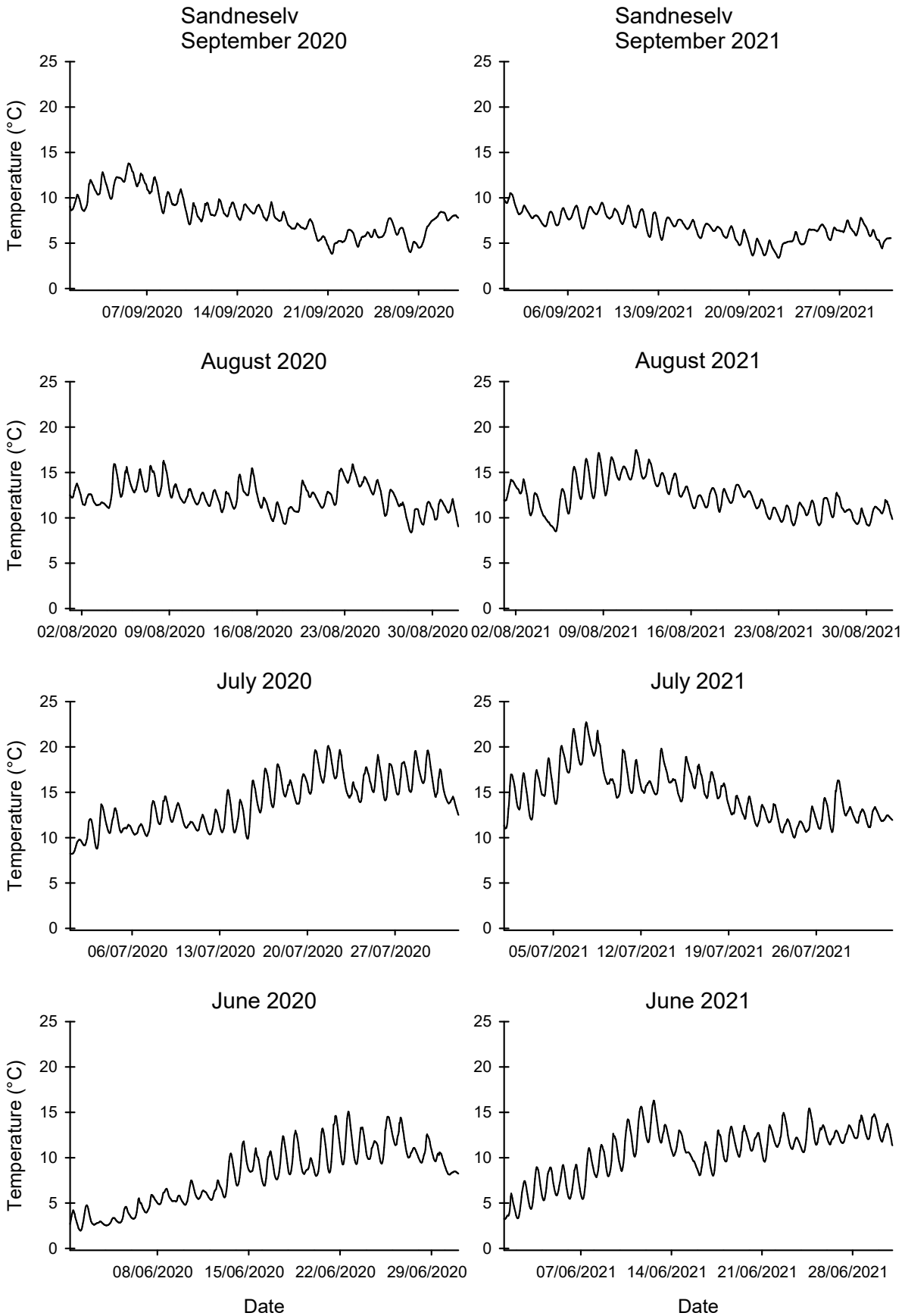


Figure 16. Hourly changes in the water temperatures in the River Sandneselv for the summer months in the years 2020-2021. Source; County Governor in Troms and Finnmark (Norway).

3.4 Water temperatures in the River Neiden

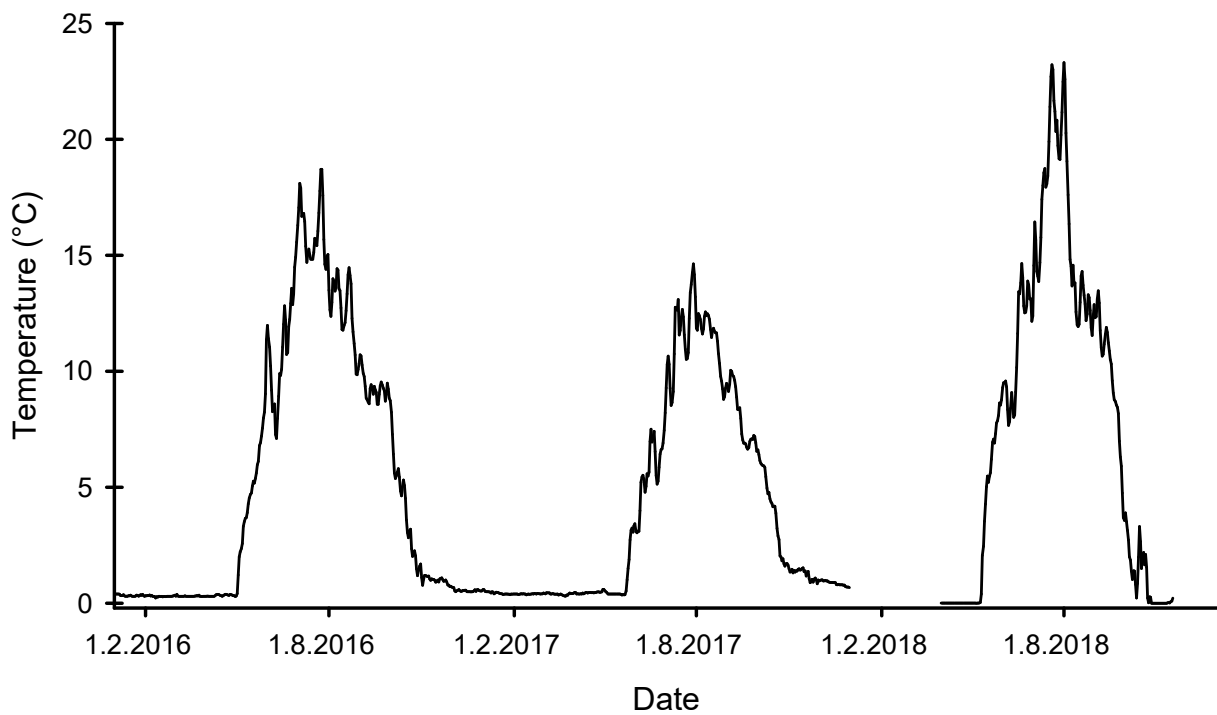
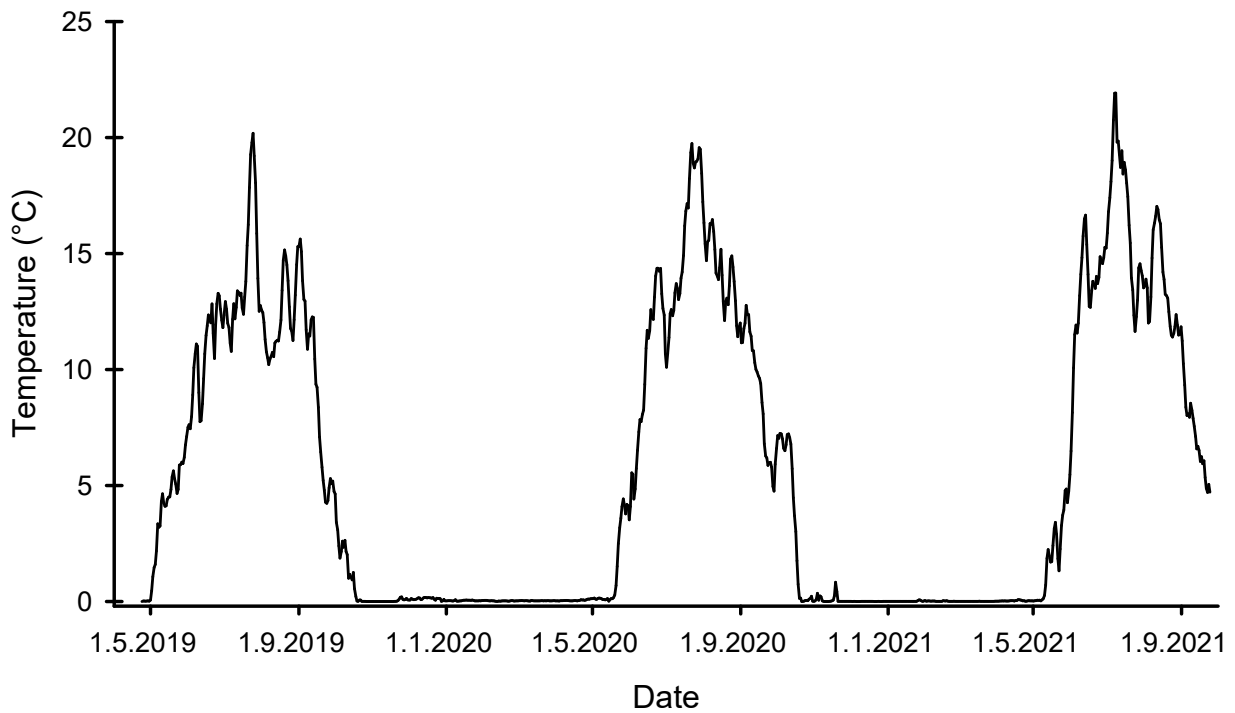


Figure 17. Daily mean water temperatures throughout six years in the River Neiden in the years 2016-2021. Source; NVE (Norway).

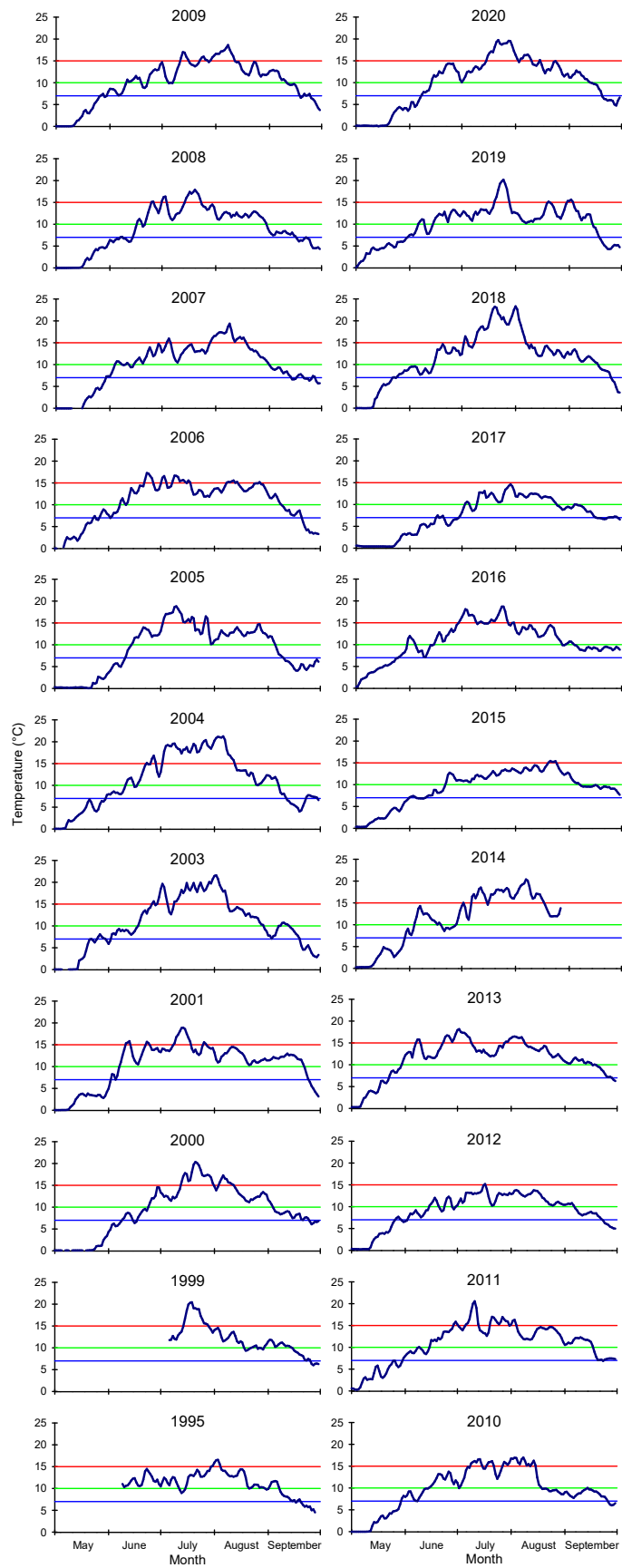


Figure 18. Daily mean water temperatures throughout open water season with 7 °C (blue), 10 °C (green) and 15 °C (red) lines in the River Neiden. Source; NVE (Norway).

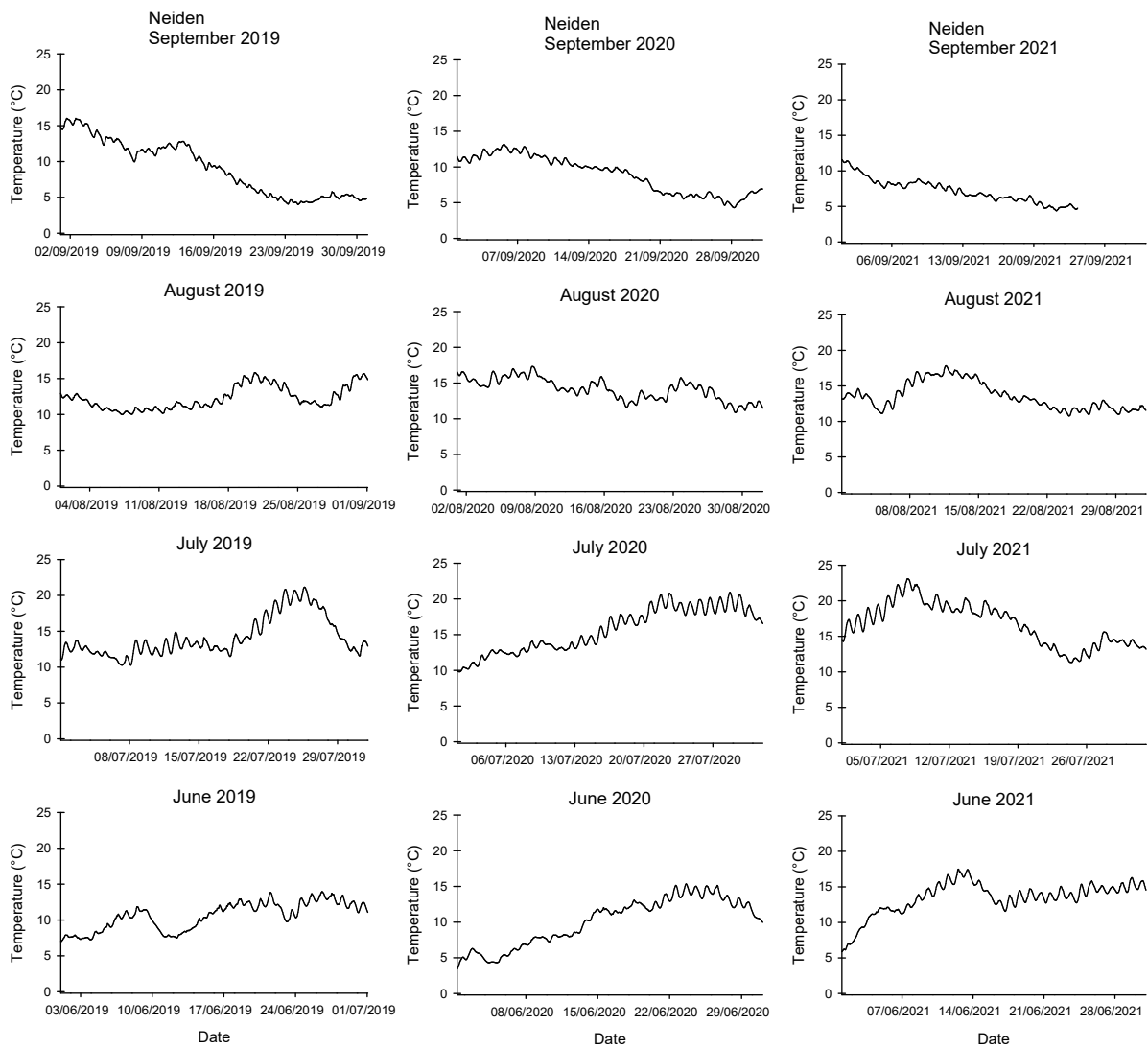


Figure 19. Hourly changes in the water temperatures in the River Neiden for the summer months in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

3.5 Water temperatures in the River Nyelv

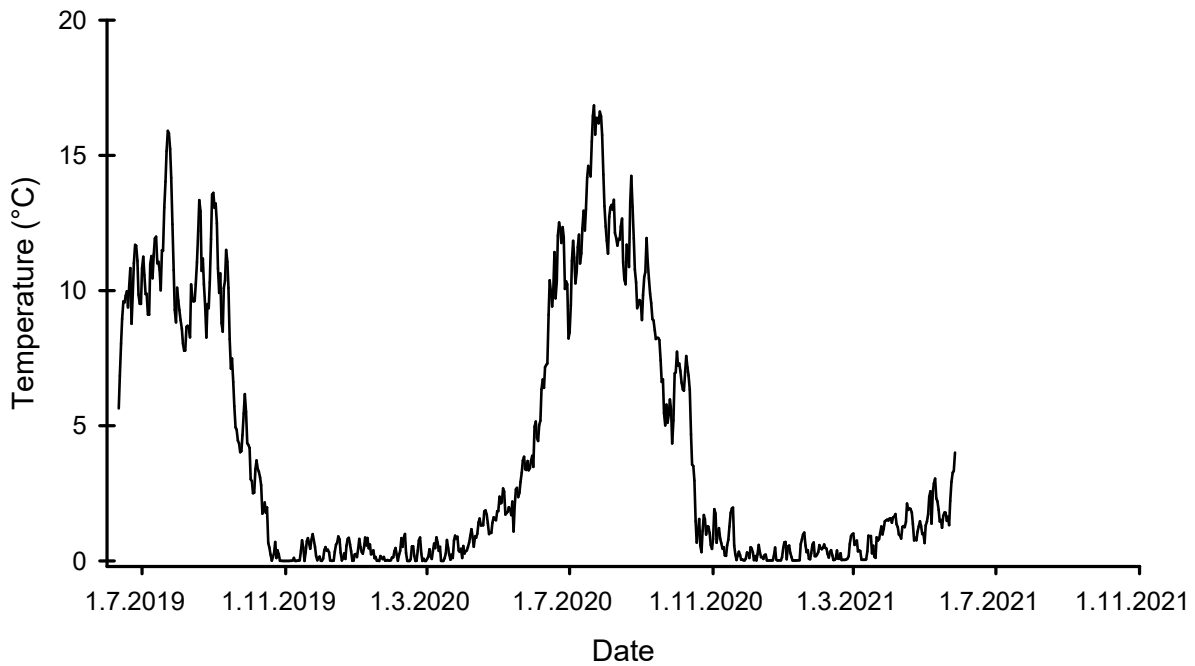


Figure 20. Daily mean water temperatures throughout two years in the River Nyelv in the years 2019-2020. Source; County Governor in Troms and Finnmark (Norway).

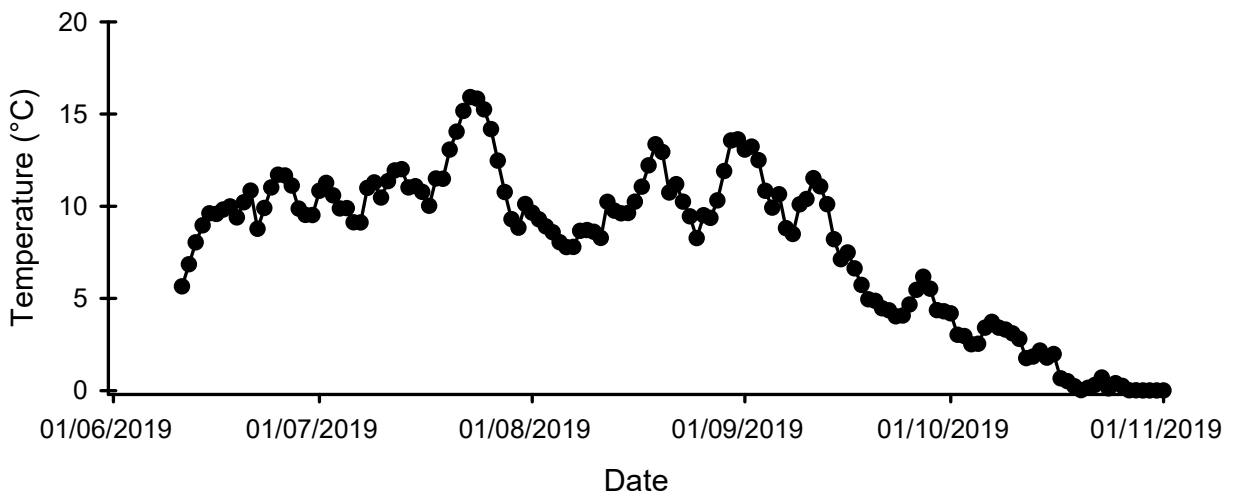
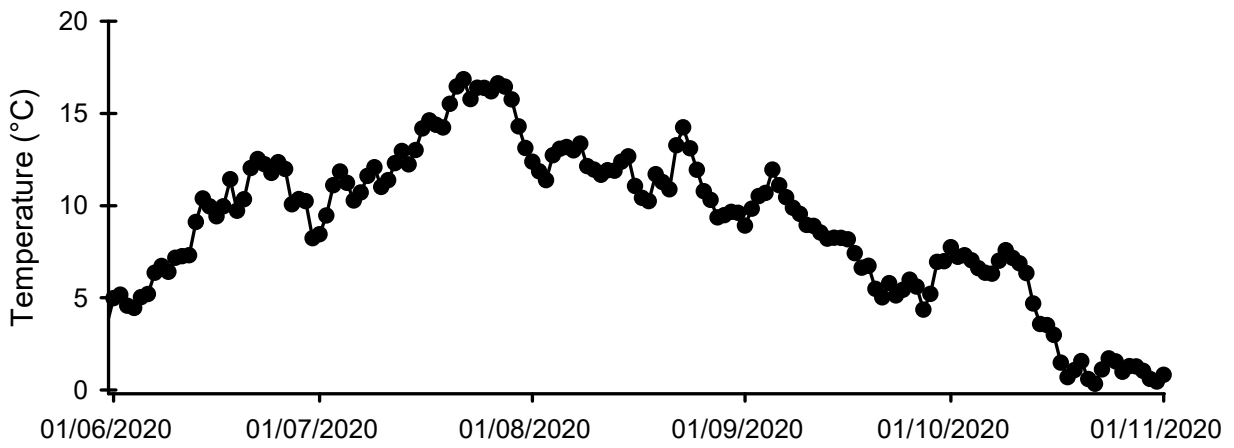


Figure 21. Fluctuations in the daily mean water temperatures from June to October in the River Nyelv in the years 2019-2020. Source; County Governor in Troms and Finnmark (Norway).

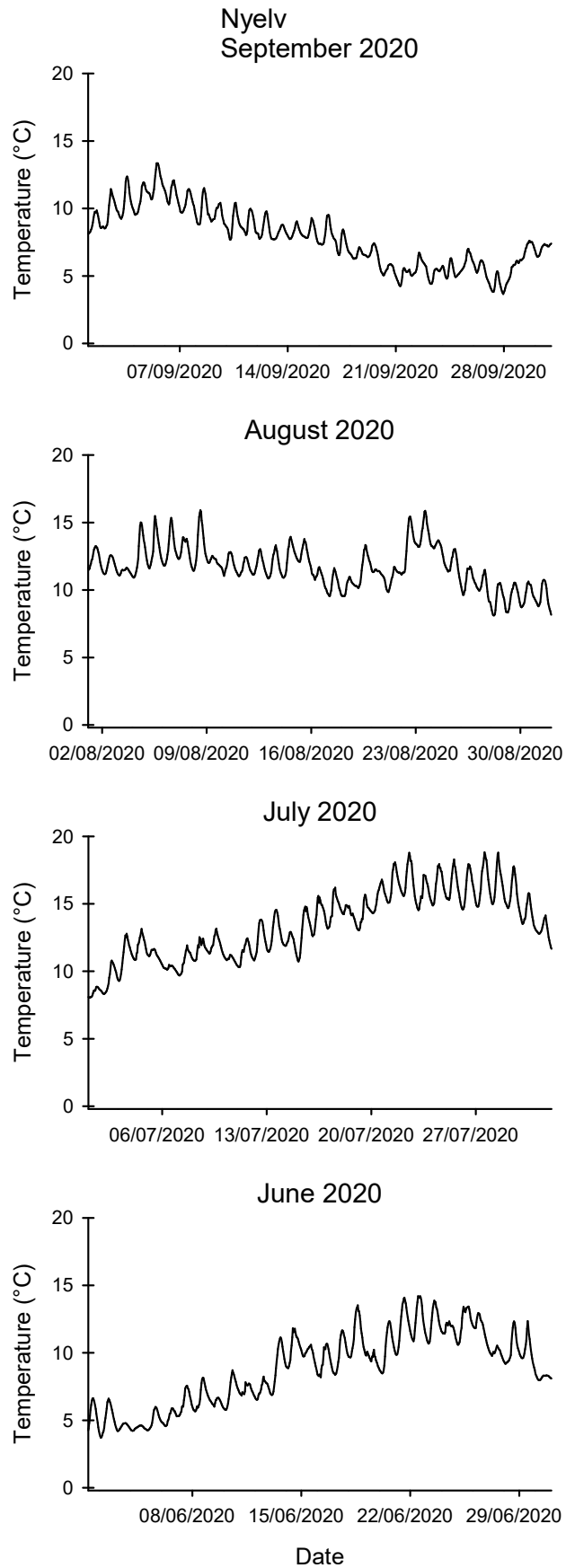


Figure 22. Hourly changes in the water temperatures in the River Nyelv for the summer months in the year 2020. Source; County Governor in Troms and Finnmark (Norway).

3.6 Water temperatures in the River Vesterelv

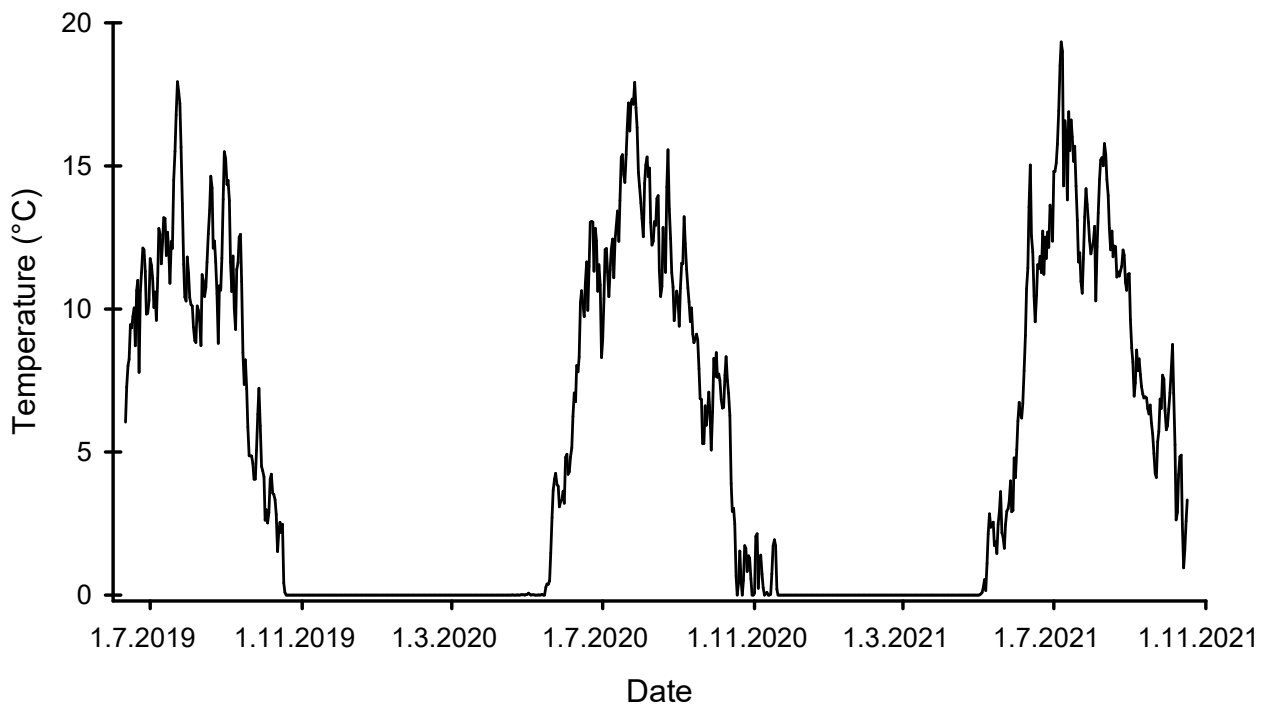


Figure 23. Daily mean water temperatures throughout three years in the River Vesterelv in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

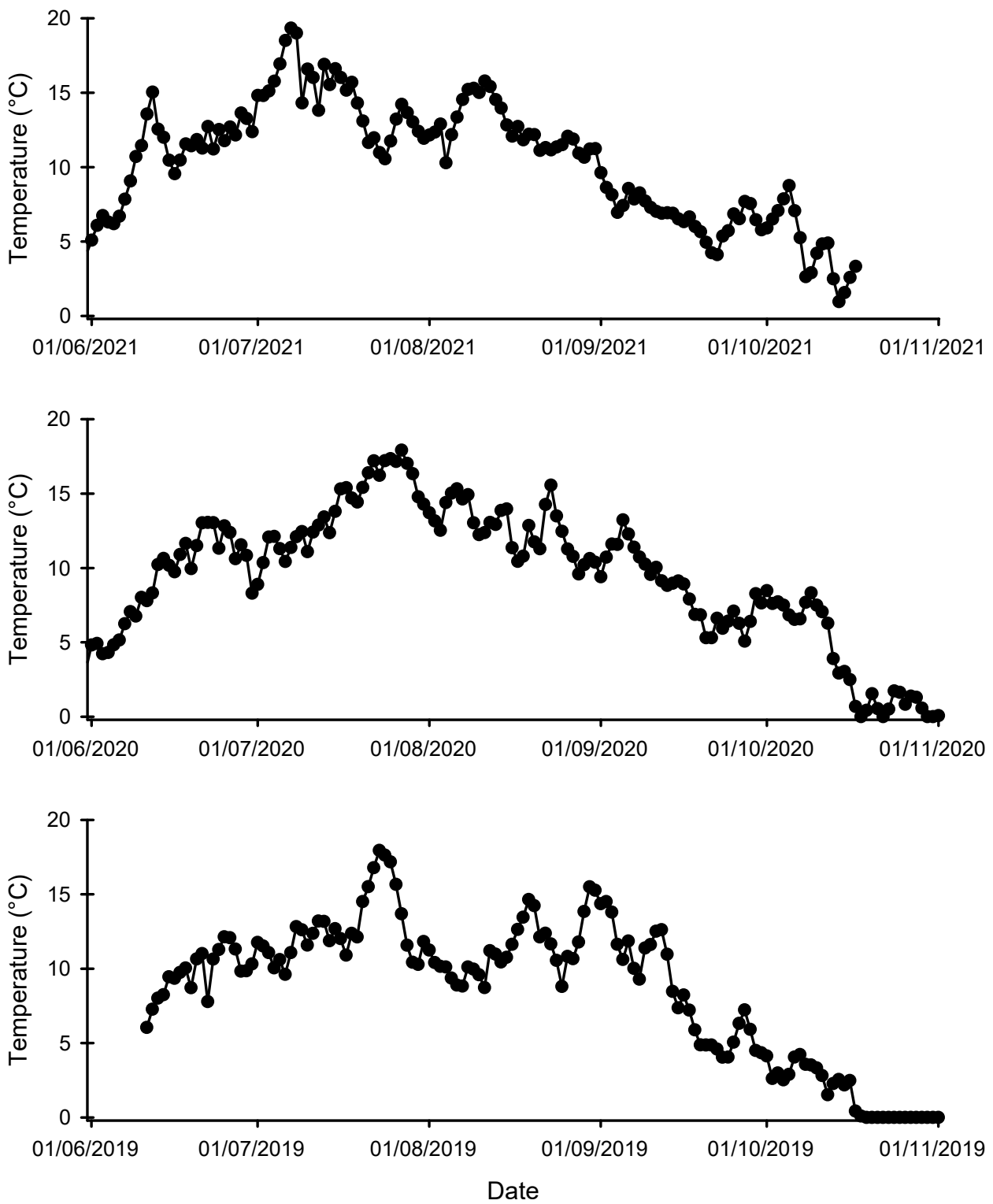


Figure 24. Fluctuations in the daily mean water temperatures from June to October in the River Vesterelv in the years 2019-2020. Source; County Governor in Troms and Finnmark (Norway).

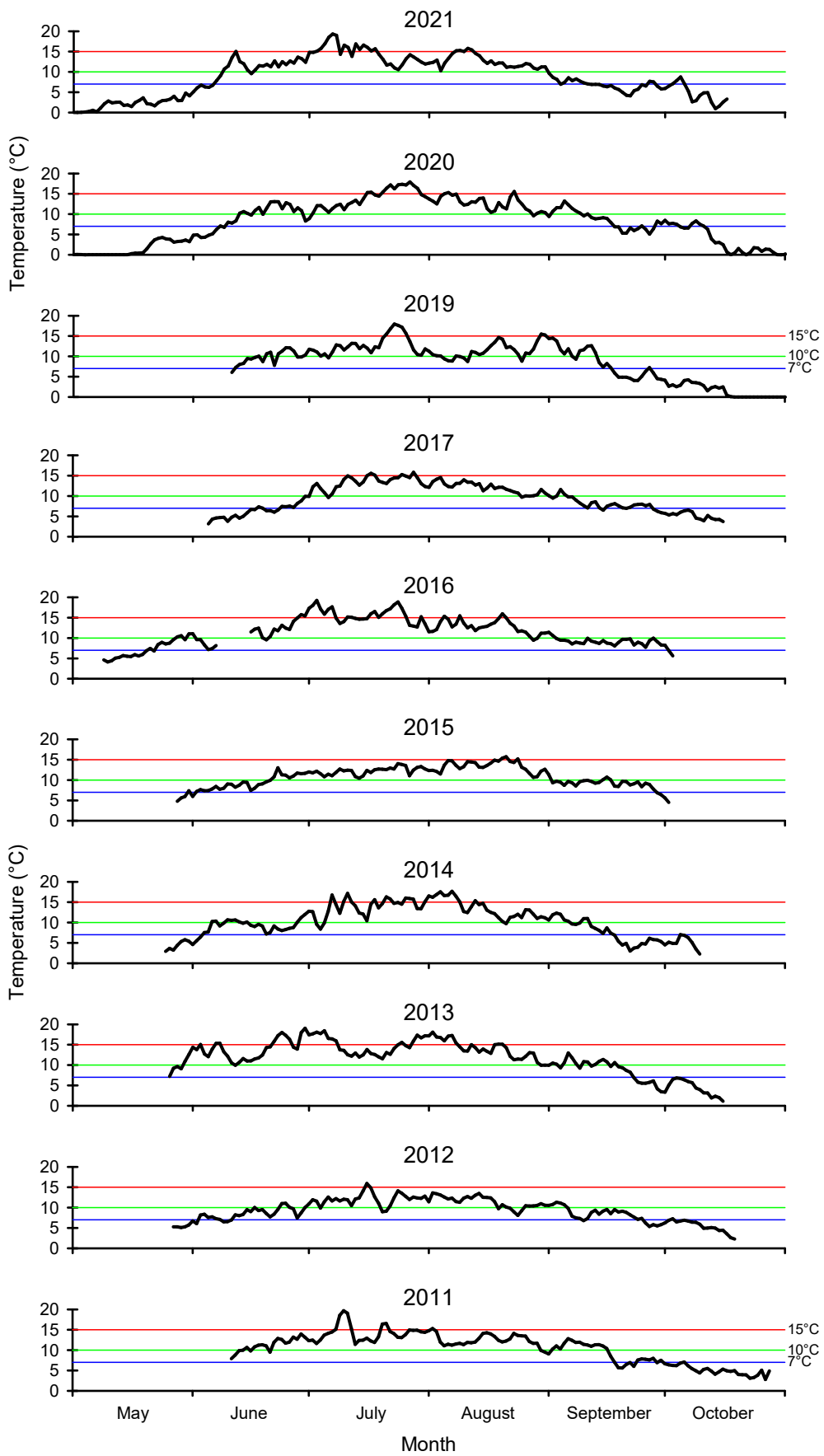


Figure 25. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the River Vesterelv. Source; County Governor in Troms and Finnmark (Norway).

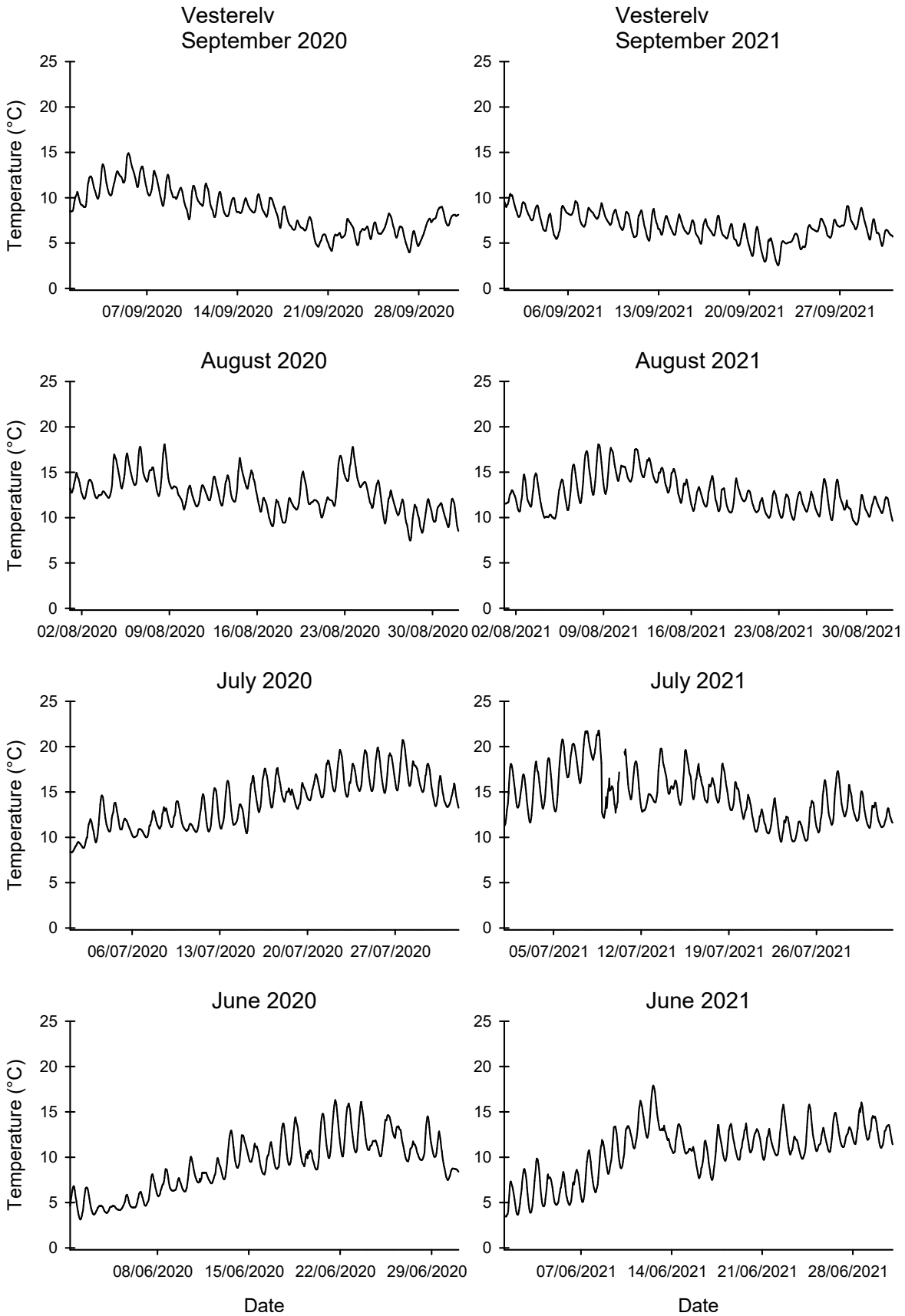


Figure 26. Hourly changes in the water temperatures in the River Vesterelv for the summer months in the years 2020-2021. Source; County Governor in Troms and Finnmark (Norway).

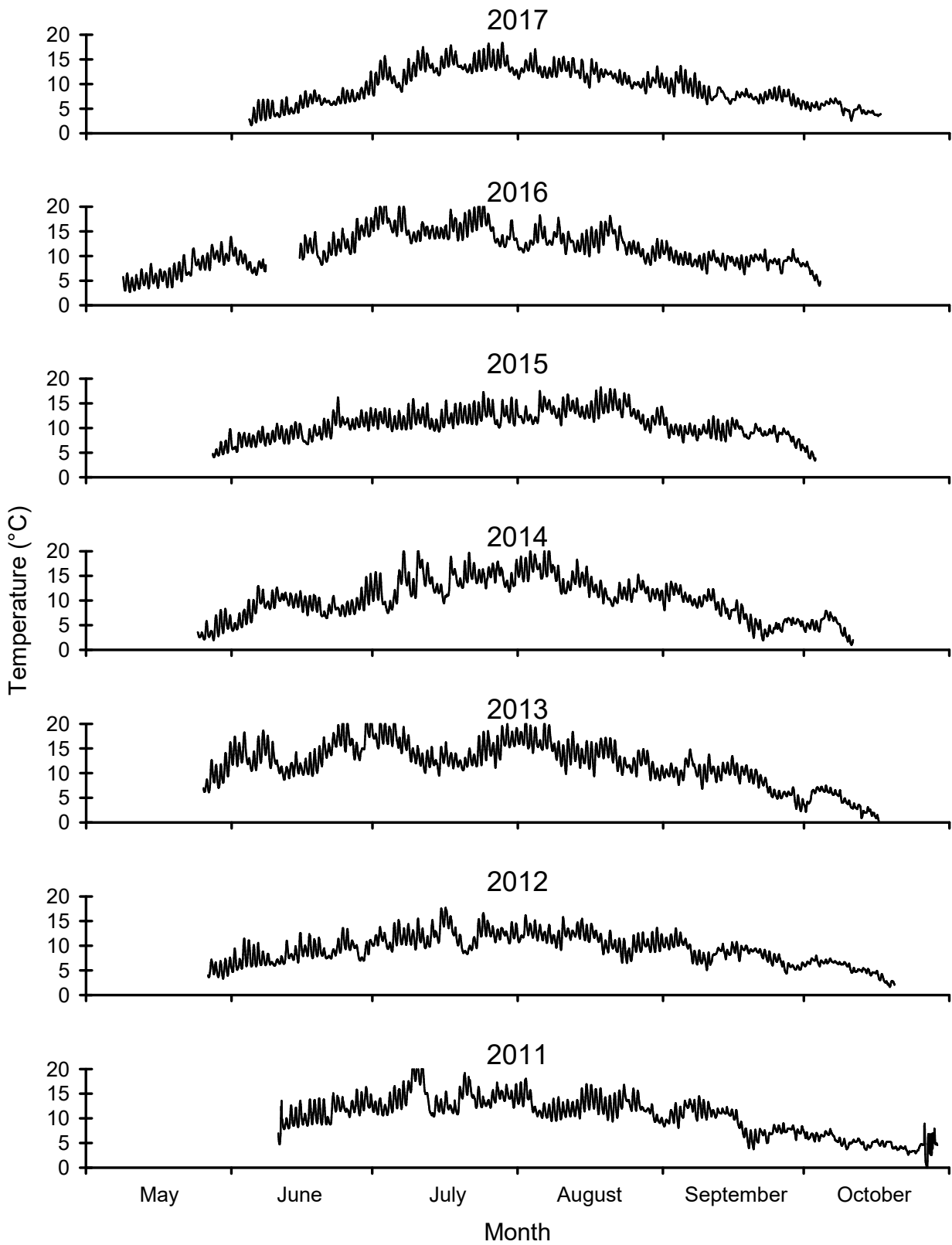


Figure 27. Long-term hourly changes in the water temperatures in the River Vesterelv for the summer months in the years 2011-2017. Source; County Governor in Troms and Finnmark (Norway).

3.7 Water temperatures in the River Bergebyelv

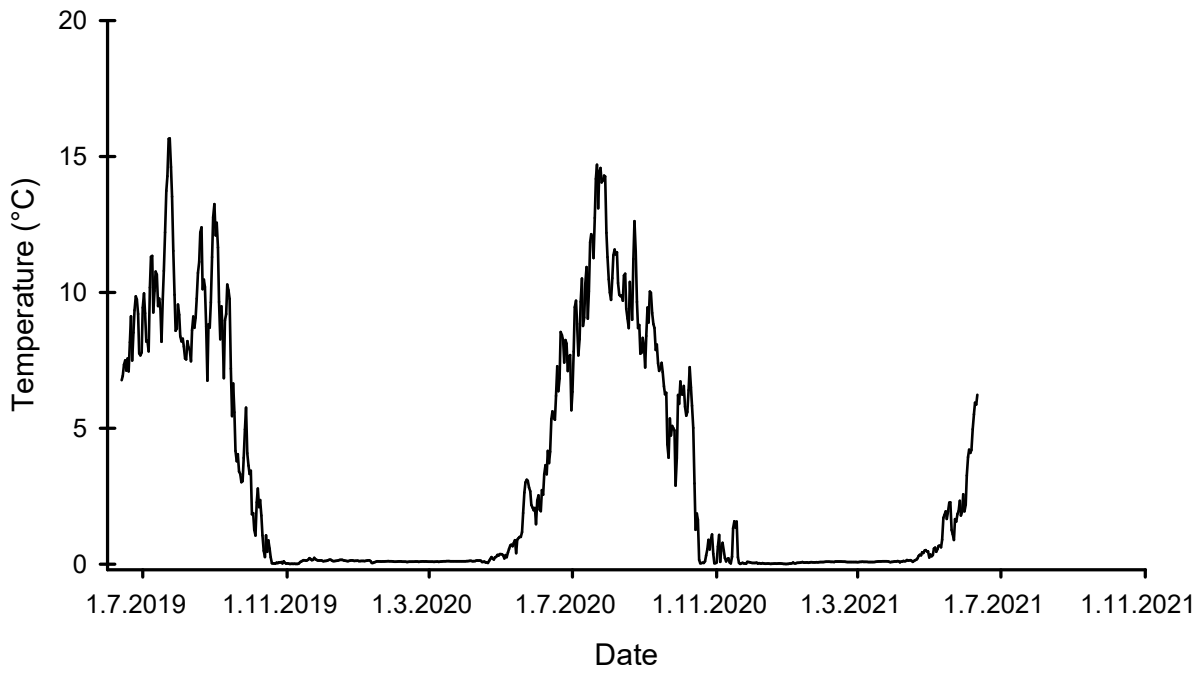


Figure 28. Daily mean water temperatures throughout two years in the River Bergebyelv in the years 2019-2020. Source; County Governor in Troms and Finnmark (Norway).

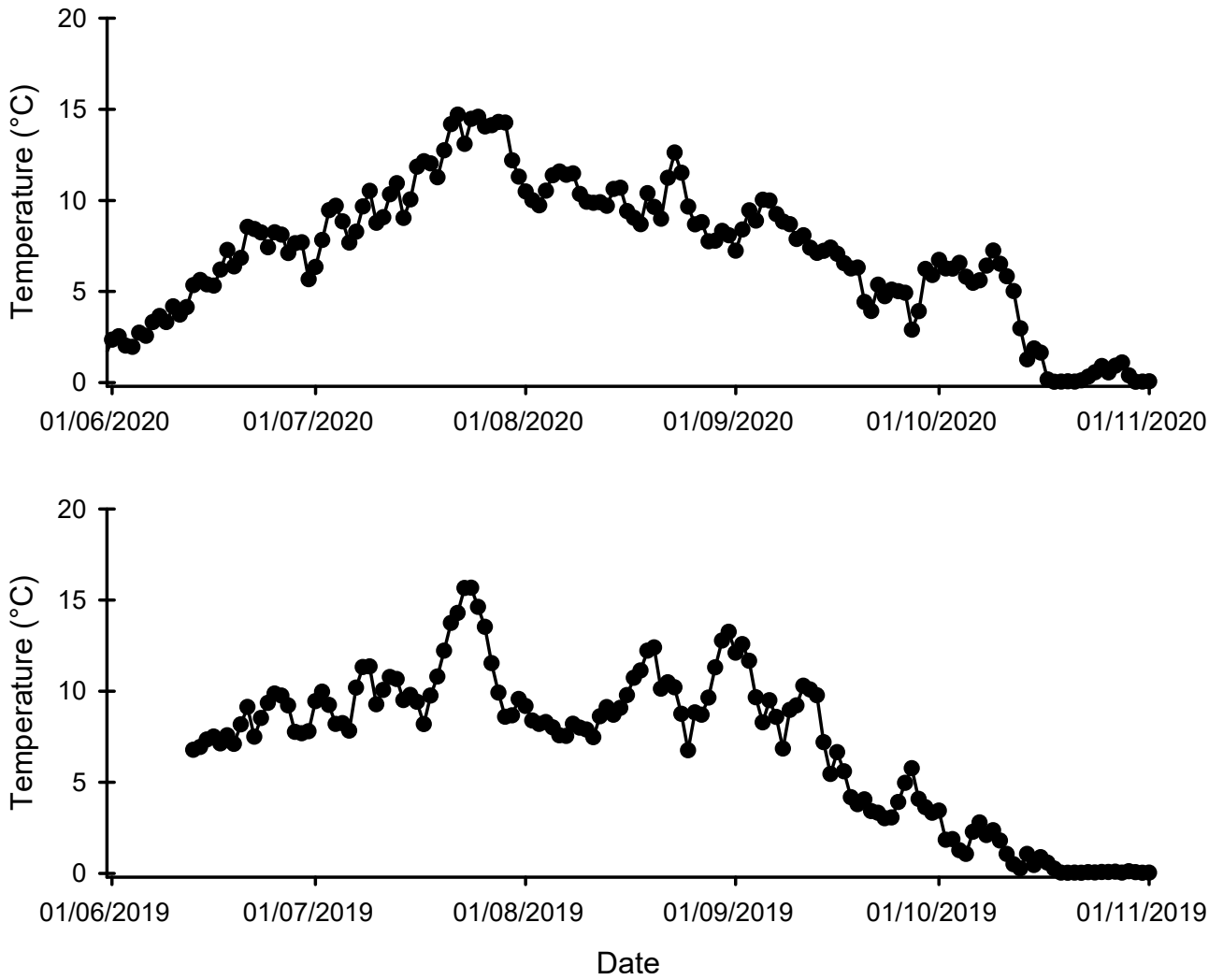


Figure 29. Fluctuations in the daily mean water temperatures from June to October in the River Bergebyelv in the years 2019-2020. Source; County Governor in Troms and Finnmark (Norway).

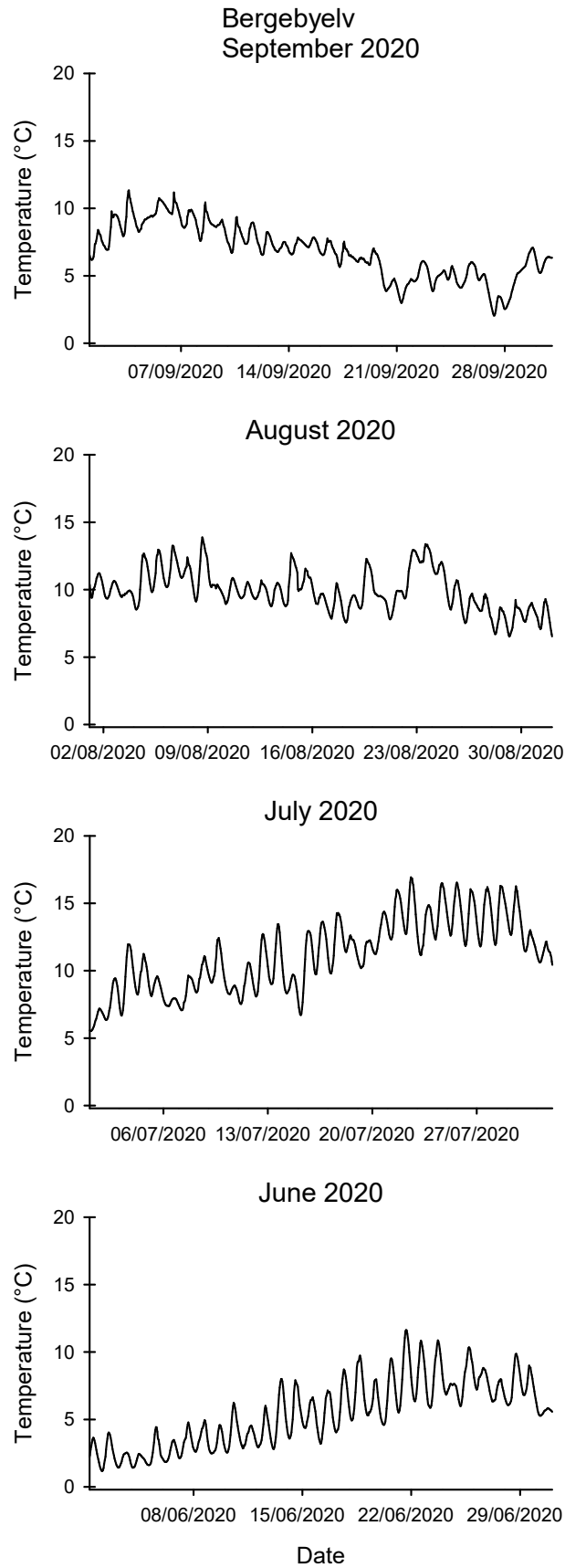


Figure 30. Hourly changes in the water temperatures in the River Bergebyelv for the summer months in the year 2020. Source; County Governor in Troms and Finnmark (Norway).

3.8 Water temperatures in the River Vestre Jakobselv

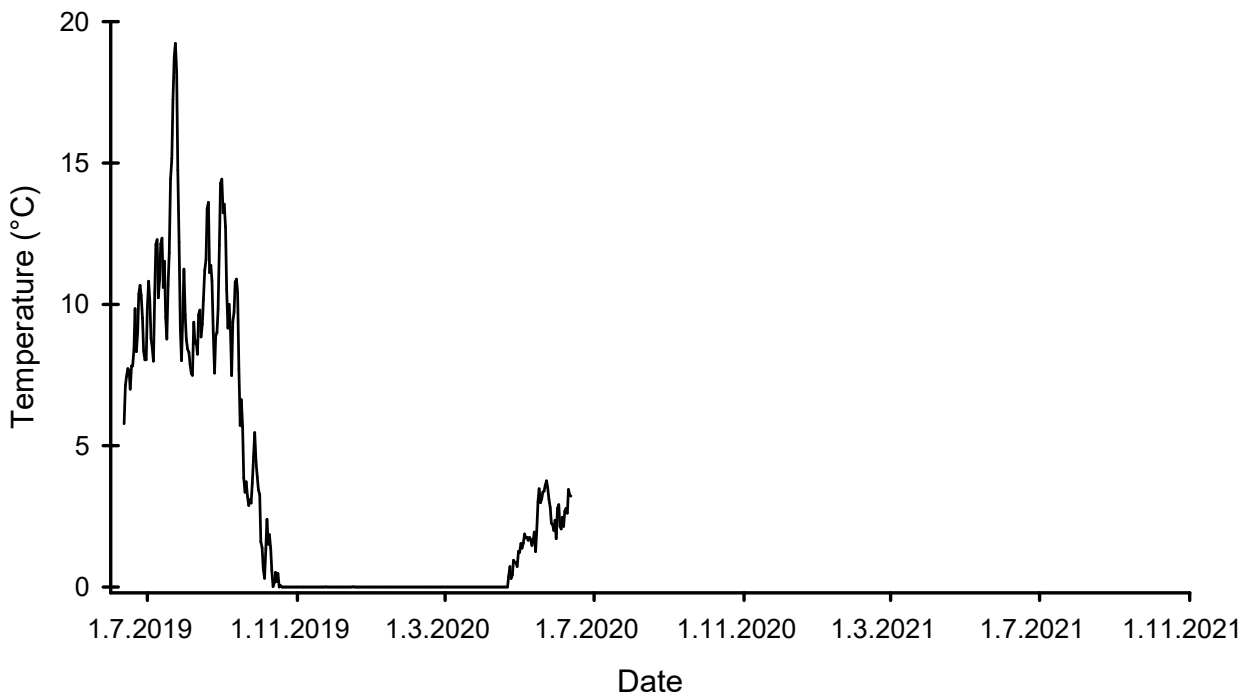


Figure 31. Daily mean water temperatures throughout one year in the River Vestre Jakobselv in the year 2019. Source; County Governor in Troms and Finnmark (Norway).

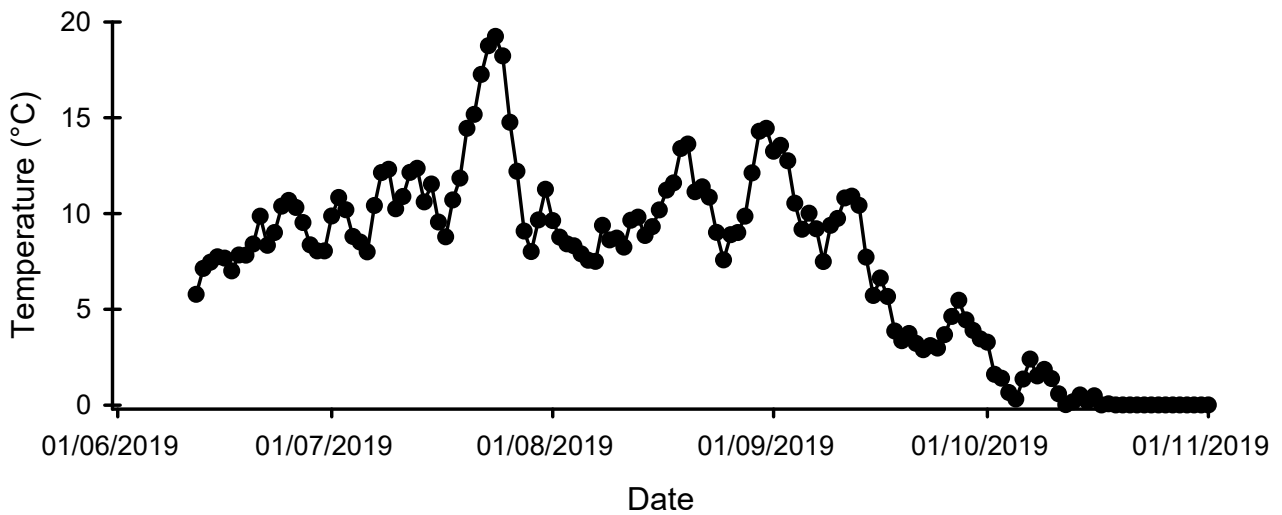


Figure 32. Fluctuations in the daily mean water temperatures from June to October in the River Vestre Jakobselv in the year 2019. Source; County Governor in Troms and Finnmark (Norway).

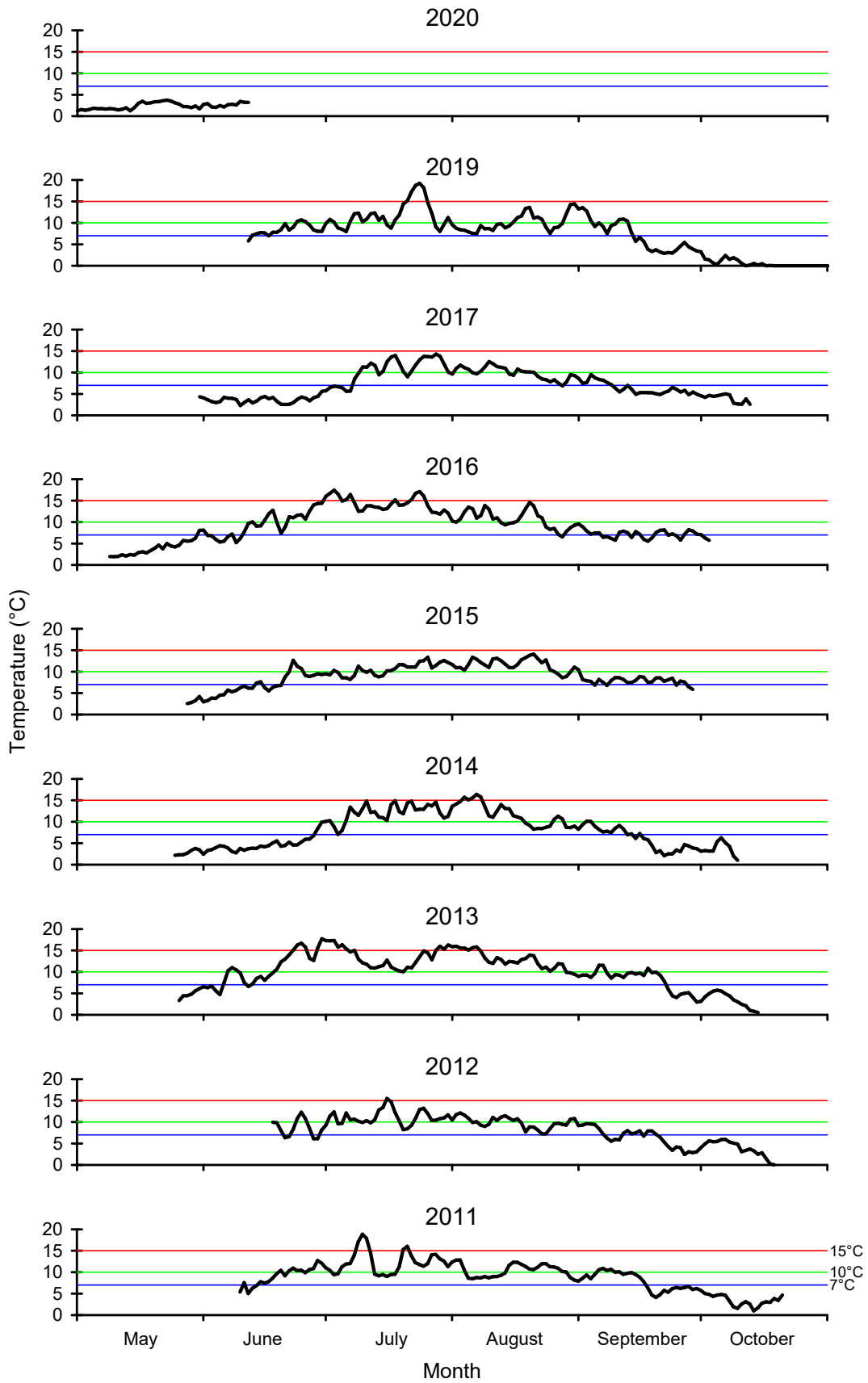


Figure 33. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the River Vestre Jakobselv. Source; County Governor in Troms and Finnmark (Norway).

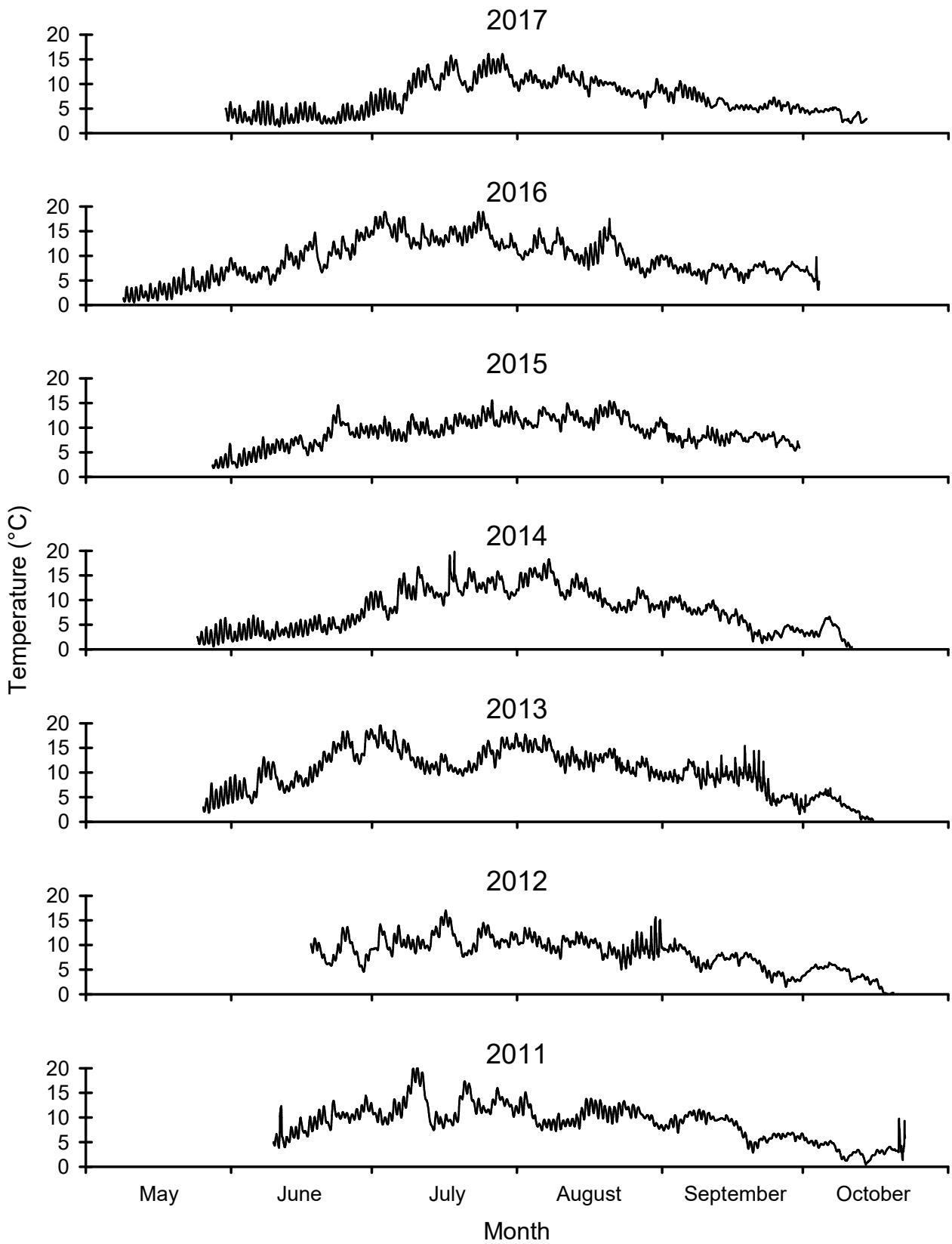


Figure 34. Long-term hourly changes in the water temperatures in the River Vestre Jakobselv for the summer months in the years 2011-2017. Source; County Governor in Troms and Finnmark (Norway).

3.9 Water temperatures in the River Skallelv

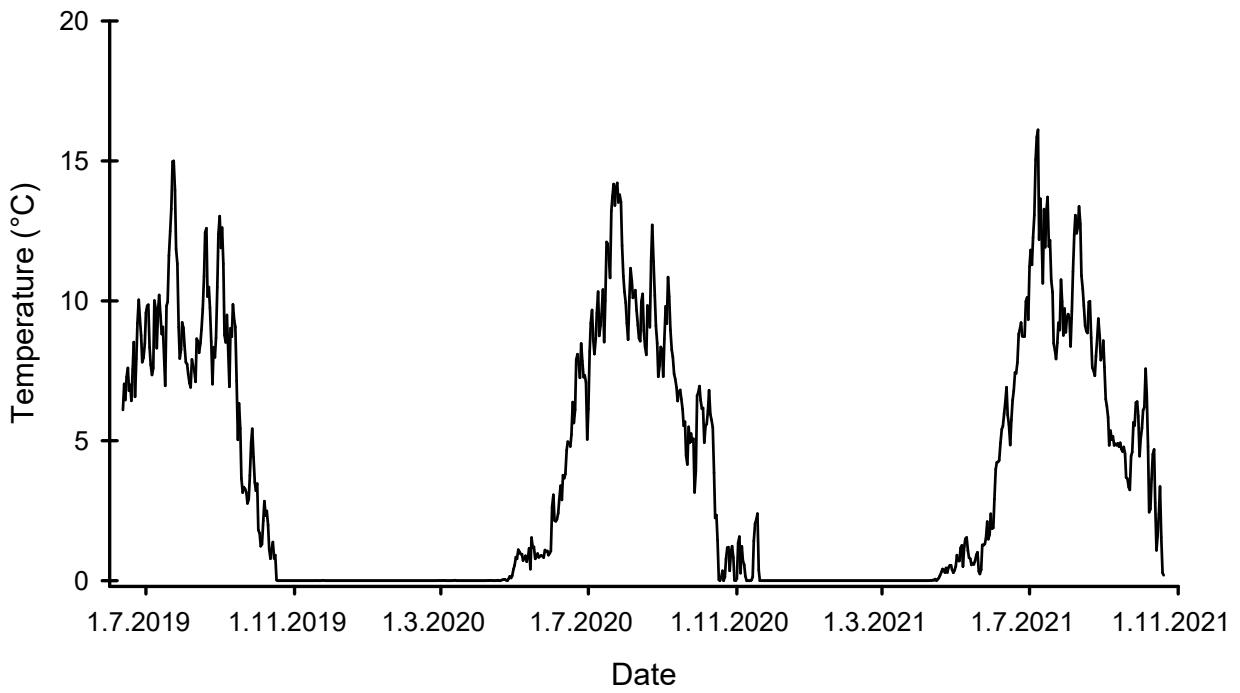


Figure 35. Daily mean water temperatures throughout three years in the River Skallelv in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

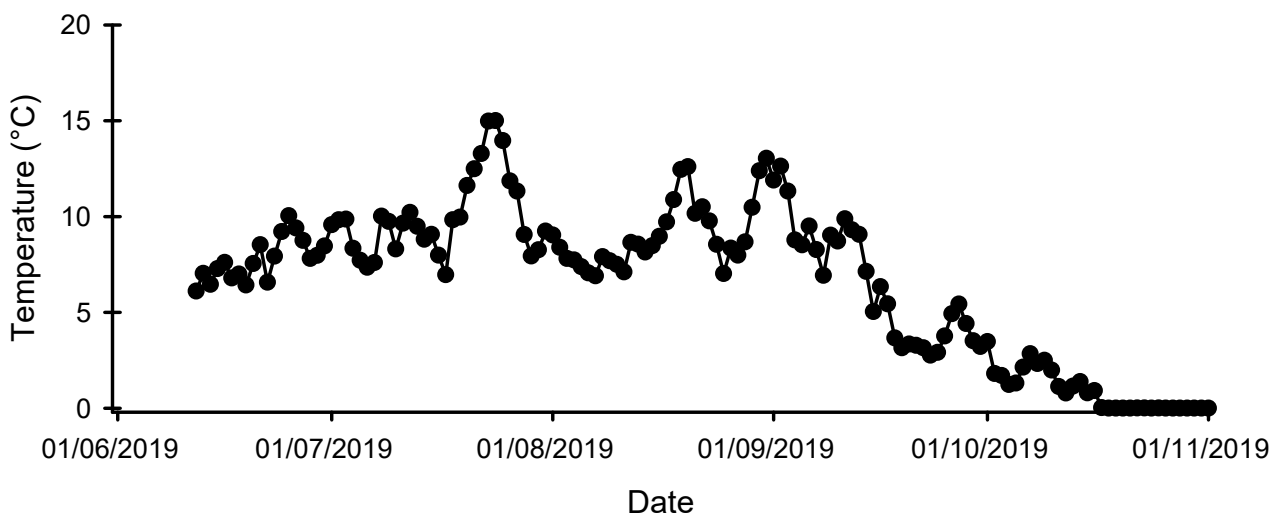
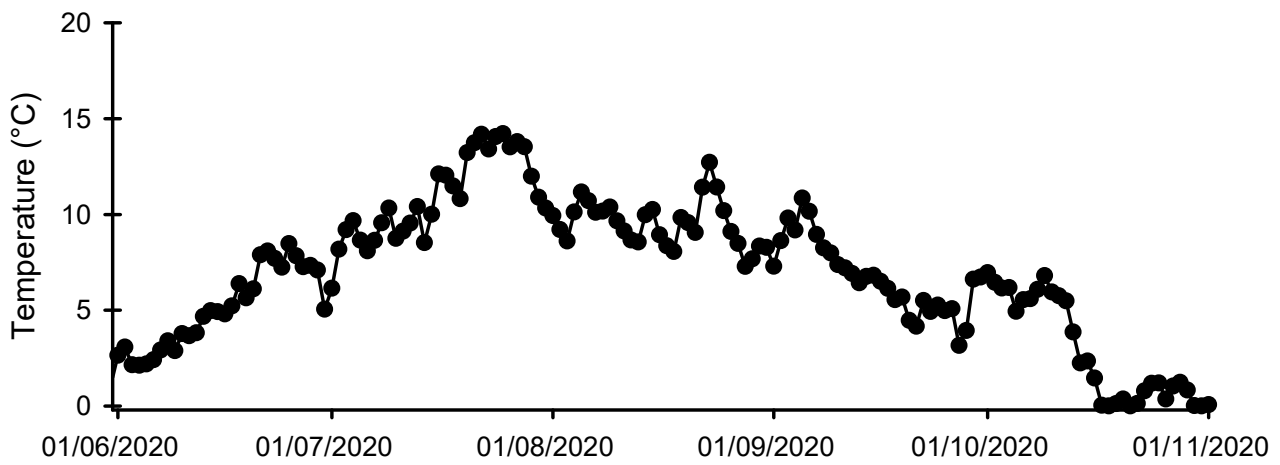
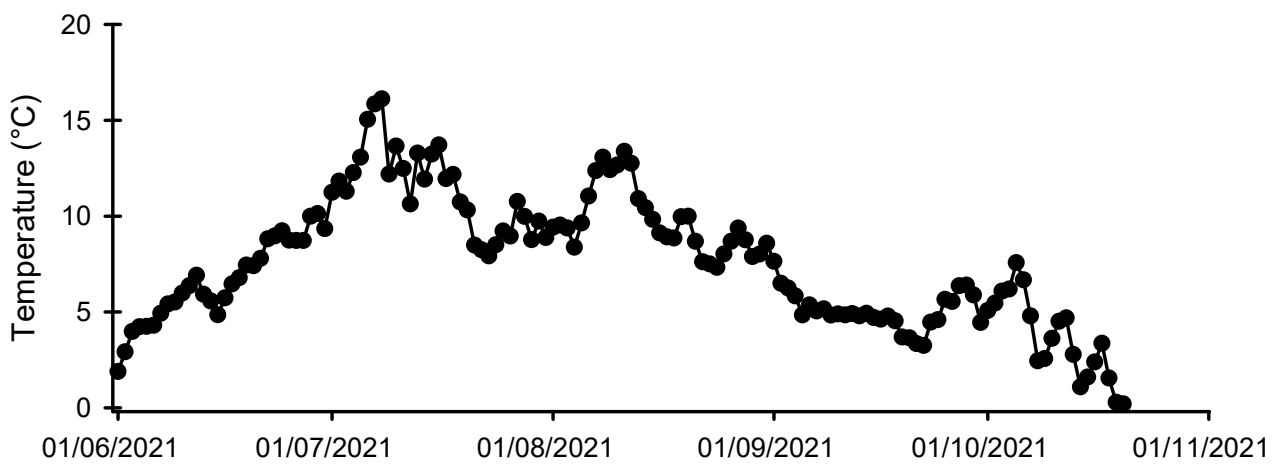


Figure 36. Fluctuations in the daily mean water temperatures from June to October in the River Skallelv in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

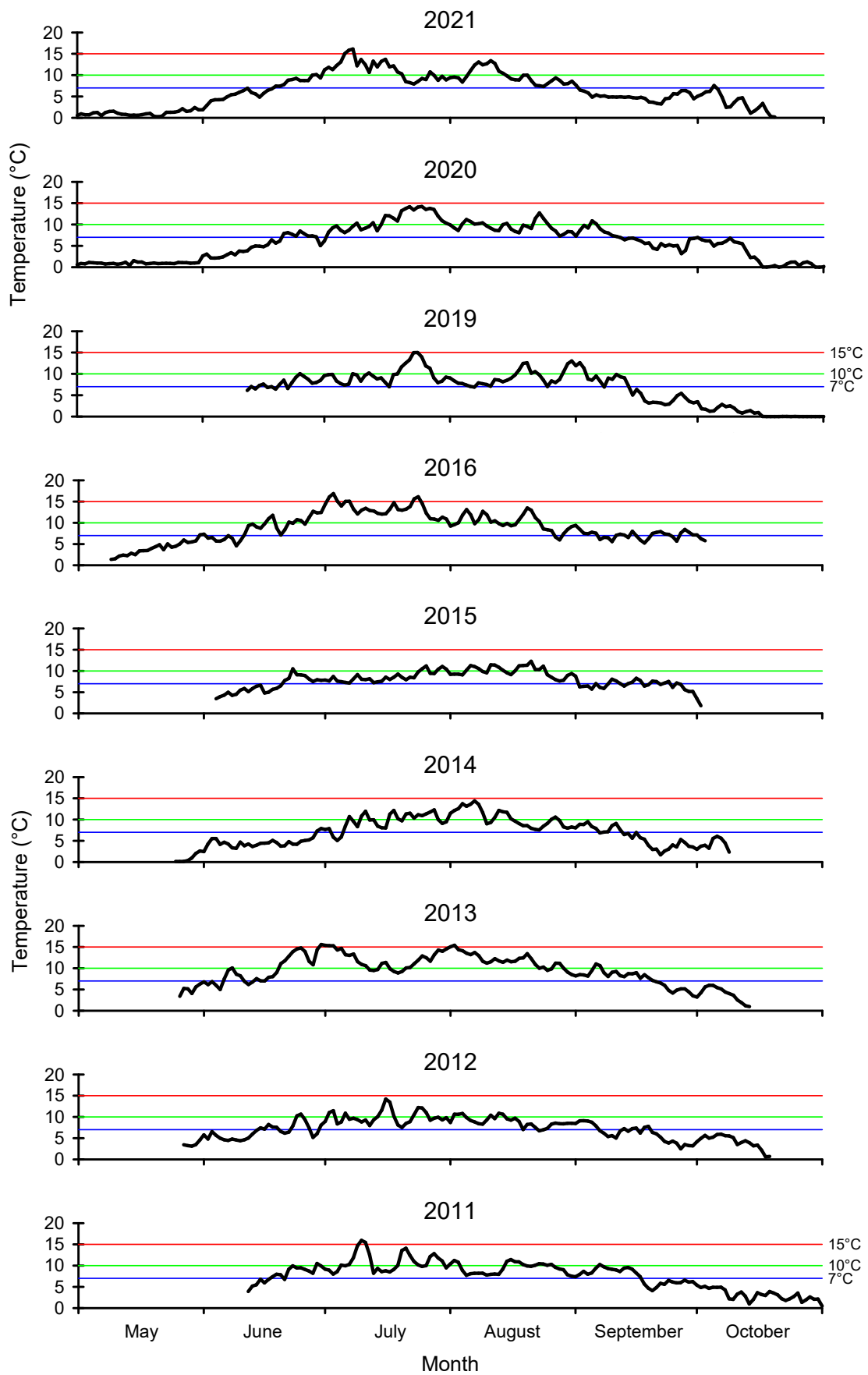


Figure 37. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the River Skallelv. Source; County Governor in Troms and Finnmark (Norway).

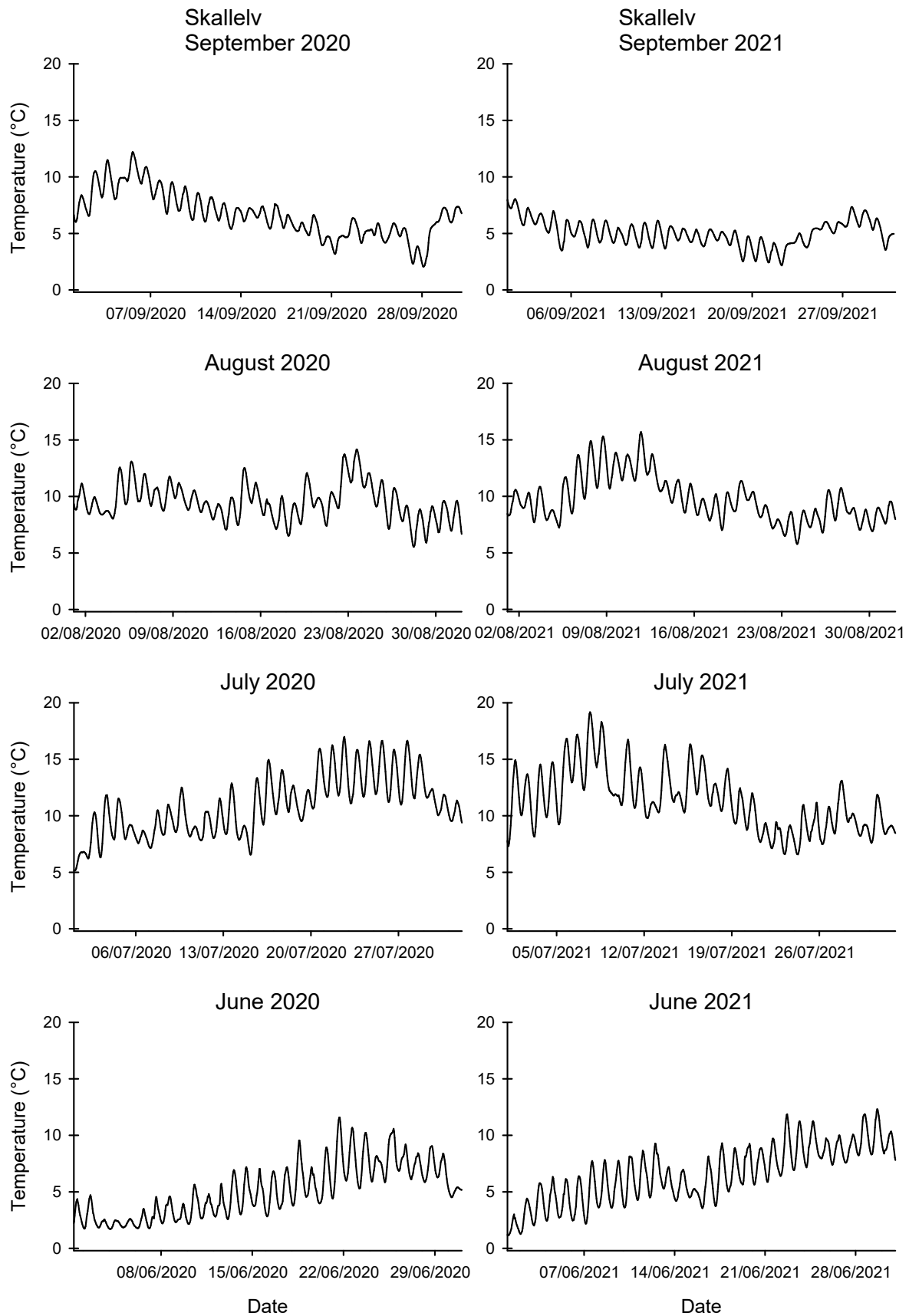


Figure 38. Hourly changes in the water temperatures in the River Skallelv for the summer months in the years 2020-2021. Source; County Governor in Troms and Finnmark (Norway).

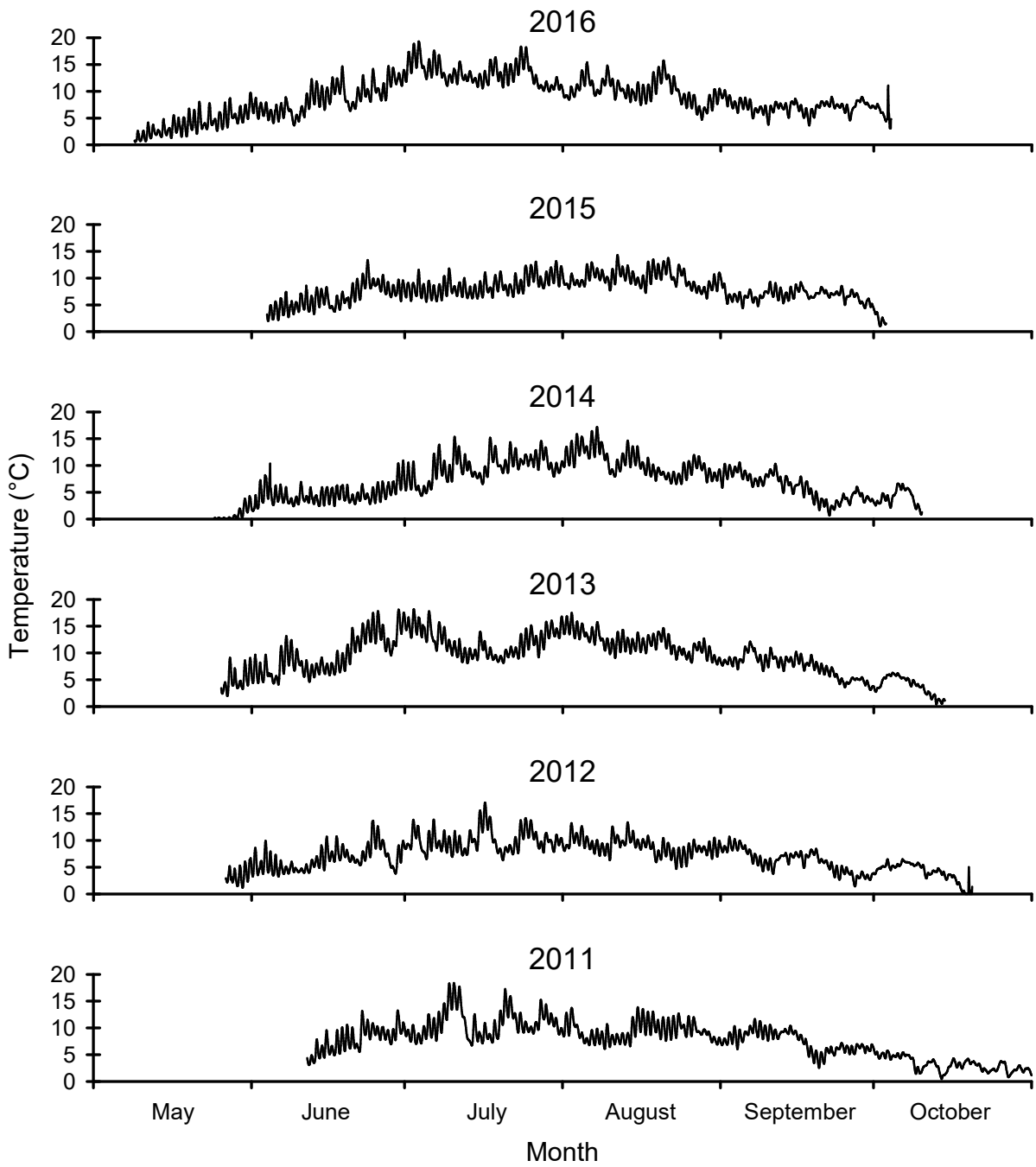


Figure 39. Long-term hourly changes in the water temperatures in the River Skallelv for the summer months in the years 2011-2016. Source; County Governor in Troms and Finnmark (Norway).

3.10 Water temperatures in the River Komagelv

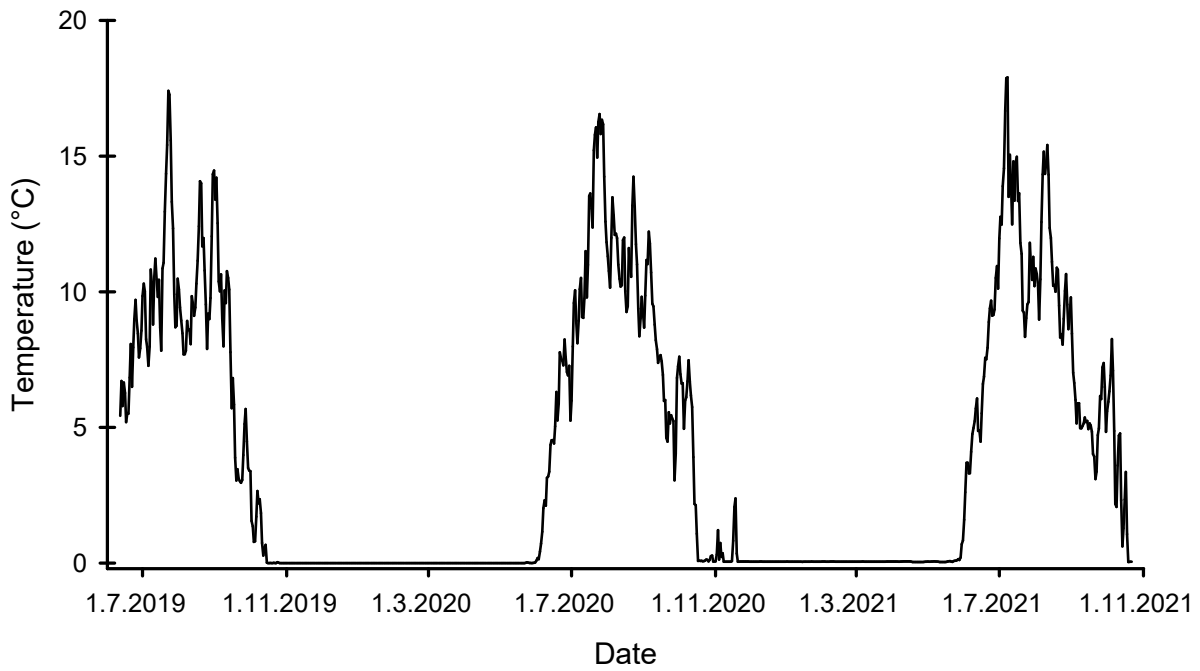


Figure 40. Daily mean water temperatures throughout three years in the River Komagelv in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

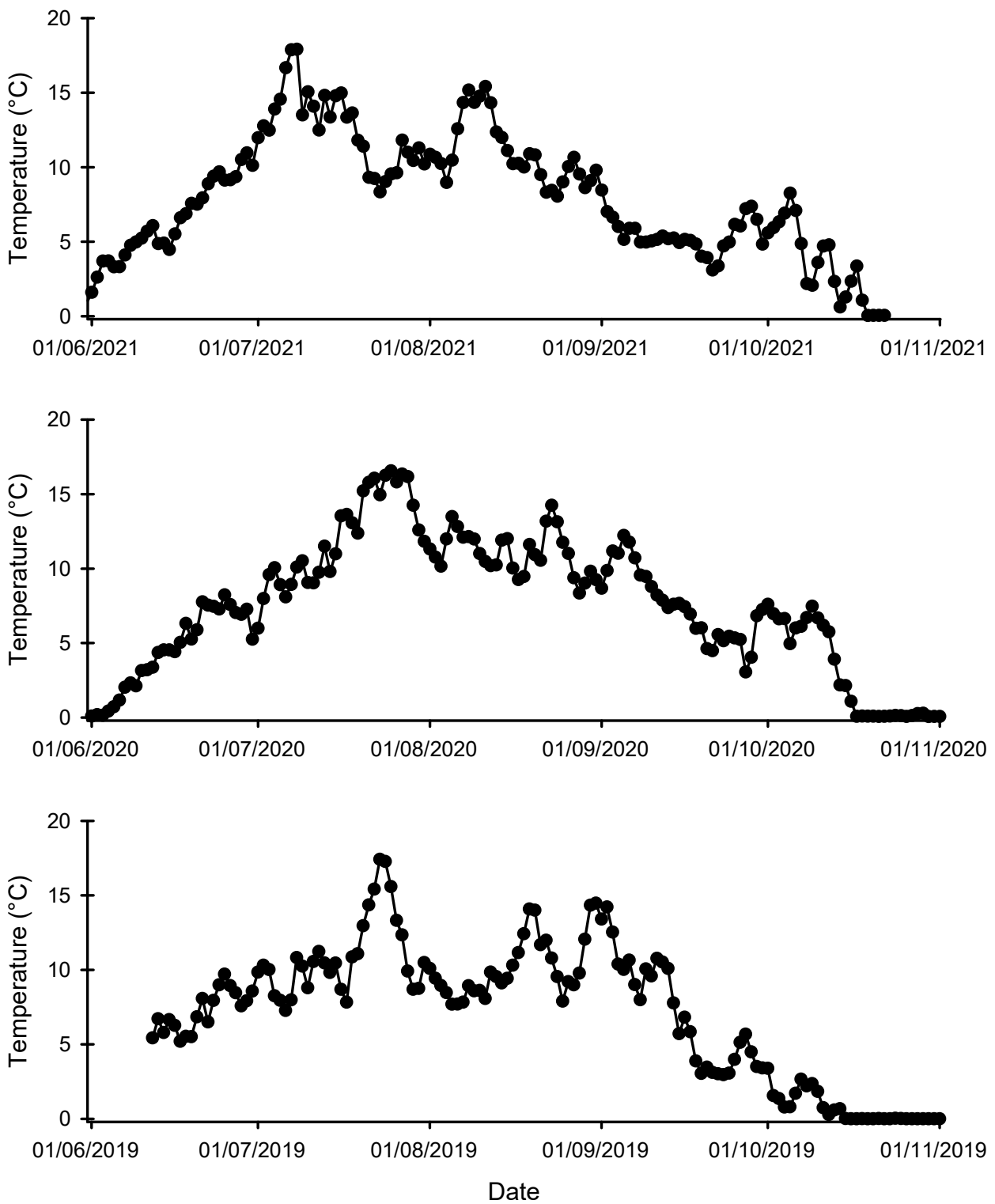


Figure 41. Fluctuations in the daily mean water temperatures from June to October in the River Komagelv in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

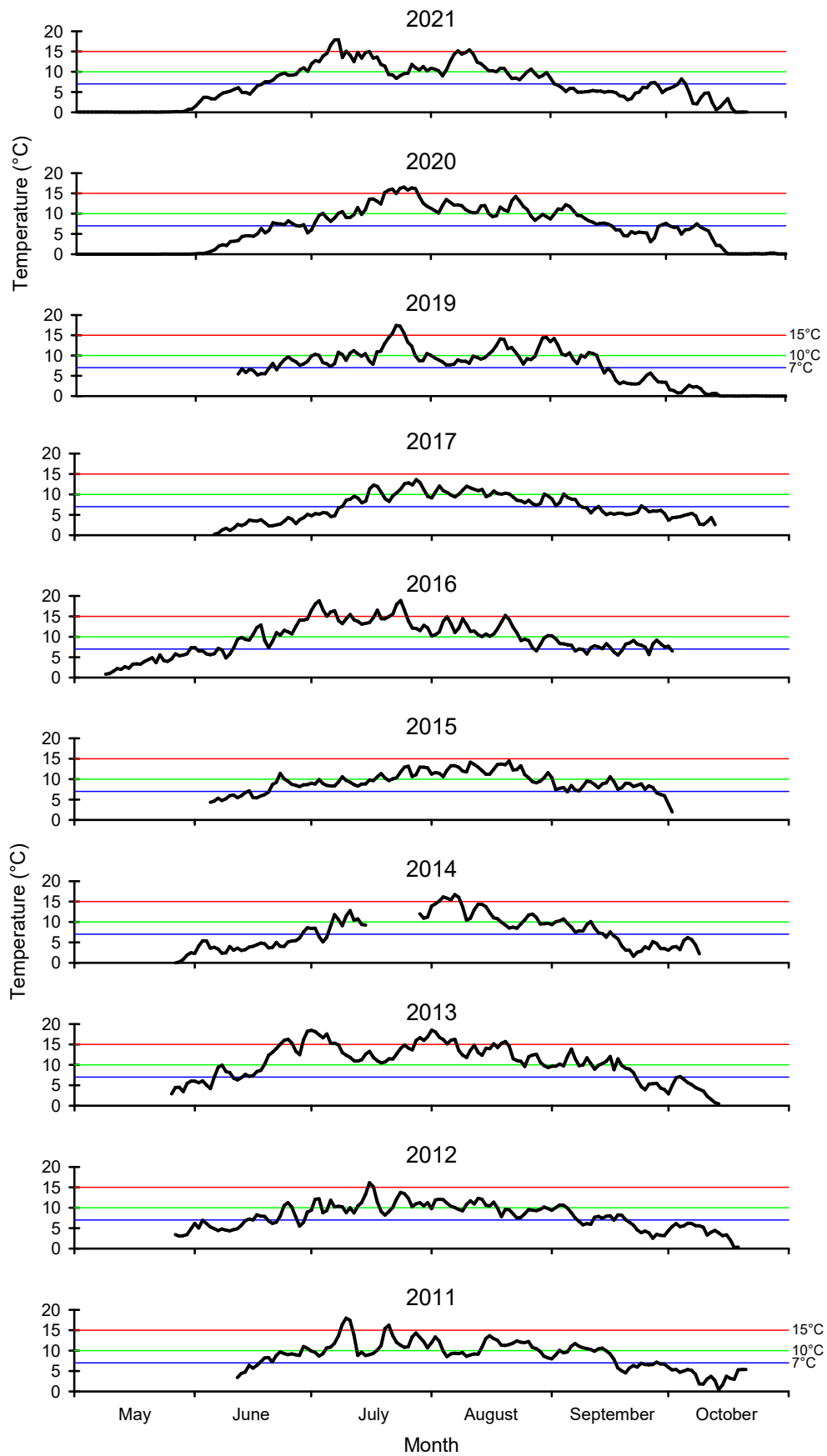


Figure 42. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the River Komagelv. Source; County Governor in Troms and Finnmark (Norway).

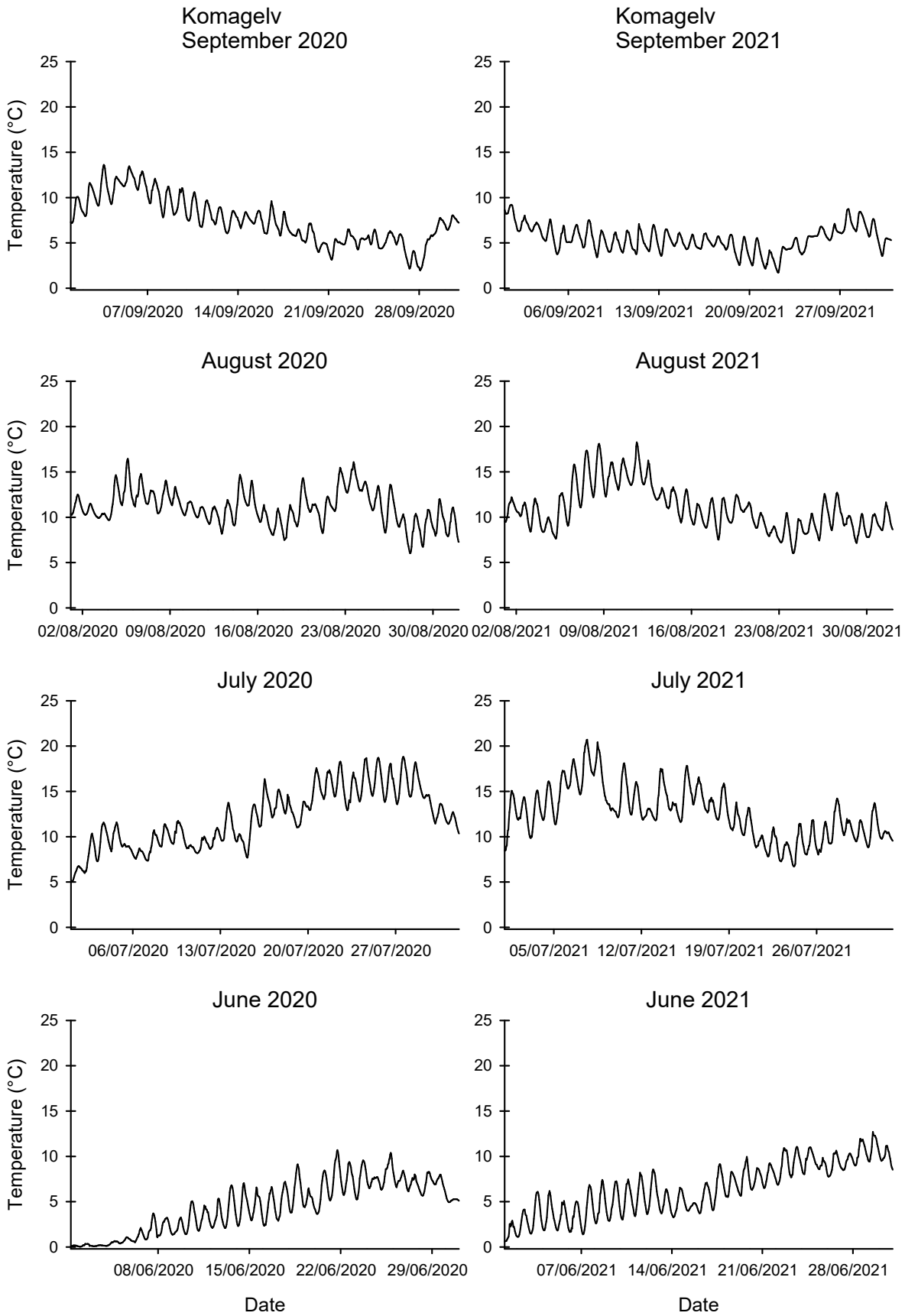


Figure 43. Hourly changes in the water temperatures in the River Komagelv for the summer months in the years 2020-2021. Source; County Governor in Troms and Finnmark (Norway).

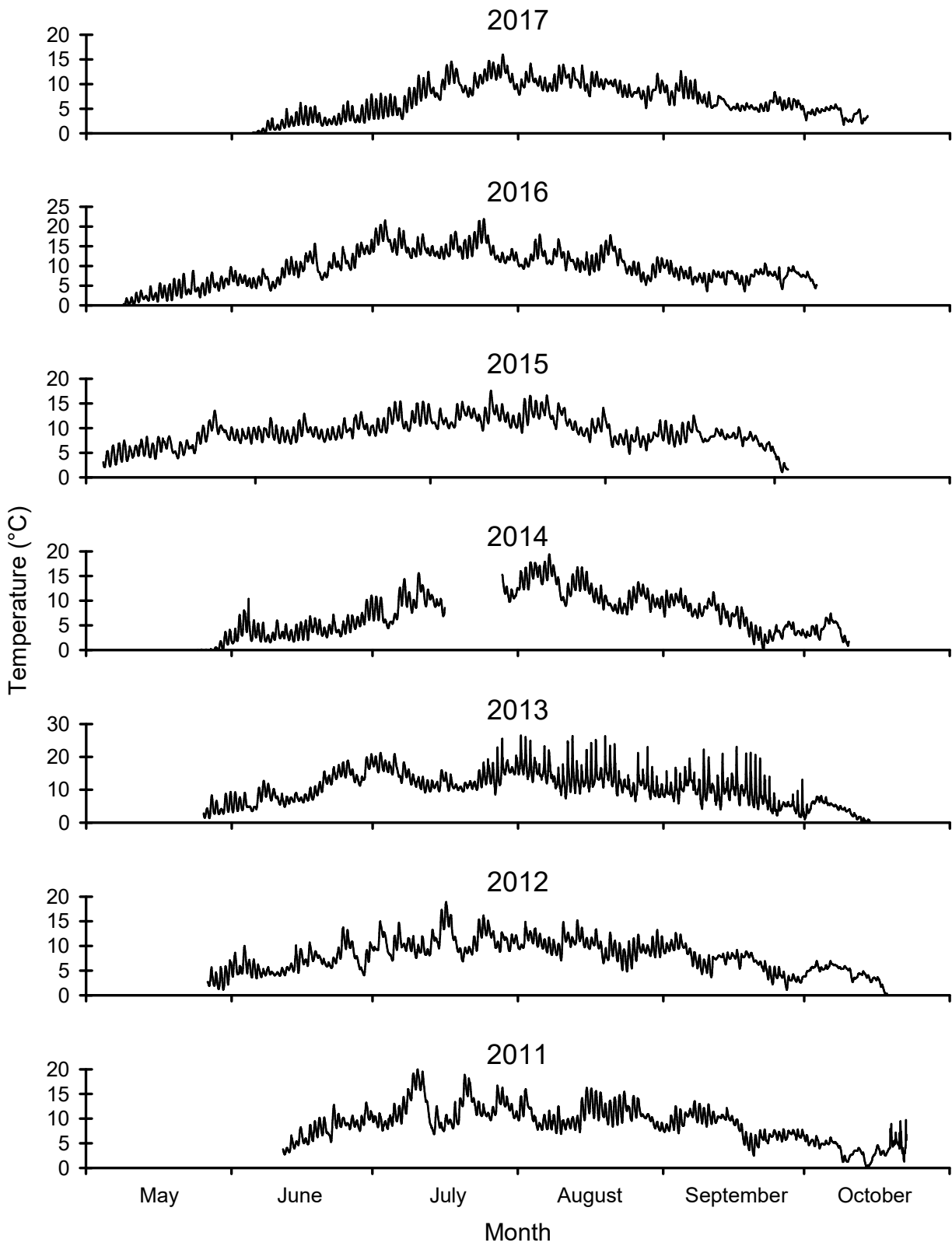


Figure 44. Long-term hourly changes in the water temperatures in the River Komagelv for the summer months in the years 2011-2017. Source; County Governor in Troms and Finnmark (Norway).

3.11 Water temperatures in the River Sandfjordelv

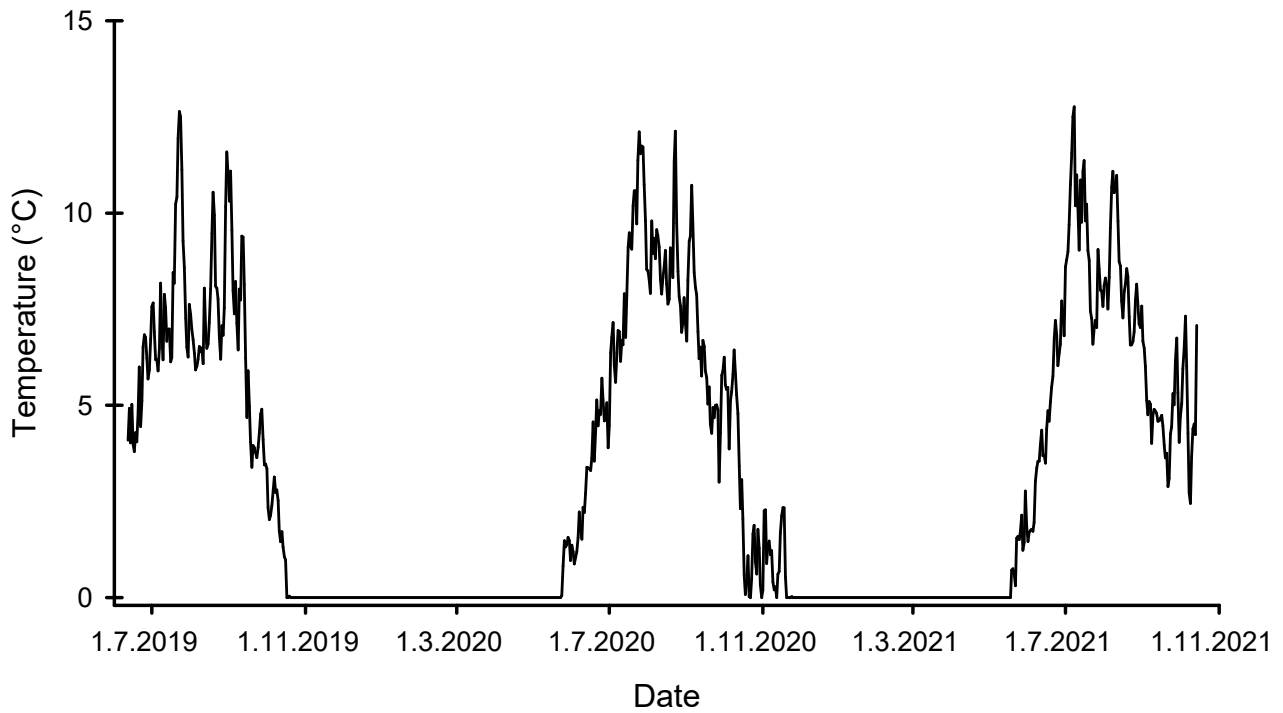


Figure 45. Daily mean water temperatures throughout three years in the River Sandfjordelv in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

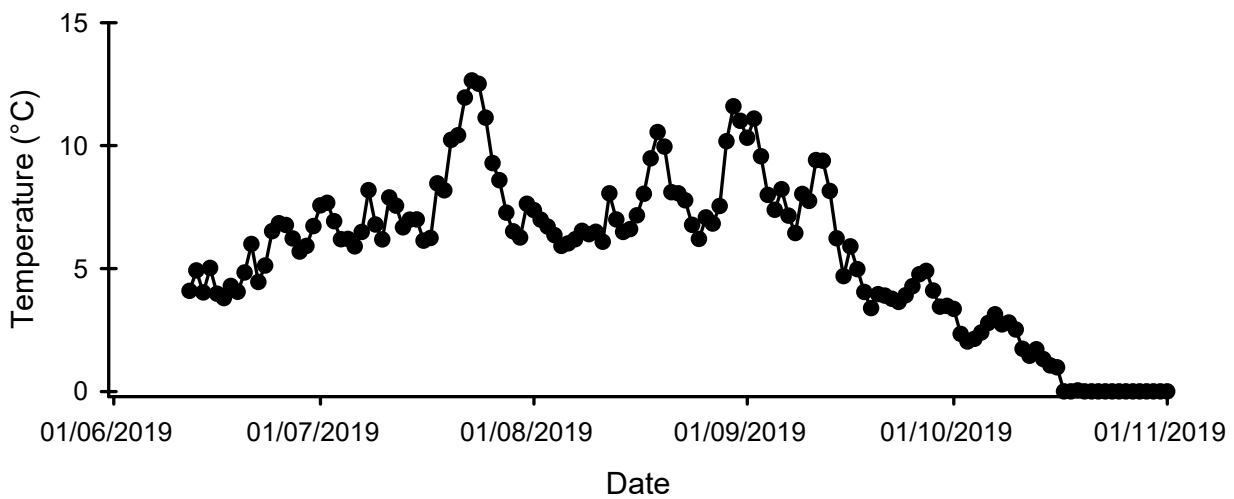
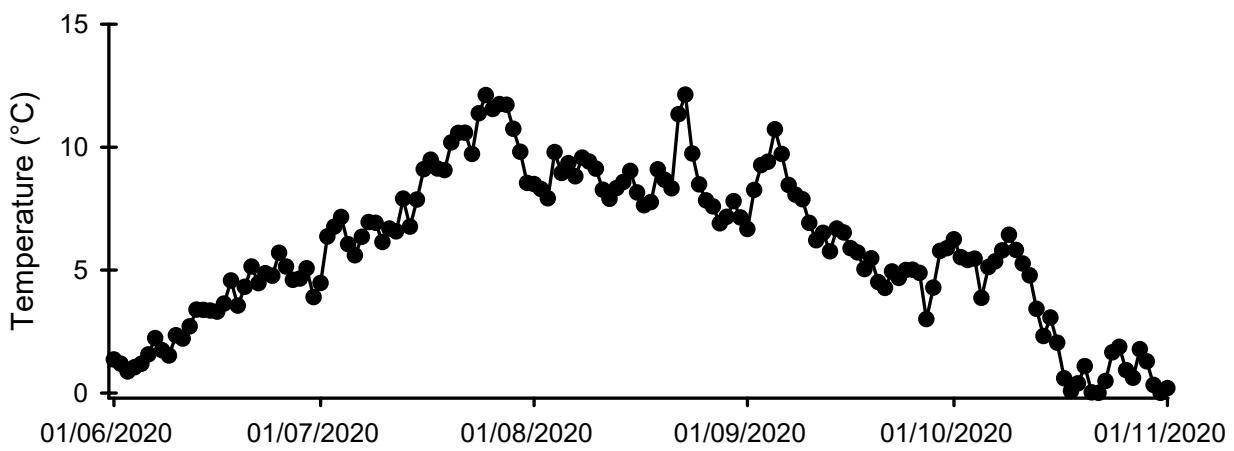
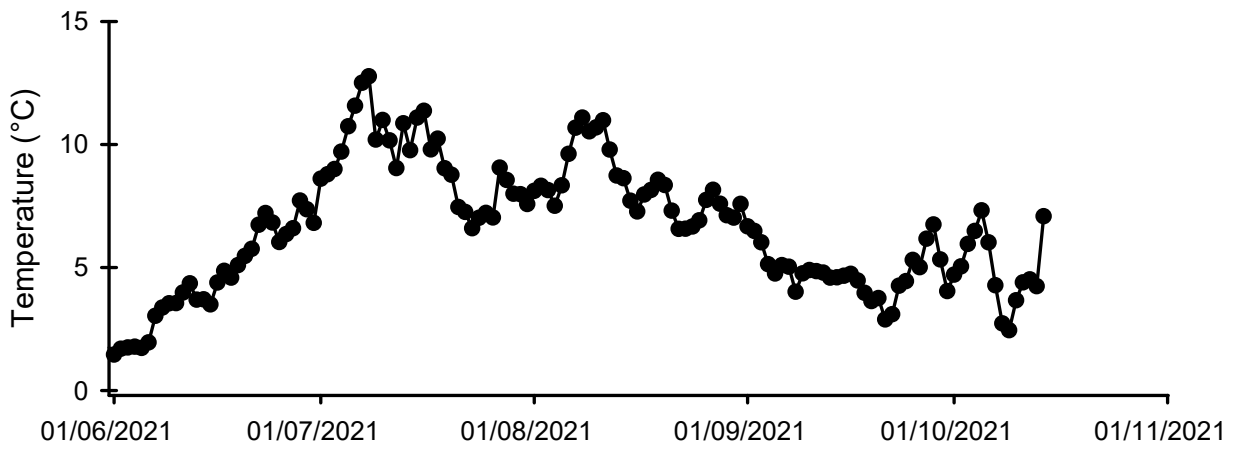


Figure 46. Fluctuations in the daily mean water temperatures from June to October in the River Sandfjordelvi in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

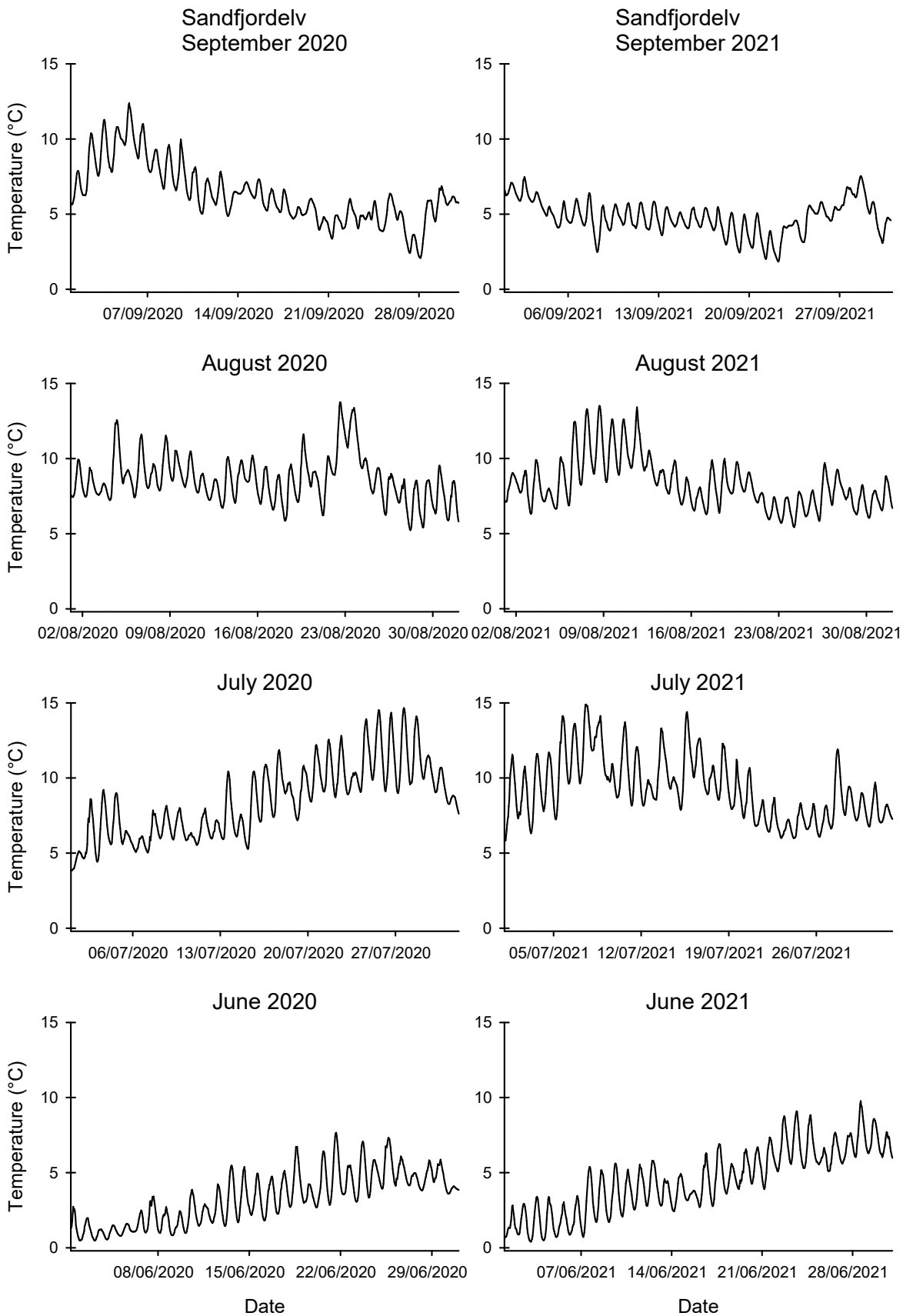


Figure 47. Hourly changes in the water temperatures in the River Sandfjordelv for the summer months in the years 2020-2021. Source; County Governor in Troms and Finnmark (Norway).

3.12 Water temperatures in the River Syltefjordelv

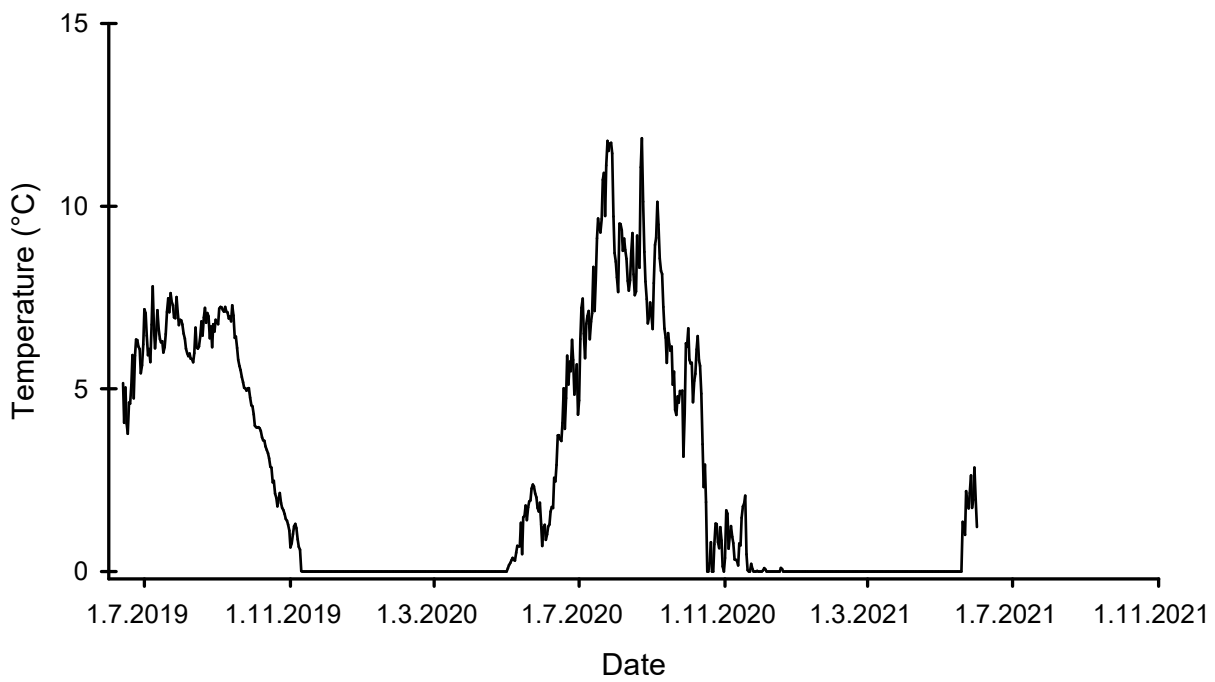


Figure 48. Daily mean water temperatures throughout two years in the River Syltefjordelv in the years 2019-2020. Source; County Governor in Troms and Finnmark (Norway).

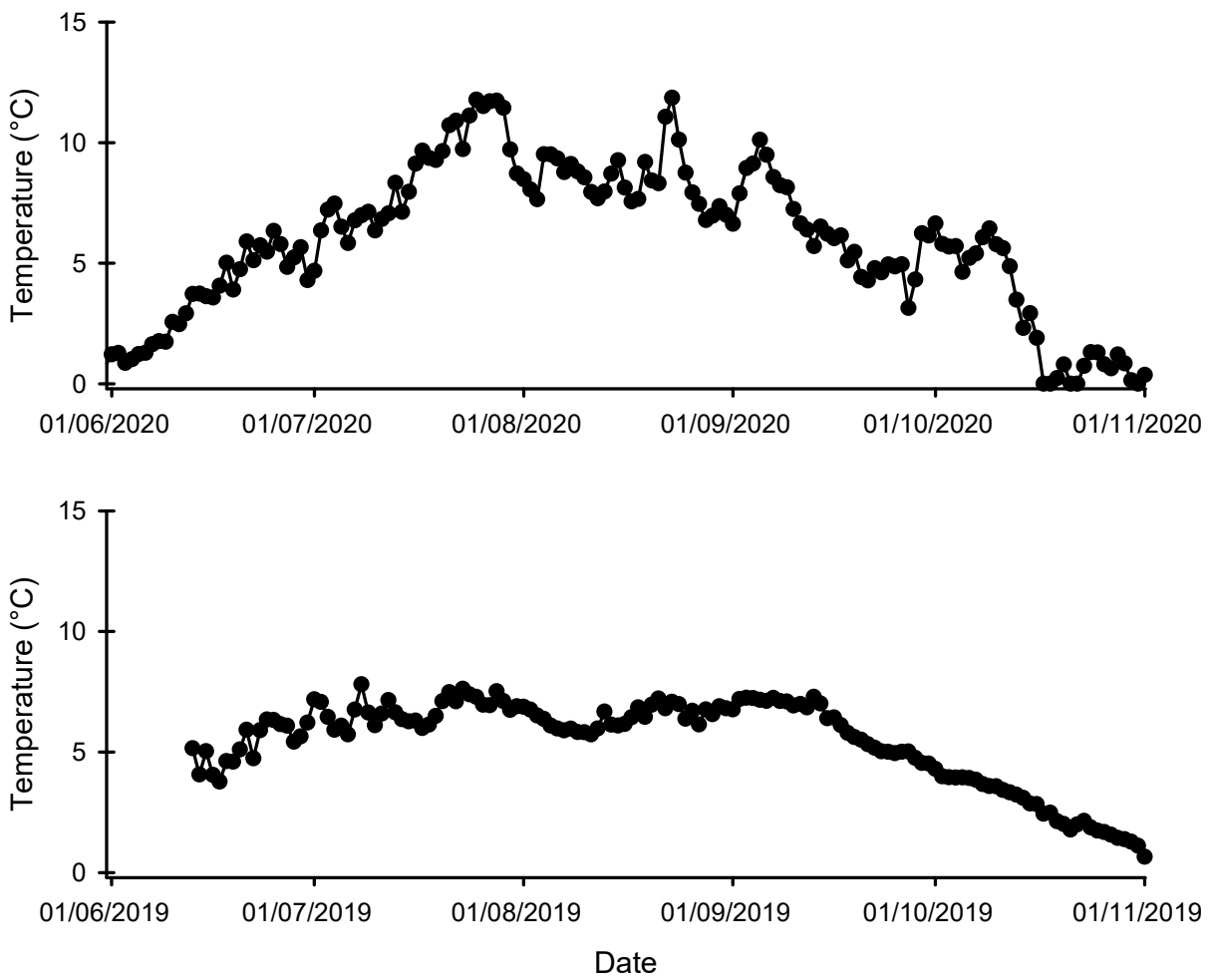


Figure 49. Fluctuations in the daily mean water temperatures from June to October in the River Syltefjordelva in the years 2019-2020. Source; County Governor in Troms and Finnmark (Norway).

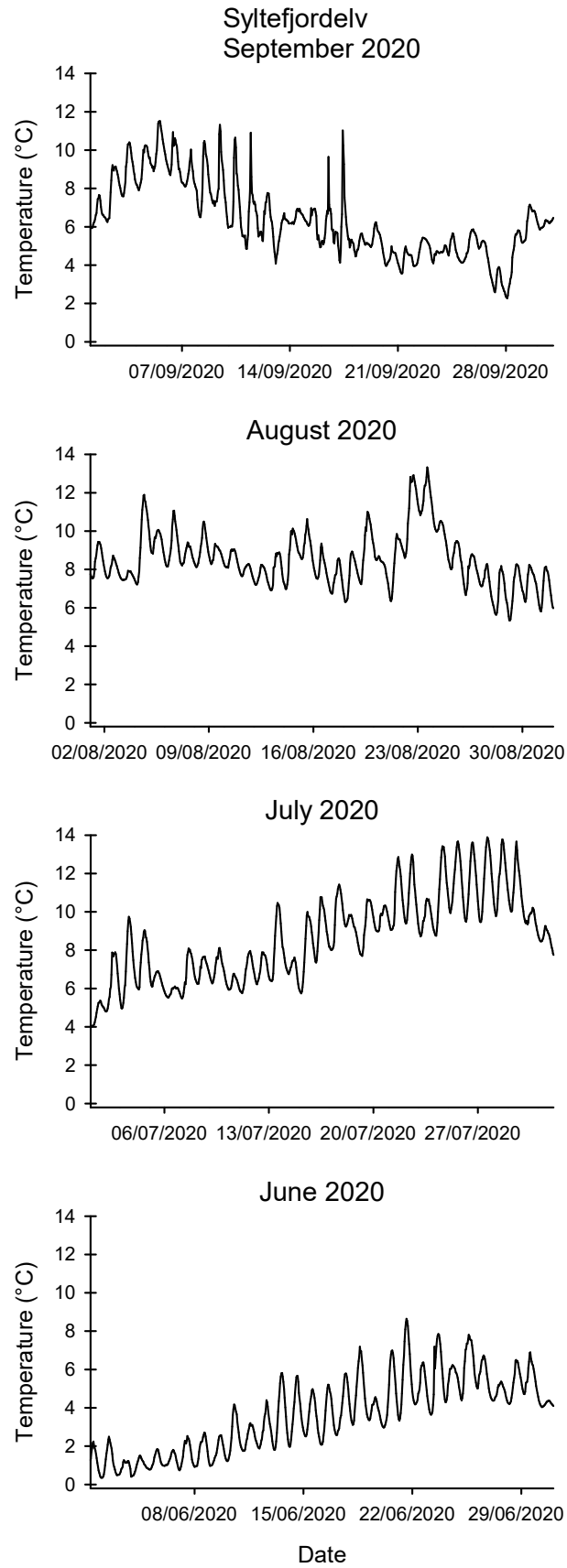


Figure 50. Hourly changes in the water temperatures in the River Syltefjordelv for the summer months in the year 2020. Source; County Governor in Troms and Finnmark (Norway)

3.13 Water temperatures in the River Kongsfjordelva

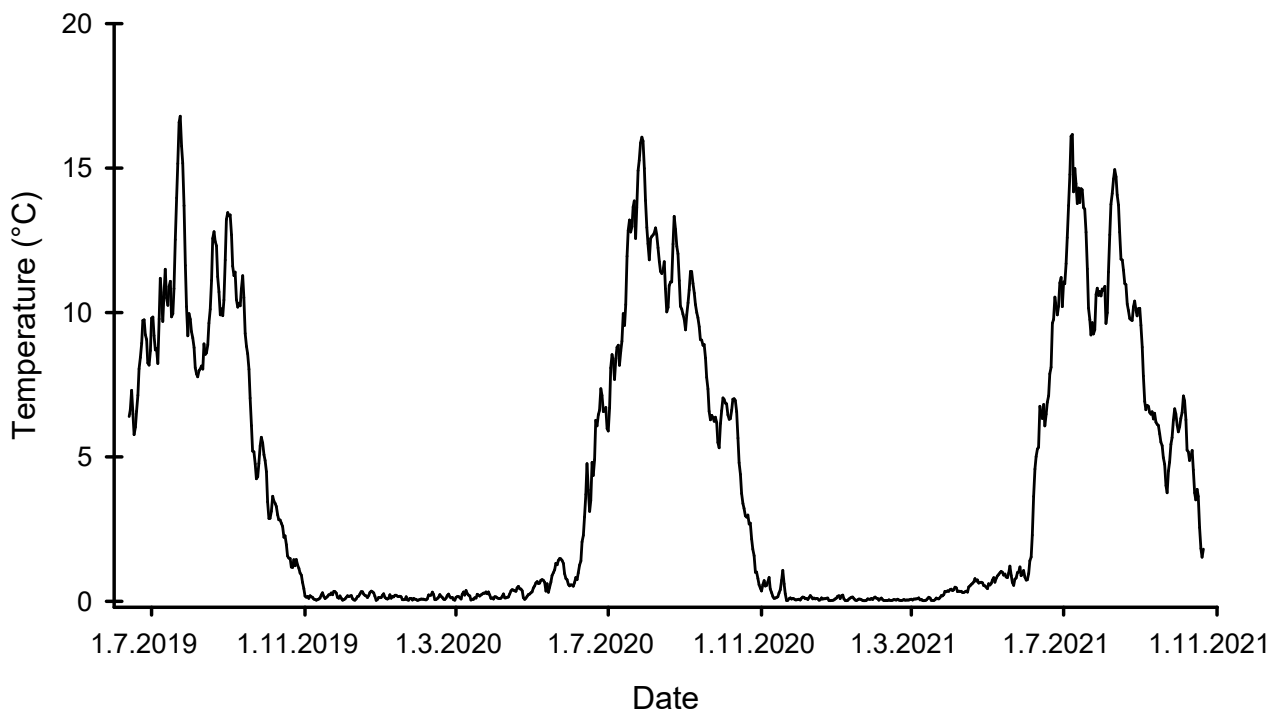


Figure 51. Daily mean water temperatures throughout three years in the River Kongsfjordelva in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

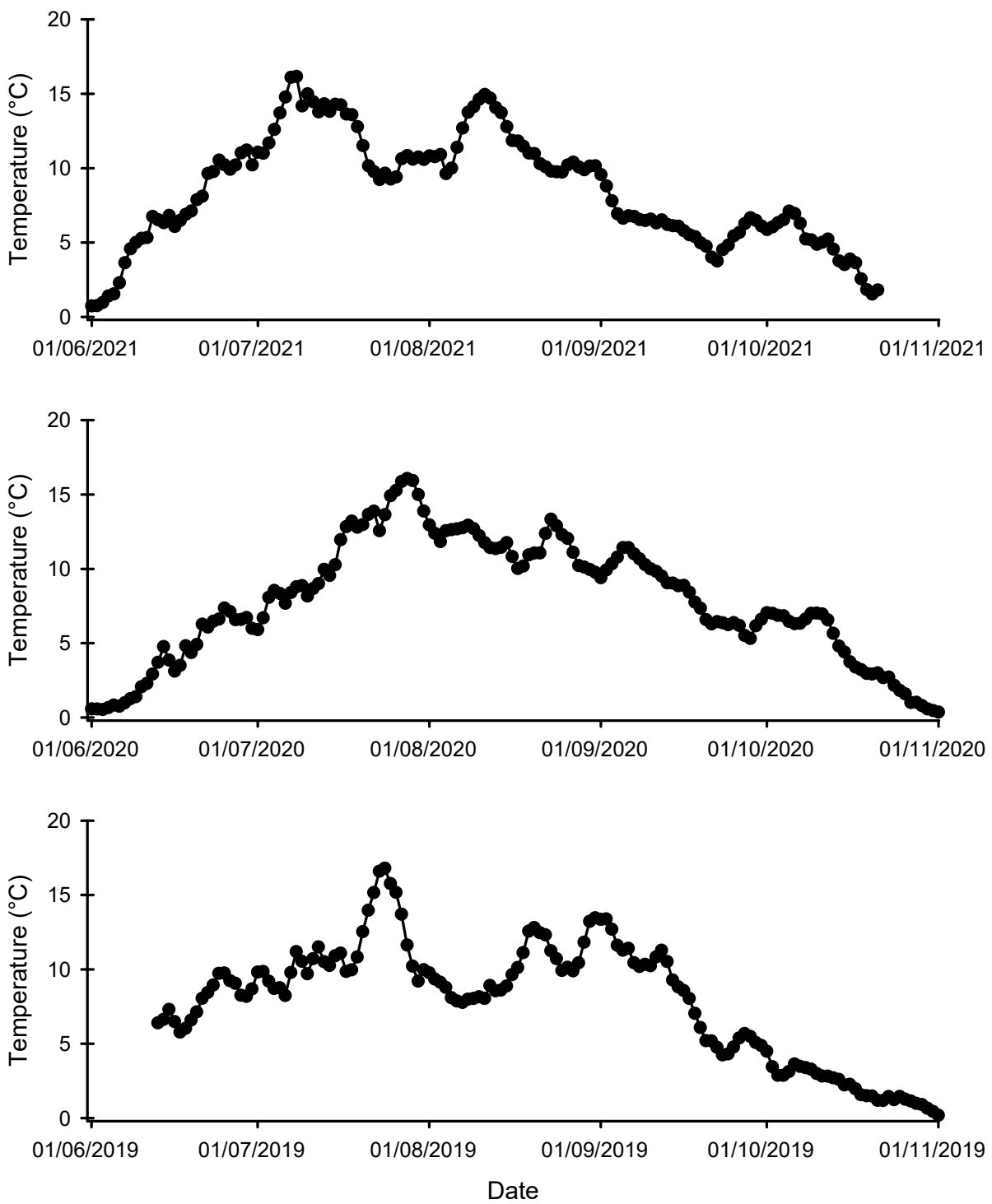


Figure 52. Fluctuations in the daily mean water temperatures from June to October in the River Kongsfjordelvi in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

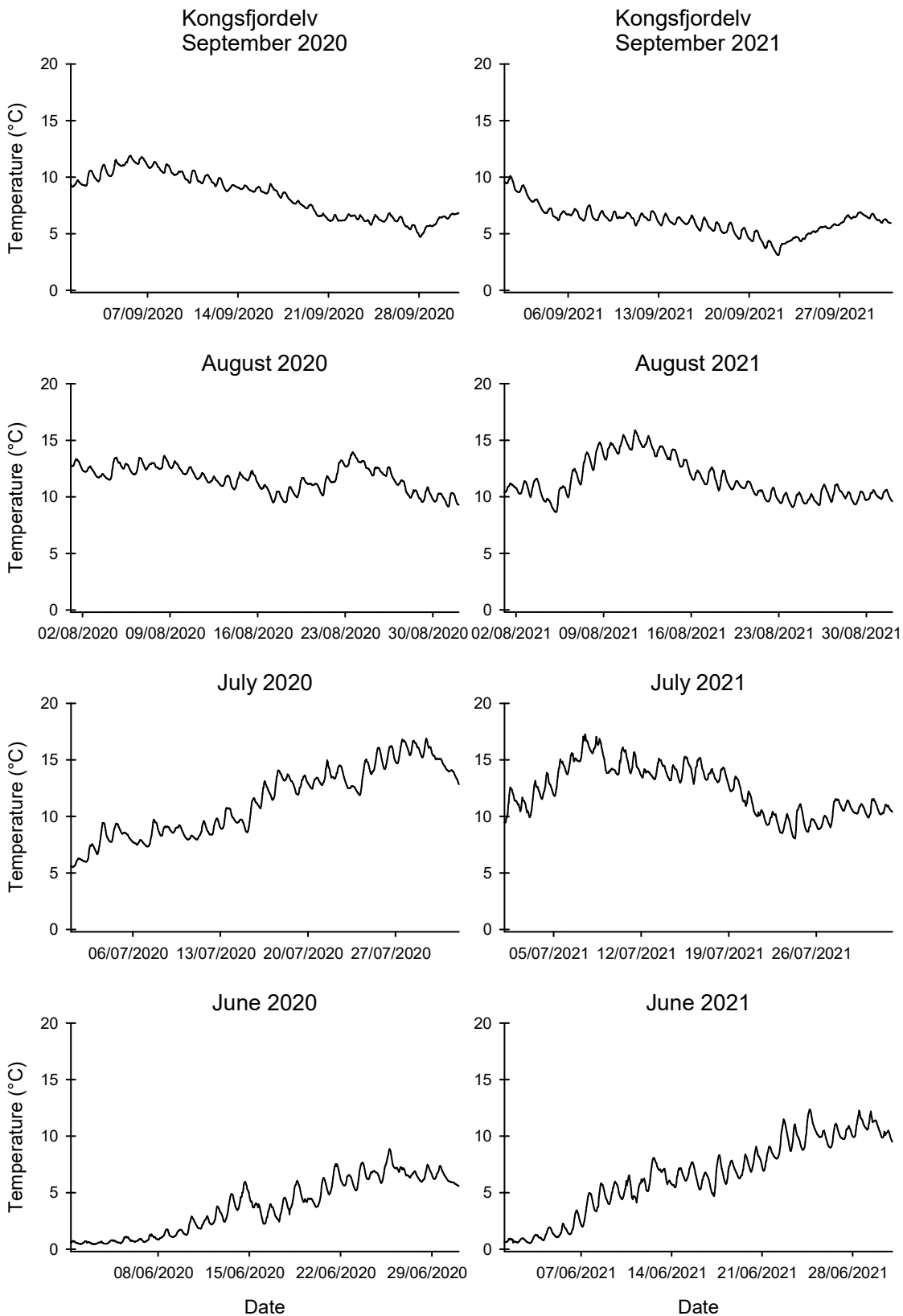


Figure 53. Hourly changes in the water temperatures in the River Kongsfjordelv for the summer months in the years 2020-2021. Source; County Governor in Troms and Finnmark (Norway).

3.14 Water temperatures in the River Stordalselv

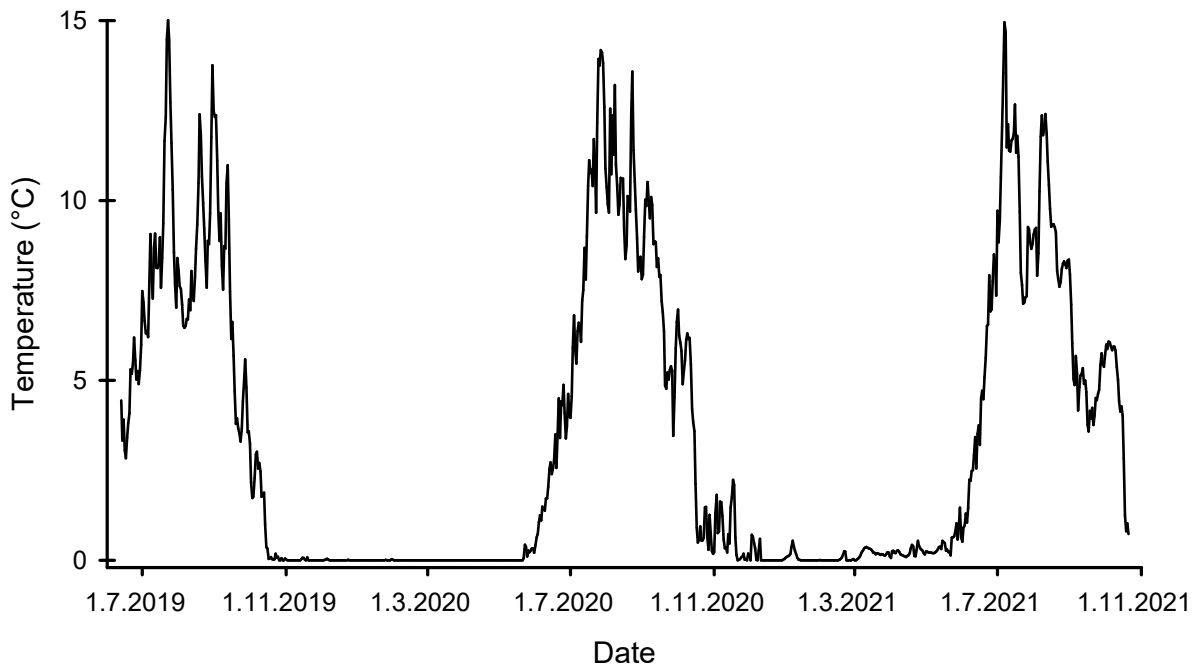


Figure 54. Daily mean water temperatures throughout three years in the River Stordalselv in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

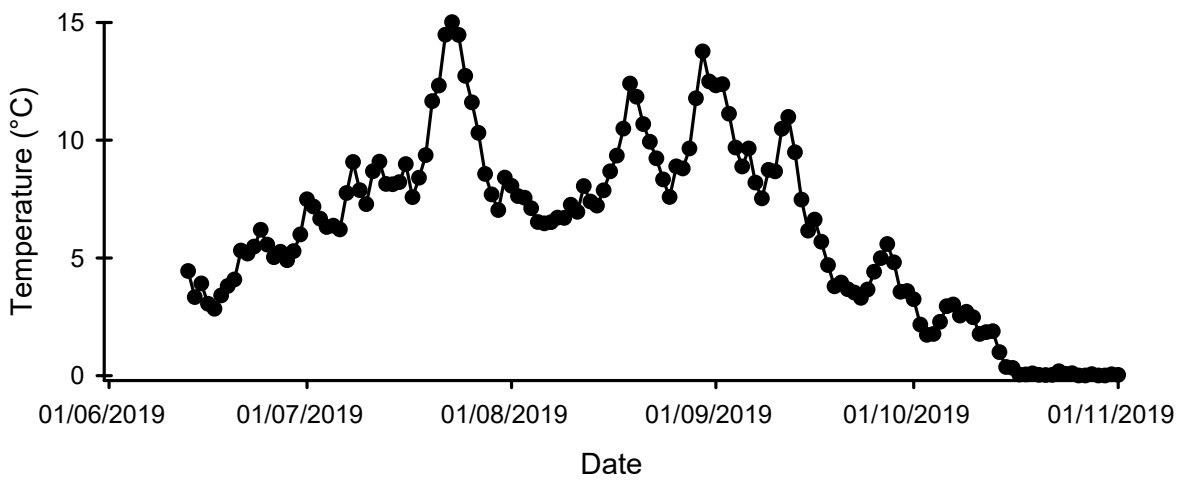
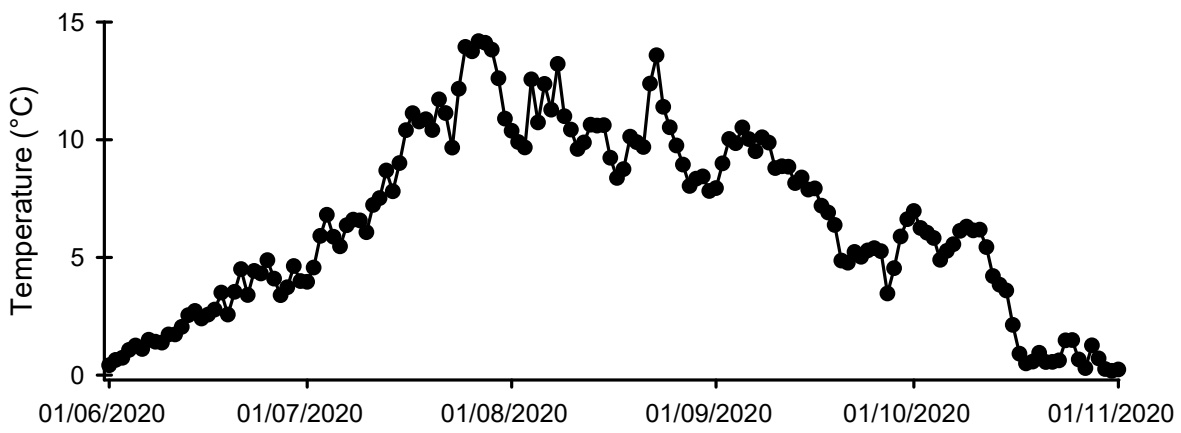
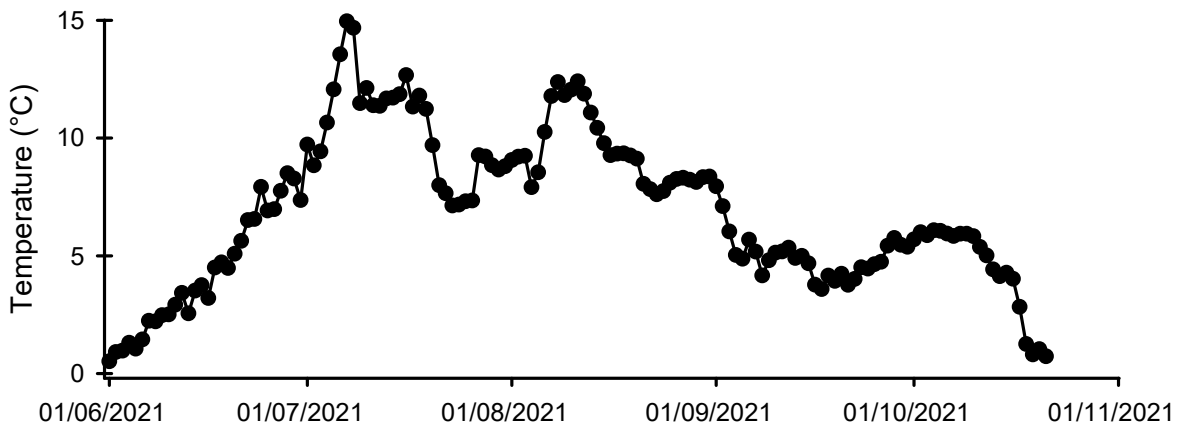


Figure 55. Fluctuations in the daily mean water temperatures from June to October in the River Stordalselv in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway).

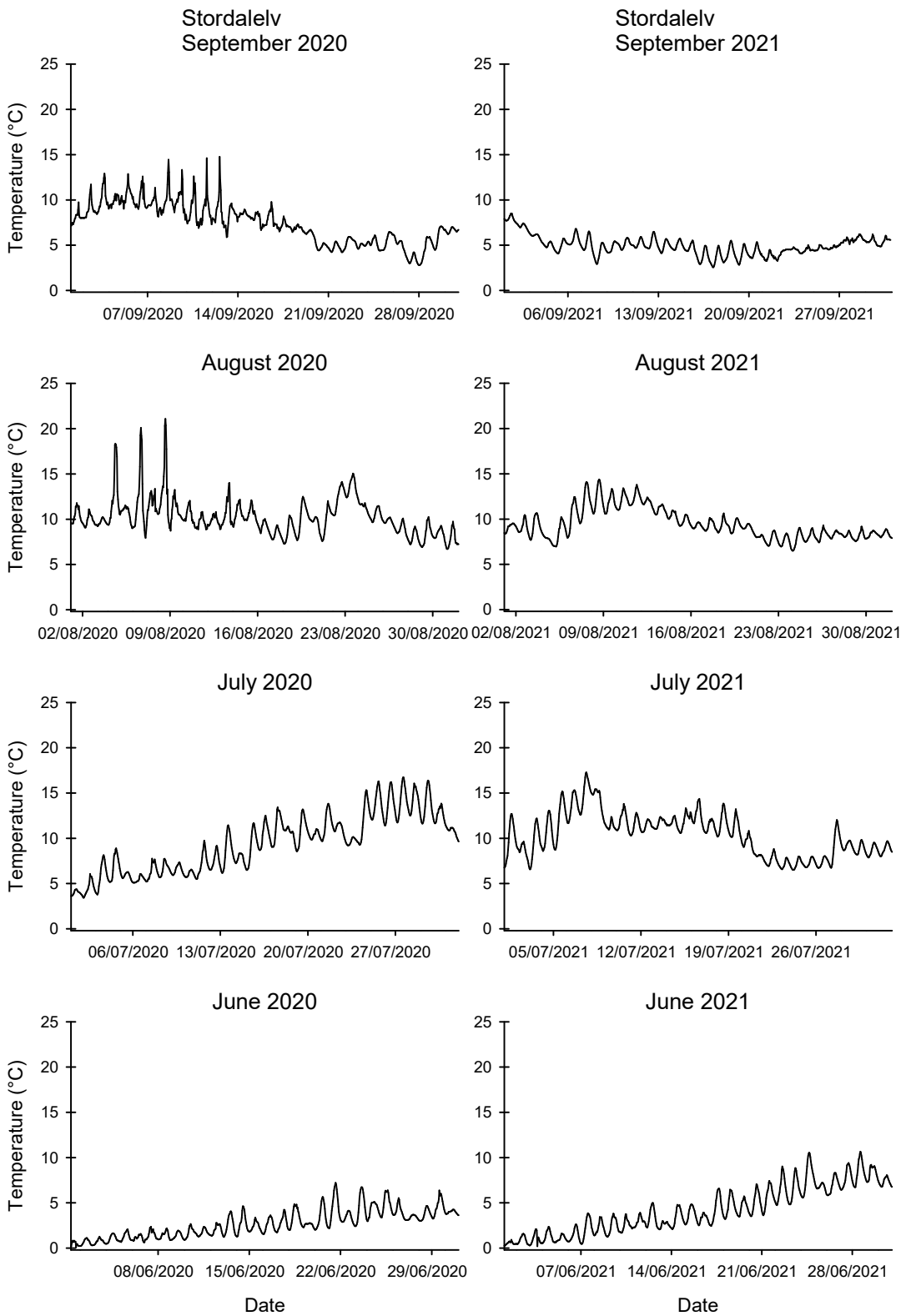


Figure 56. Hourly changes in the water temperatures in the River Stordalselv for the summer months in the years 2020-2021. Source; County Governor in Troms and Finnmark (Norway).

4. Hourly and mean daily water temperatures in the years 2006-2021 in Atlantic salmon tributaries in the River Tana watershed

4.1 Water temperatures in the River Leavvajohka

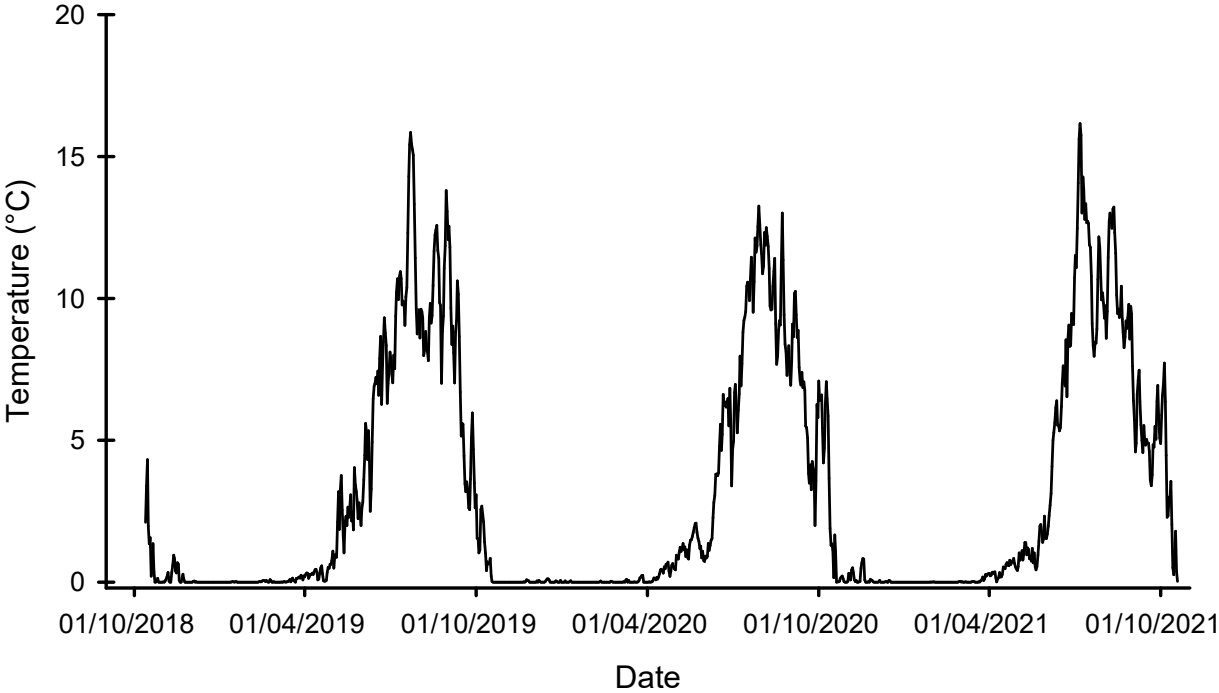


Figure 57. Daily mean water temperatures throughout three years in the River Leavvajohka in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

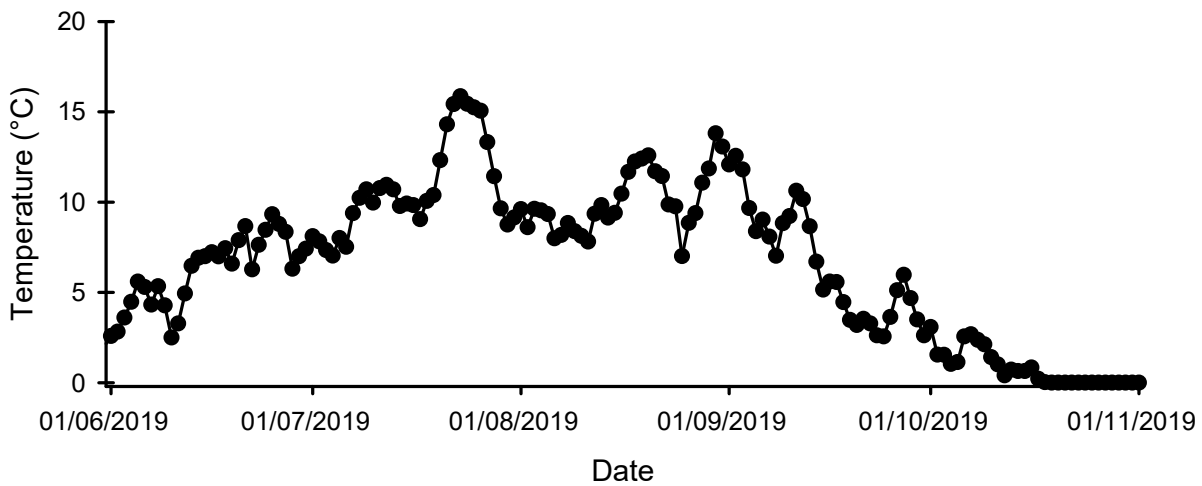
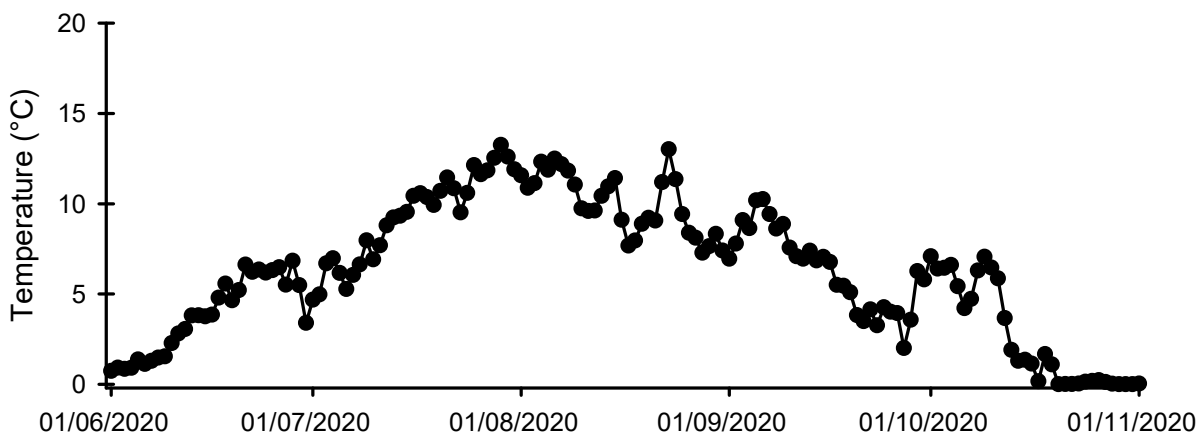
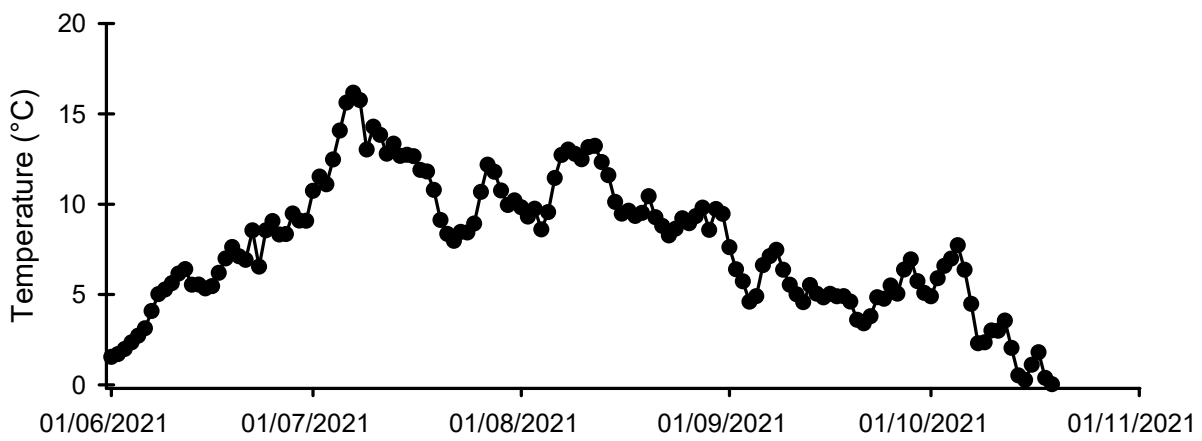


Figure 58. Fluctuations in the daily mean water temperatures from June to October in the River Leavvajohka in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

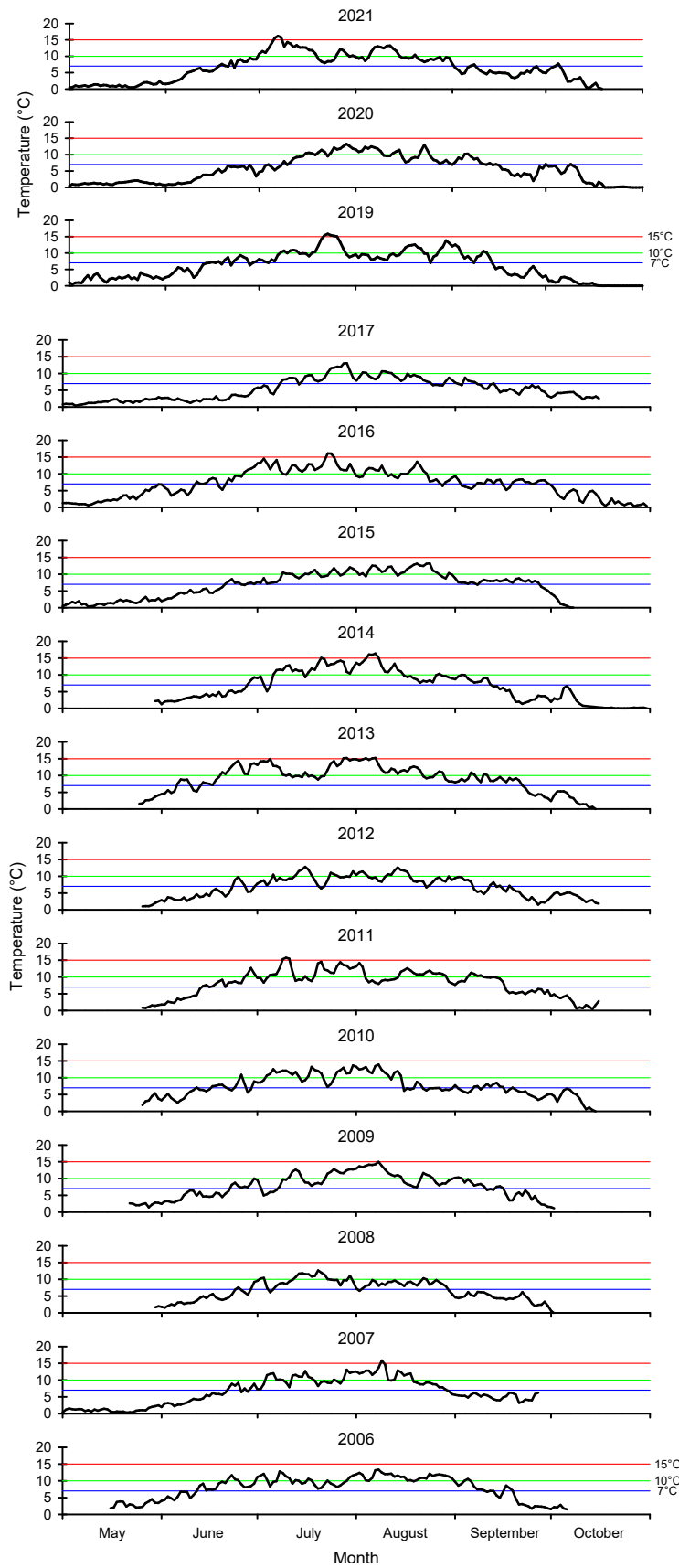


Figure 59. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the River Leavvajohka in the years 2006-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

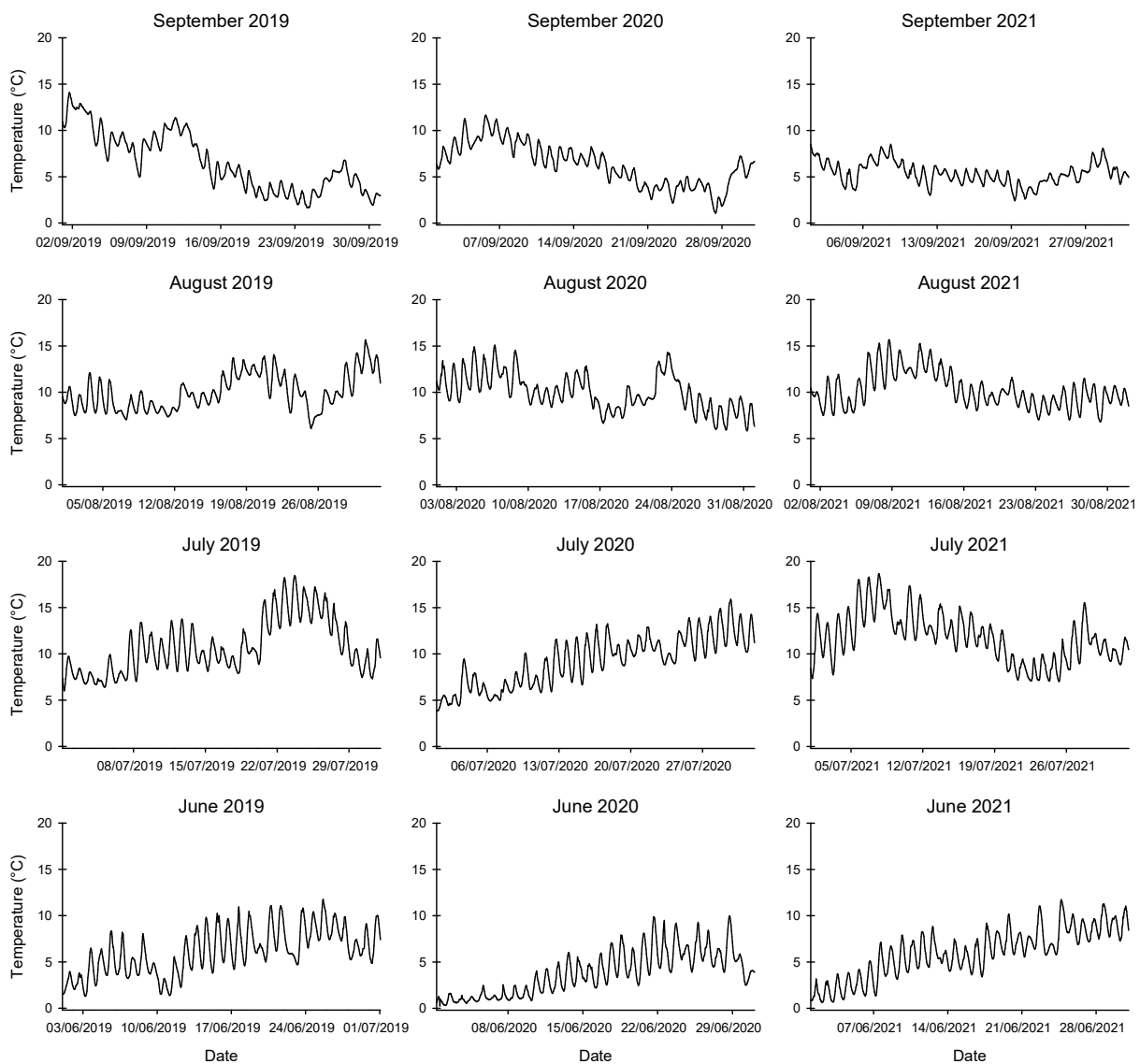


Figure 60. Hourly changes in the water temperatures in the River Leavvajohka for the summer months in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

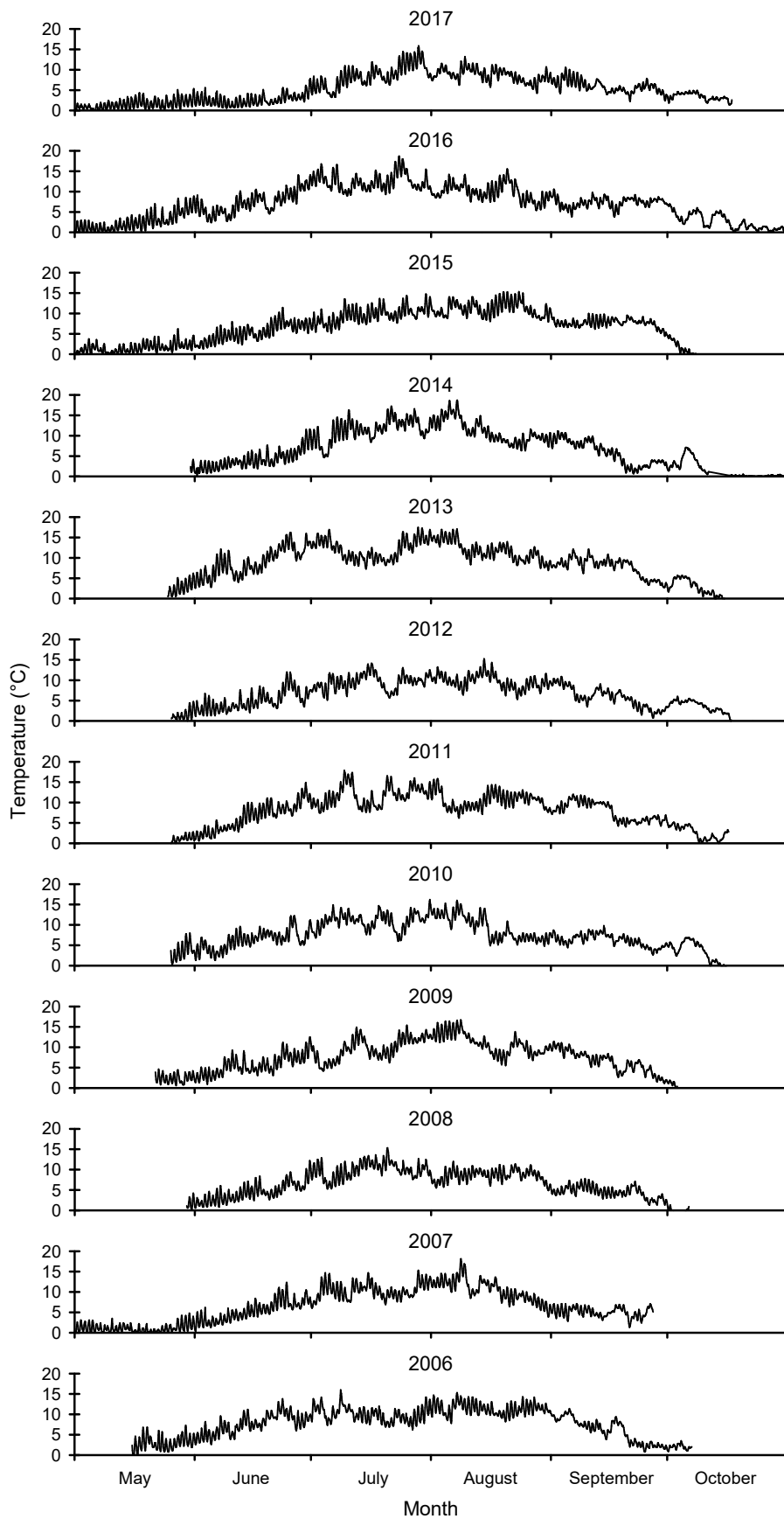


Figure 61. Long-term hourly changes in the water temperatures in the River Leavvajohka for the summer months in the years 2006-2017. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

4.2 Water temperatures in the River Kuoppilasjoki

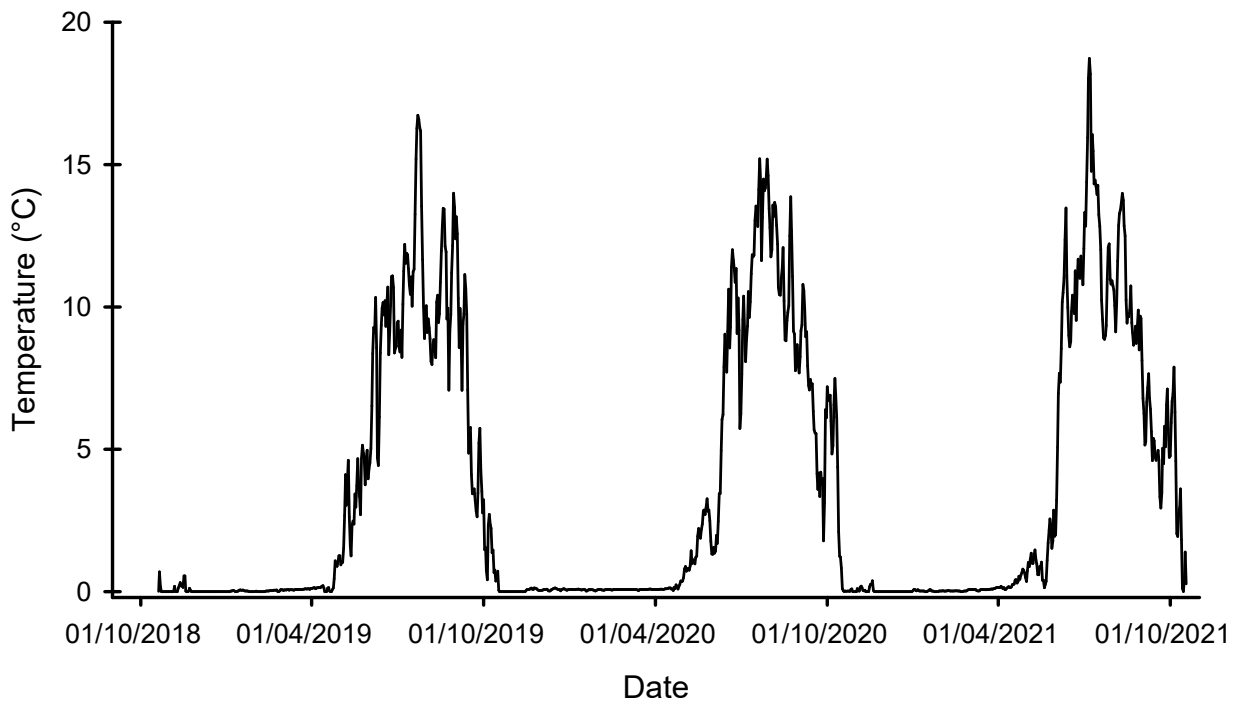


Figure 62. Daily mean water temperatures throughout three years in the River Kuoppilasjoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

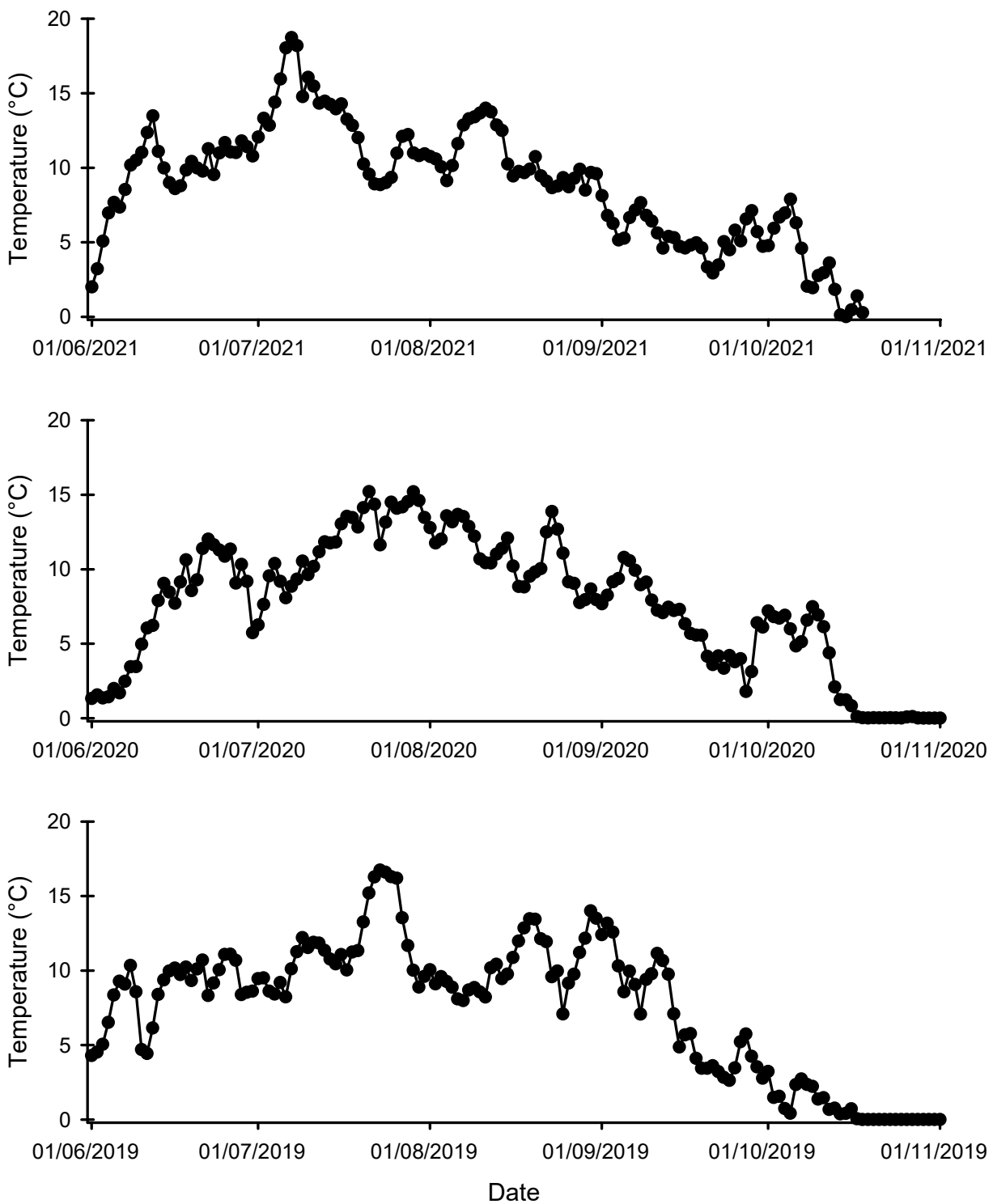


Figure 63. Fluctuations in the daily mean water temperatures from June to October in the River Kuoppilasjoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

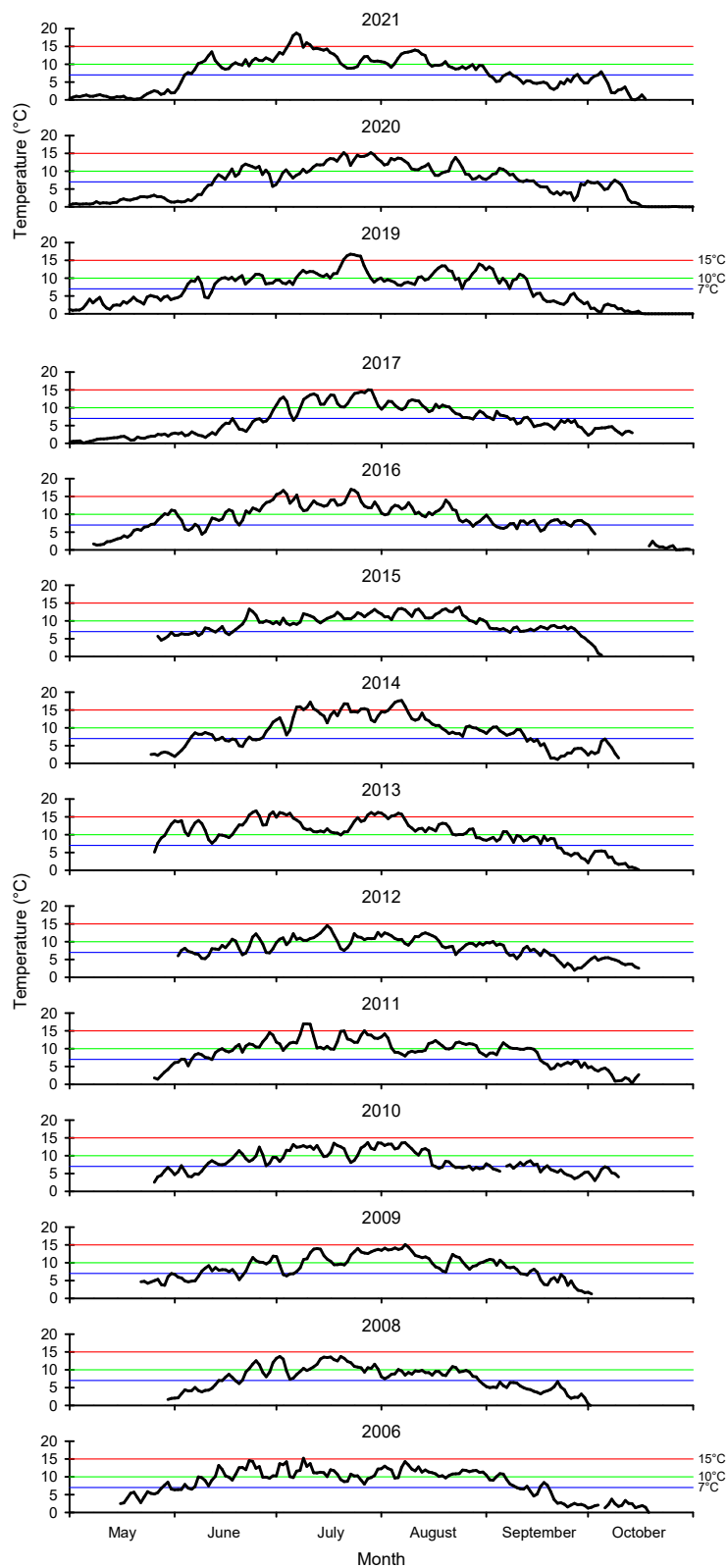


Figure 64. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the River Kuoppilasjoki. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

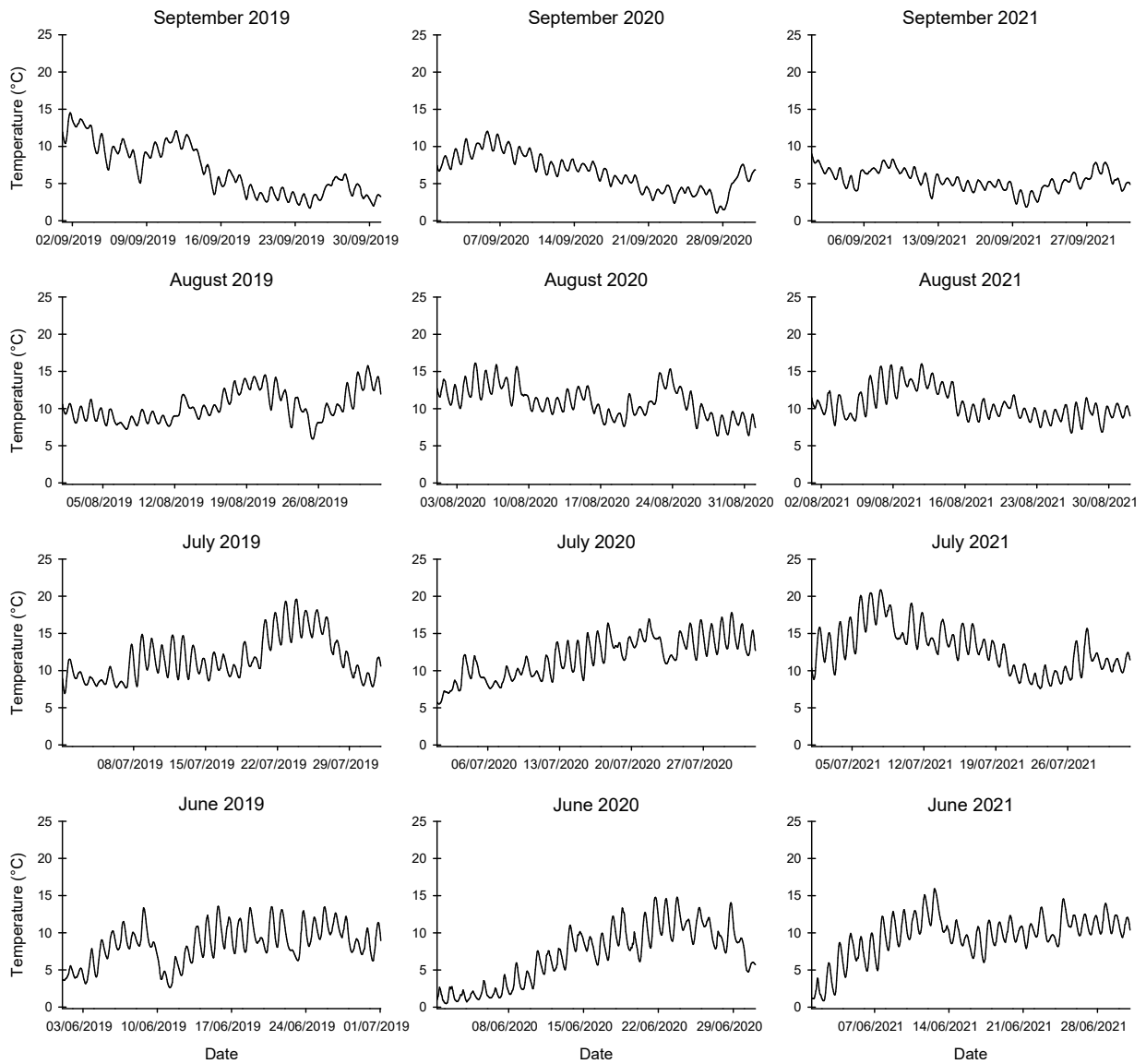


Figure 65. Hourly changes in the water temperatures in the River Kuoppilasjoki for the summer months in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

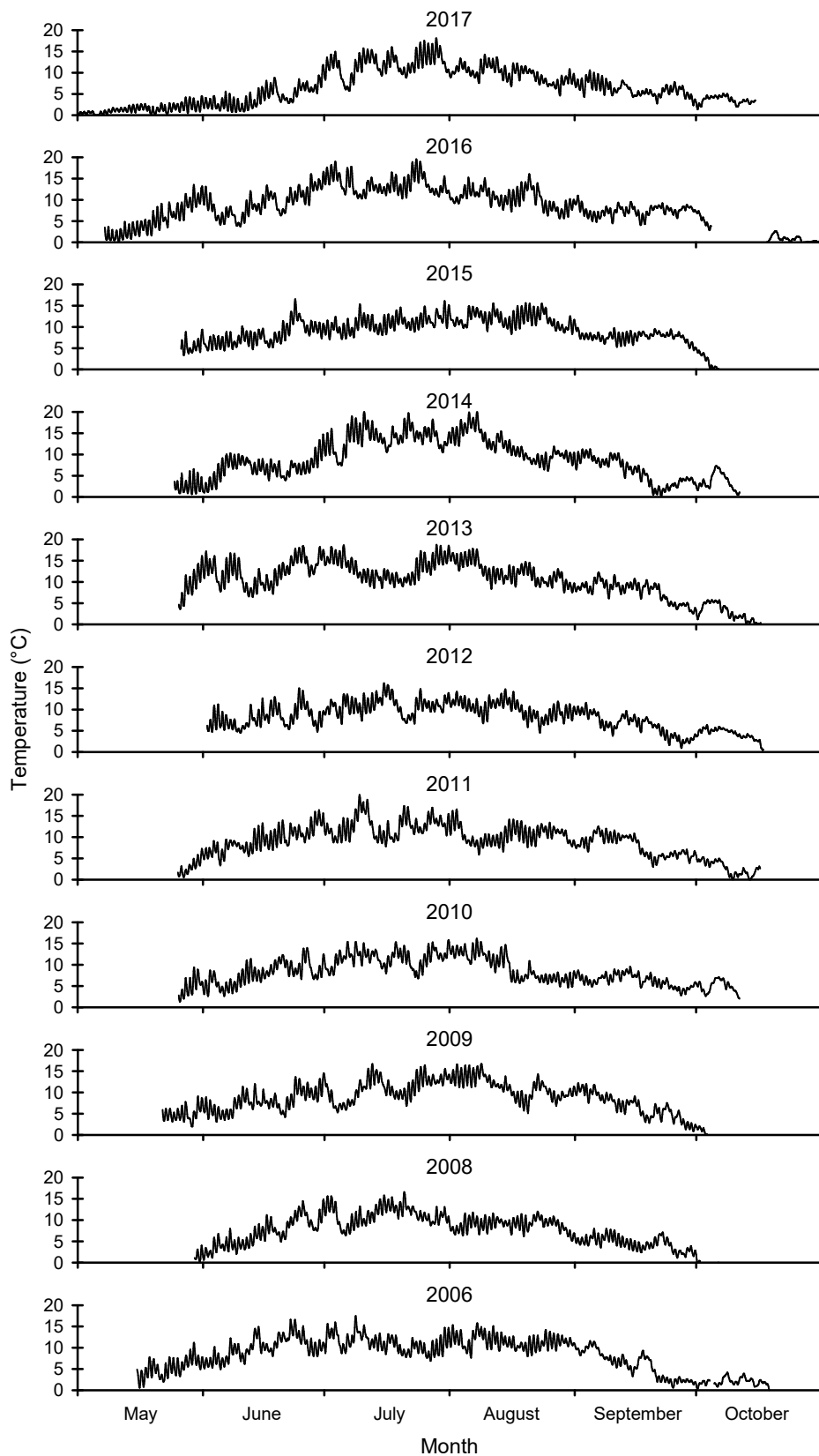


Figure 66. Long-term hourly changes in the water temperatures in the River Kuoppilasjoki for the summer months in the years 2006-2017. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

4.3 Water temperatures in the River Vetsikkojoki

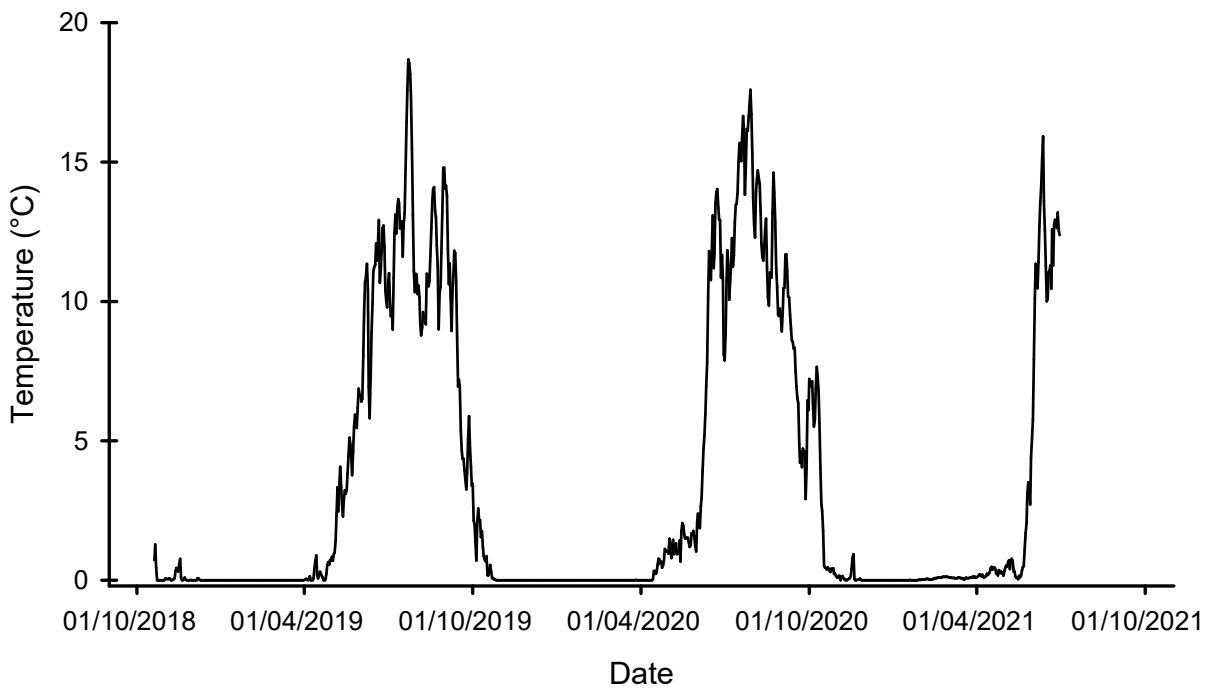


Figure 67. Daily mean water temperatures throughout three years in the River Vetsikkojoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

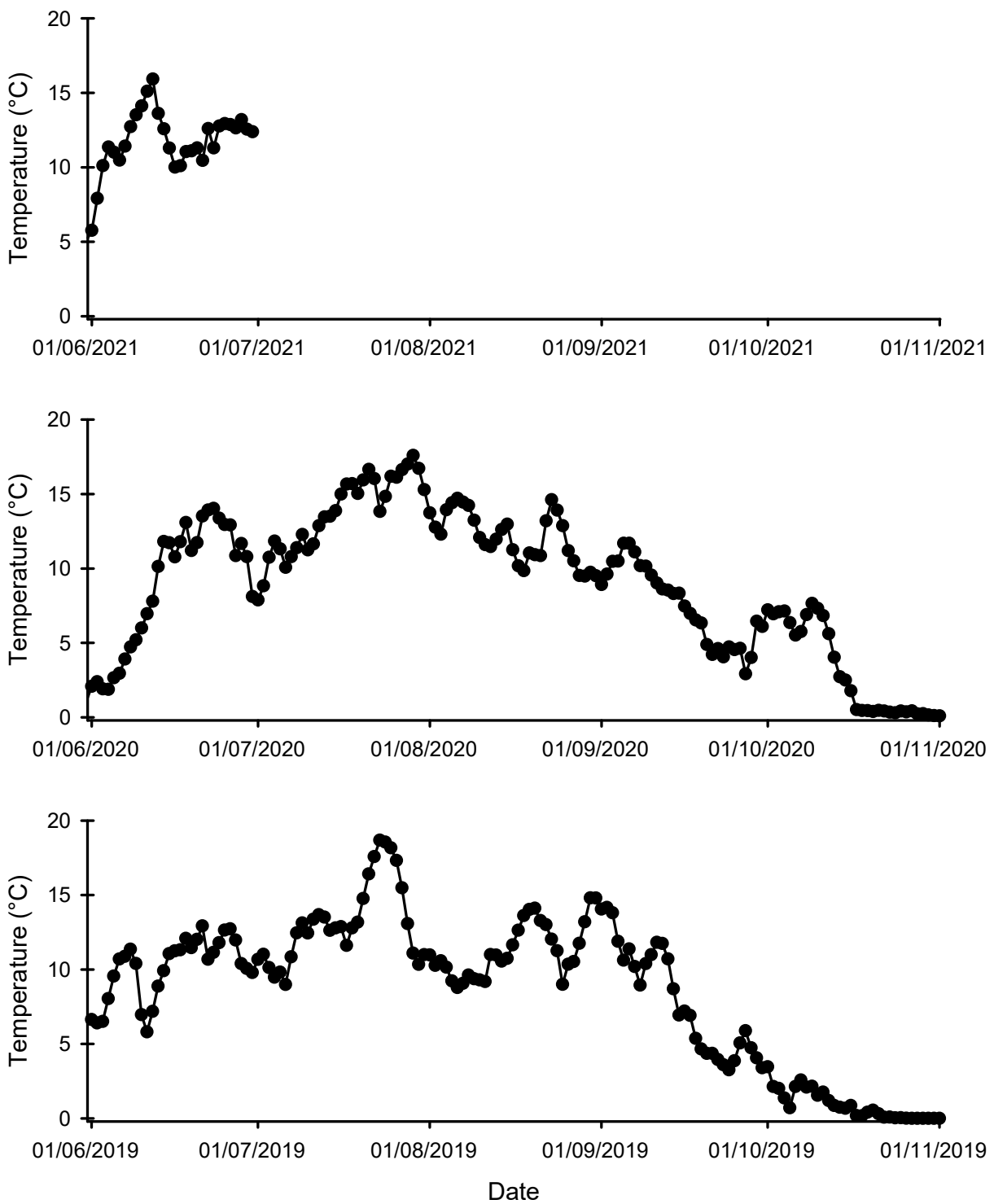


Figure 68. Fluctuations in the daily mean water temperatures from June to October in the River Vetsikkojoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

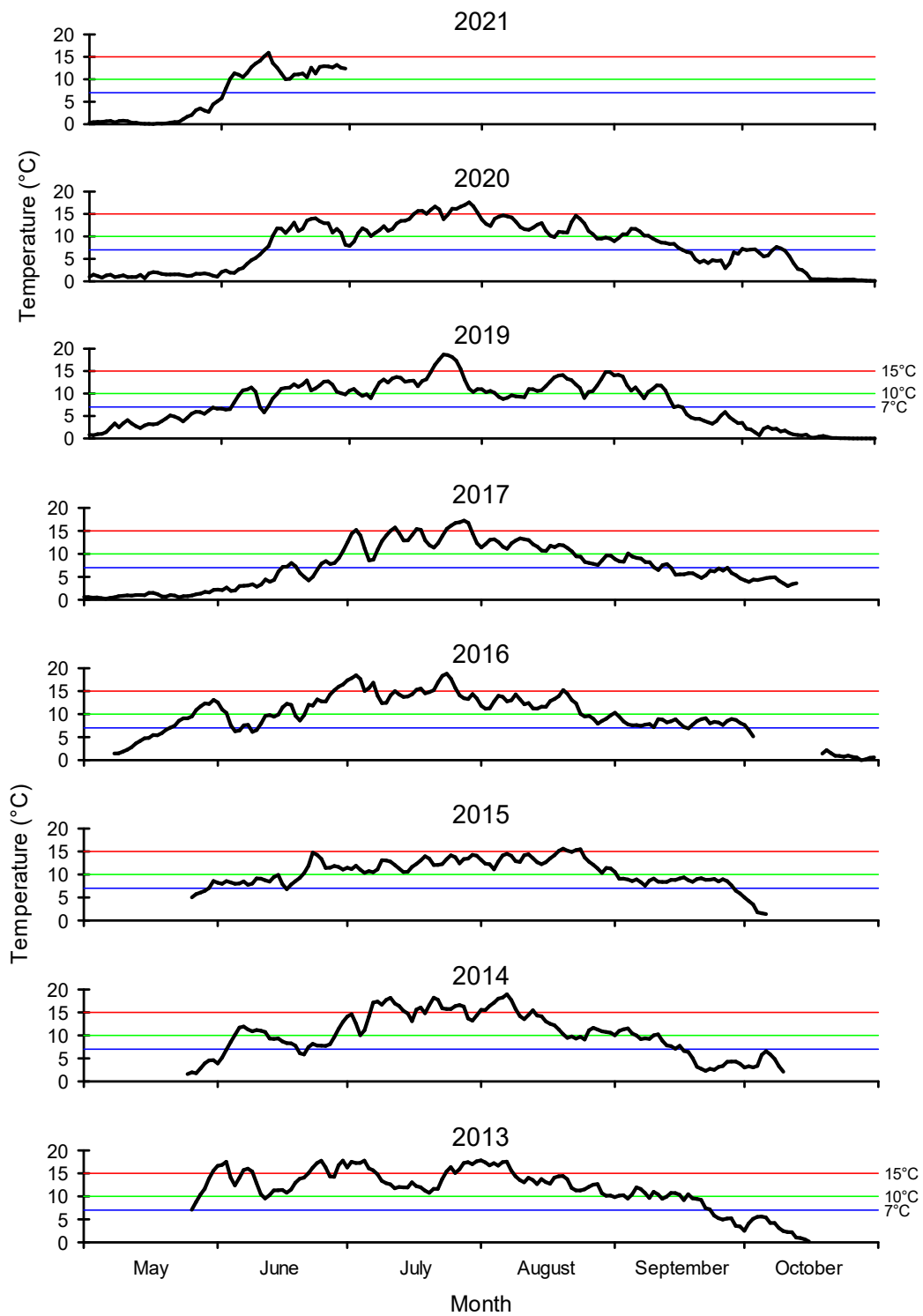
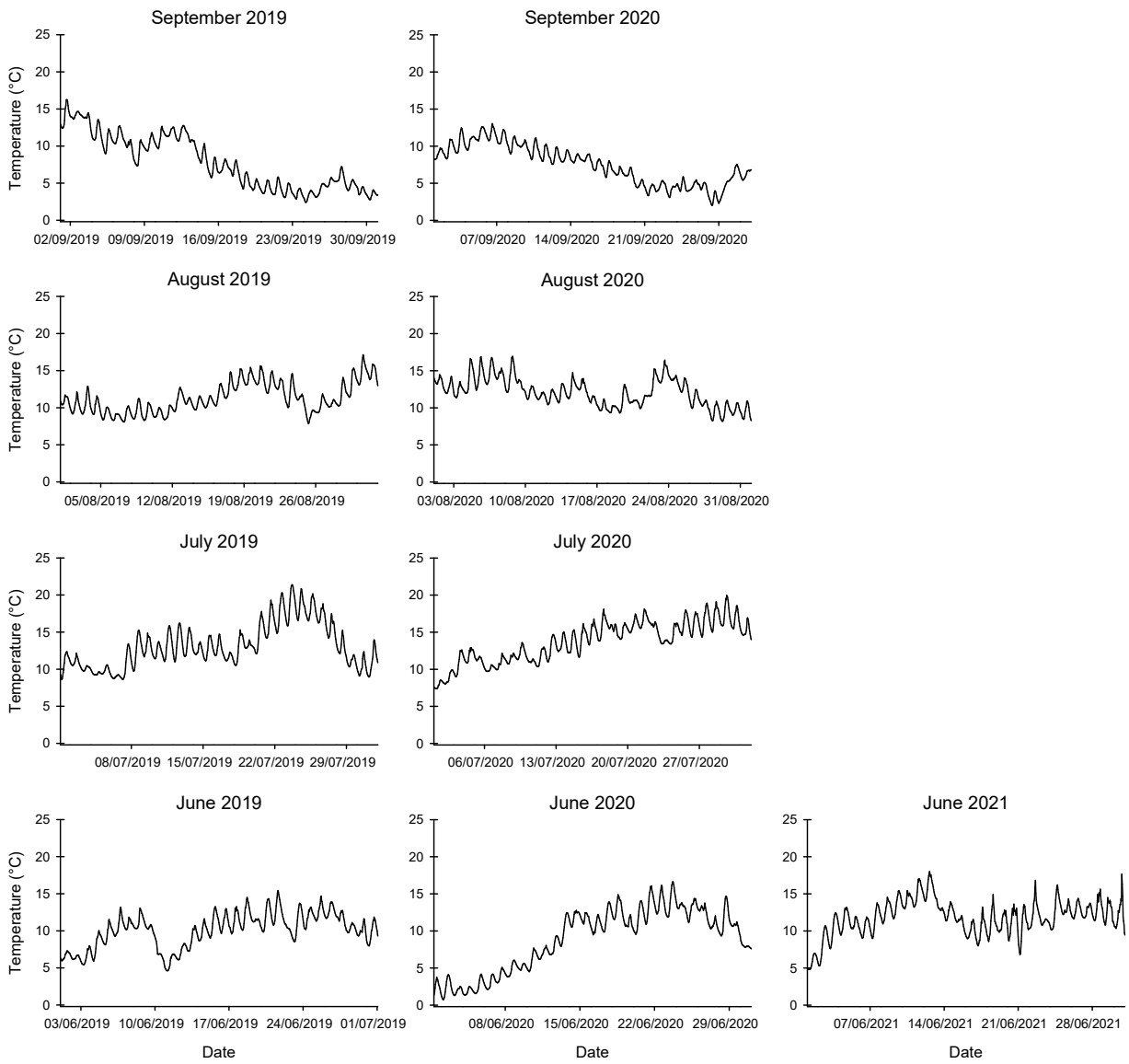


Figure 69. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the River Vetsikkojoki. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).



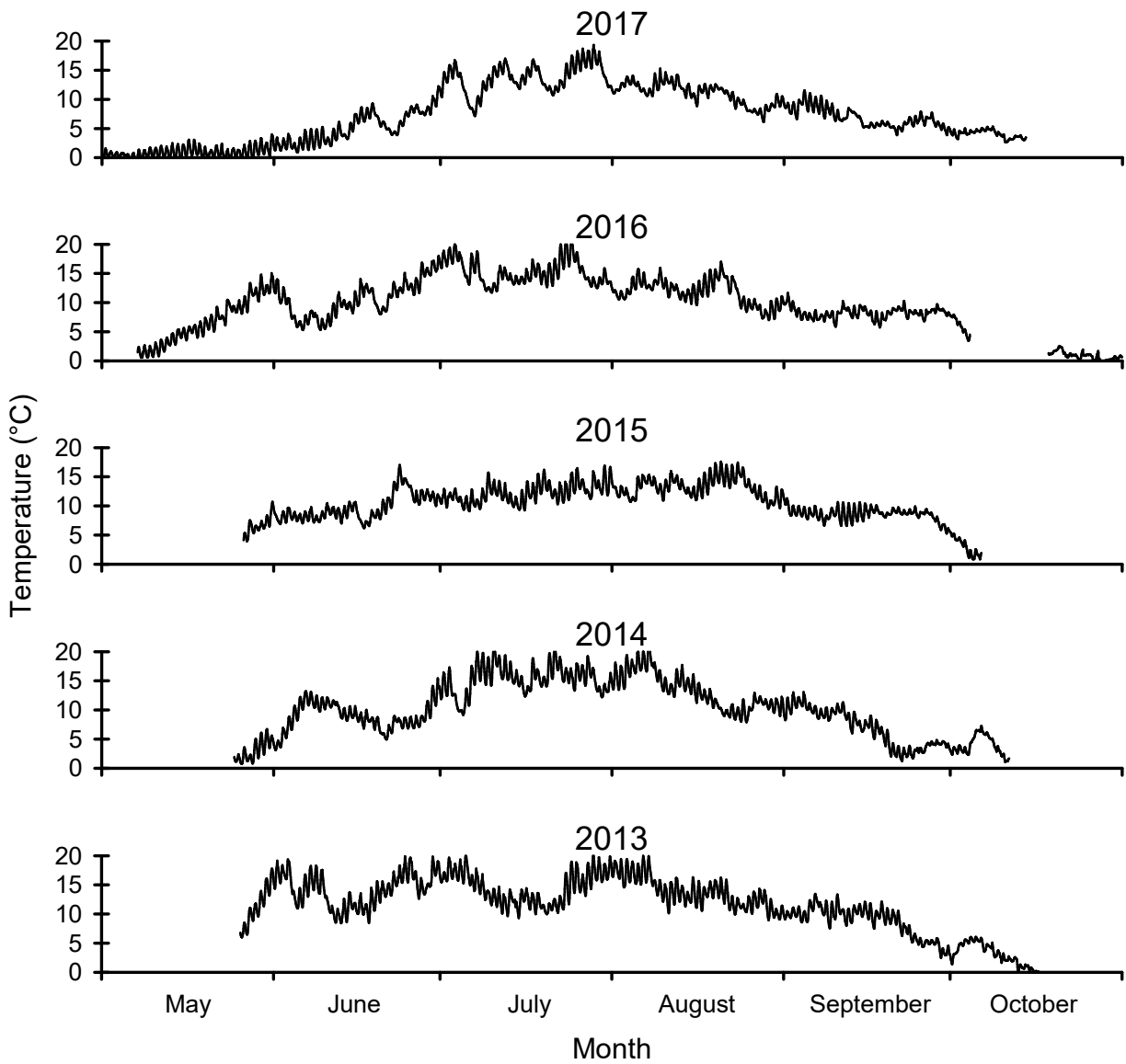


Figure 71. Long-term hourly changes in the water temperatures in the River Vetsikkojoki for the summer months in the years 2013-2017. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

4.4 Water temperatures in the River Utsjoki (river mouth)

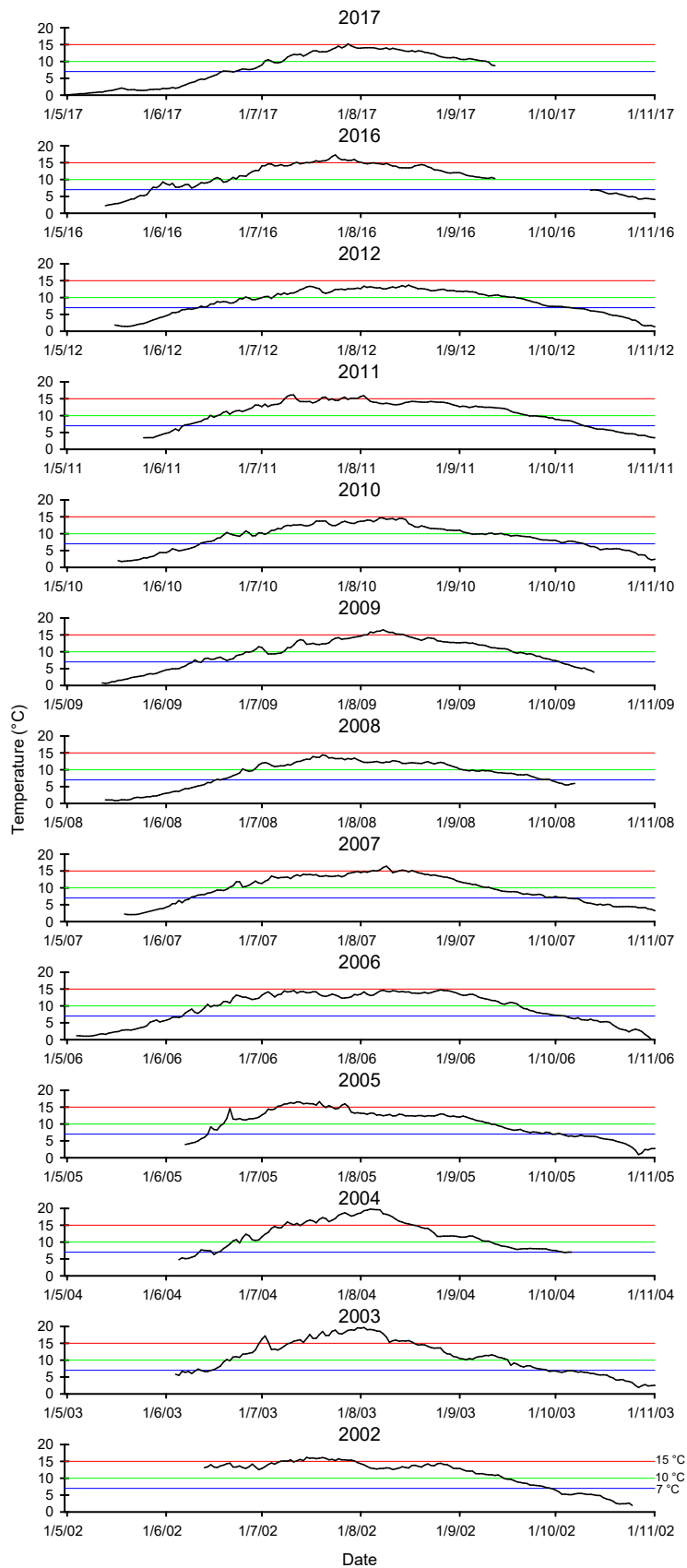


Figure 72. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the River Utsjoki. Source; Luke (Finland).

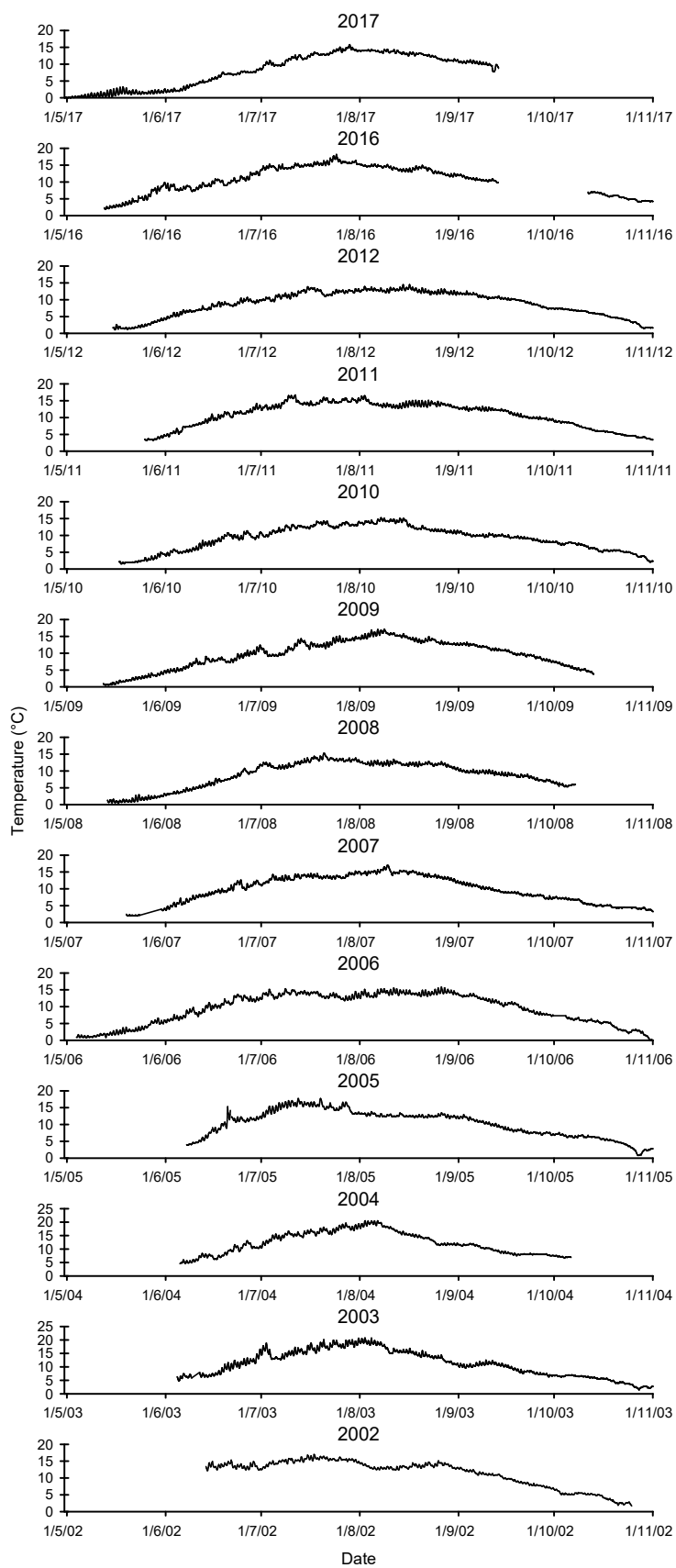


Figure 73. Long-term hourly changes in the water temperatures in the River Utsjoki for the summer months in the years 2002-2017. Source; Luke (Finland).

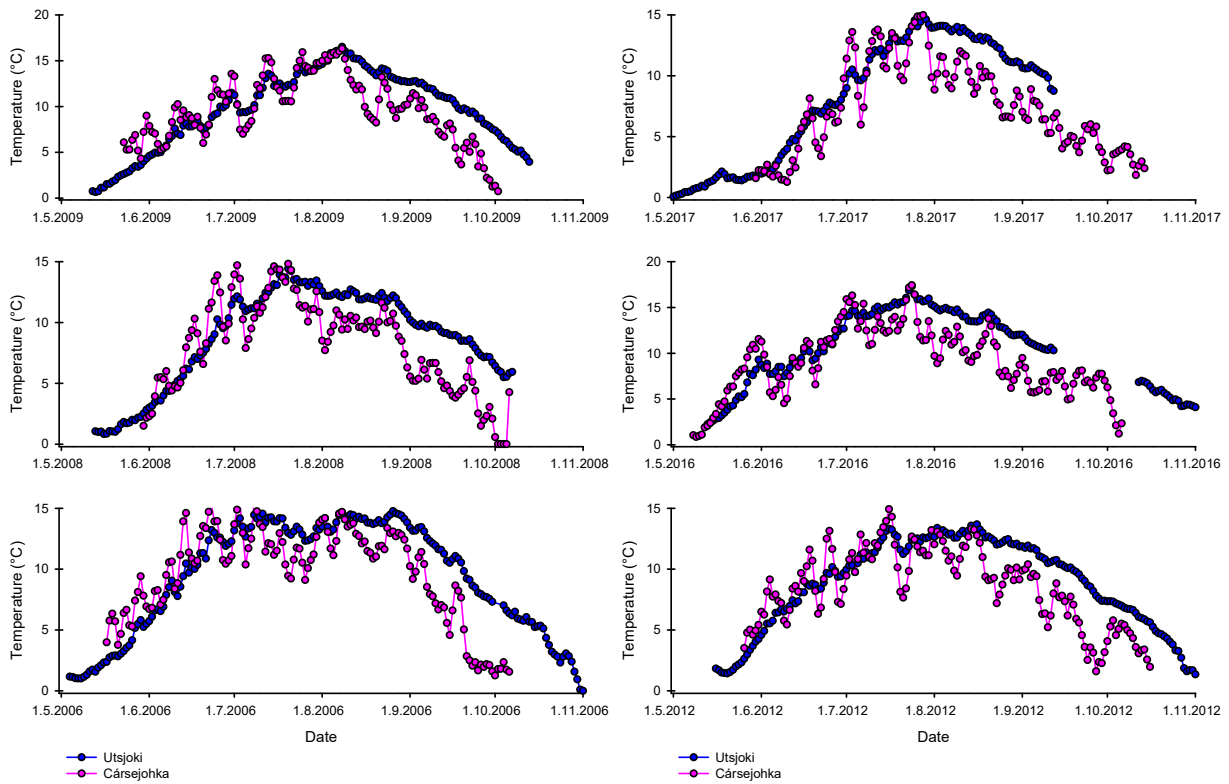


Figure 74. Daily mean water temperatures from May to October in the rivers Utsjoki and Tsarsejoki in the years 2006, 2008, 2009, 2012, 2016 and 2017. Source; Luke (Finland).

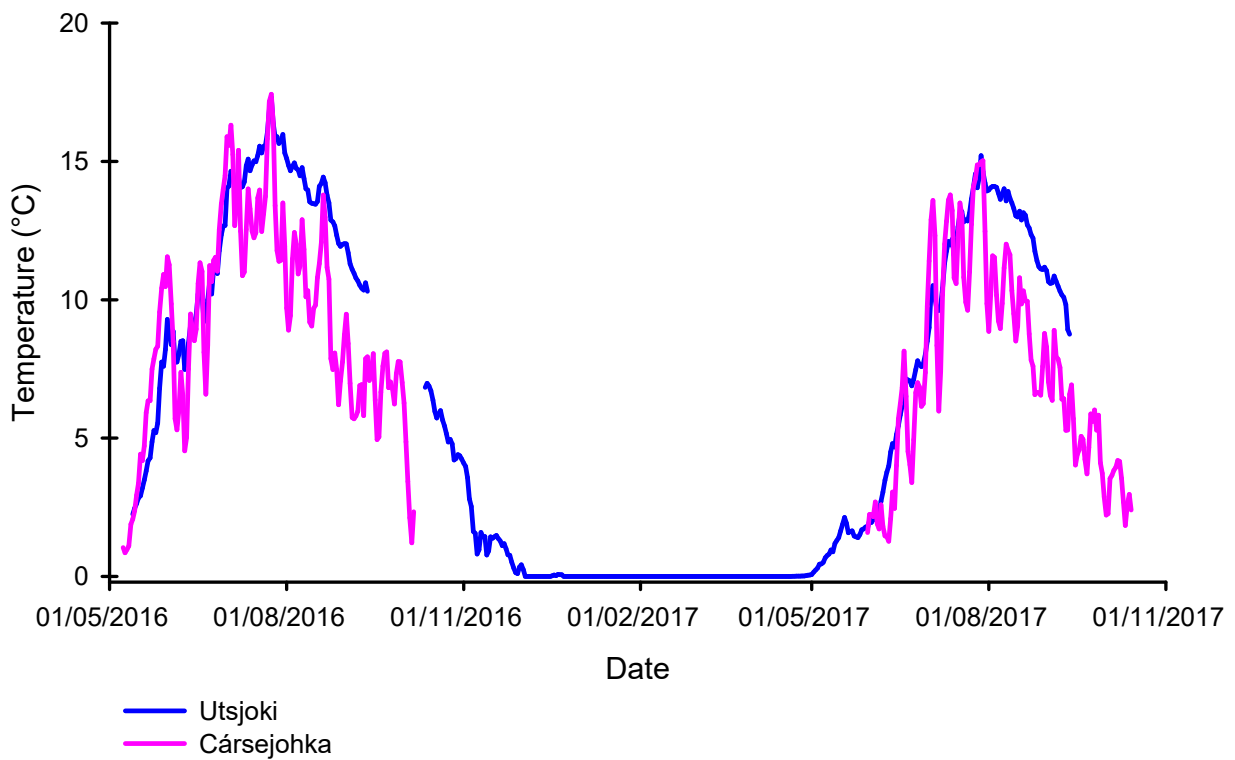


Figure 75. Daily mean water temperatures throughout two years in the rivers Utsjoki and Tsarsejoki in the years 2016-2017. Source; Luke (Finland).

4.5 Water temperatures in the River Laksjohka

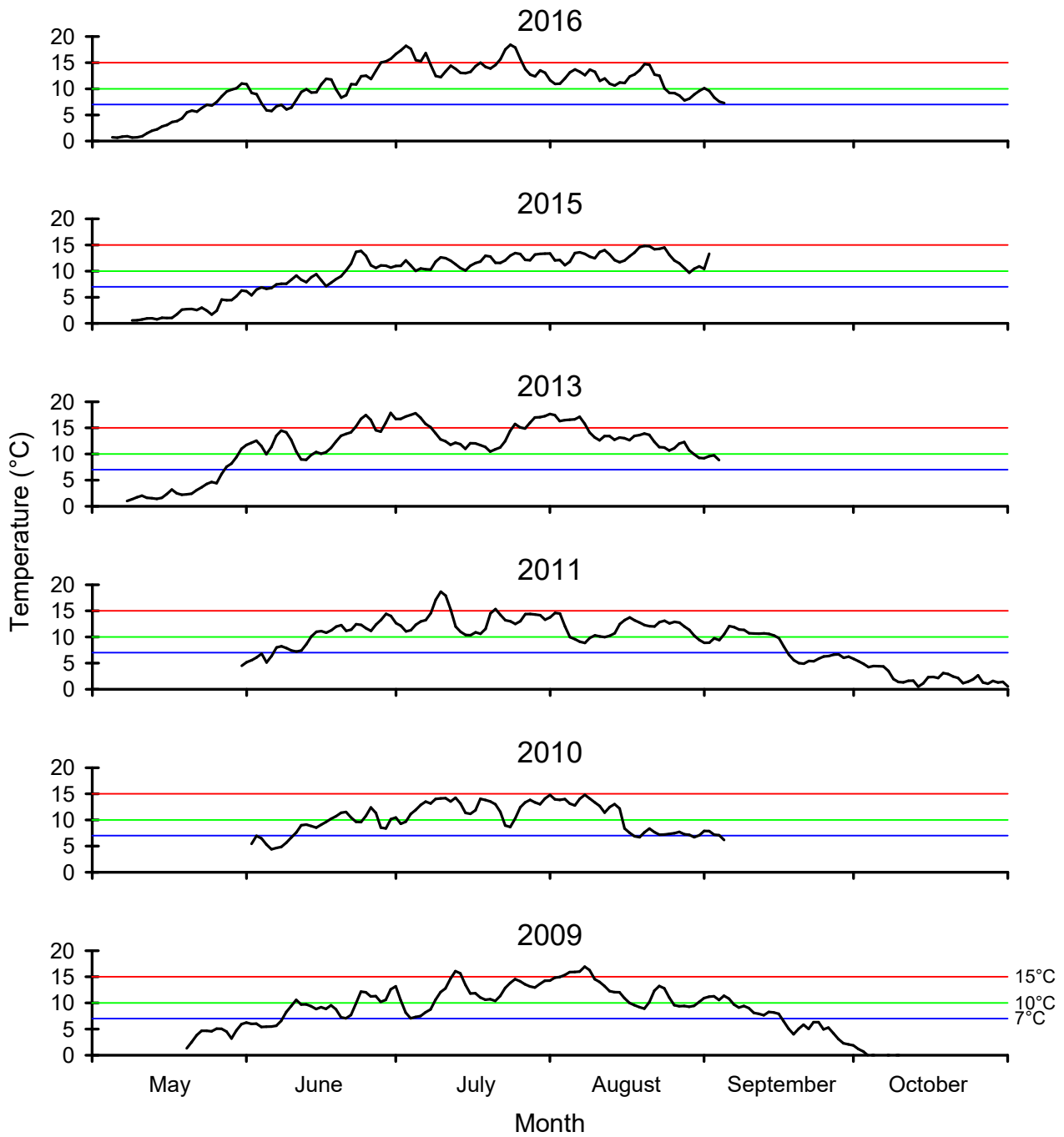


Figure 76. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the River Laksjohka. Source; Luke (Finland).

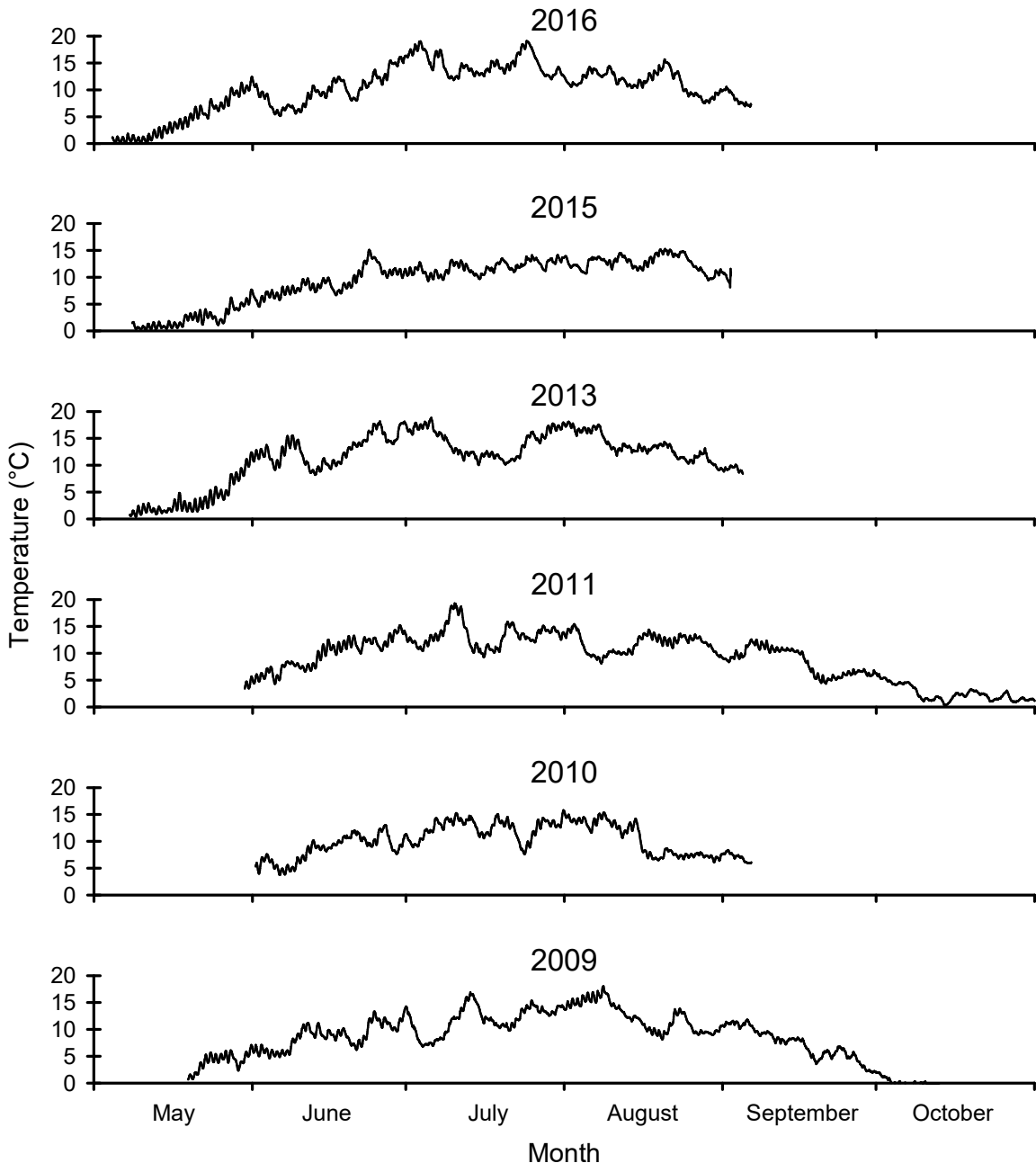


Figure 77. Long-term hourly changes in the water temperatures in the River Laksjohka for the summer months in the years 2009-2016. Source; Luke (Finland).

4.6 Water temperatures in the River Tsarsejoki

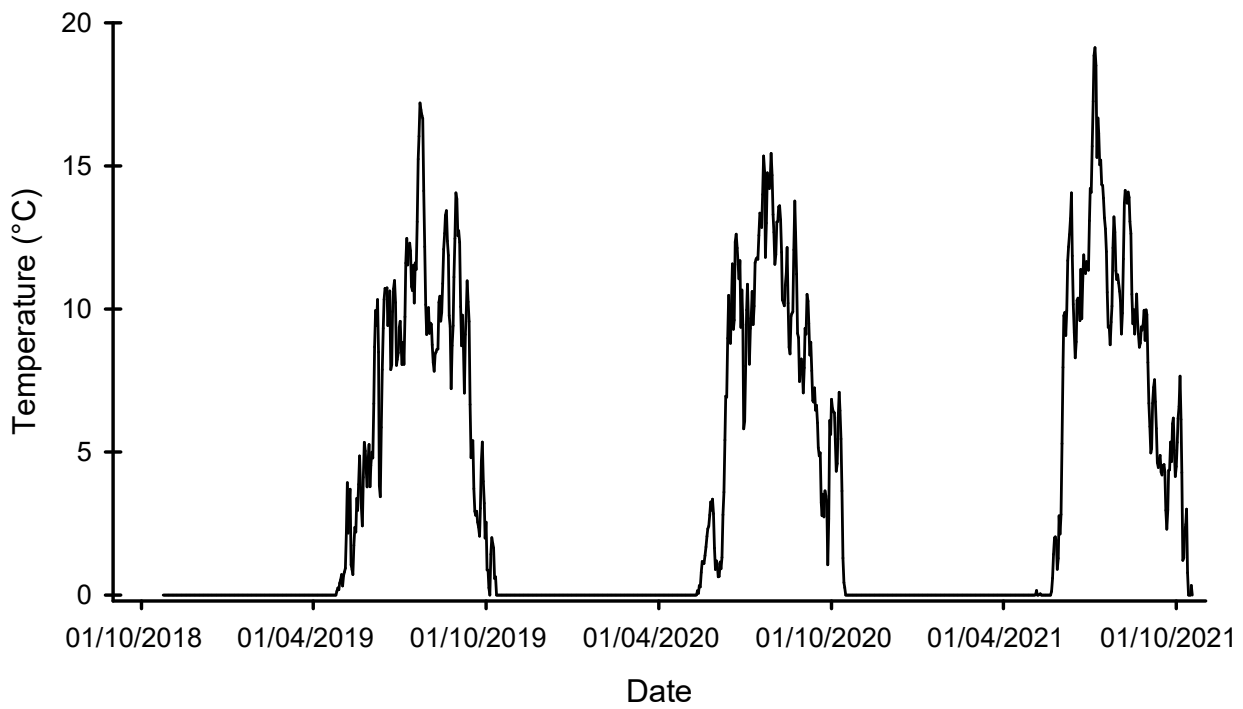


Figure 78. Daily mean water temperatures throughout three years in the River Tsarsejohka in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

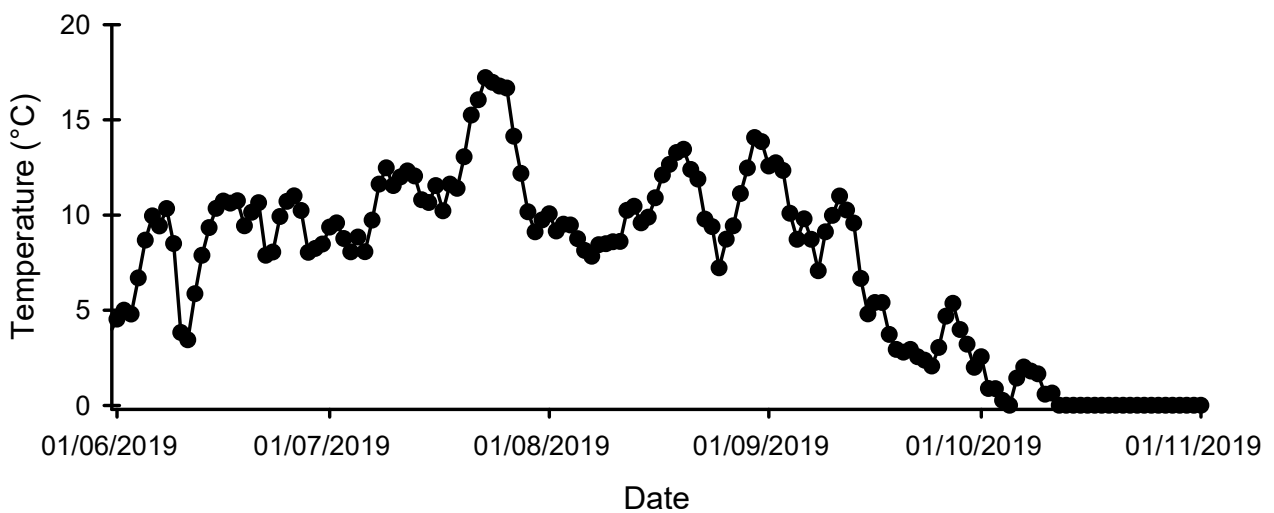
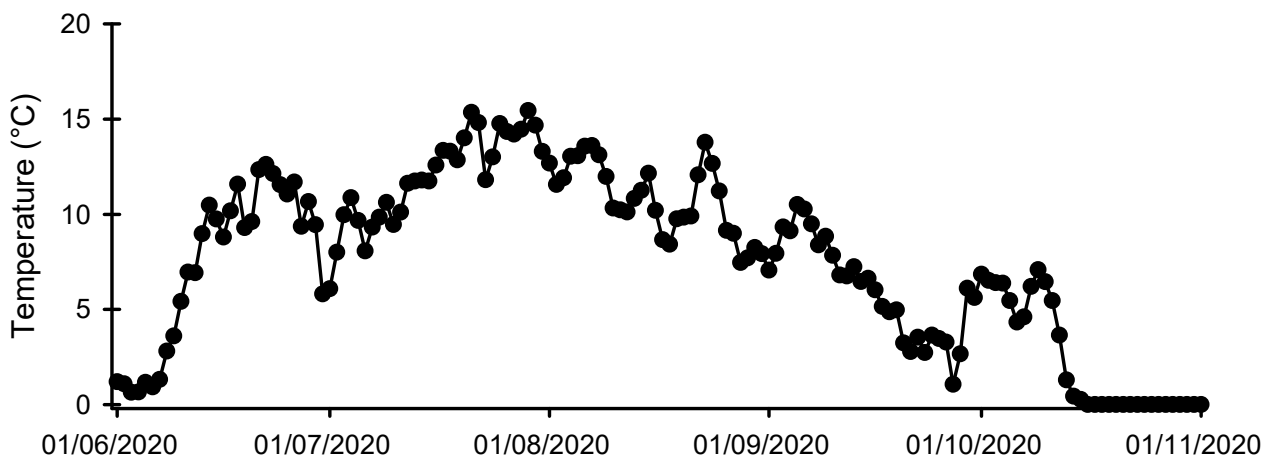
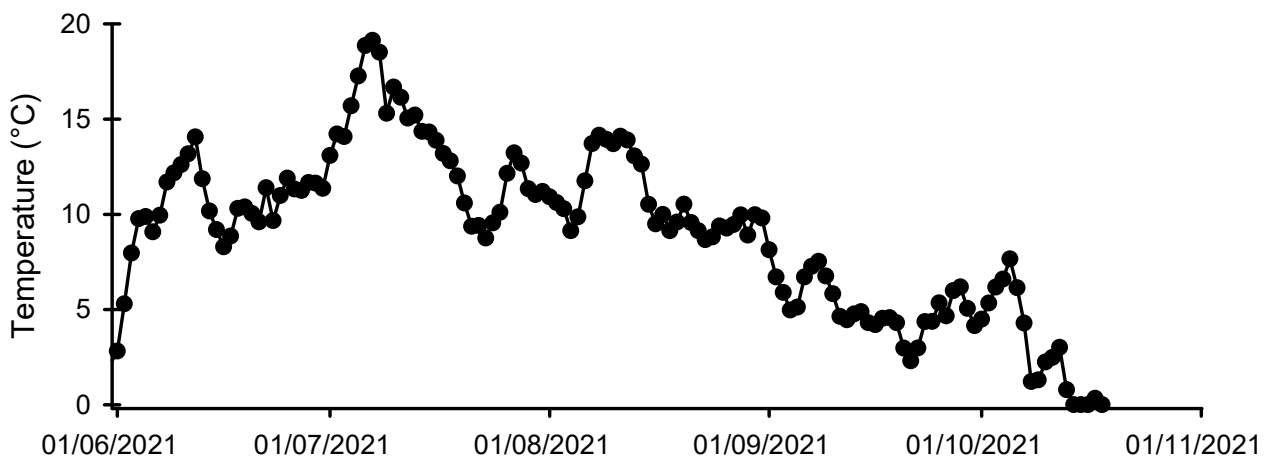


Figure 79. Fluctuations in the daily mean water temperatures from June to October in the River Tsarsejohka in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

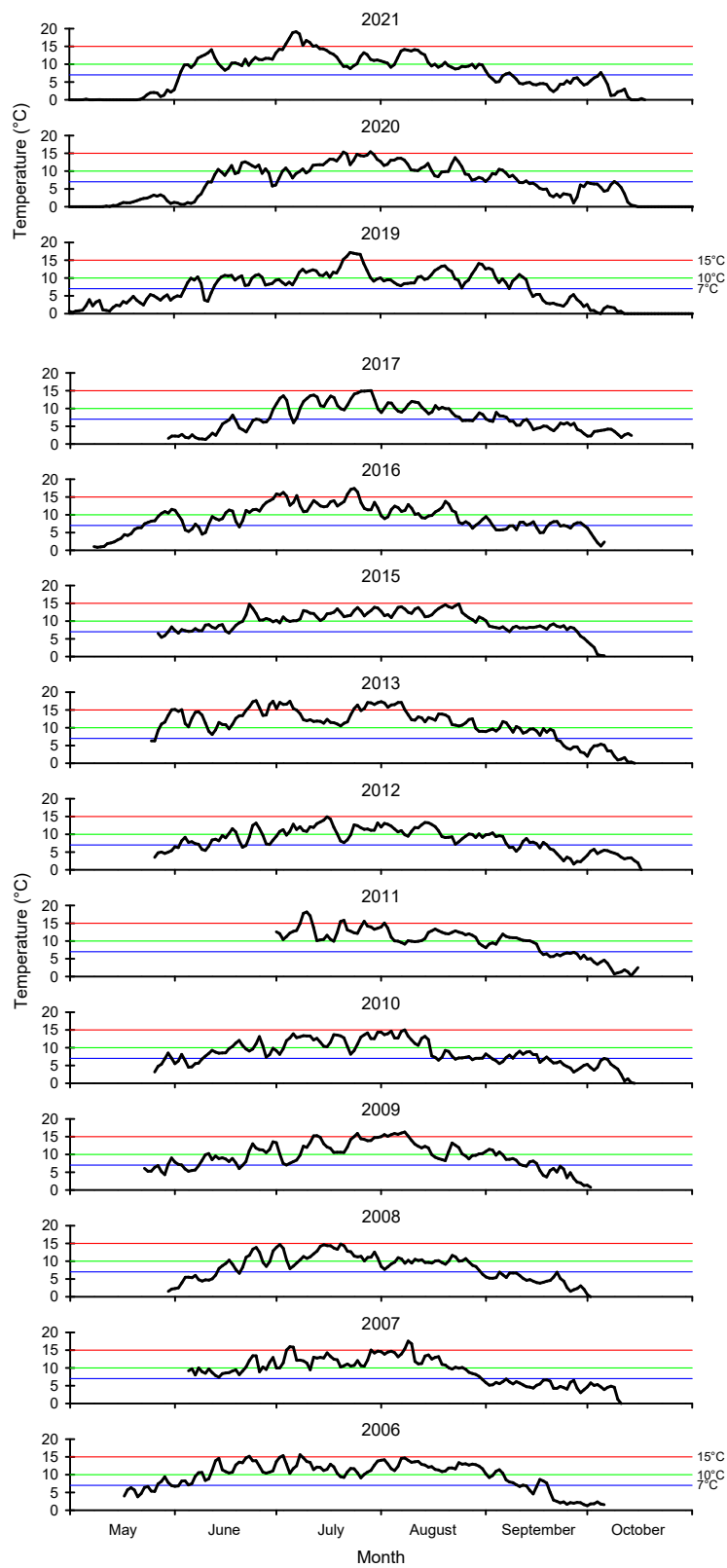


Figure 80. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the River Tsarsejohka. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

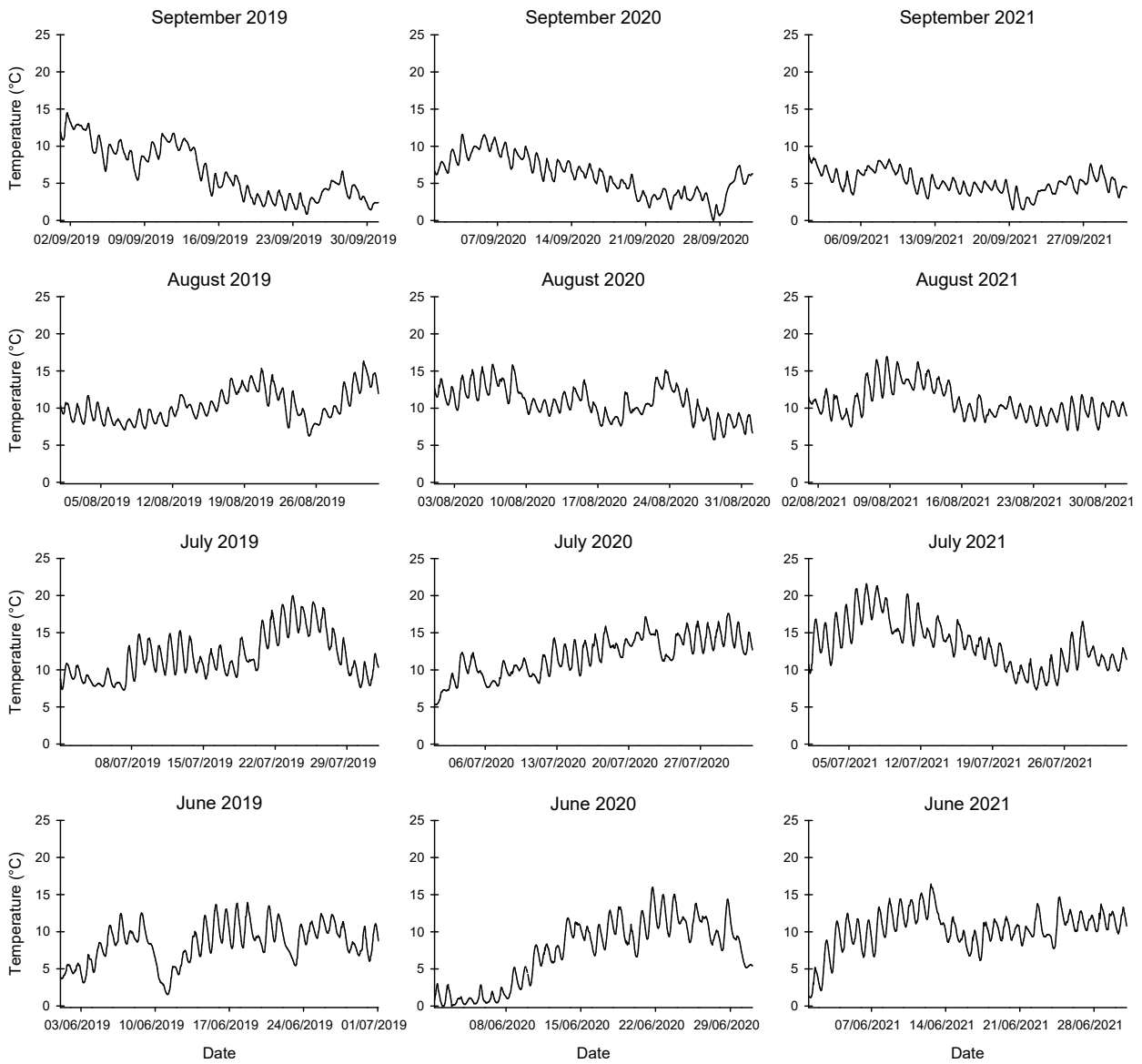


Figure 81. Hourly changes in the water temperatures in the River Tsarsejohka for the summer months in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

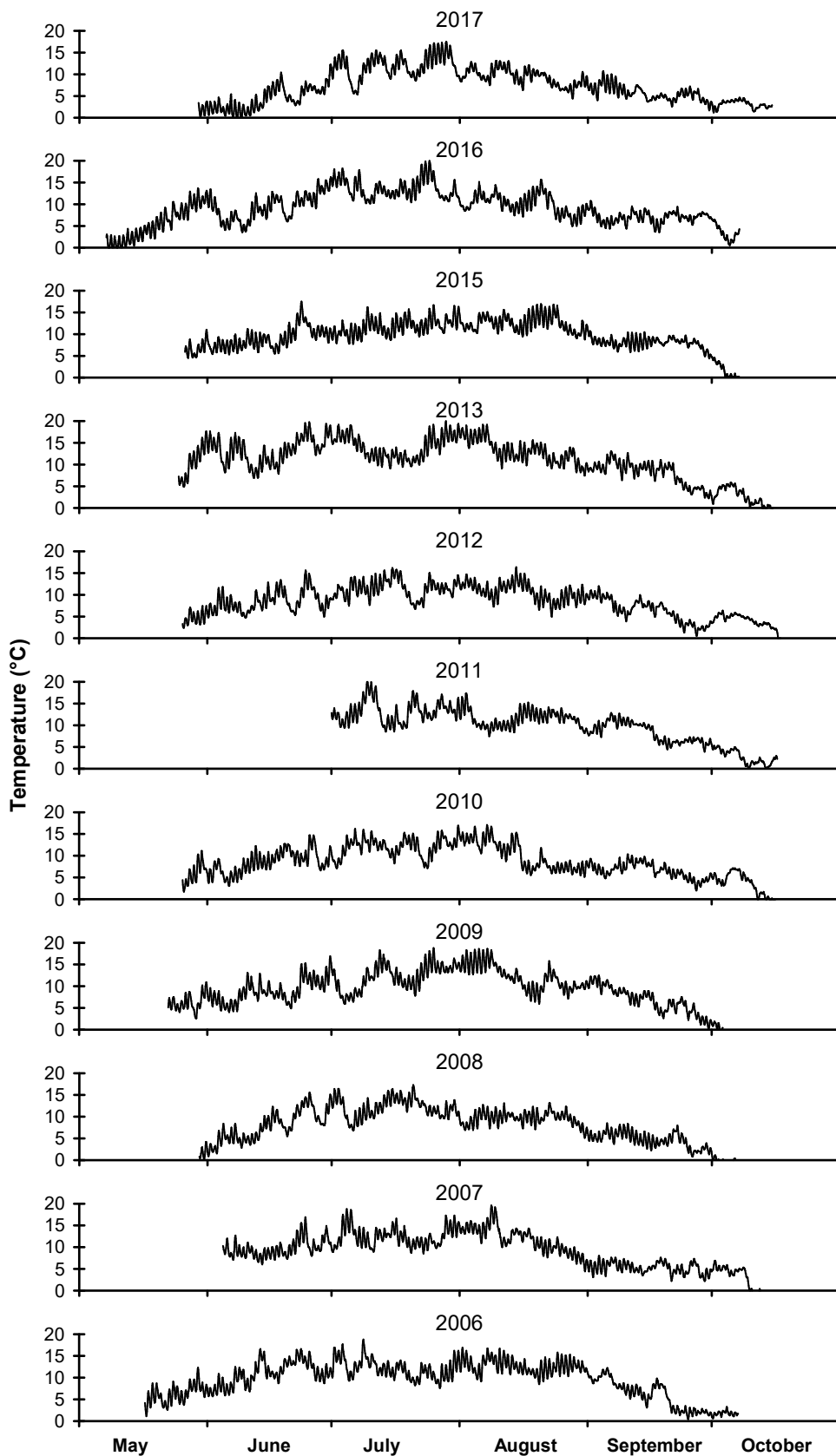


Figure 82. Long-term hourly changes in the water temperatures in the River Tsarsejohka for the summer months in the years 2006-2017. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

5. Hourly and mean daily water temperatures in the years 2006-2021 in Atlantic salmon brooks in the River Tana watershed

5.1 Water temperatures in the Brook Vidisjohka

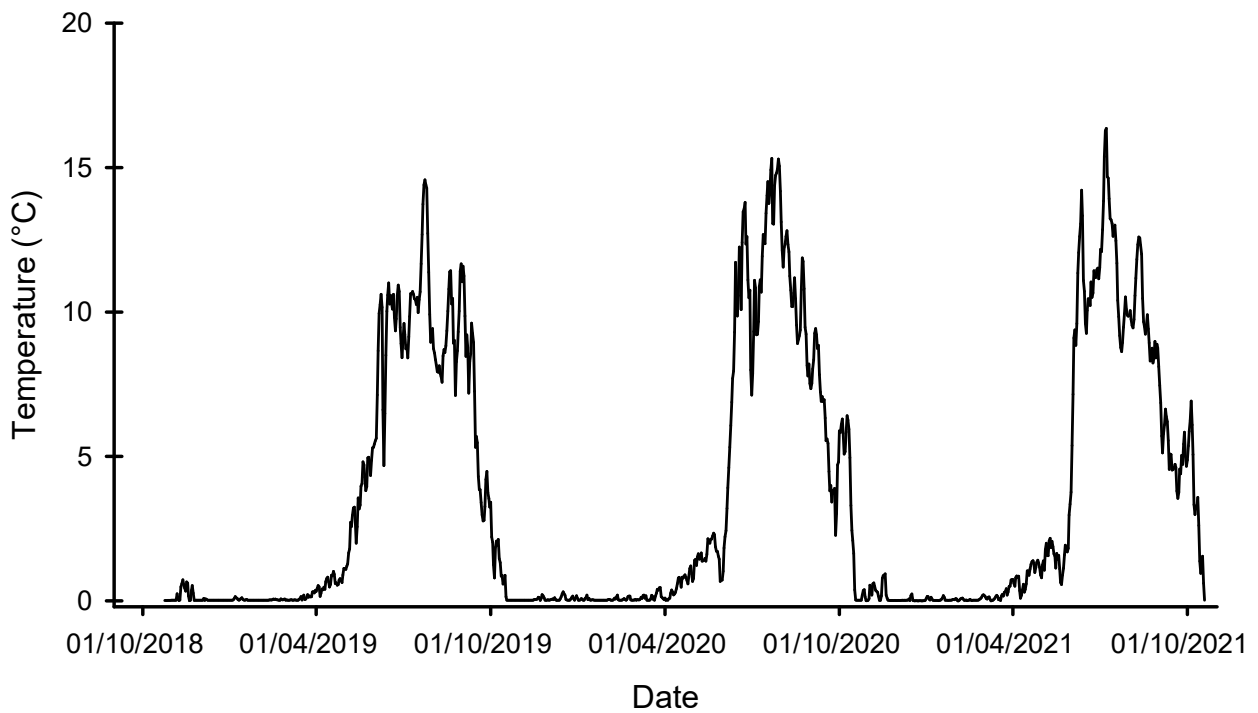


Figure 83. Daily mean water temperatures throughout three years in the Brook Vidisjohka in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

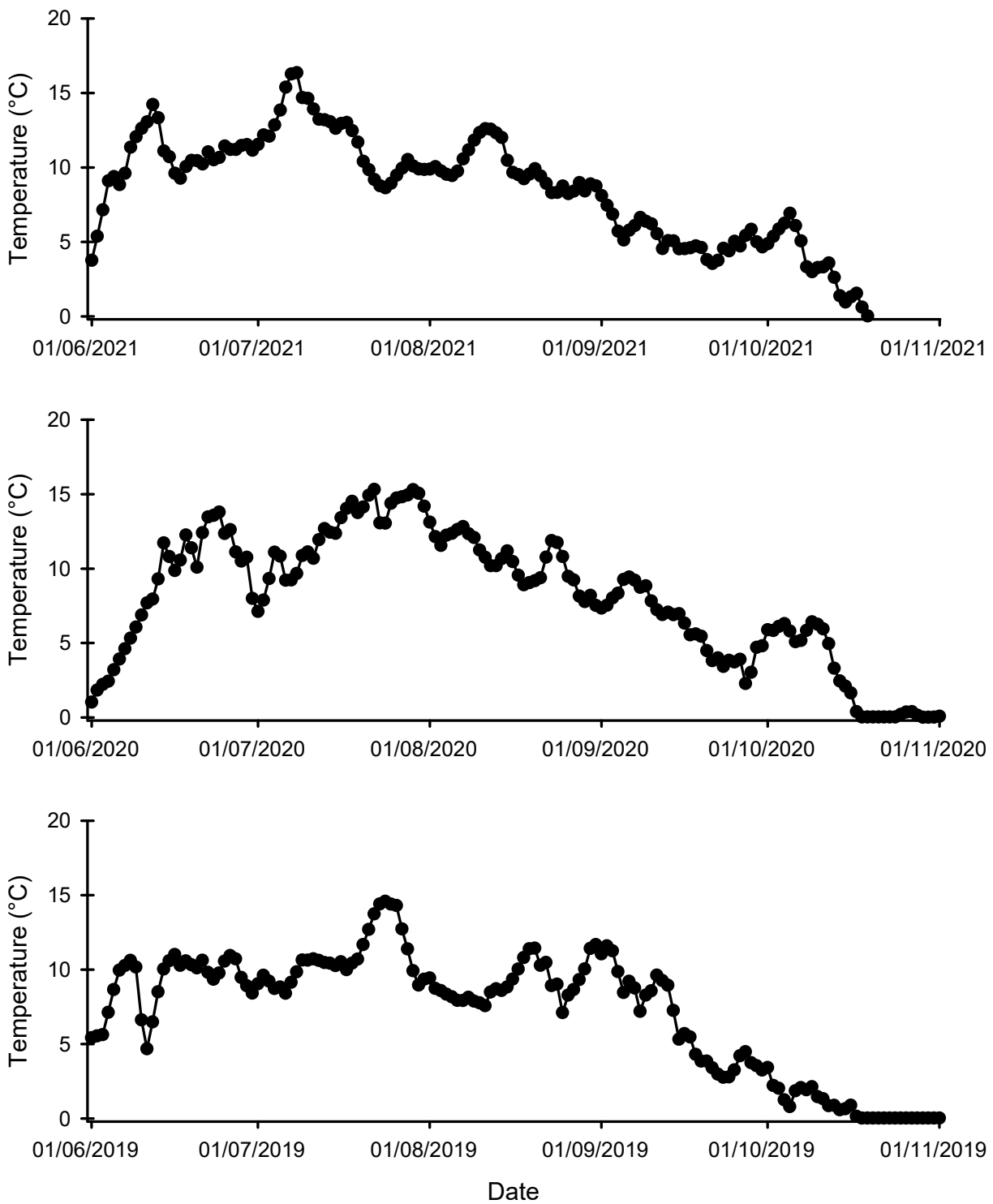


Figure 84. Fluctuations in the daily mean water temperatures from June to October in the Brook Vidisjoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

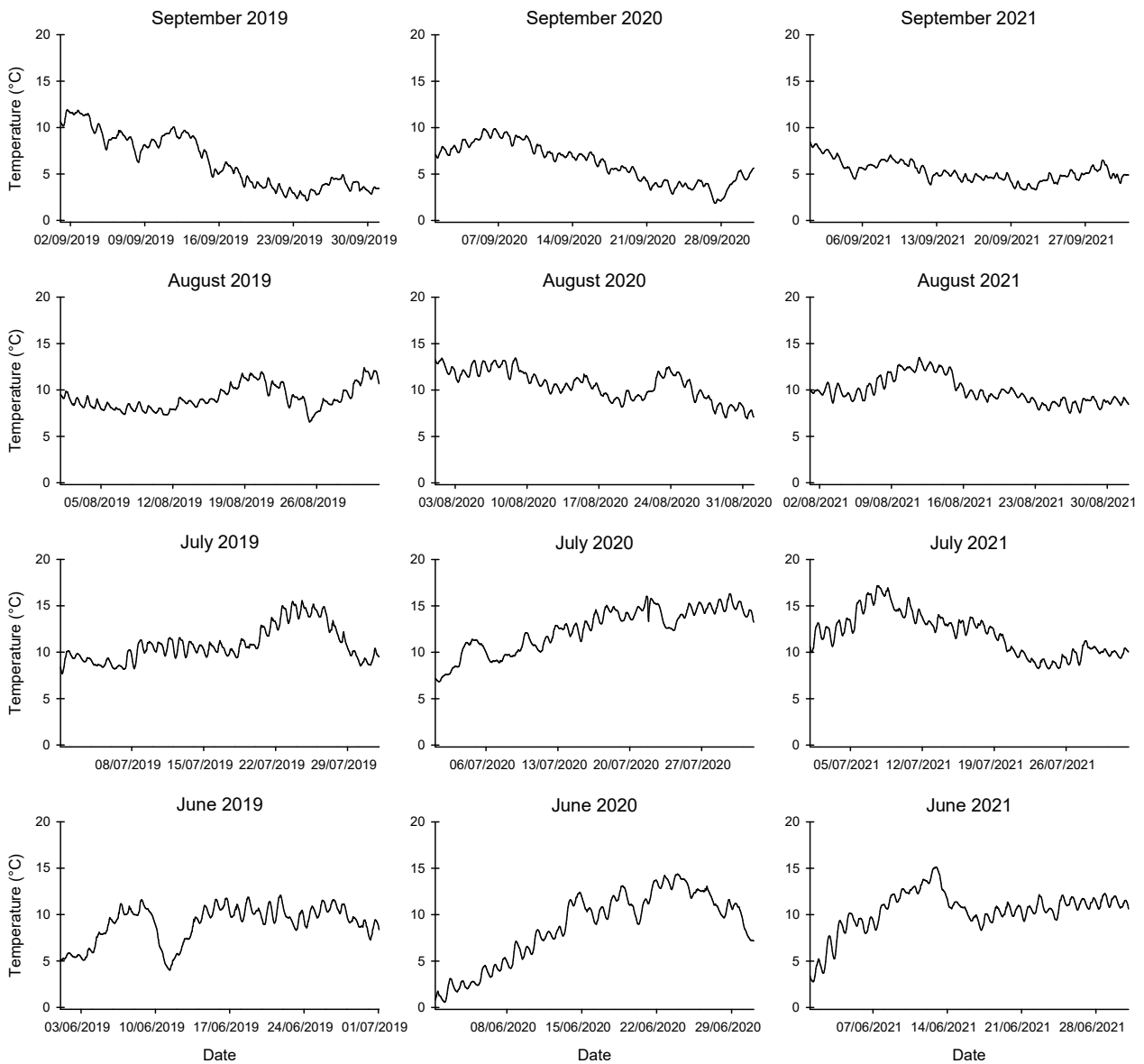


Figure 85. Hourly changes in the water temperatures in the Brook Vidisjoki for the summer months in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

5.2 Water temperatures in the Brook Äimäjoki

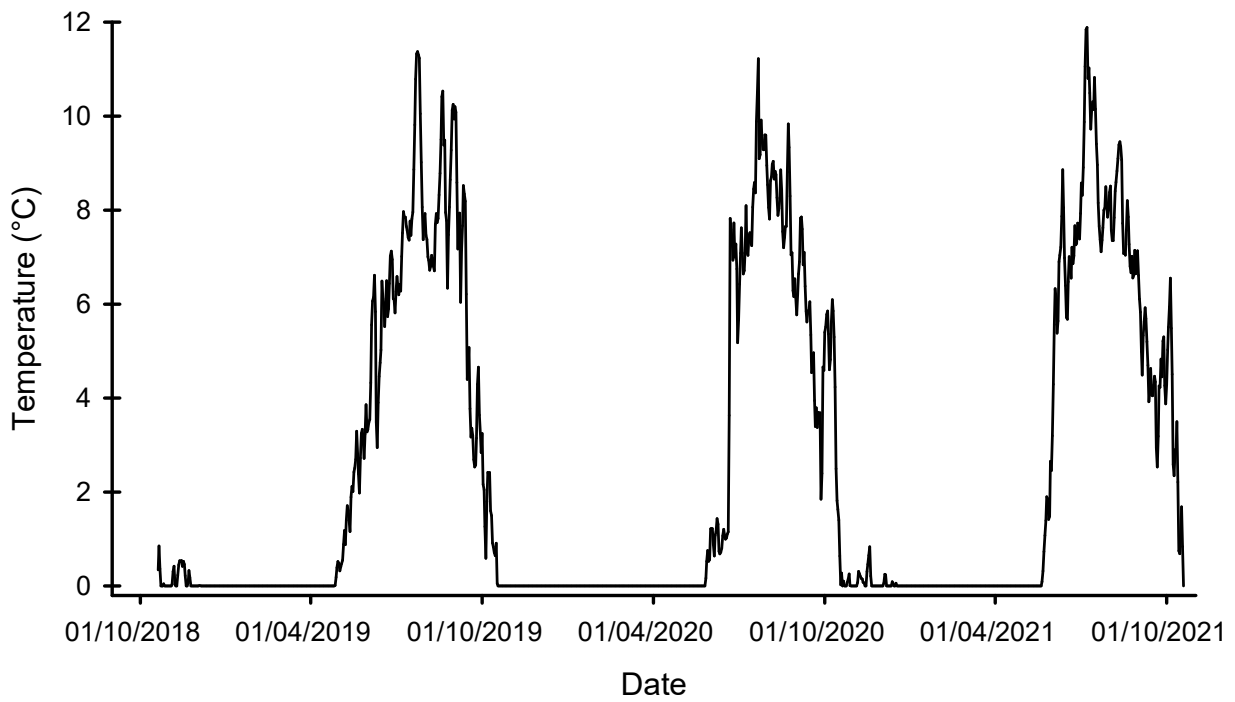


Figure 86. Daily mean water temperatures throughout three years in the Brook Äimäjoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

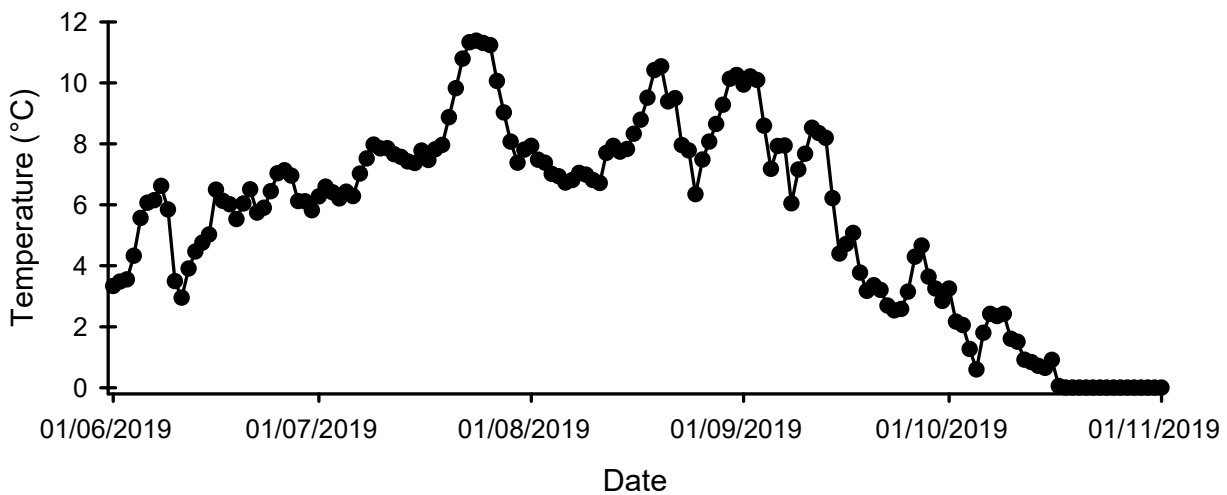
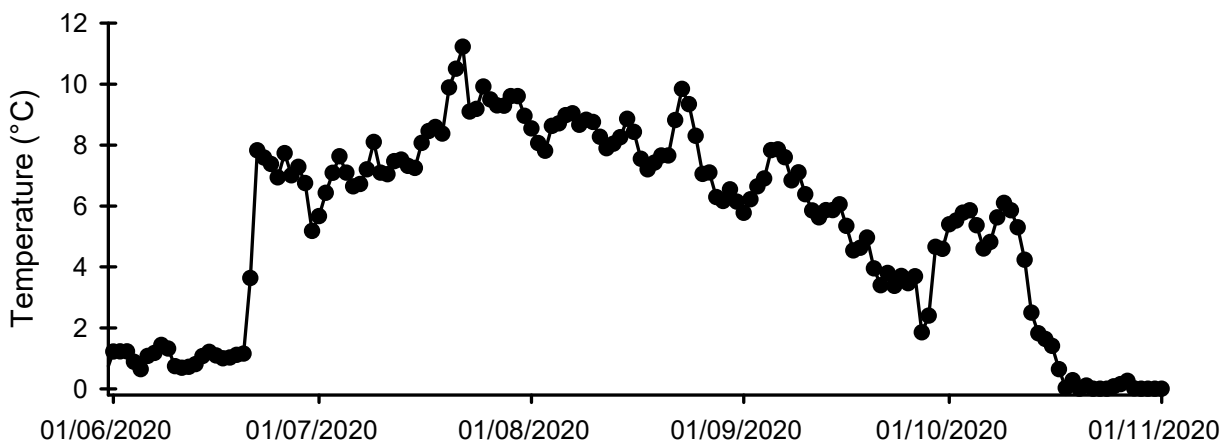
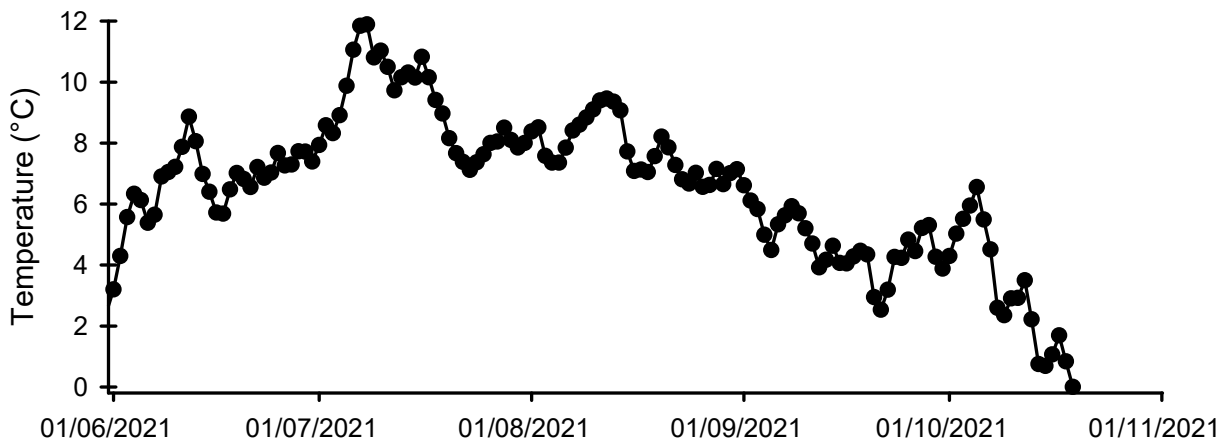


Figure 87. Fluctuations in the daily mean water temperatures from June to October in the Brook Äimäjoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

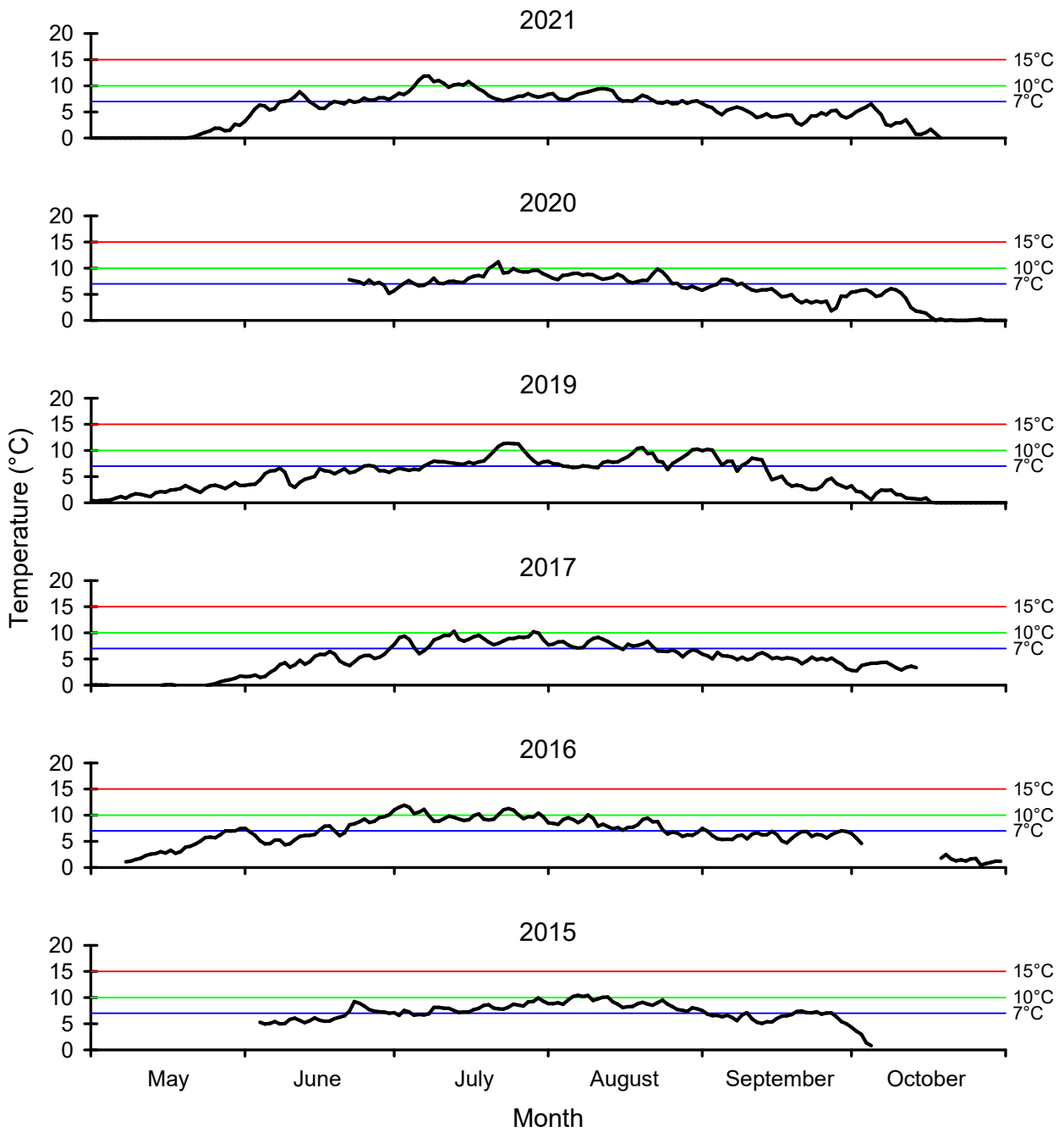


Figure 88. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the Brook Äimäjoki. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

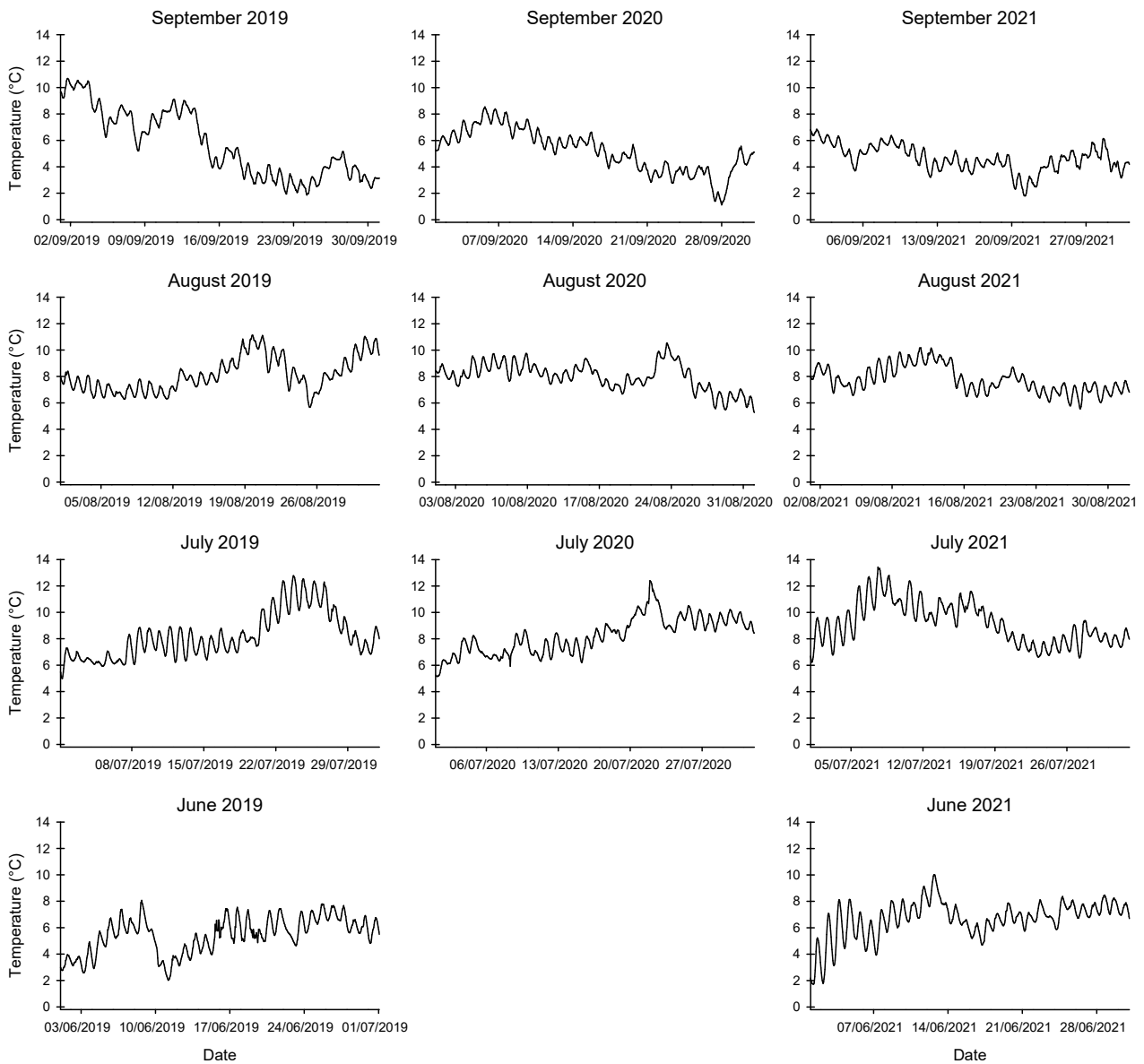


Figure 89. Hourly changes in the water temperatures in the Brook Äimäjoki for the summer months in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

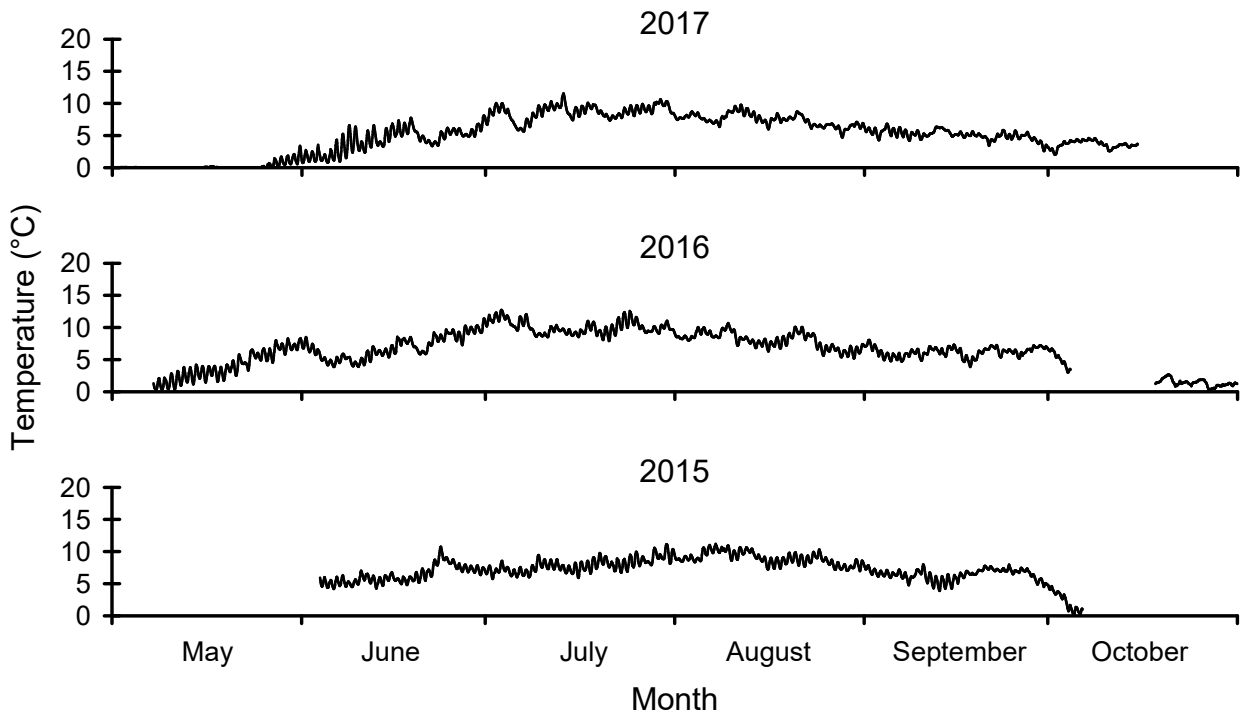


Figure 90. Long-term hourly changes in the water temperatures in the Brook Äimäjoki for the summer months in the years 2015-2017. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

5.3 Water temperatures in the Brook Yläseitikkajoki

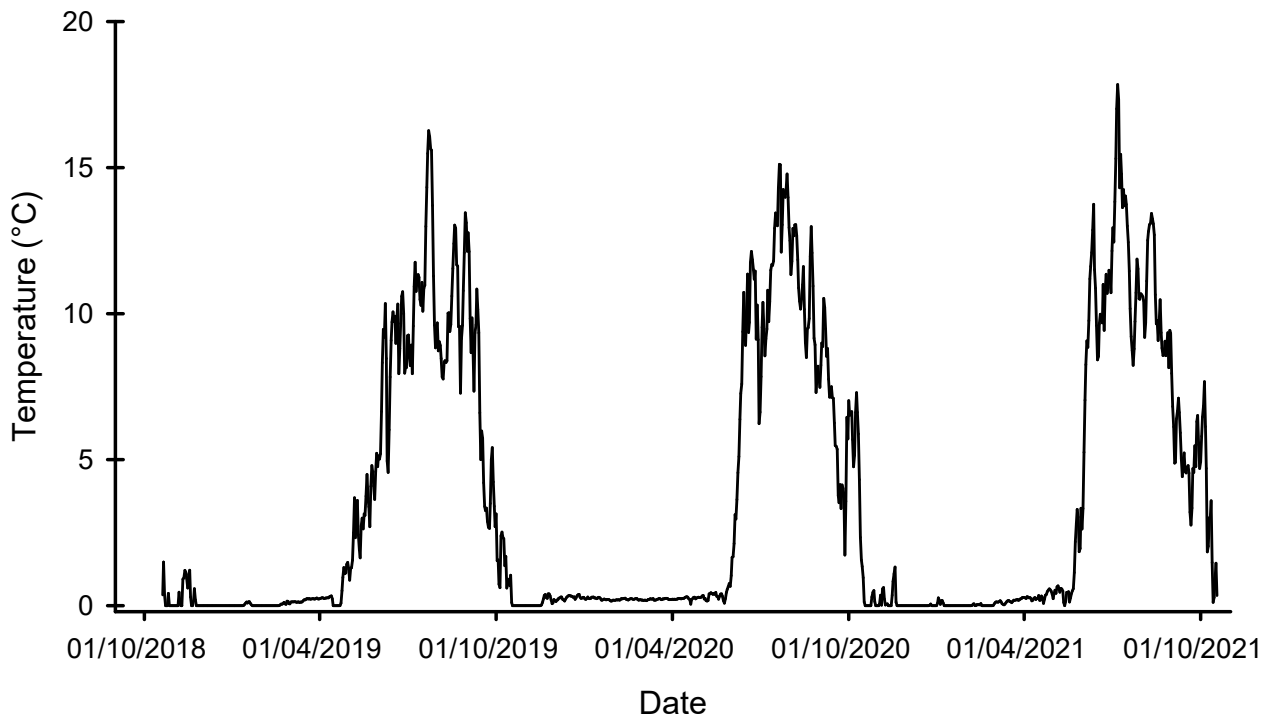


Figure 91. Daily mean water temperatures throughout three years in the Brook Yläseitikkajoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

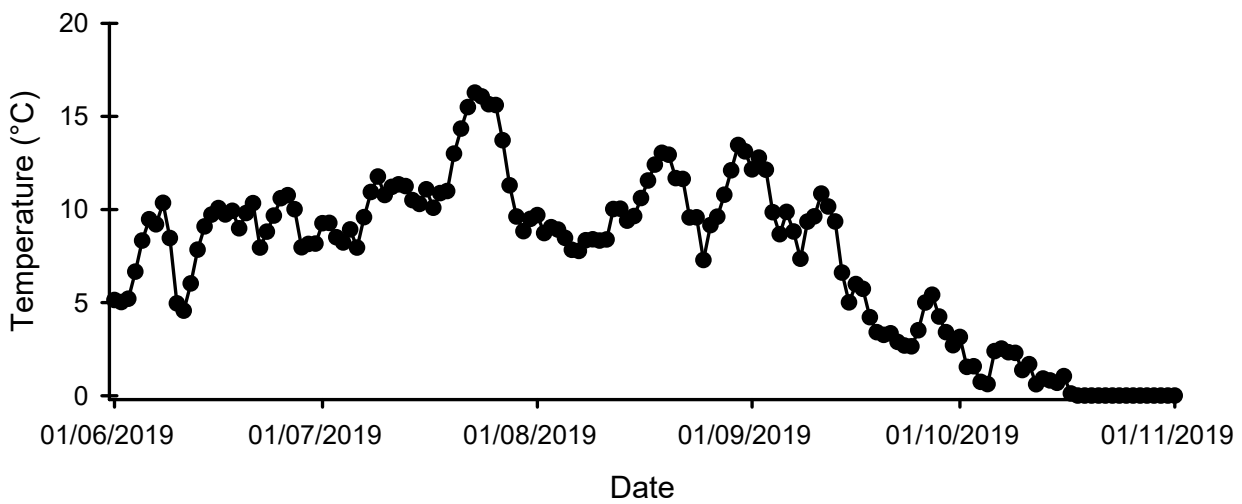
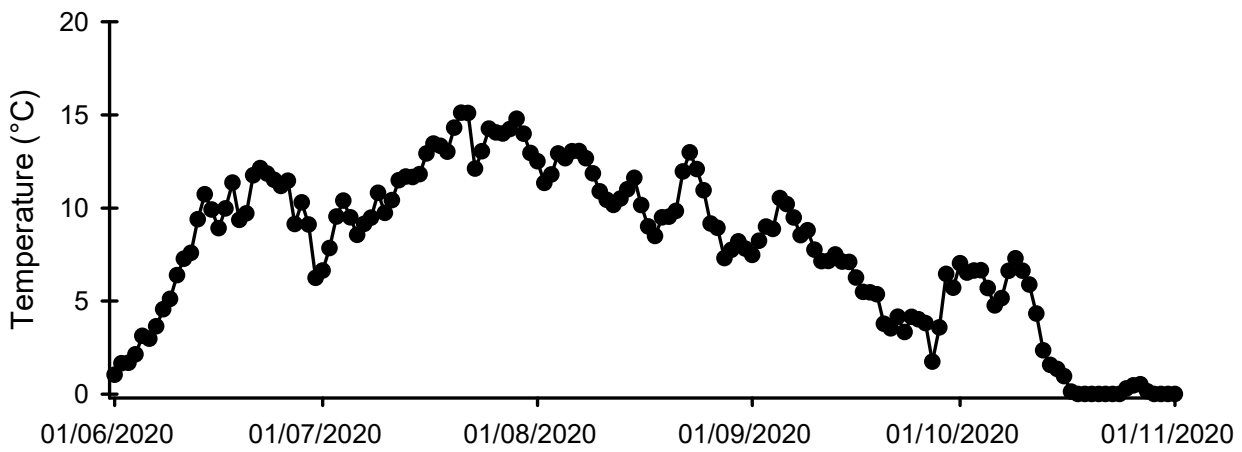
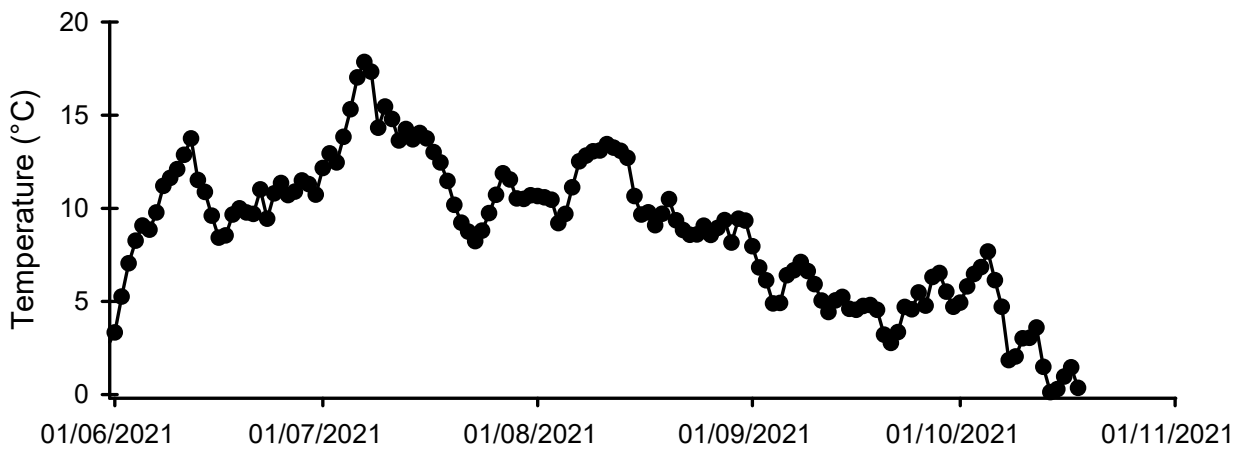


Figure 92. Fluctuations in the daily mean water temperatures from June to October in the Brook Yläseitikkajoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

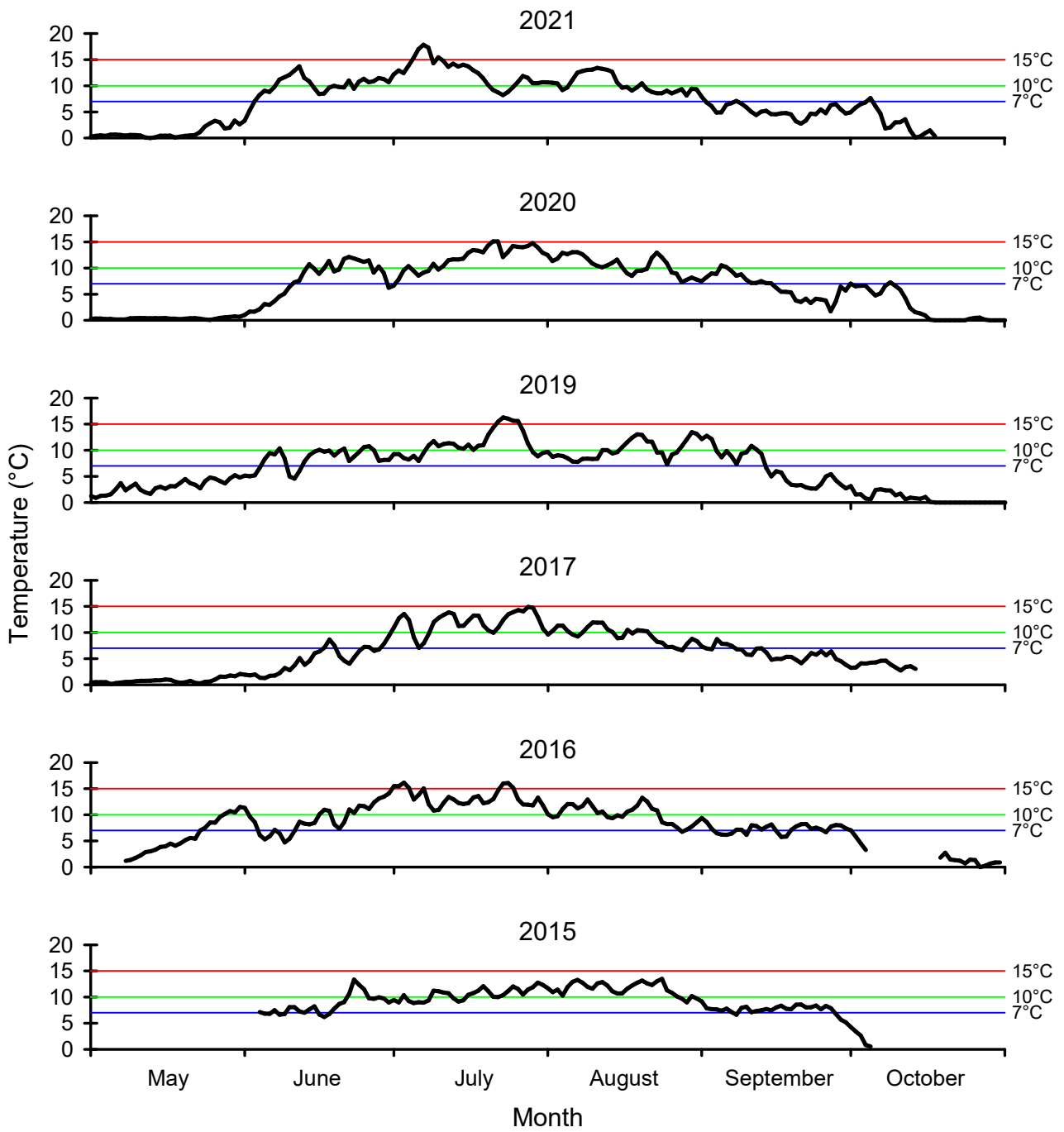


Figure 93. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the Brook Yläseitikkajoki. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

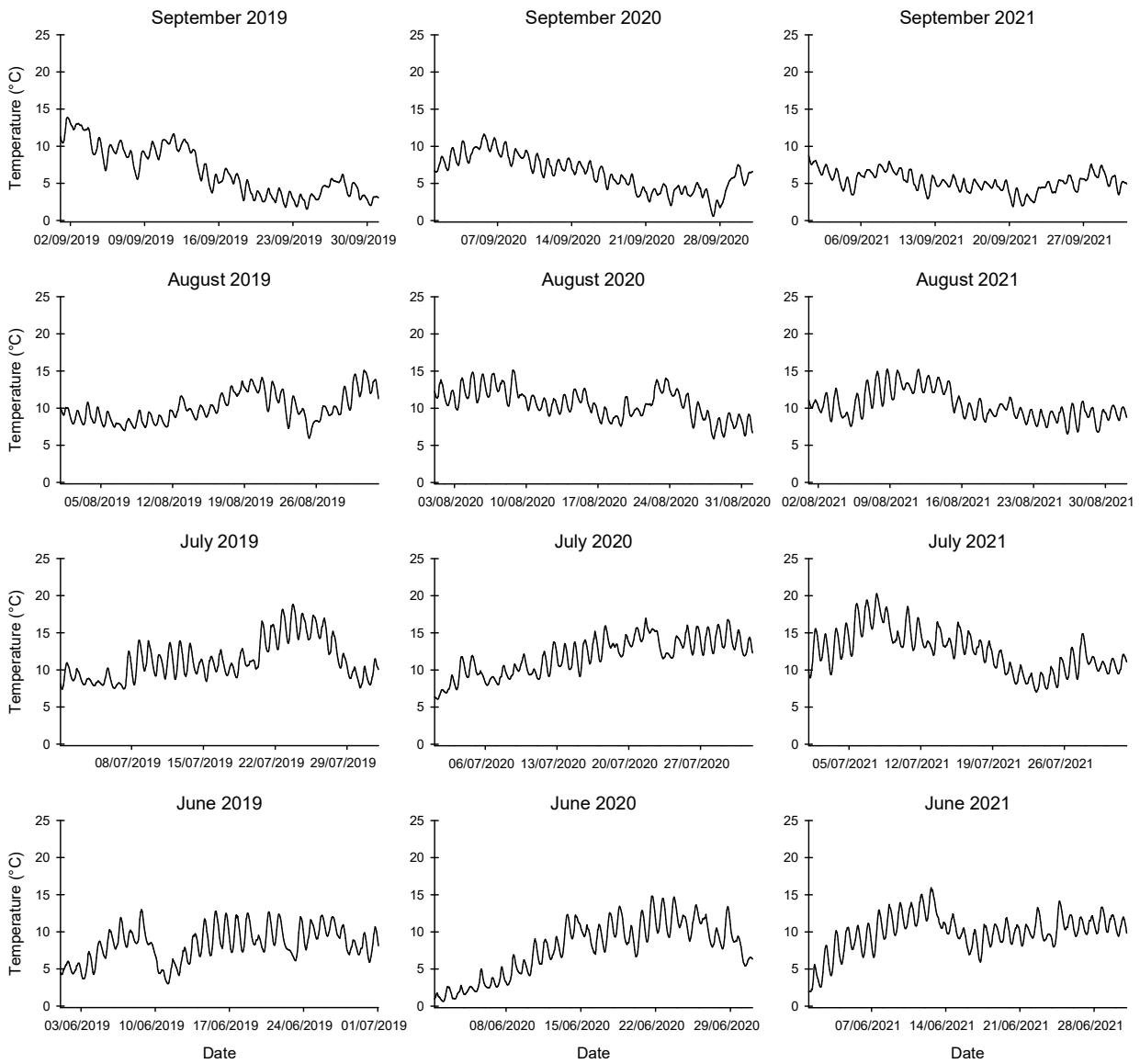


Figure 94. Hourly changes in the water temperatures in the Brook Yläseitikkajoki for the summer months in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

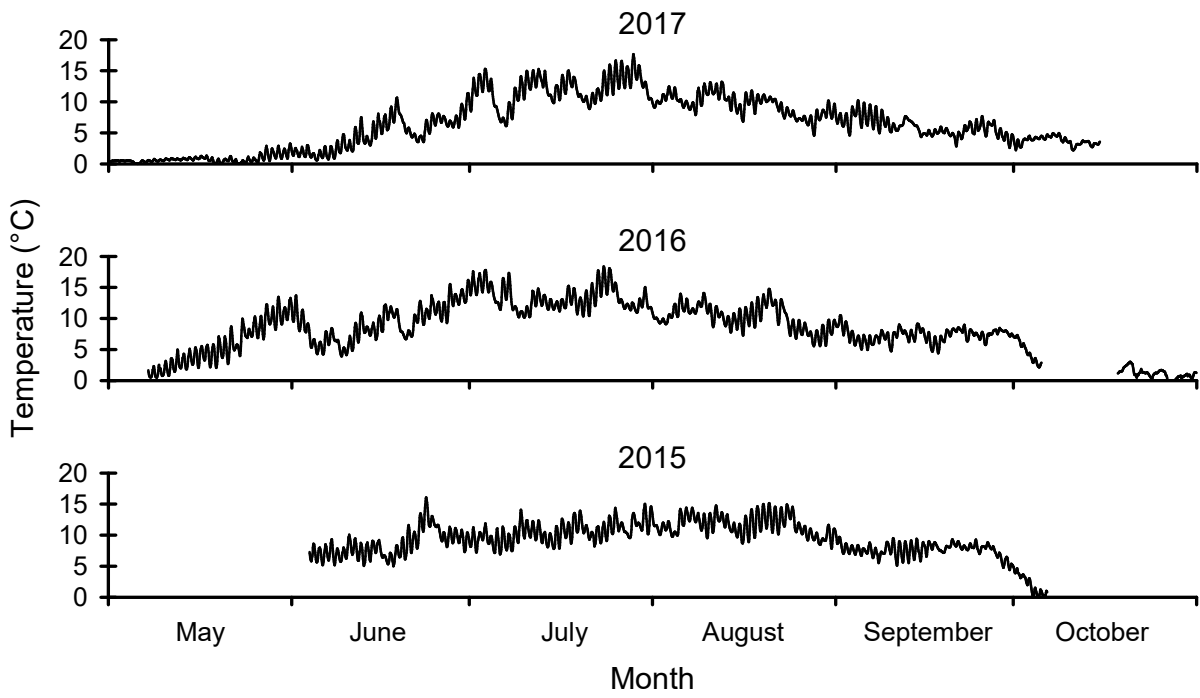


Figure 95. Long-term hourly changes in the water temperatures in the Brook Yläseitikkajoki for the summer months in the years 2015-2017. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

5.4 Water temperatures in the Brook Rassijoki

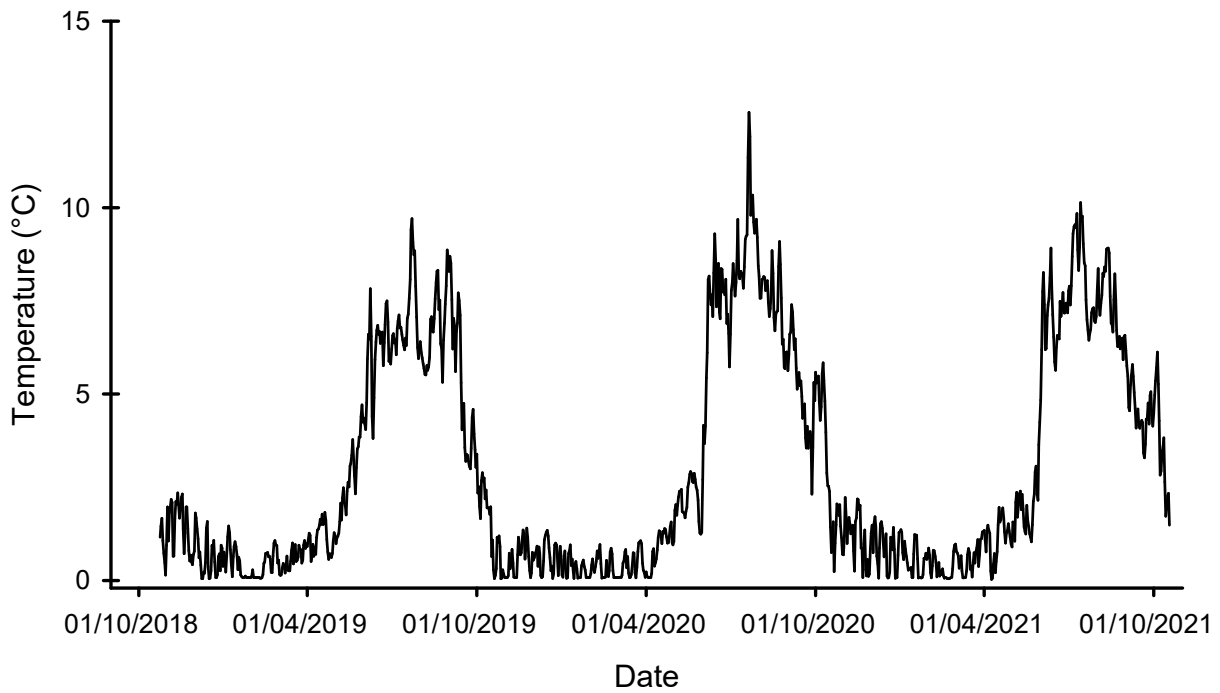


Figure 96. Daily mean water temperatures throughout three years in the Brook Rassijoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

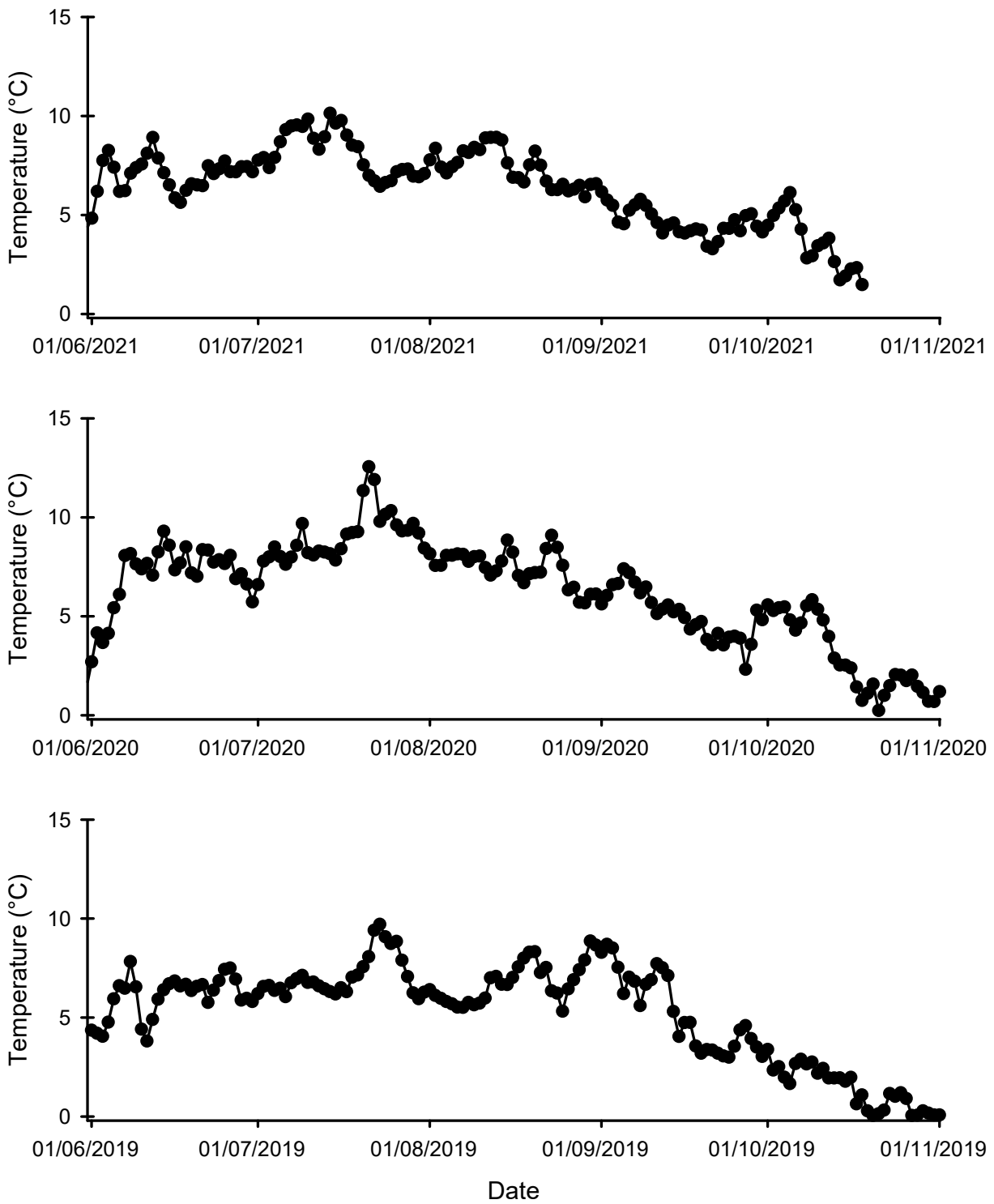


Figure 97. Fluctuations in the daily mean water temperatures from June to October in the Brook Rassijoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

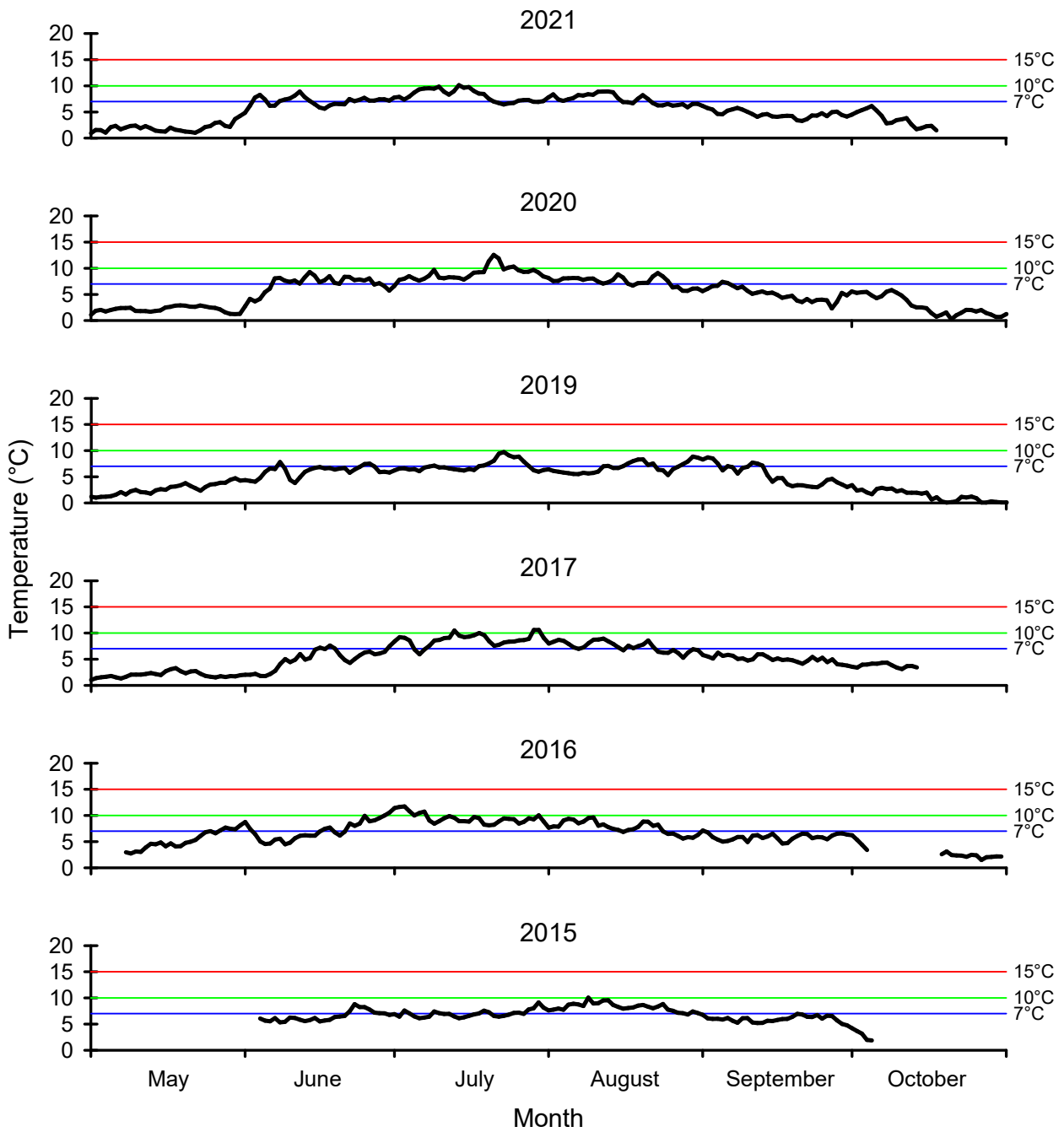


Figure 98. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the Brook Rassijoki. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

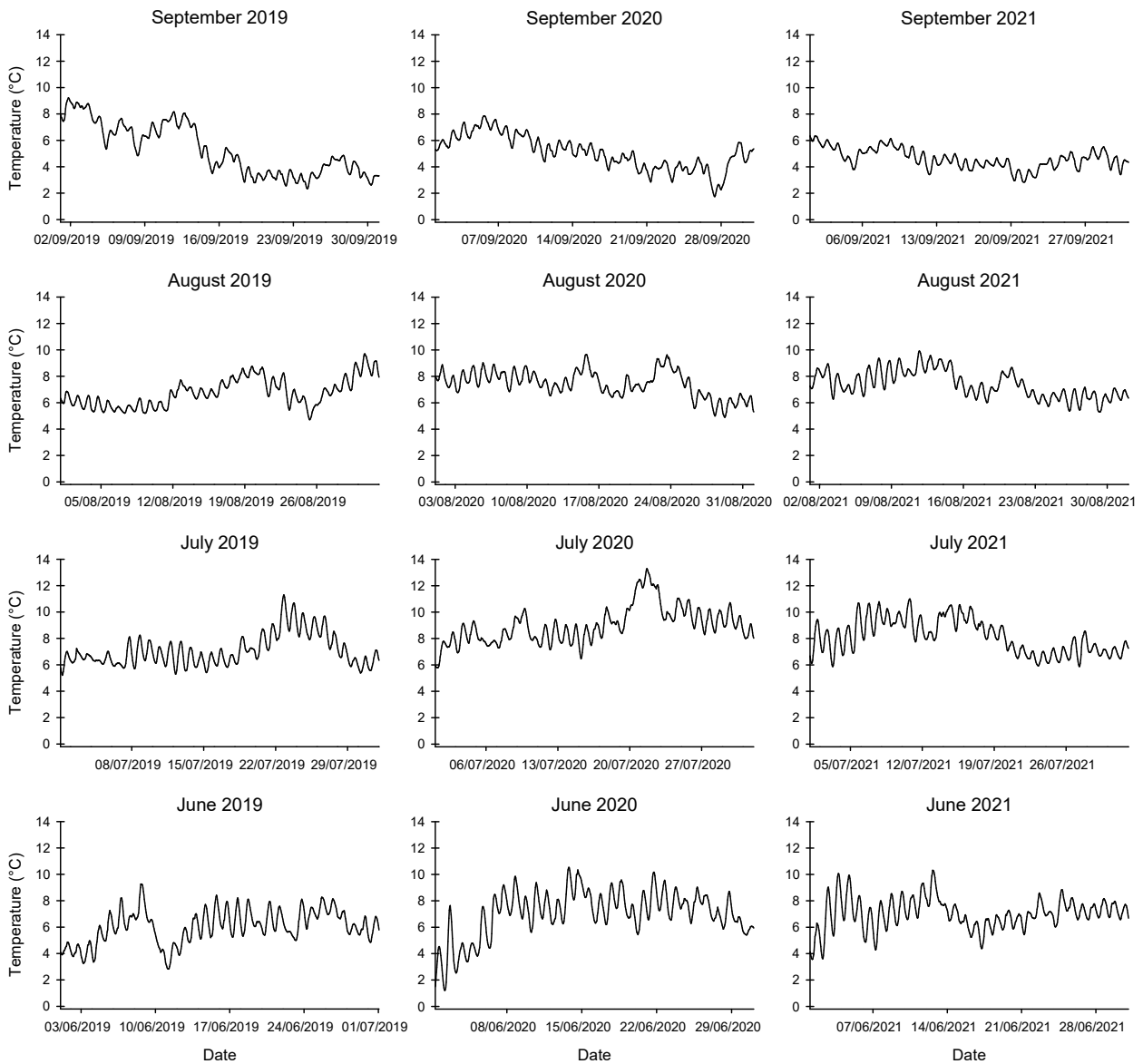


Figure 99. Hourly changes in the water temperatures in the Brook Rassijoki for the summer months in the year 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

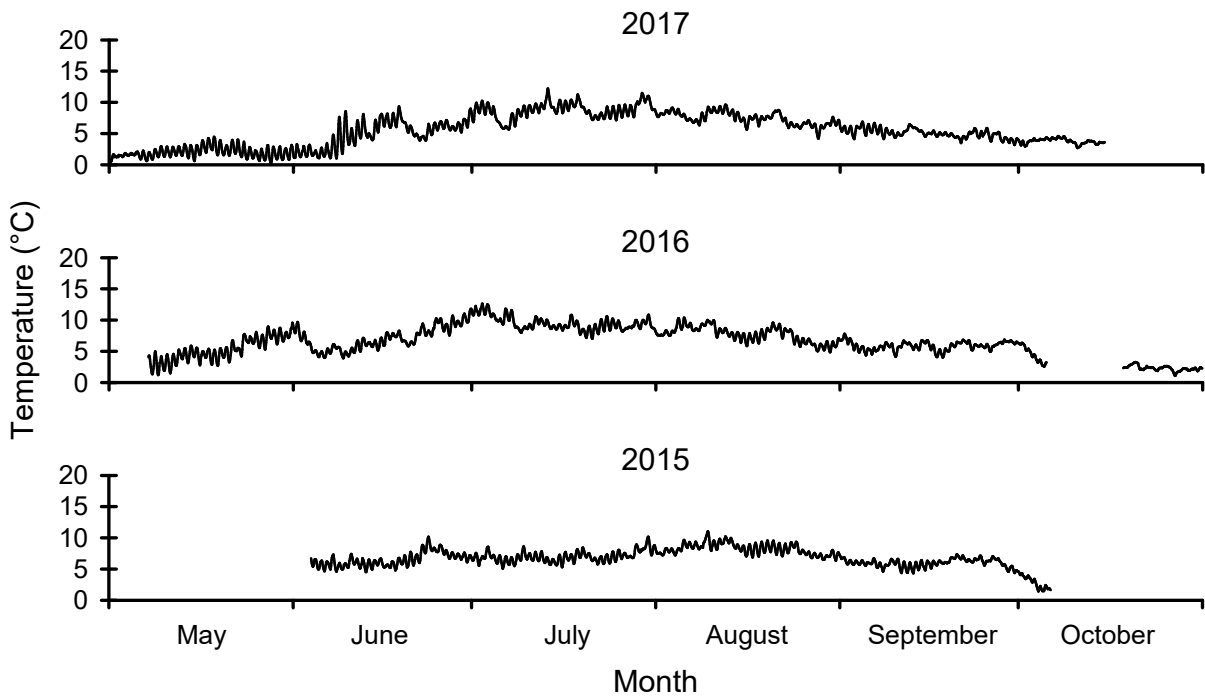


Figure 100. Long-term hourly changes in the water temperatures in the Brook Rassijoki for the summer months in the years 2015-2017. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

5.5 Water temperatures in the Brook Puksaljoki

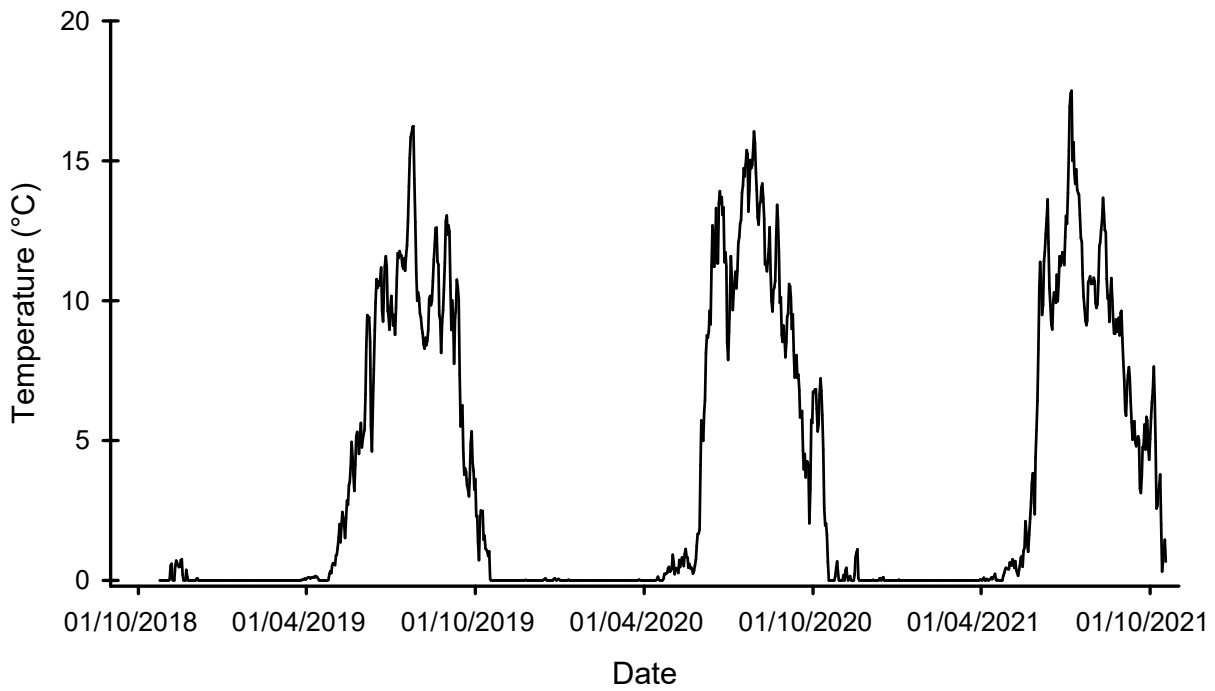


Figure 101. Daily mean water temperatures throughout three years in the Brook Puksaljoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

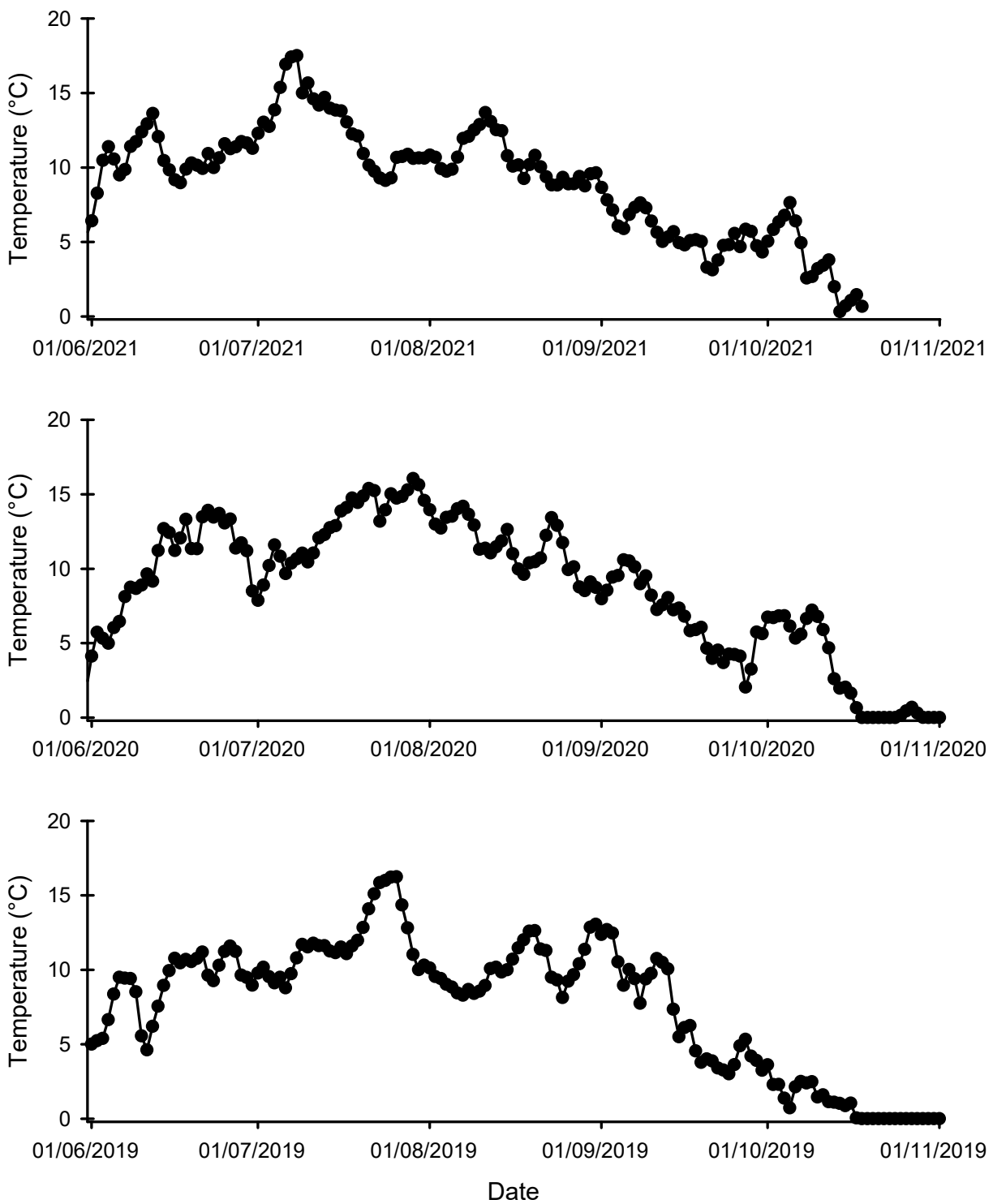


Figure 102. Fluctuations in the daily mean water temperatures from June to October in the Brook Puksaljoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

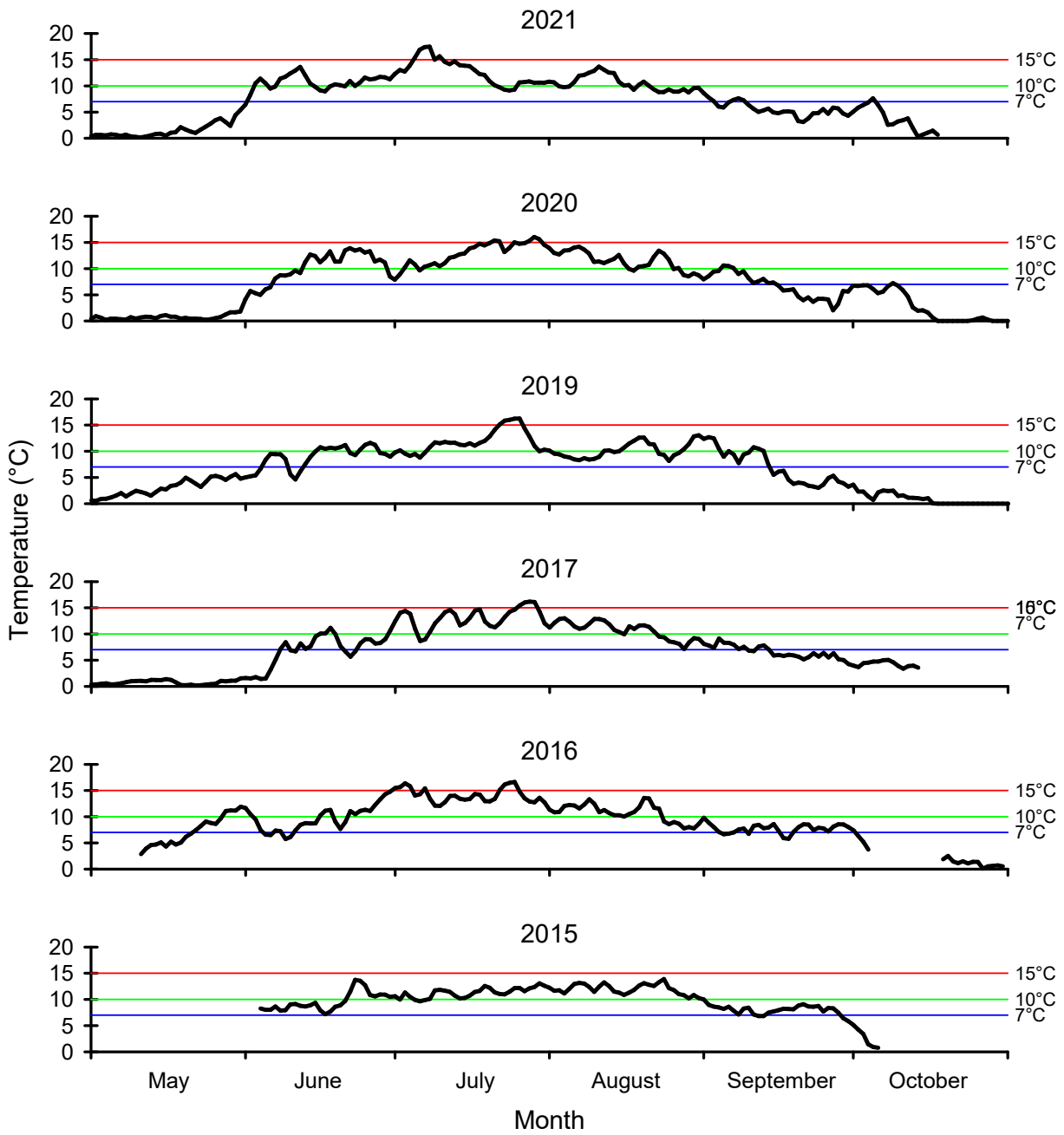


Figure 103. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the Brook Puksaljoki. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

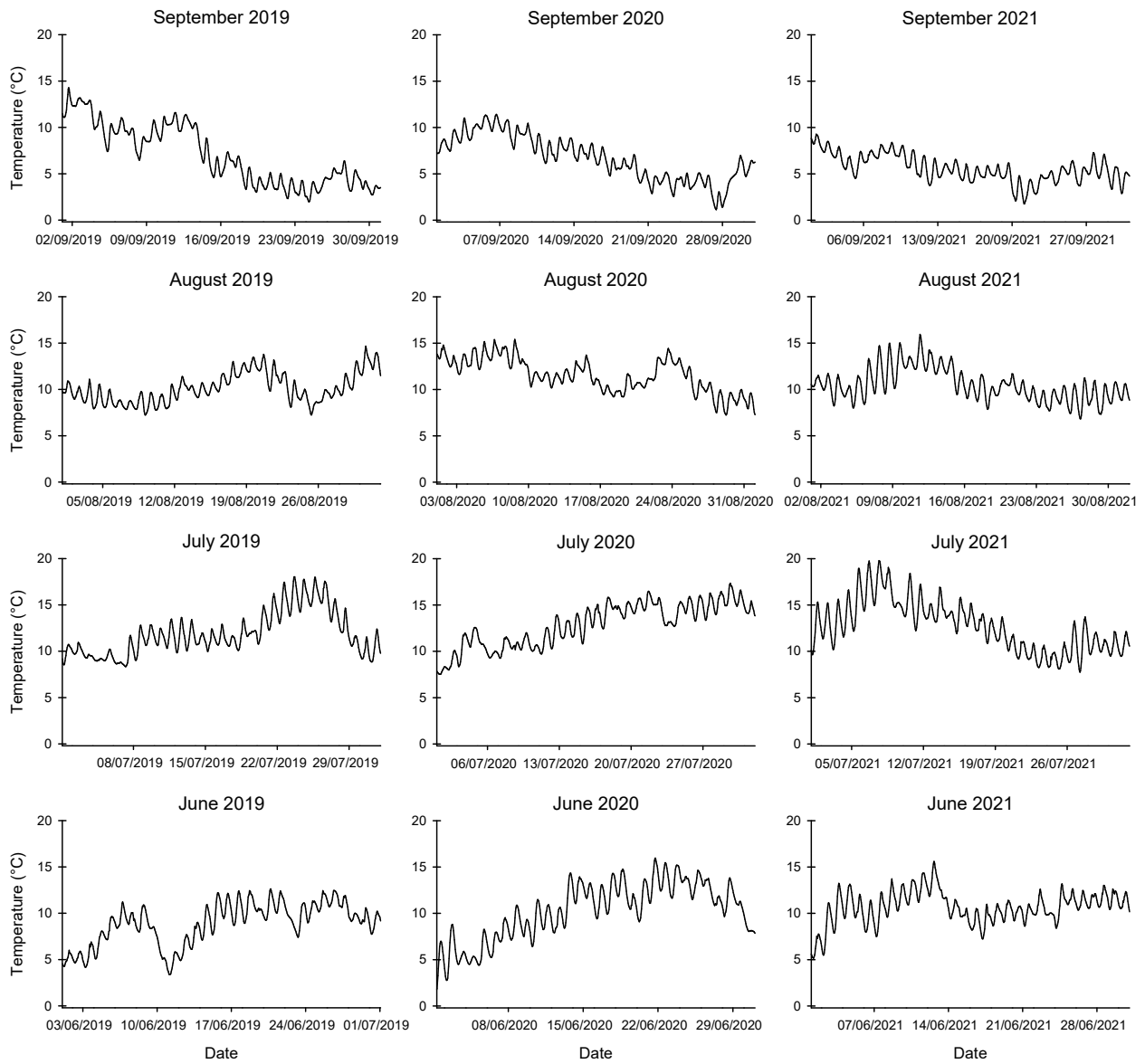


Figure 104. Hourly changes in the water temperatures in the Brook Puksaljoki for the summer months in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

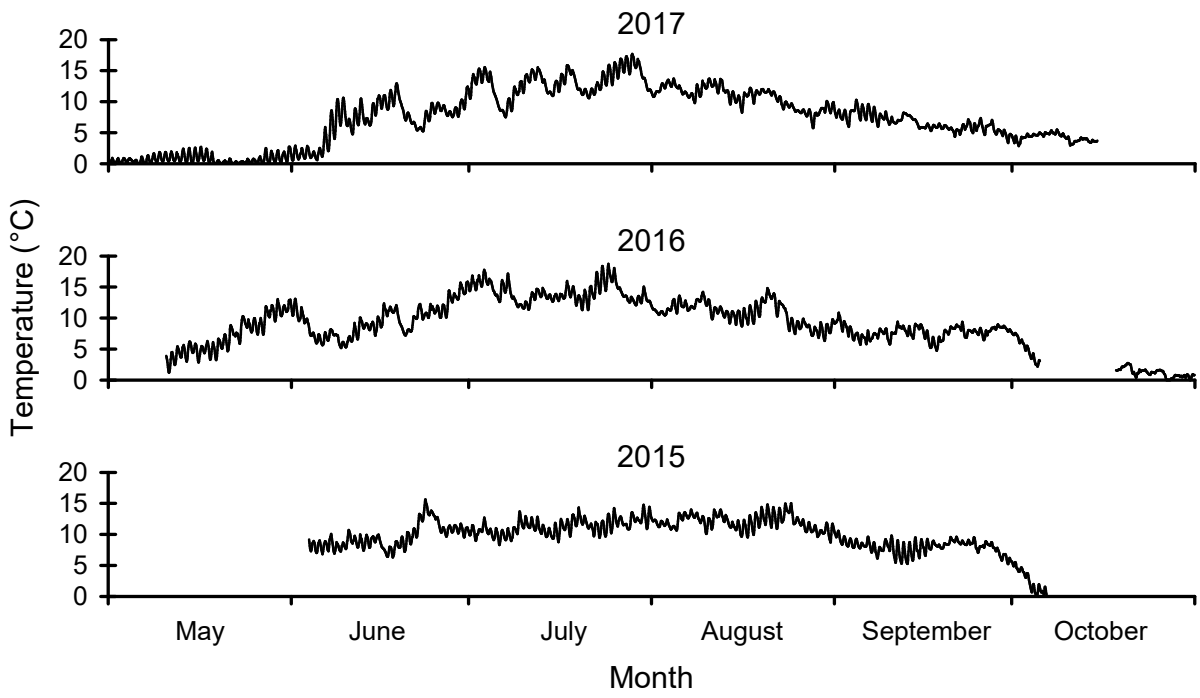


Figure 105. Long-term hourly changes in the water temperatures in the Brook Puksaljoki for the summer months in the years 2015-2017. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

5.6 Water temperatures in the Brook Leppäjoki

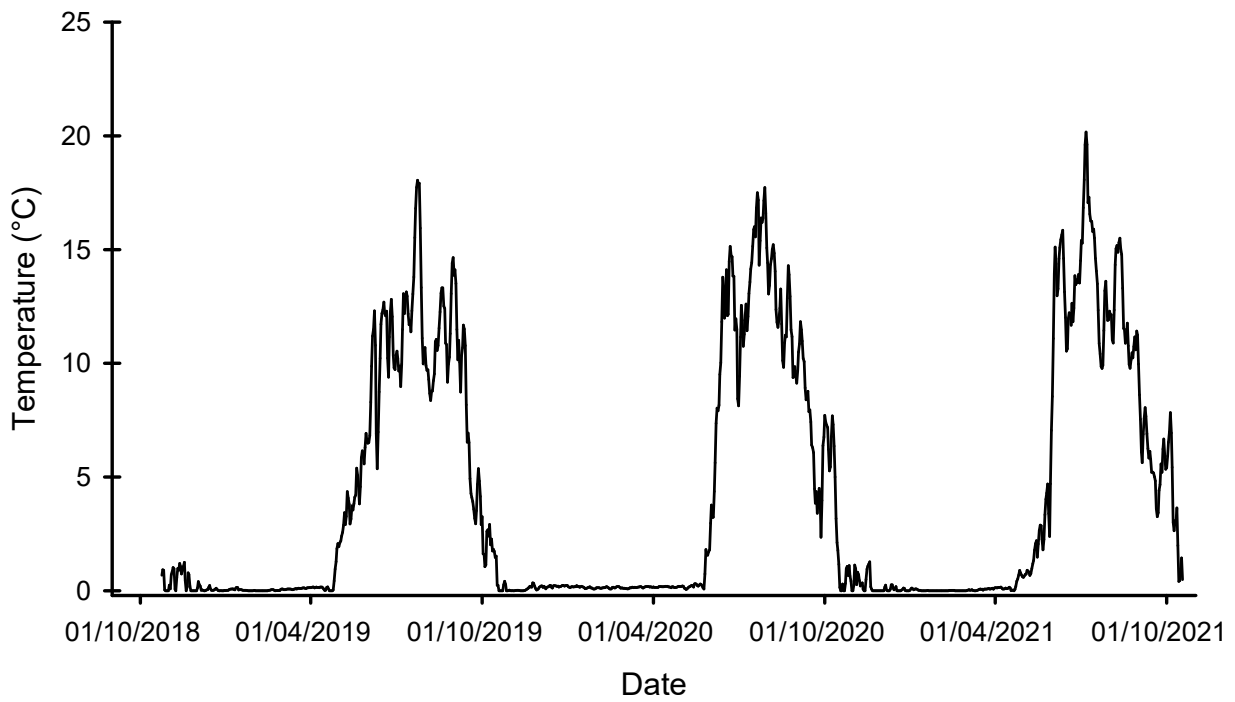


Figure 106. Daily mean water temperatures throughout three years in the Brook Leppäjoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

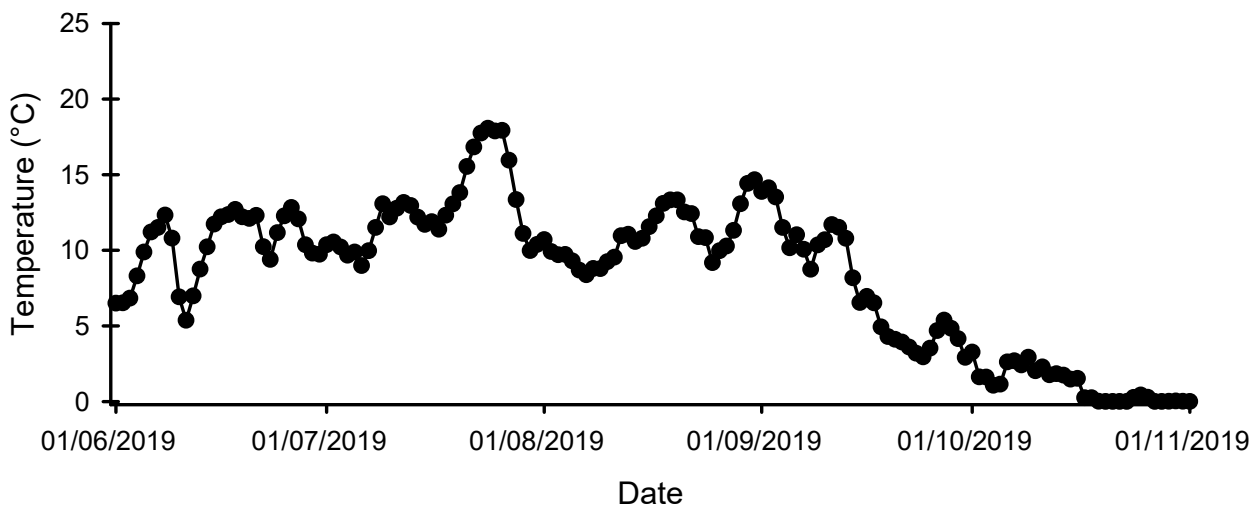
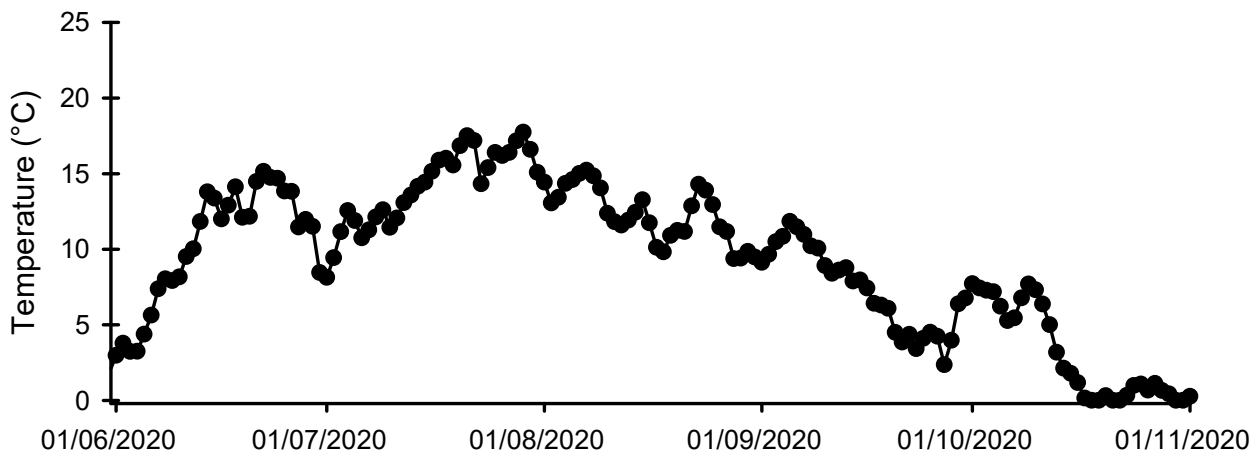
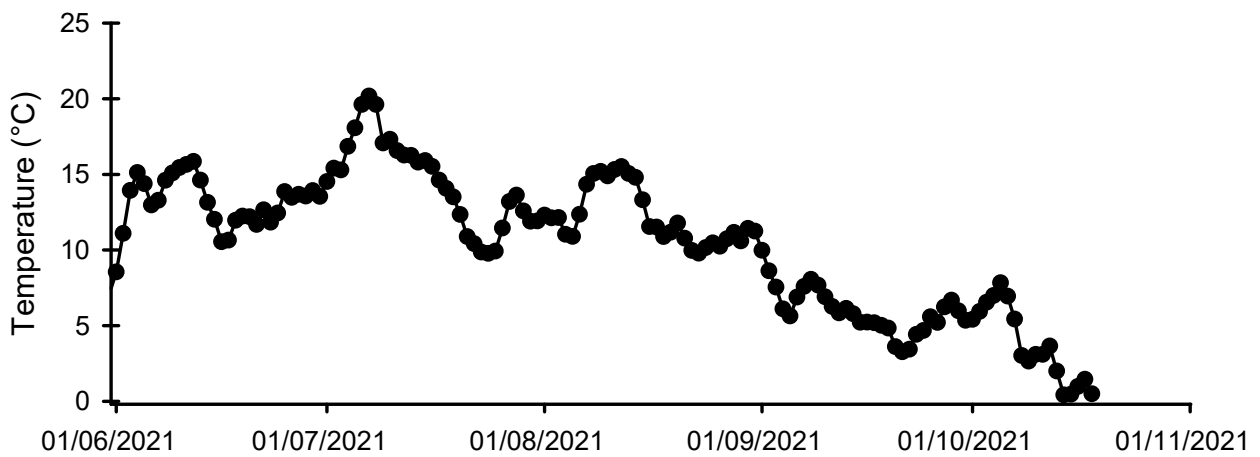


Figure 107. Fluctuations in the daily mean water temperatures from June to October in the Brook Leppäjoki in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

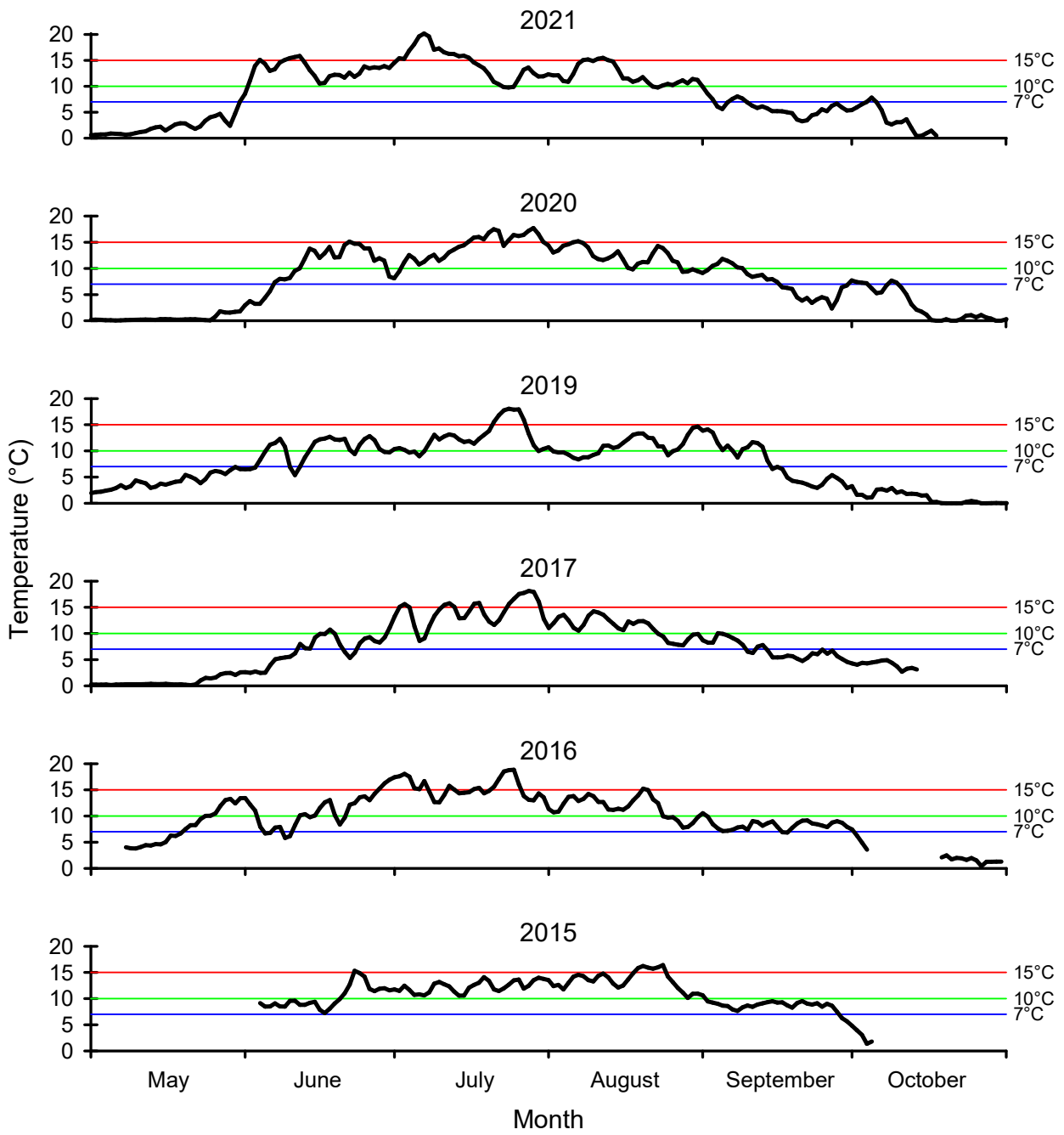


Figure 108. Daily mean water temperatures throughout open water season with 7 °C, 10 °C and 15 °C lines in the Brook Leppäjoki. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

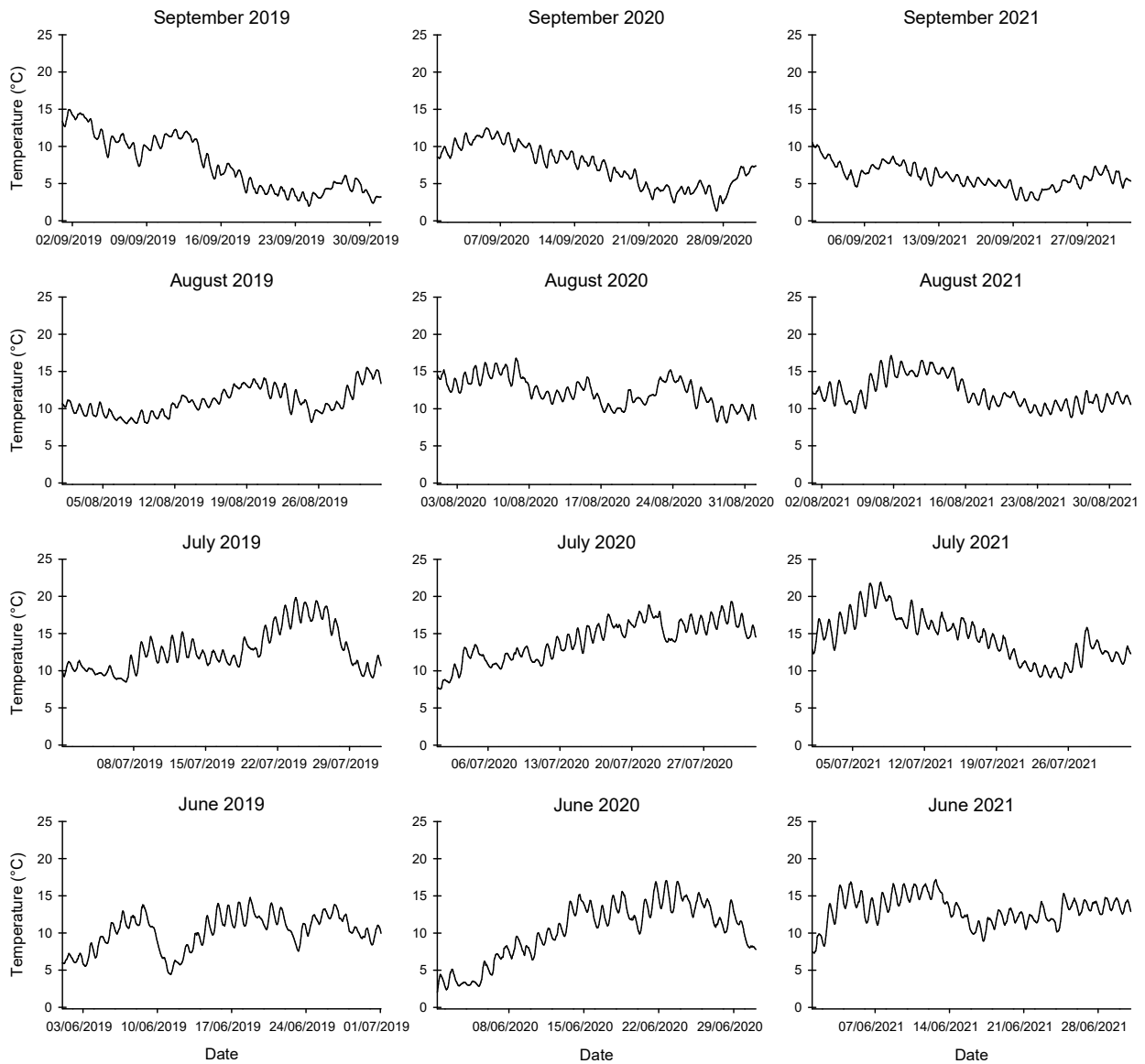


Figure 109. Hourly changes in the water temperatures in the Brook Leppäjoki for the summer months in the years 2019-2021. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).

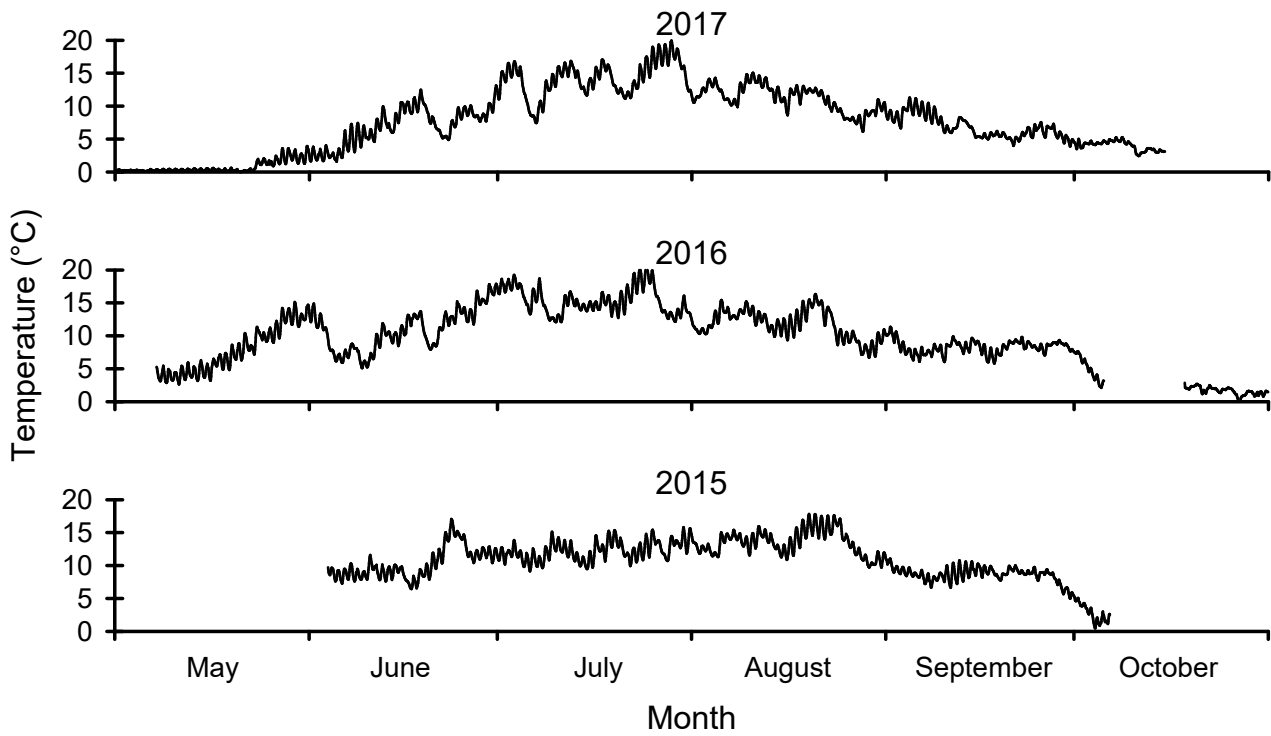


Figure 110. Long-term hourly changes in the water temperatures in the Brook Leppäjoki for the summer months in the years 2015-2017. Source; County Governor in Troms and Finnmark (Norway), Luke (Finland).