

**APPENDICES TO
PHYTOPLANKTON AND NUTRIENT DYNAMICS IN IRON GATE
AND COPCO RESERVOIRS, 2005-2010**



**PREPARED FOR THE
KLAMATH BASIN TRIBAL WATER QUALITY WORK GROUP**

BY

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APPENDICES

Appendix A: Depth-time isopleths of dissolved oxygen and pH

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Appendix E: Time series of biovolume and percent biovolume for major taxonomic groups and dominant phytoplankton species at shoreline stations

Appendix F: Time Series of Seasonal Cyanophyta Dynamics for 0.5-1m Depth, for Each Year

Appendix G: Annual Time Series of Biovolume and Nitrate Concentration for 0.5-1m Depth

APPENDIX A: Depth-time isopleths of dissolved oxygen and pH at IR01 and CR01

The main text of the report includes depth-time isopleths of water temperature and dissolved oxygen concentration. This appendix presents supplemental plots of pH and dissolved oxygen saturation.

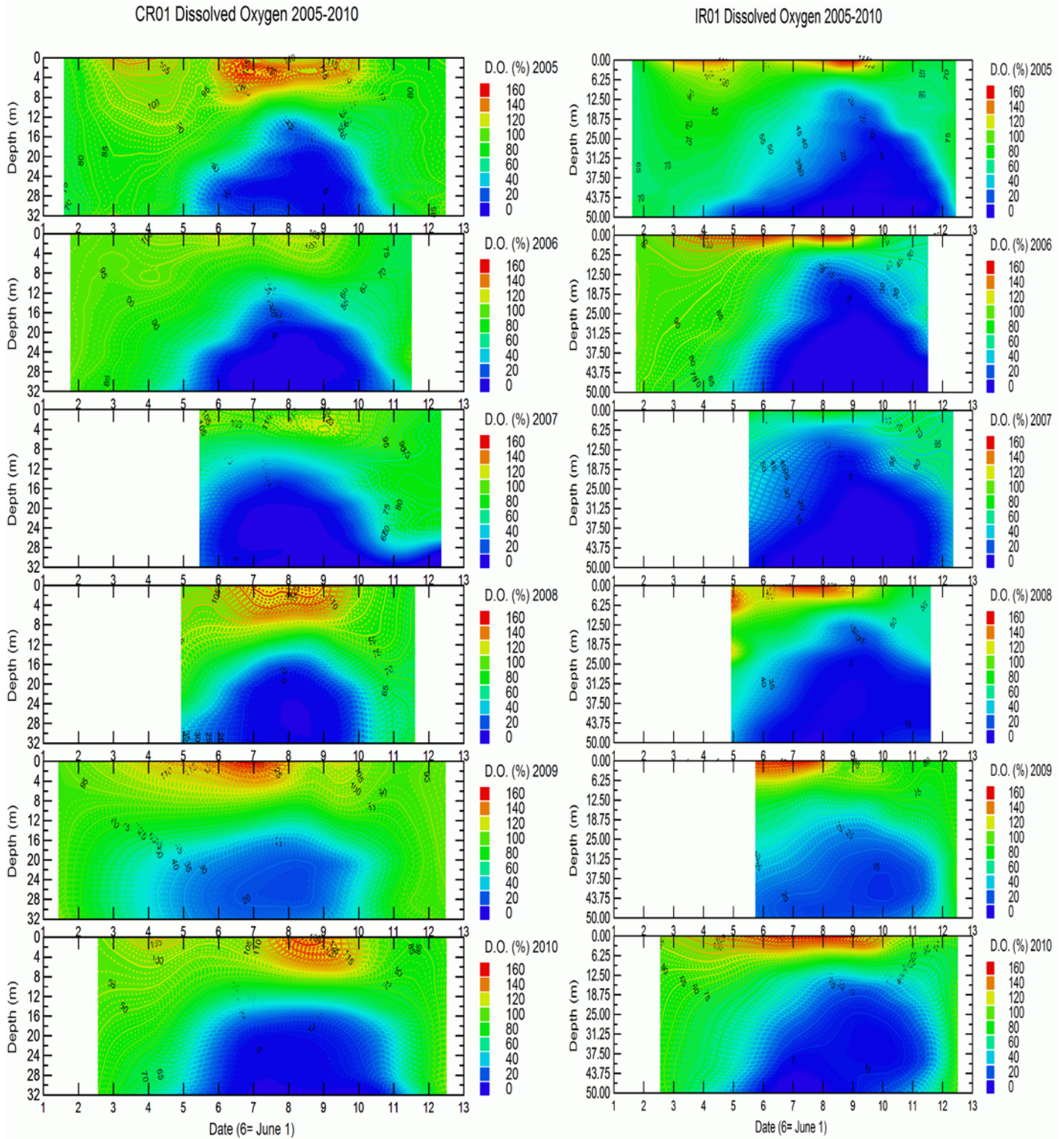


Figure A1. Depth-time distributions of isopleths of dissolved oxygen (% saturation) at station CR01 in Copco Reservoir and IR01 in Iron Gate Reservoir, January 2005-December 2010.

CR01 pH 2005-2010

IR01 pH 2005-2010

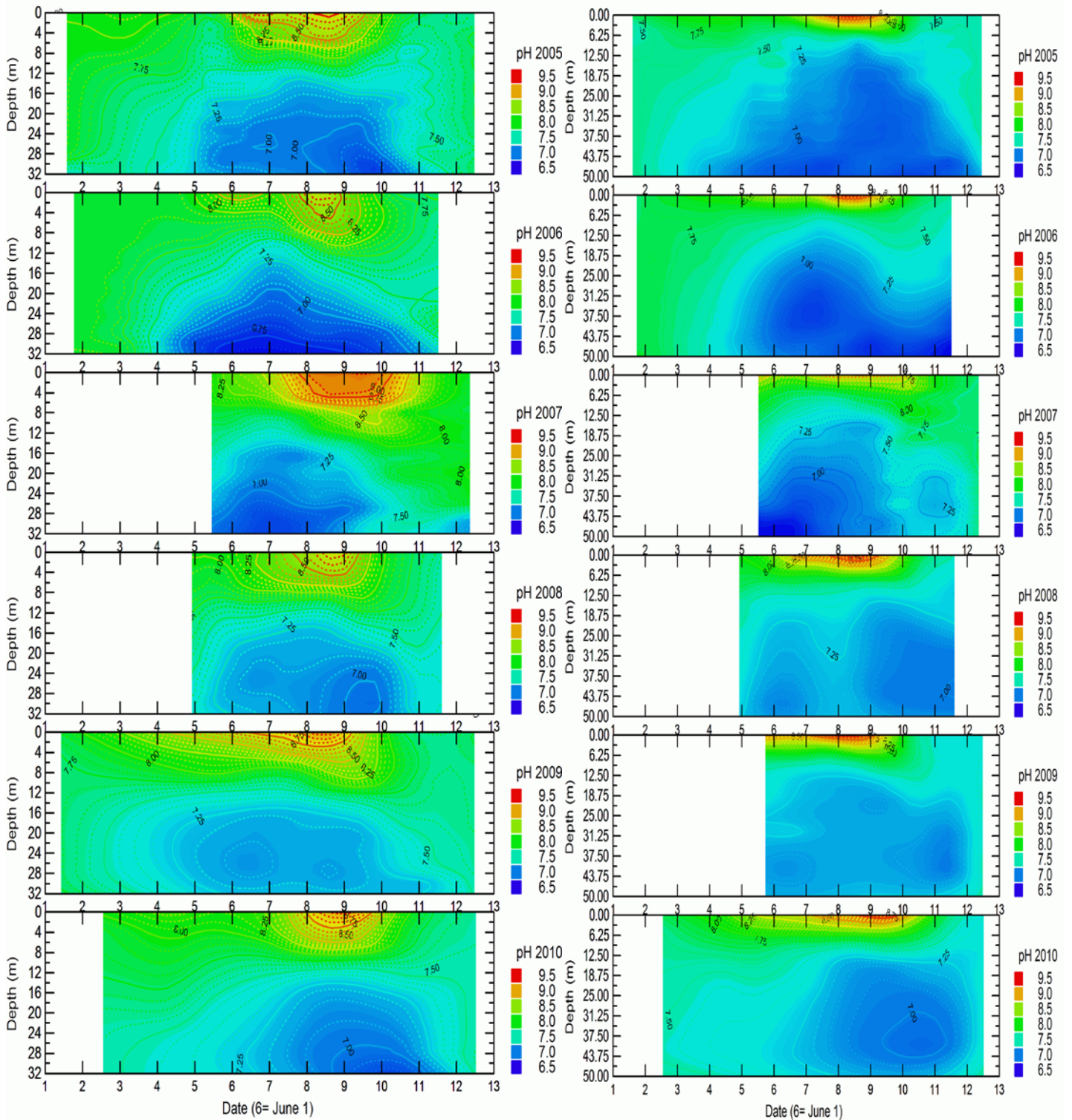


Figure A2. Depth-time distributions of isopleths of pH at station CR01 in Copco Reservoir and IR01 in Iron Gate Reservoir, January 2005-December 2010.

APPENDIX B: Depth profiles of temperature, dissolved oxygen, and pH for each sampled date at IR01 and CR01

Note: K above graph indicates Karuk Tribe sampling and P indicates PacifiCorp

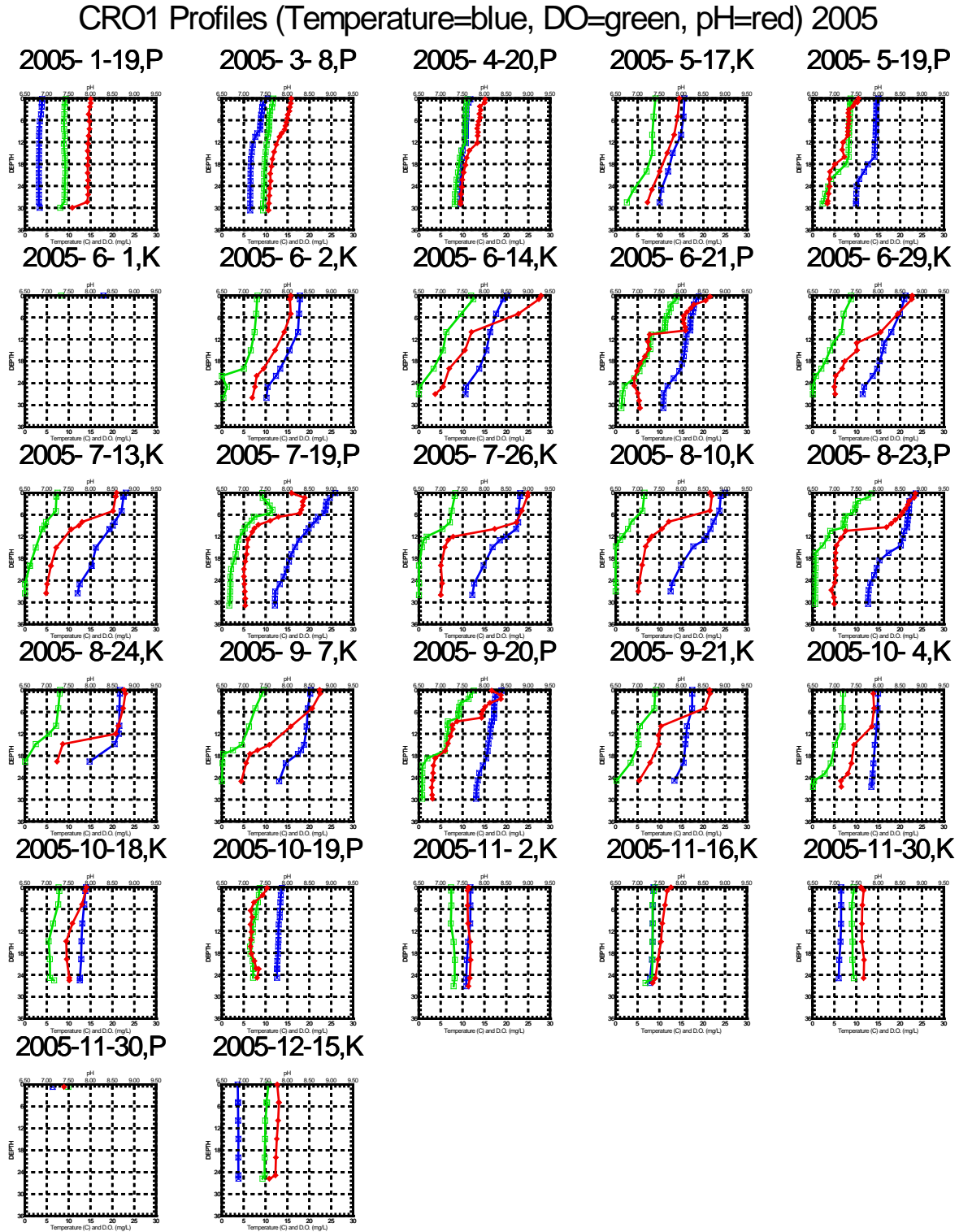


Fig. B1. Depth profiles of temperature, D.O., and pH at Copco Reservoir site CR01 in 2005.

CRO1 Profiles (Temperature=blue, DO=green, pH=red) 2006

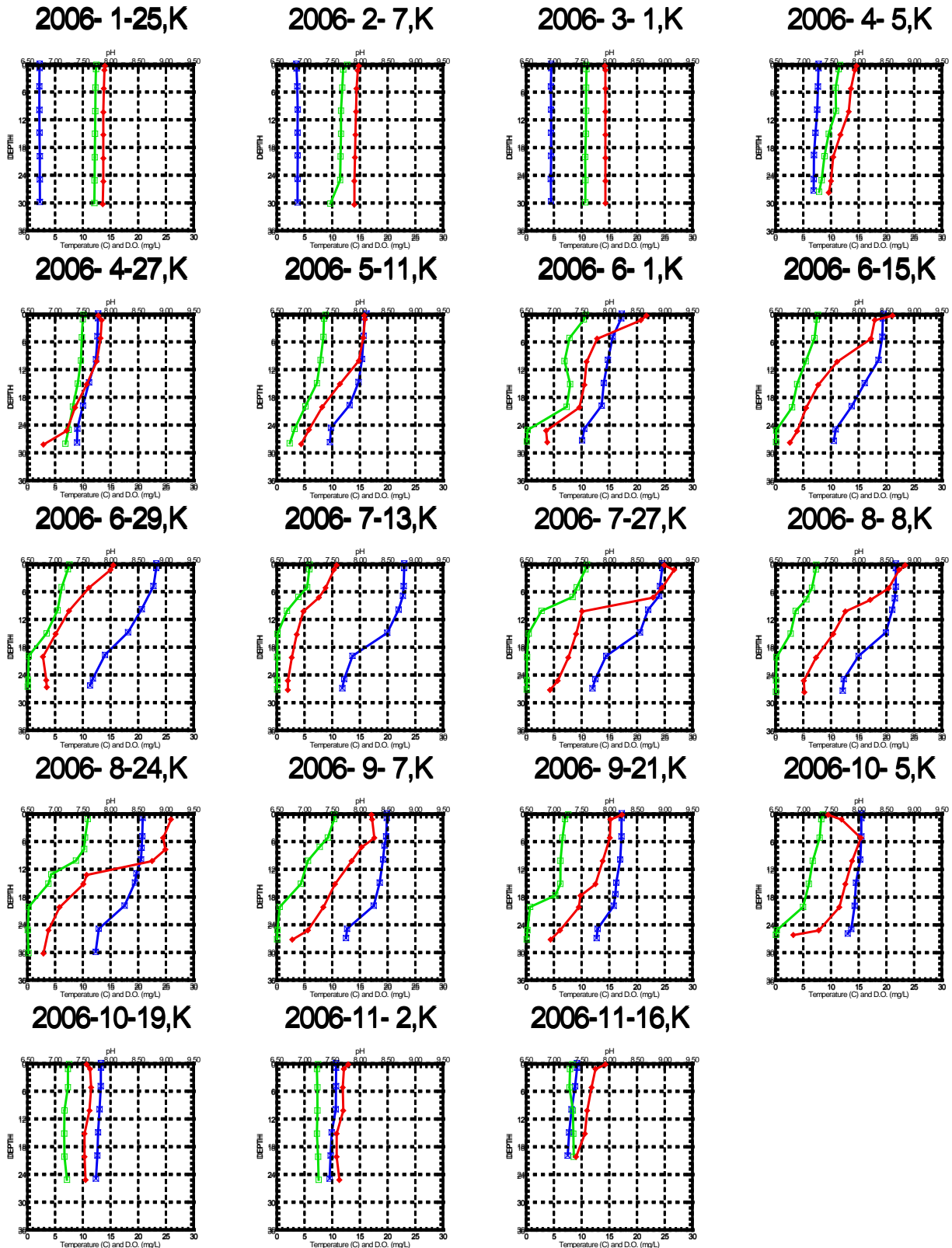


Fig. B2. Depth profiles of temperature, D.O., and pH at Copco Reservoir site CR01 in 2006.

CRO1 Profiles (Temperature=blue, DO=green, pH=red) 2006

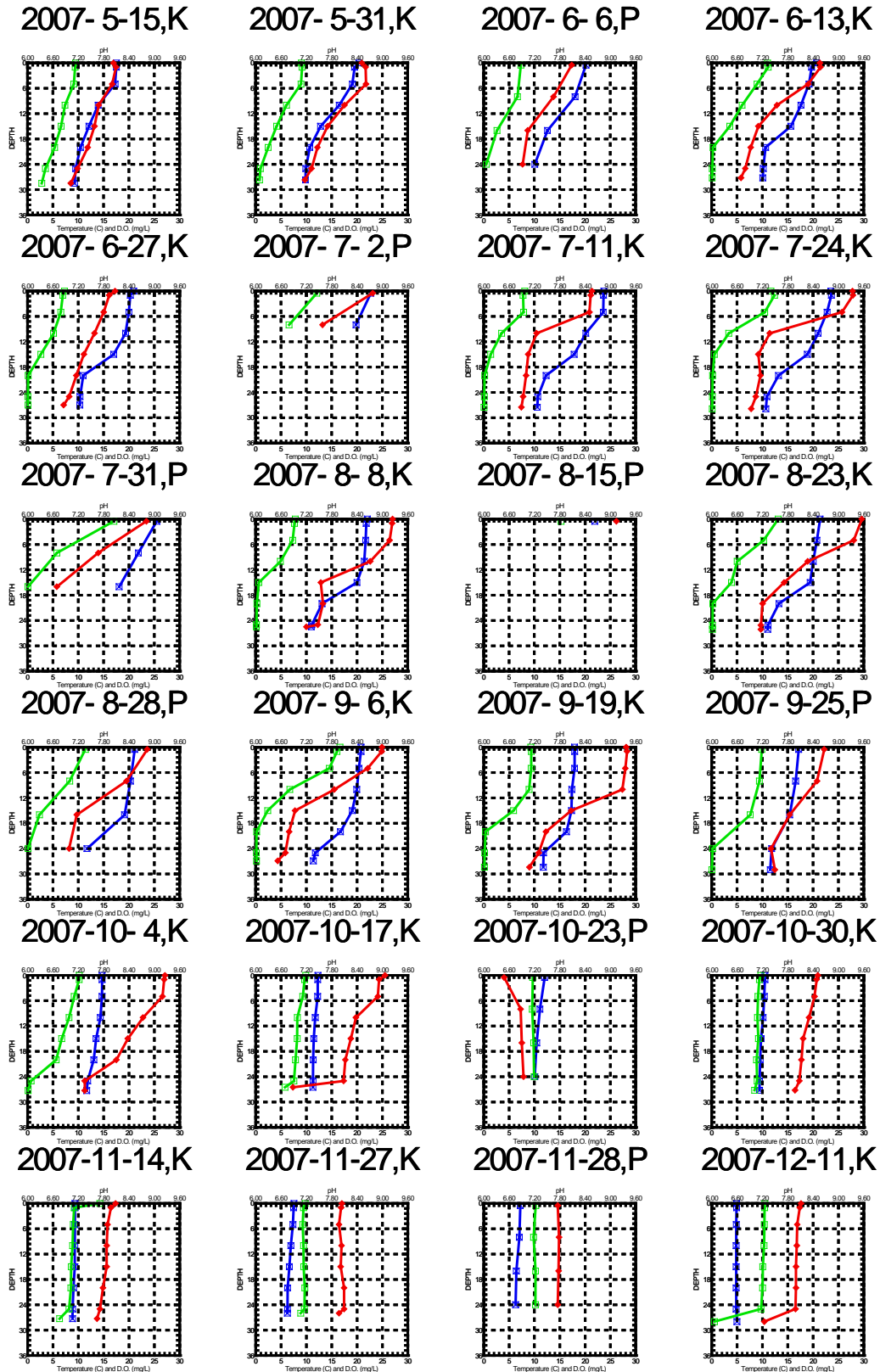


Fig. B3. Depth profiles of temperature, D.O., and pH at Copco Reservoir site CR01 in 2007.

CRO1 Profiles (Temperature=blue, DO=green, pH=red) 2008

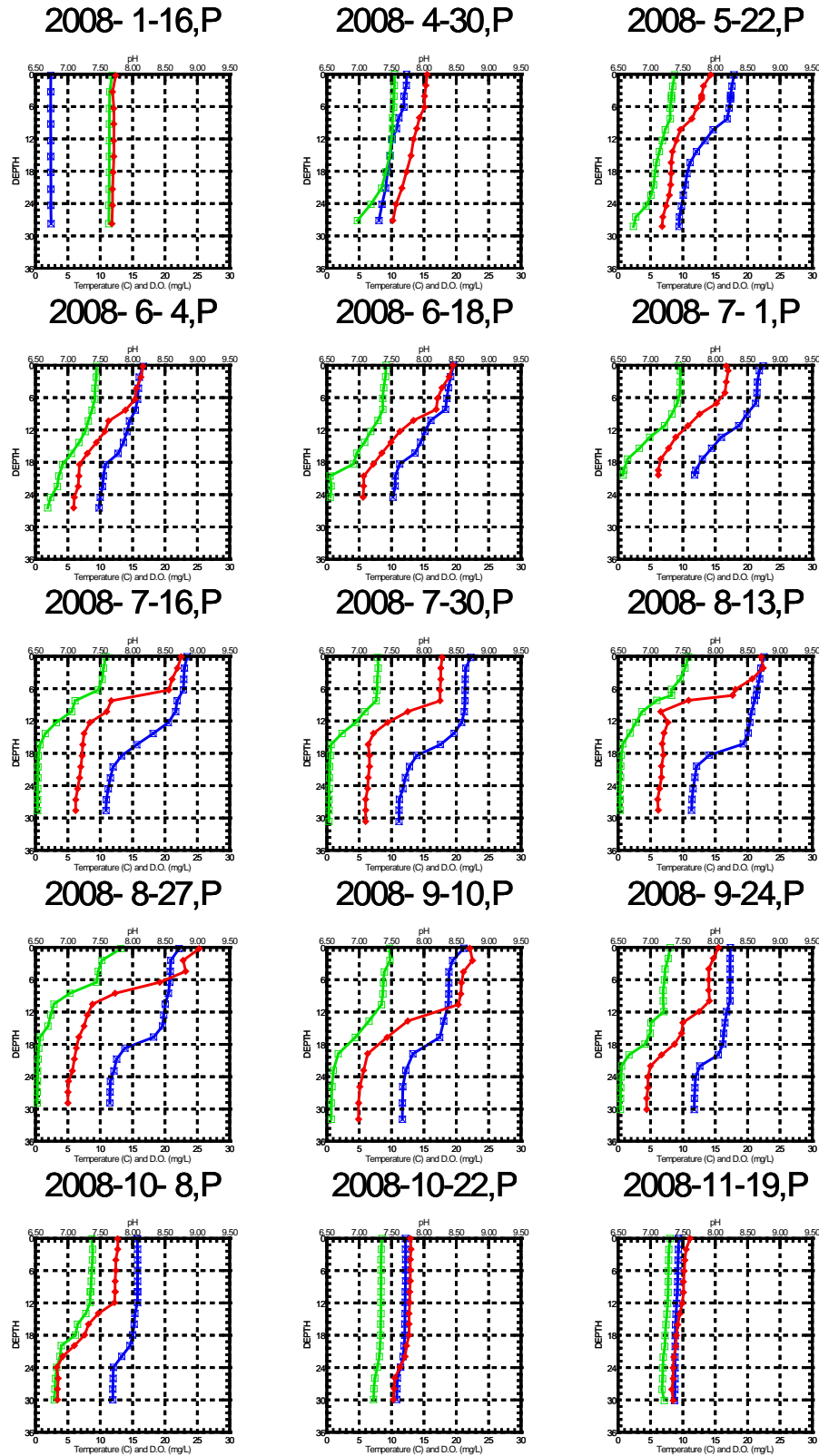


Fig. B4. Depth profiles of temperature, D.O., and pH at Copco Reservoir site CR01 in 2008.

CRO1 Profiles (Temperature=blue, DO=green, pH=red) 2009

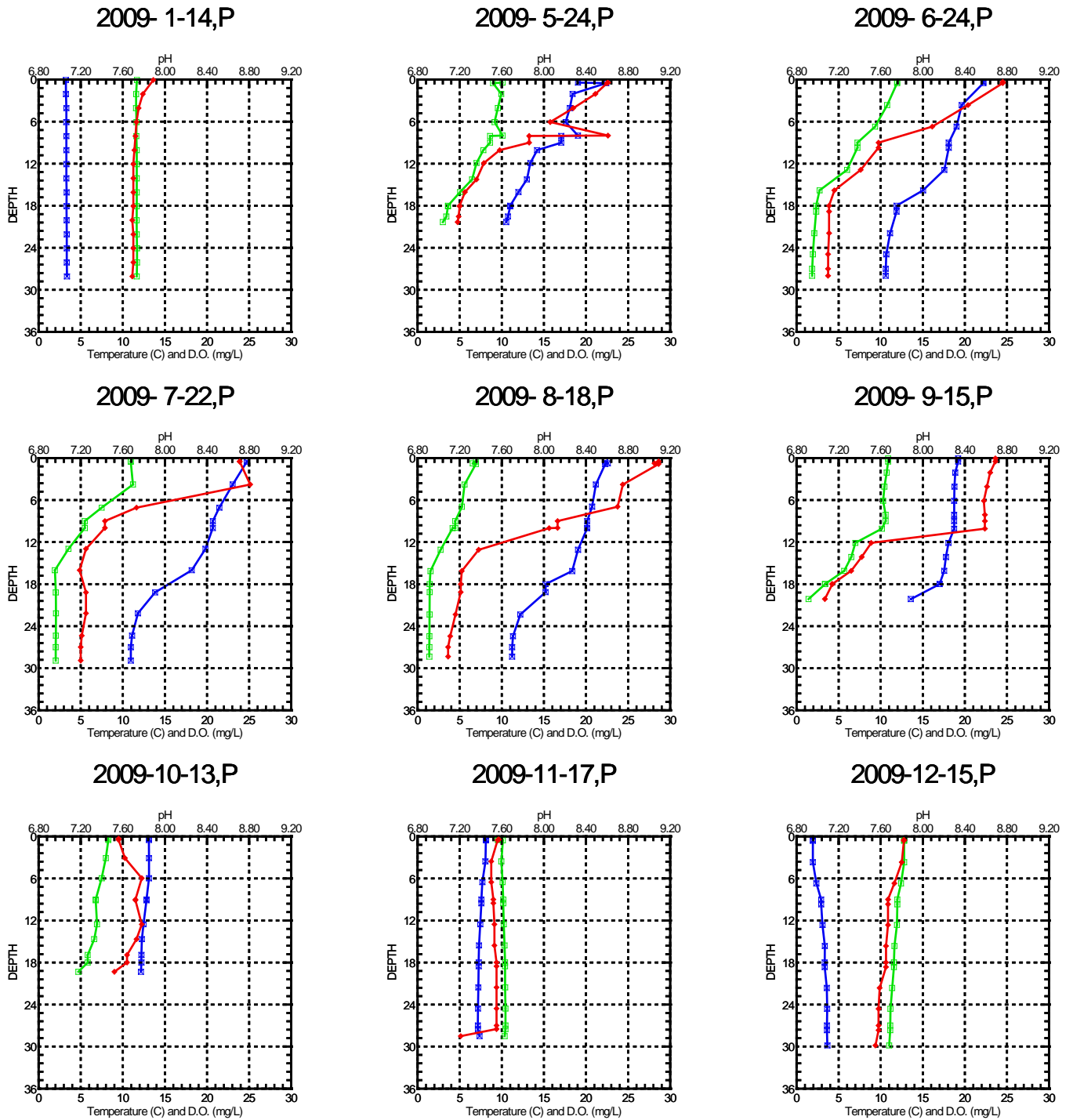


Fig. B5. Depth profiles of temperature, D.O., and pH at Copco Reservoir site CR01 in 2009.

CRO1 Profiles (Temperature=blue, DO=green, pH=red) 2010

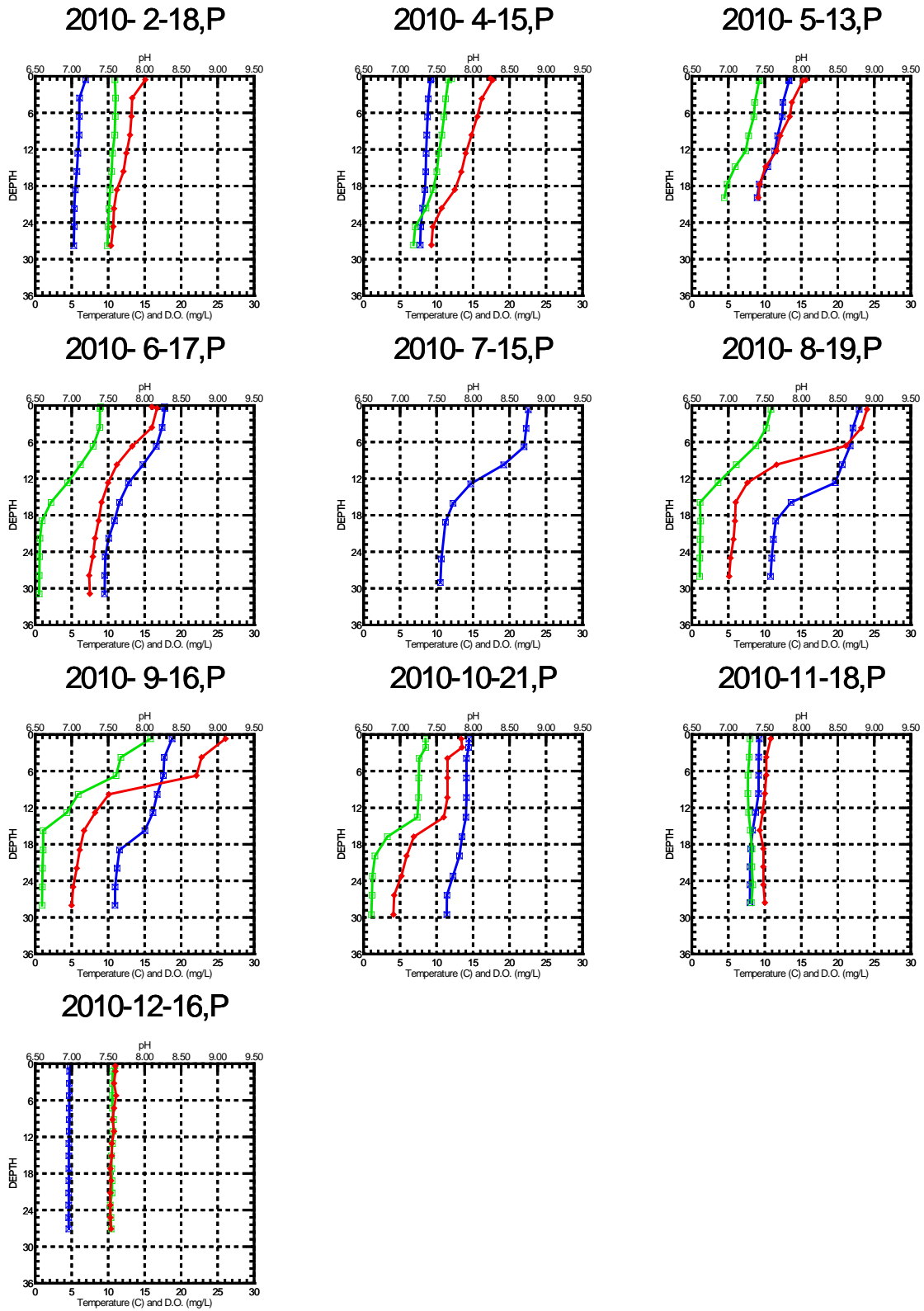


Fig. B6. Depth profiles of temperature, D.O., and pH at Copco Reservoir site CR01 in 2010.

IR01 Profiles (Temperature=blue, DO=green, pH=red) 2005

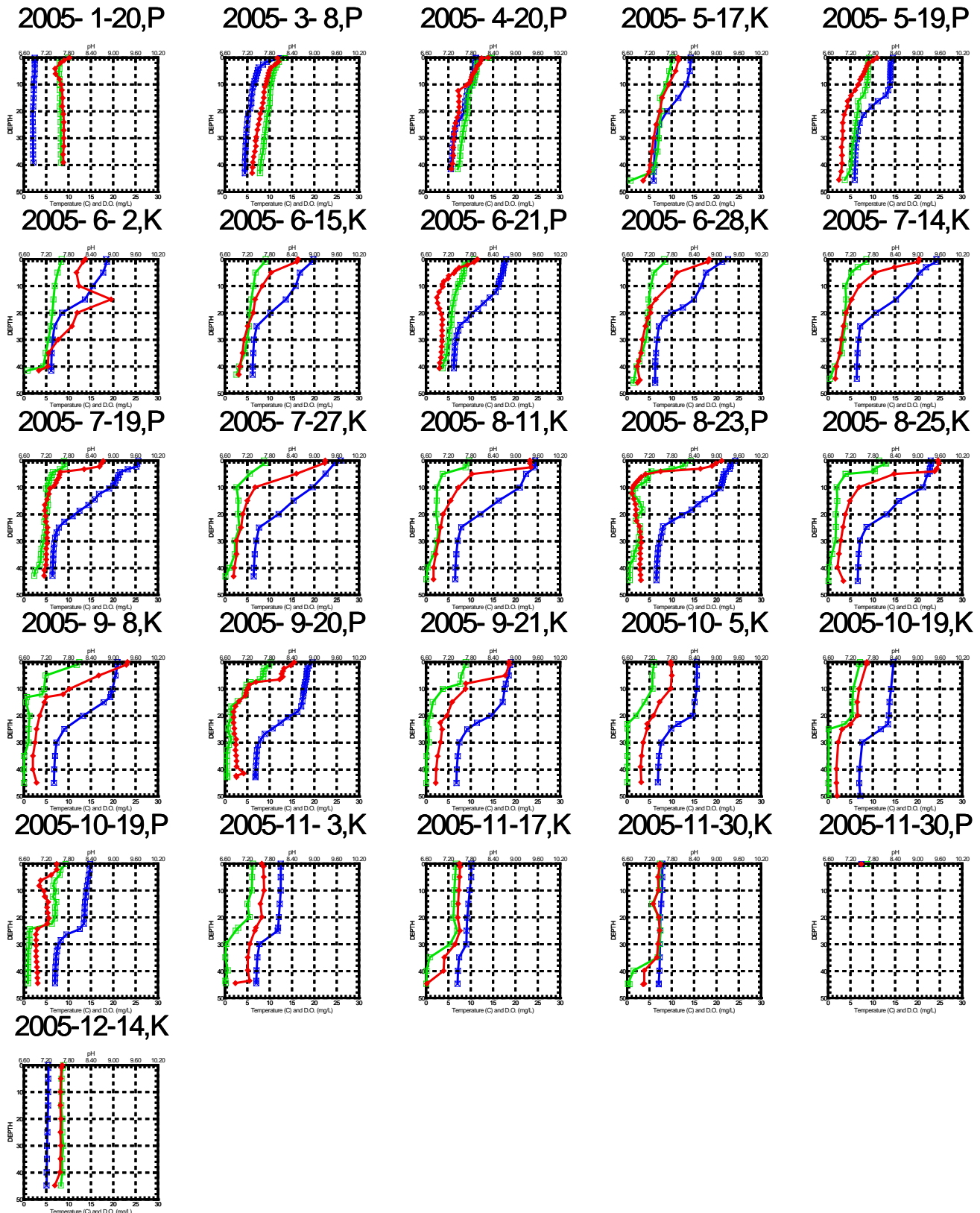


Fig. B7. Depth profiles of temperature, D.O., and pH at Iron Gate Reservoir site IR01 in 2005.

IR01 Profiles (Temperature=blue, DO=green, pH=red) 2006

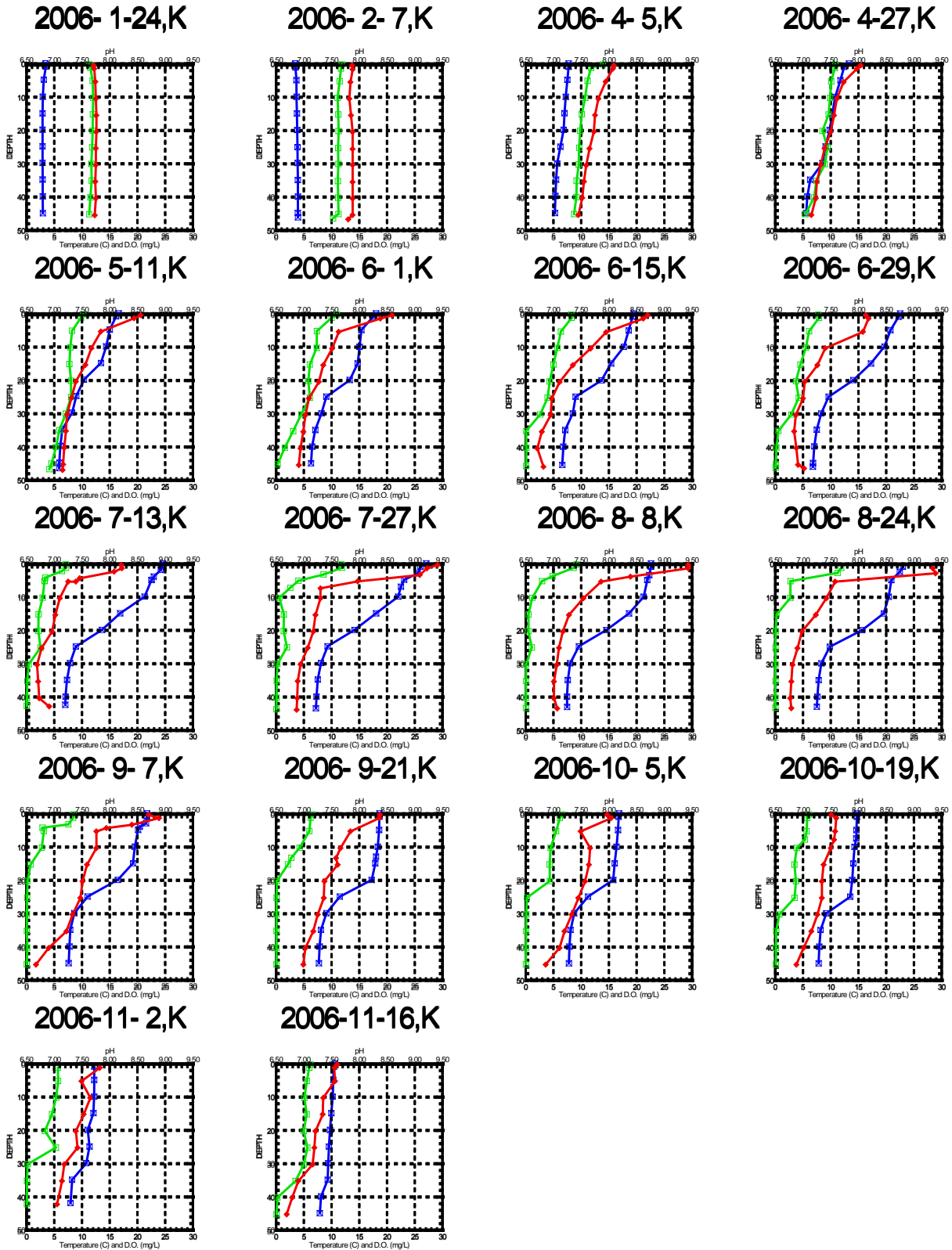


Fig. B8. Depth profiles of temperature, D.O., and pH at Iron Gate Reservoir site IR01in 2006.

IR01 Profiles (Temperature=blue, DO=green, pH=red) 2007

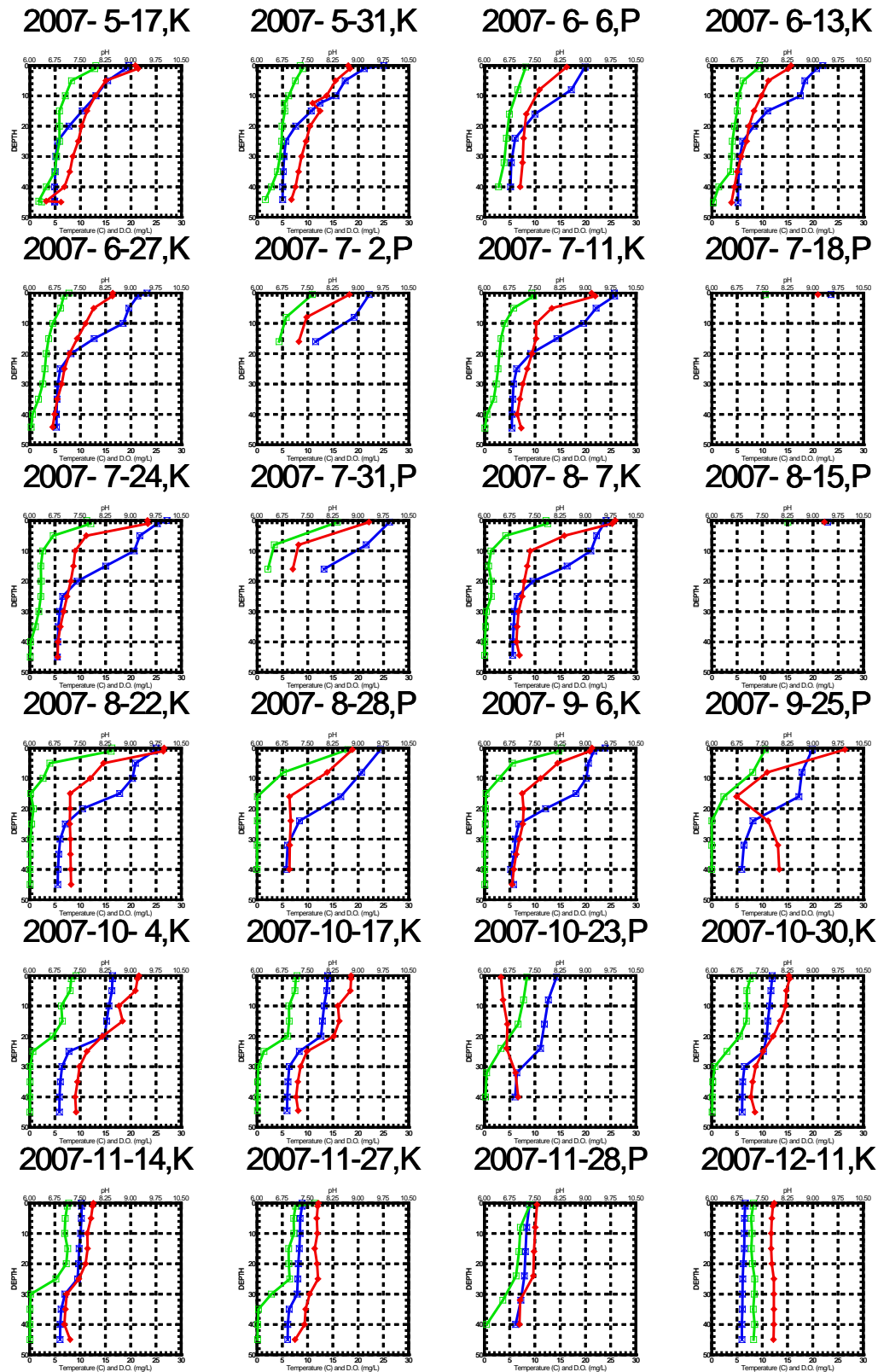


Fig. B9. Depth profiles of temperature, D.O., and pH at Iron Gate Reservoir site IR01 in 2007.

IR01 Profiles (Temperature=blue, DO=green, pH=red) 2008

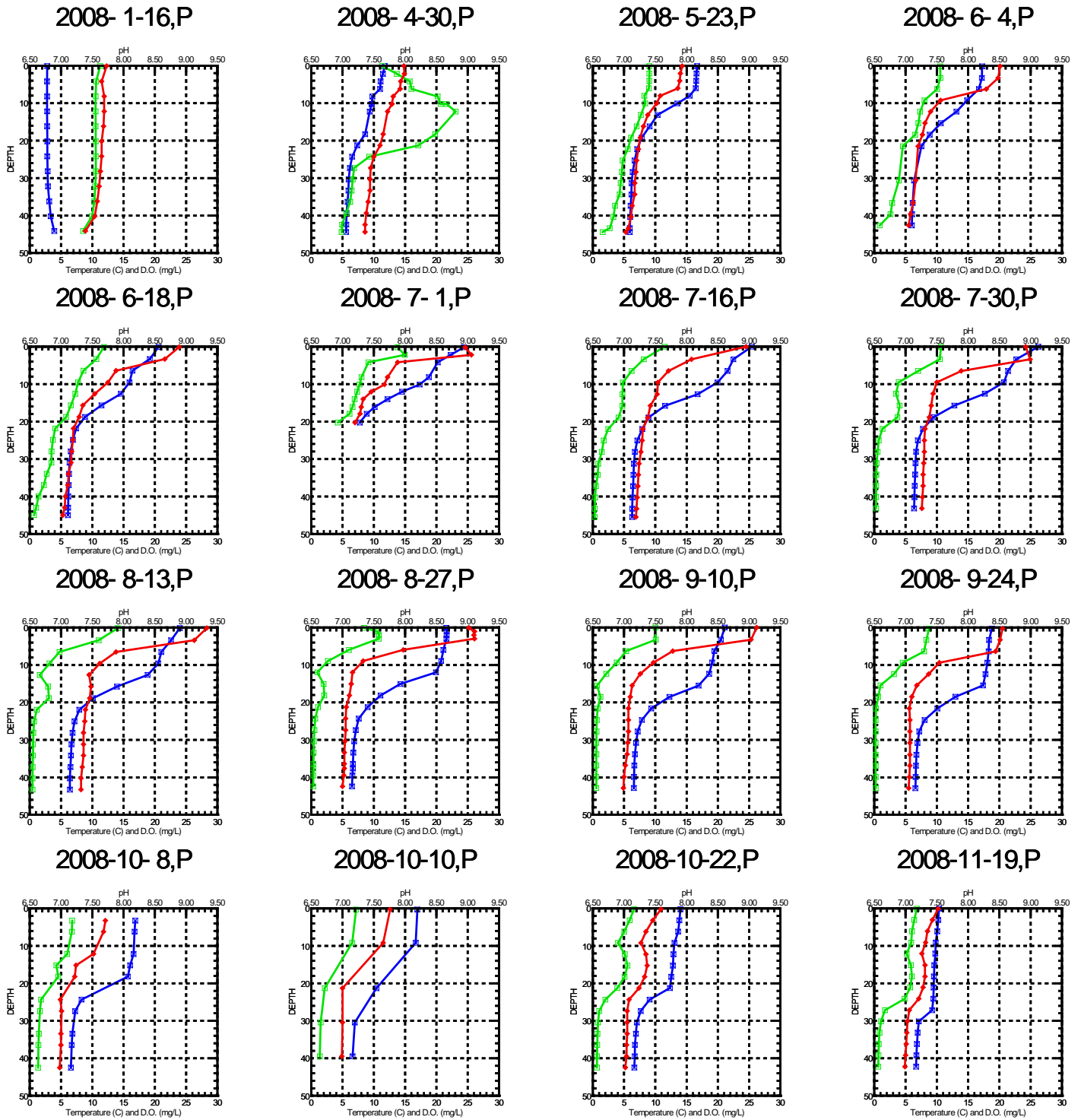


Fig. B10. Depth profiles of temperature, D.O., and pH at Iron Gate Reservoir site IR01 in 2008.

IR01 Profiles (Temperature=blue, DO=green, pH=red) 2009

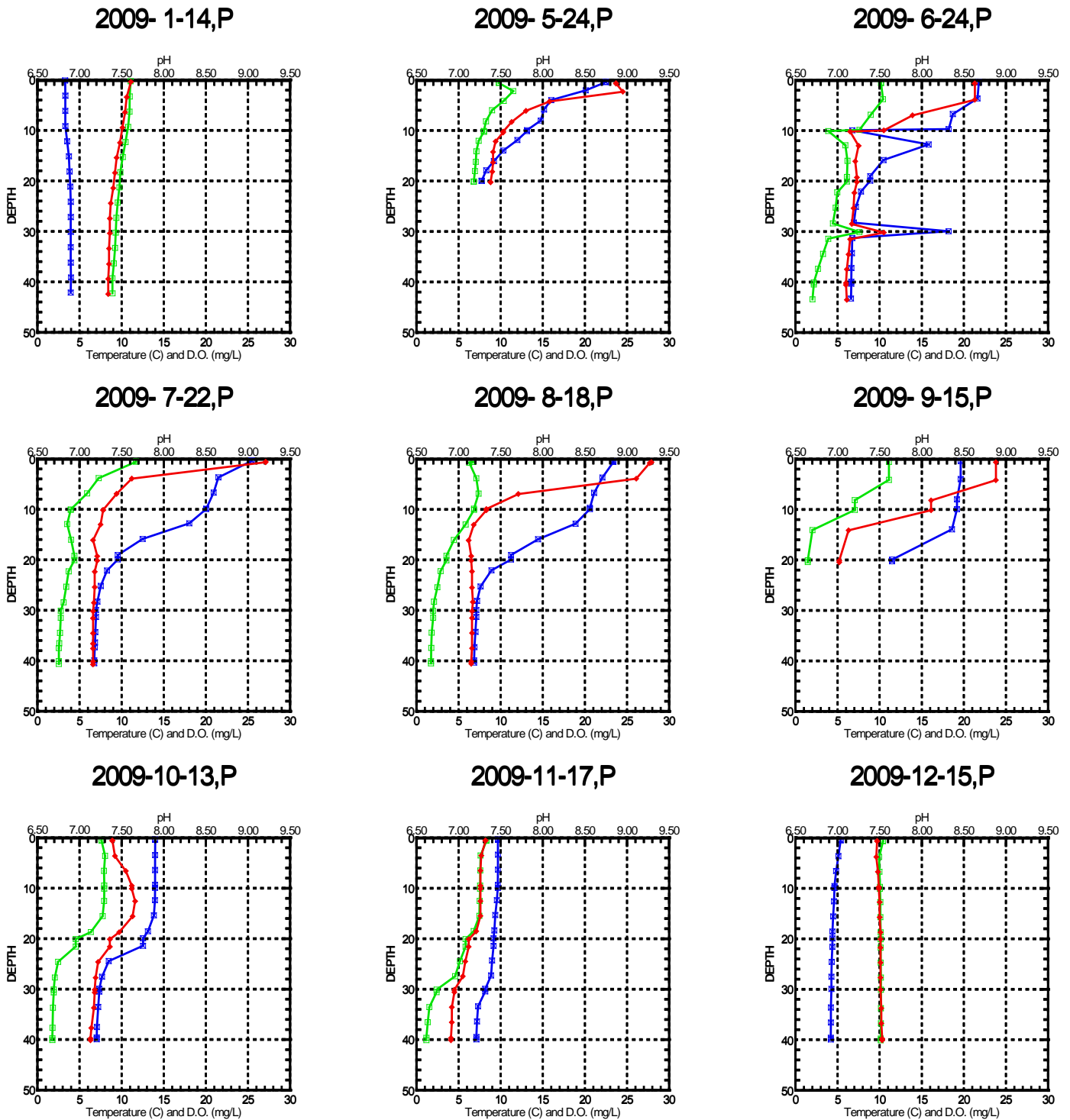


Fig. B11. Depth profiles of temperature, D.O., and pH at Iron Gate Reservoir site IR01 in 2009.

IR01 Profiles (Temperature=blue, DO=green, pH=red) 2010

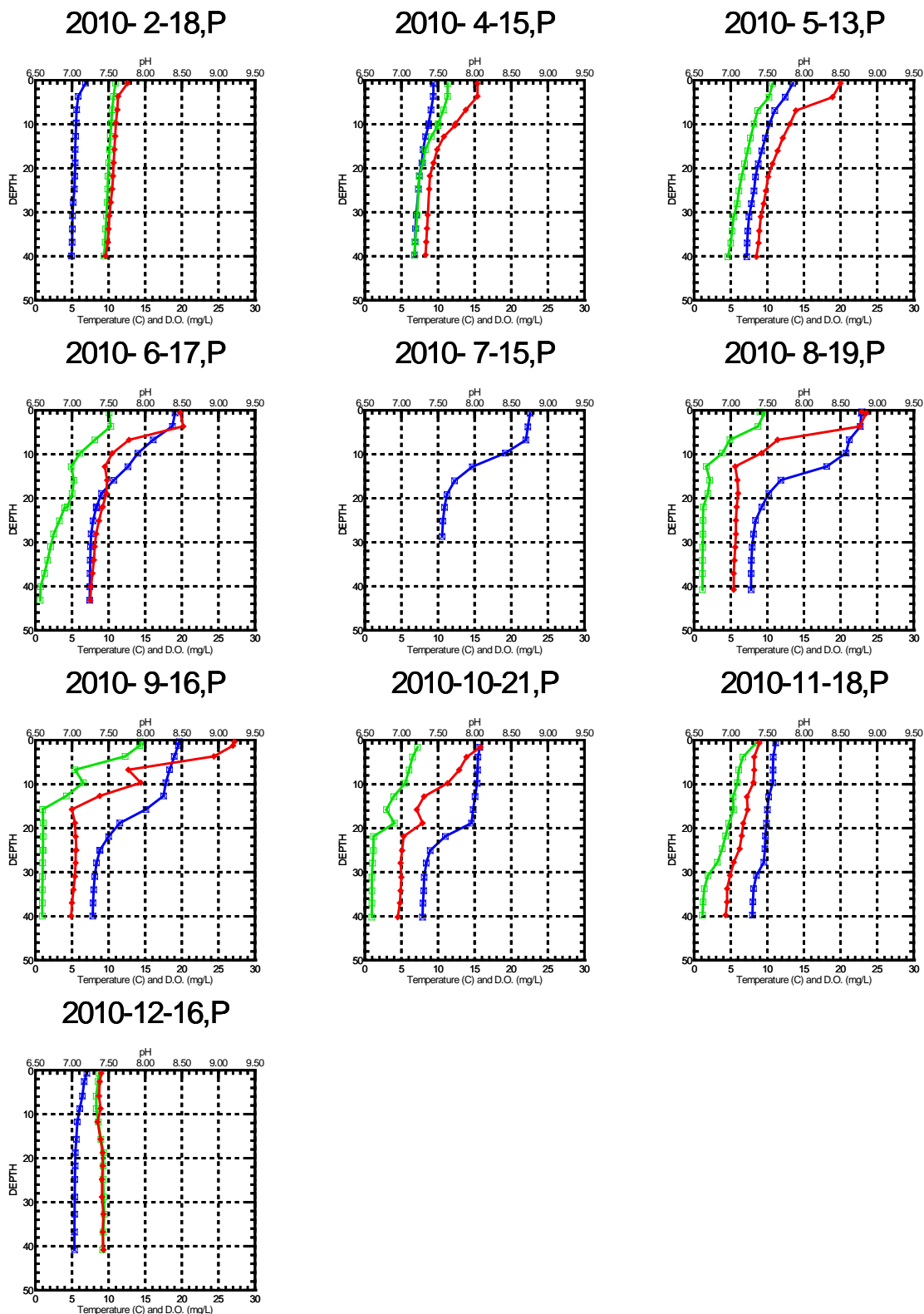


Fig. B12. Depth profiles of temperature, D.O., and pH at Iron Gate Reservoir site IR01 in 2010.

APPENDIX C: Time Series for Nutrient Parameters at CR01 and IR01, by Depth

Copco (CR01)

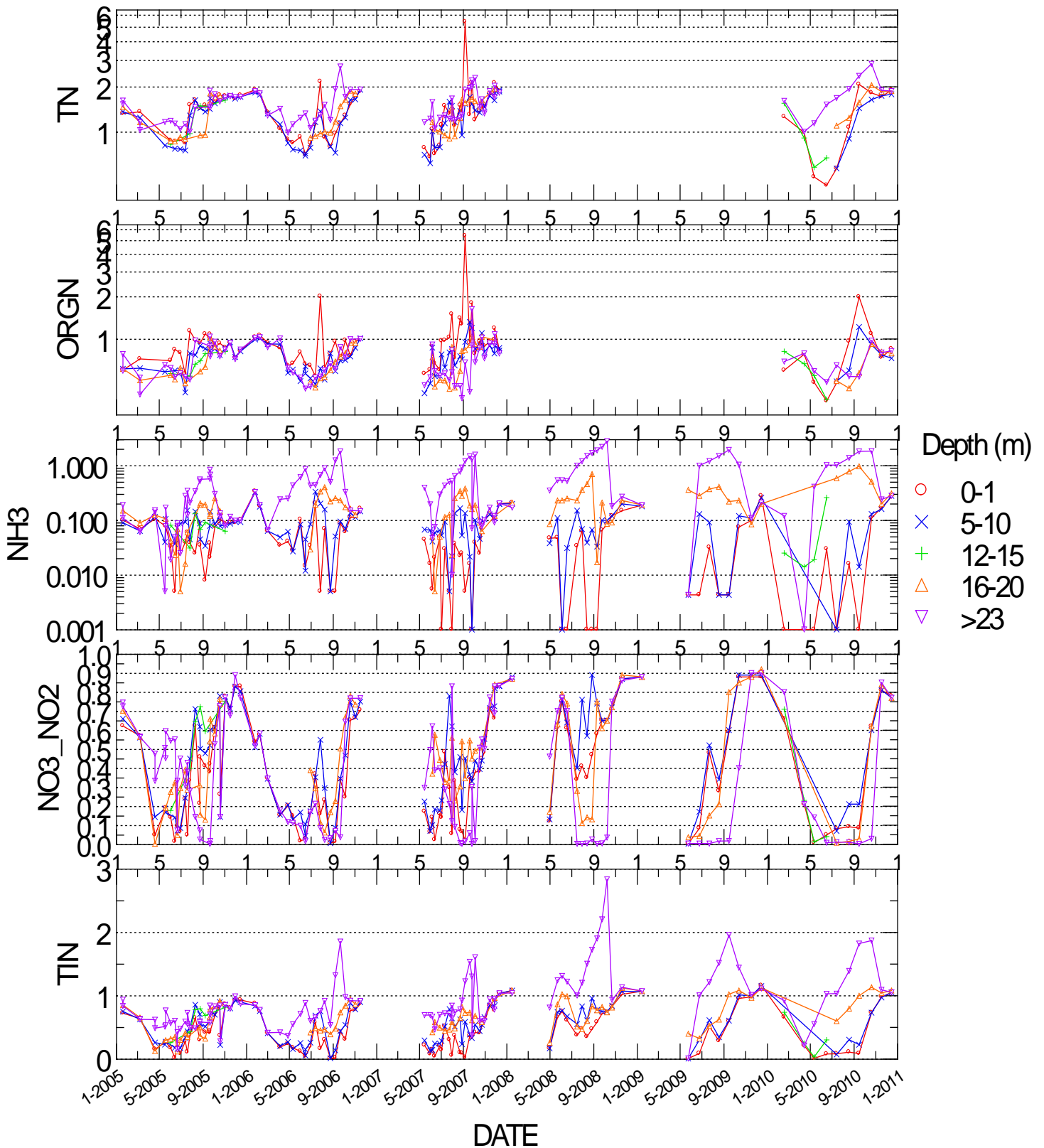


Figure C1. Depth-profiles of nitrogen concentrations at Copco Reservoir sampling station CR01, January 2005 – December 2010.

Copco (CR01)

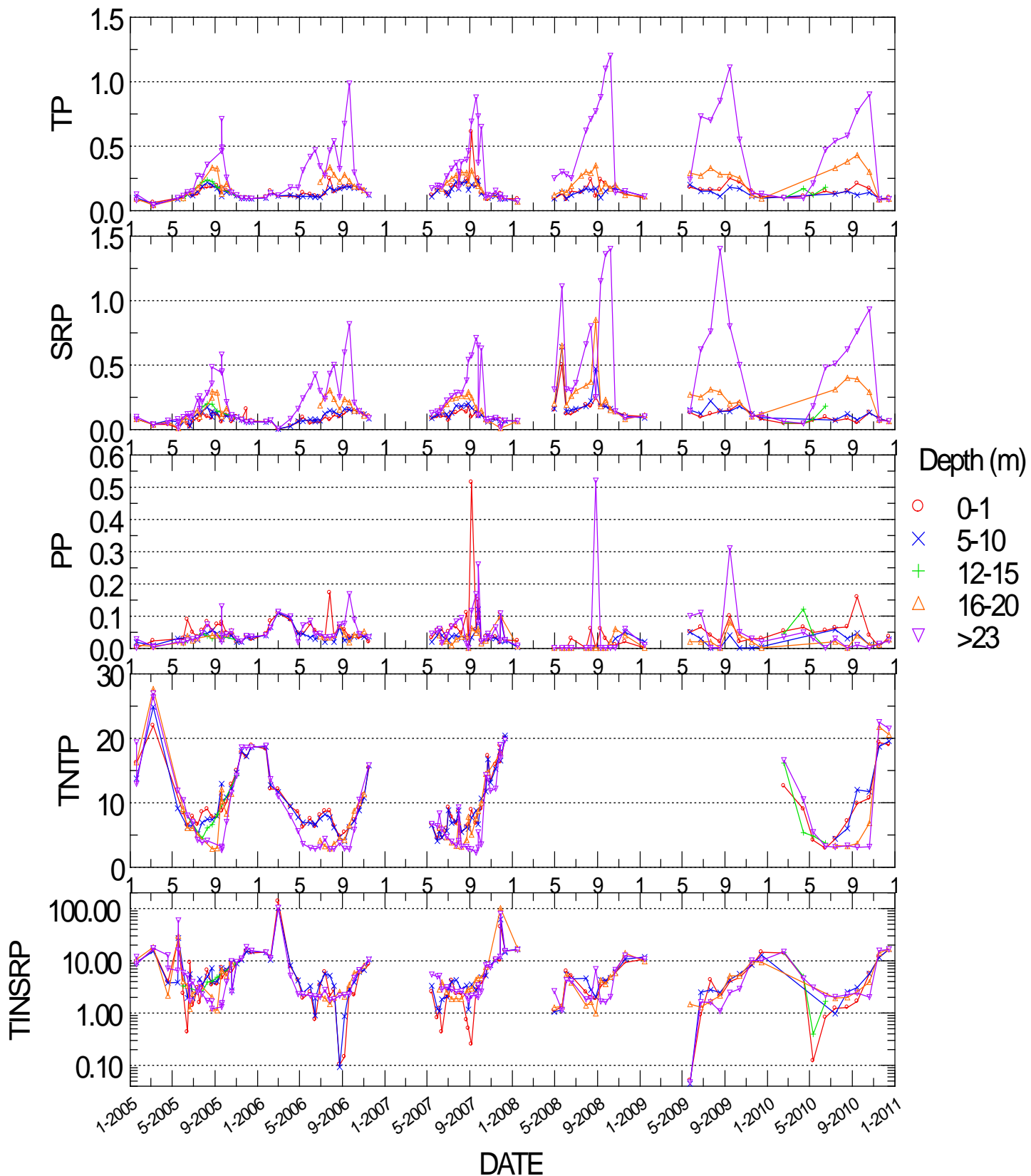


Figure C2. Depth-profiles of phosphorus concentrations and nitrogen:phosphorus mass ratios at Copco Reservoir sampling station CR01, January 2005 – December 2010. TNTP is mass ratio of TN to TP, and TINSRP is mass ratio of TIN to SRP.

Iron Gate (IR01)

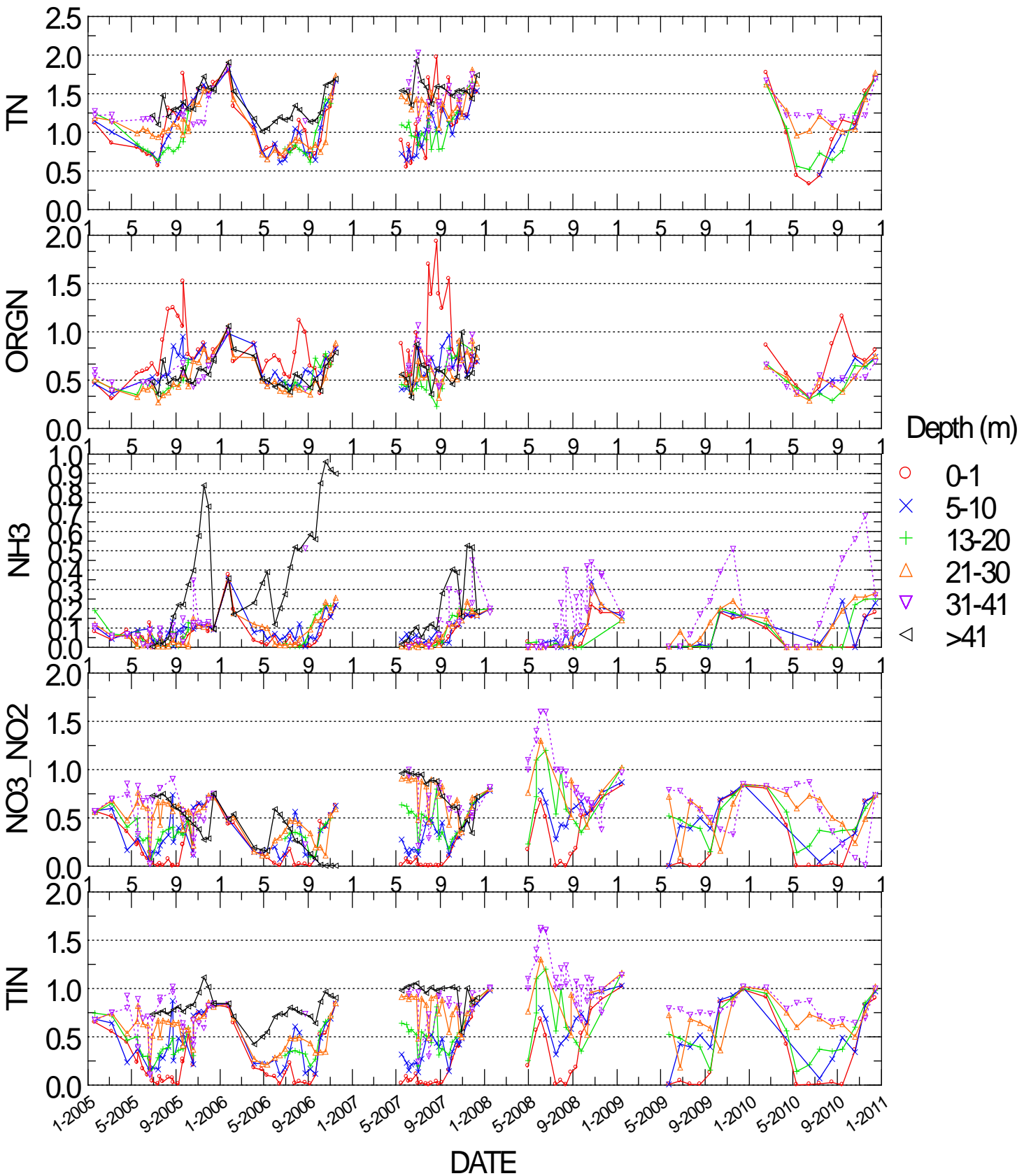


Figure C3. Depth-profiles of nitrogen concentrations at Iron Gate Reservoir sampling station IR01, January 2005 – December 2010

Iron Gate (IR01)

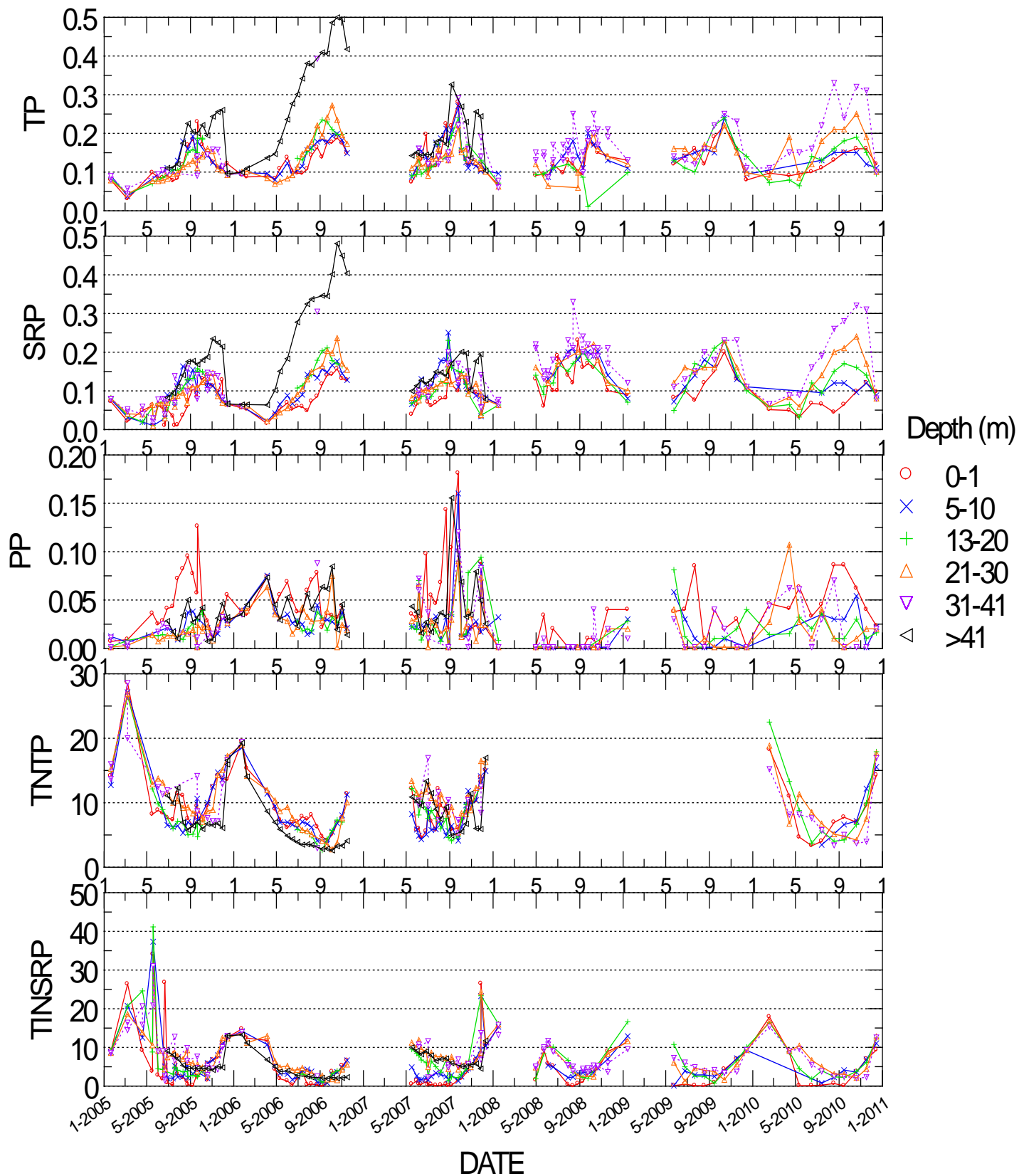


Figure C4. Depth-profiles of phosphorus concentrations and nitrogen:phosphorus mass ratios at Iron Gate Reservoir sampling station IR01, January 2005 – December 2010. TNTP is mass ratio of TN to TP, and TINSRP is mass ratio of TIN to SRP.

APPENDIX D: Time Series for Nutrient Parameters at River Stations

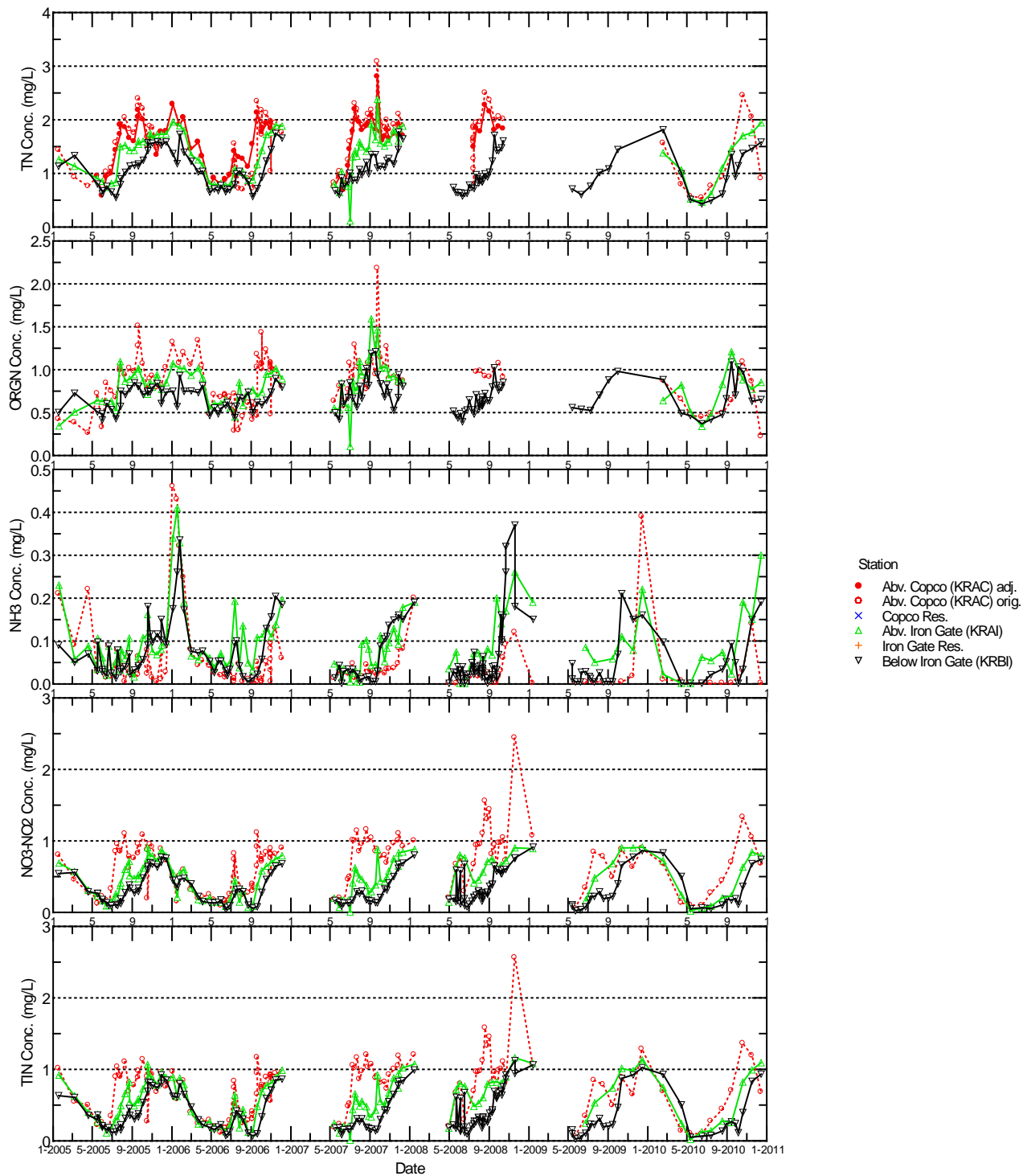


Figure D1. Time series of nitrogen concentrations above, within, and below Copco and Iron Gate Reservoirs, January 2005 – December 2010. KRAC data are affected by hydropower peaking (see Asarian and Kann 2009) but sufficient data were only available to adjust TN and TP. Comparison of adjusted and unadjusted TN (or TP) for a sample can be used to approximate the effect of adjustment on other parameters.

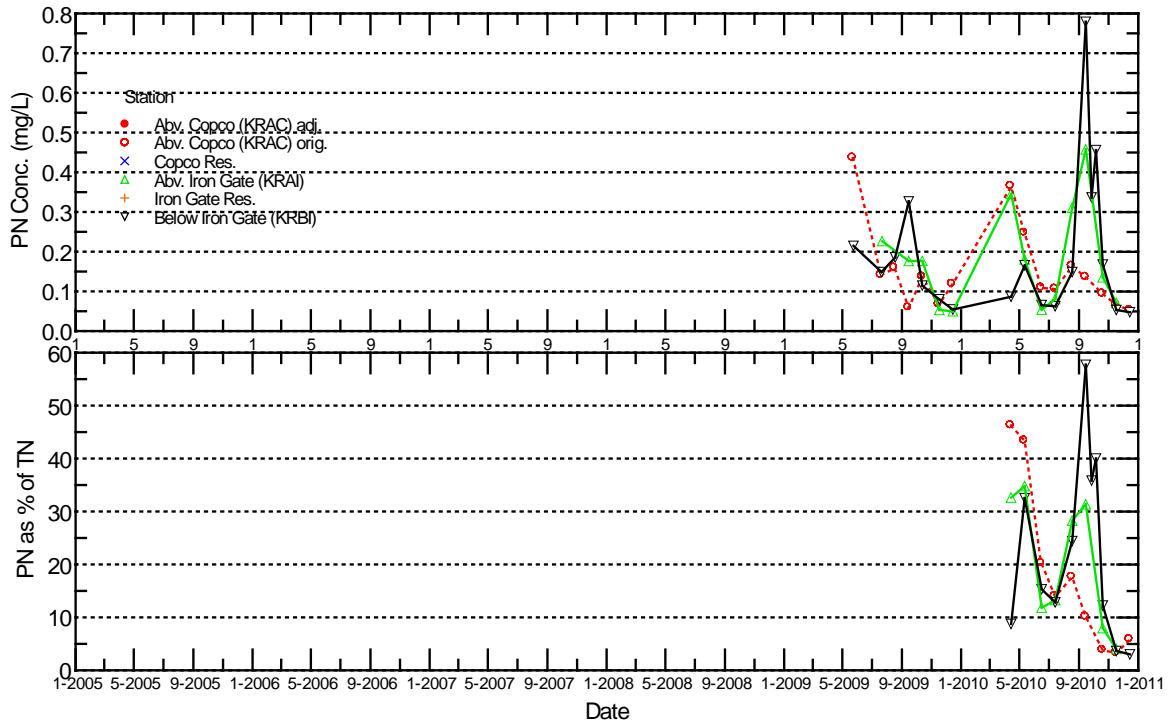


Figure D2. Time series of phosphorus concentrations and nitrogen:phosphorus ratios above, within, and below Copco and Iron Gate Reservoirs, January 2005 – December 2010. KRAC data are affected by hydropower peaking (see Asarian and Kann 2009) but sufficient data were only available to adjust TN and TP. Comparison of adjusted and unadjusted TN (or TP) for a sample can be used to approximate the effect of adjustment on other parameters.

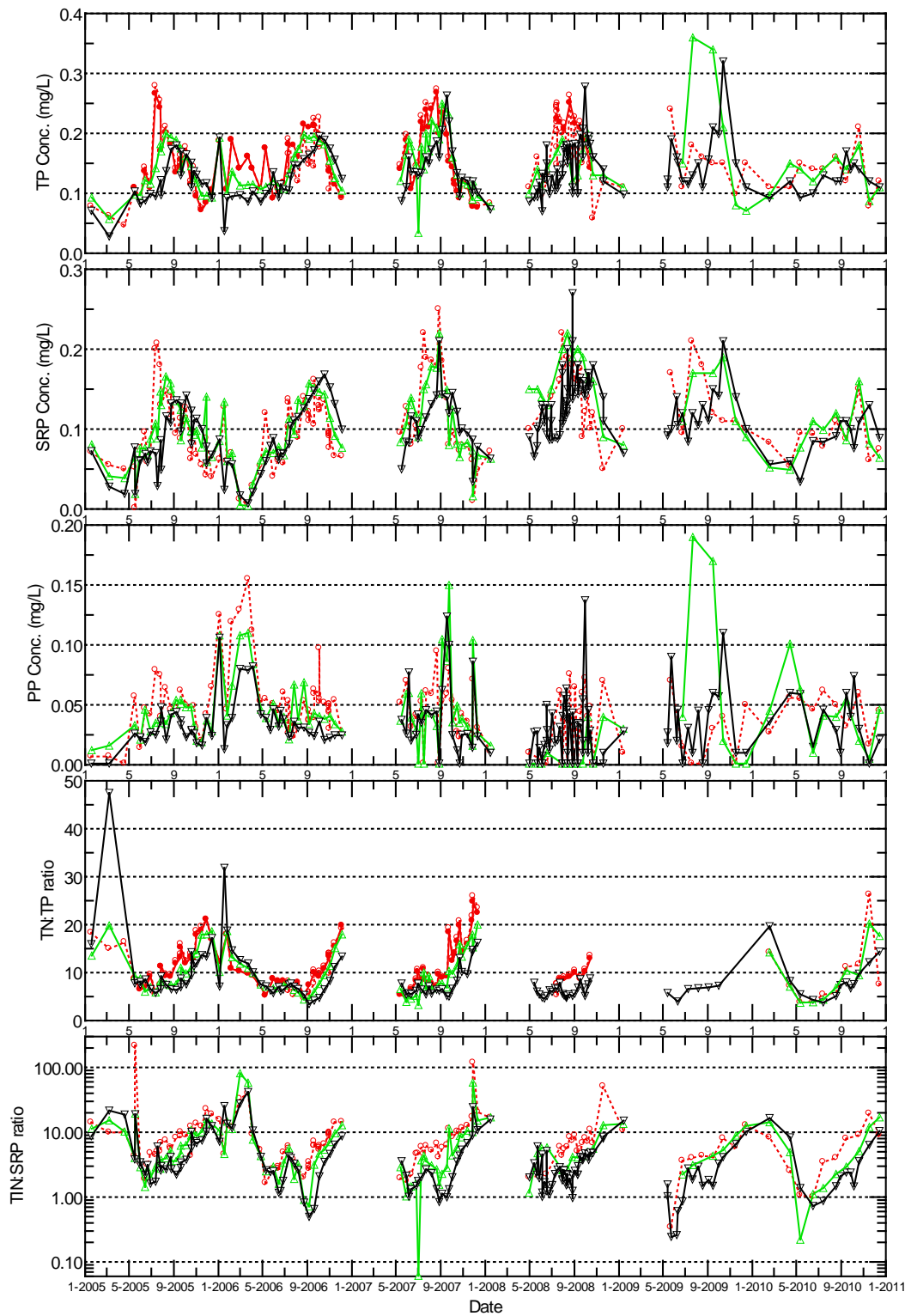


Figure D3. Time series of phosphorus concentrations and nitrogen:phosphorus ratios above, within, and below Copco and Iron Gate Reservoirs, January 2005 – December 2010. KRAC data are affected by hydropower peaking (see Asarian and Kann 2009) but sufficient data were only available to adjust TN and TP. Comparison of adjusted and unadjusted TN (or TP) for a sample can be used to approximate the effect of adjustment on other parameters.

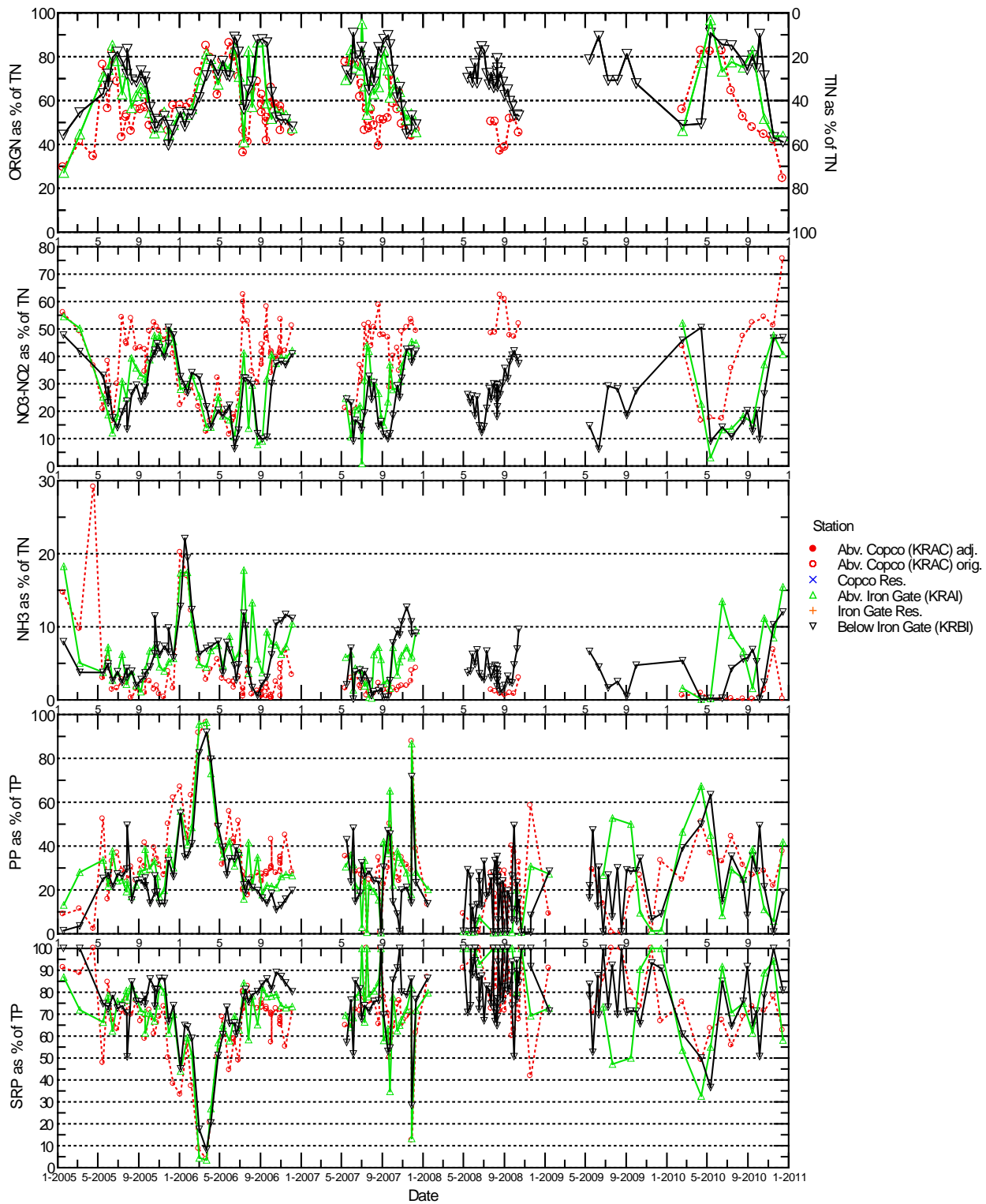
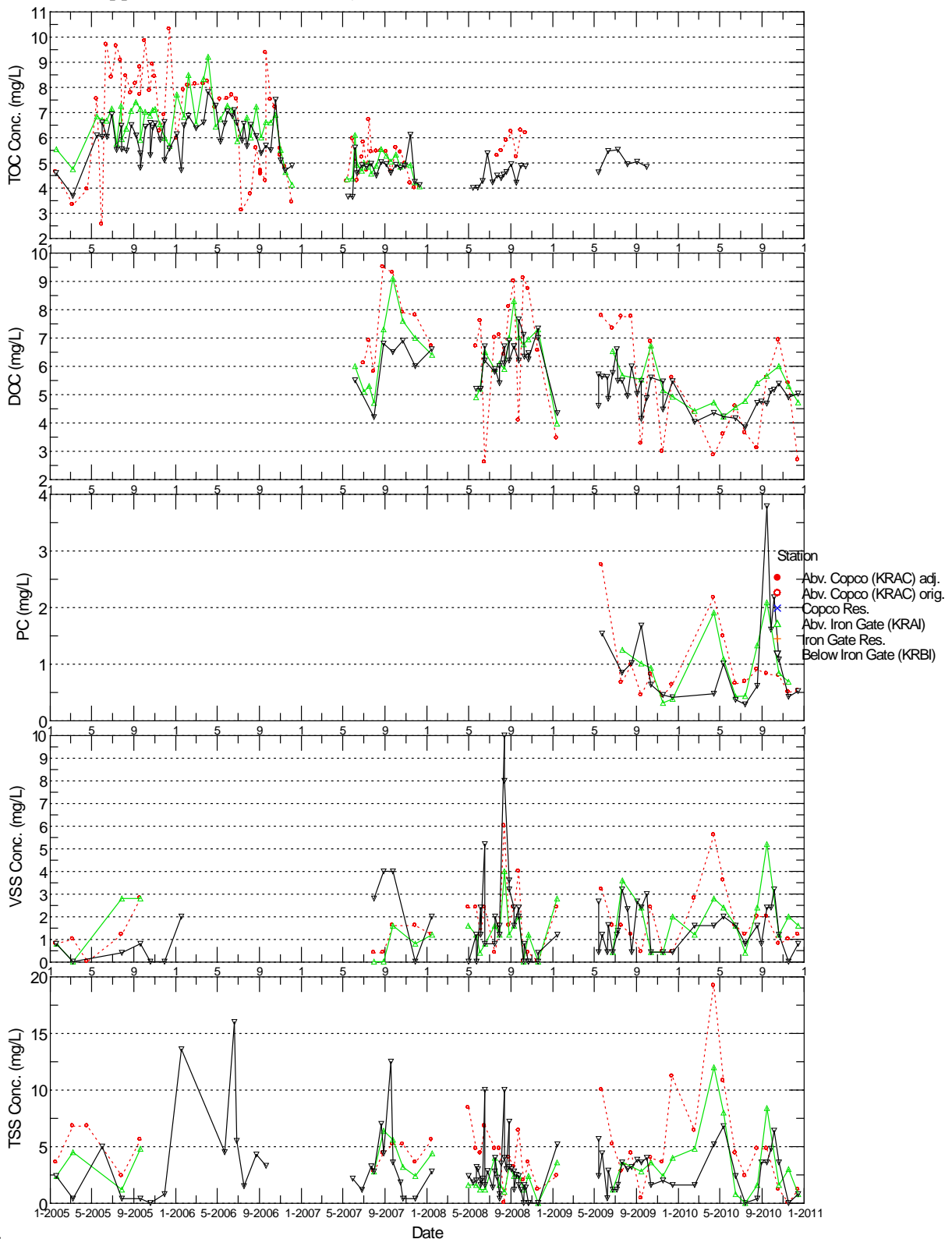


Figure D4. Time series of percent composition of nitrogen and phosphorus species above, within, and below Copco and Iron Gate Reservoirs, January 2005 – December 2010. KRAC data are affected by hydropower peaking (see Asarian and Kann 2009) but sufficient data were only available to adjust TN and TP. Comparison of adjusted and unadjusted TN (or TP) for a

sample can be used to approximate the effect of adjustment on other



parameters.

Figure D5. Time series of carbon species, VSS, and TSS above, within, and below Copco and Iron Gate Reservoirs, January 2005 – December 2010. PacifiCorp’s reporting limit for VSS (and TSS) is 2.0 mg/L; many samples are below the reporting limit, limiting their utility. KRAC data are affected by hydropower peaking (see Asarian and Kann 2009) but sufficient data were only available to adjust TN and TP. Comparison of adjusted and unadjusted TN (or TP) for a sample can be used to approximate the effect of adjustment on other parameters.

APPENDIX E:
Time Series of Biovolume and Percent Biovolume for Major Taxonomic Groups
and Dominant Phytoplankton Species at Shoreline Stations
Shoreline Stations

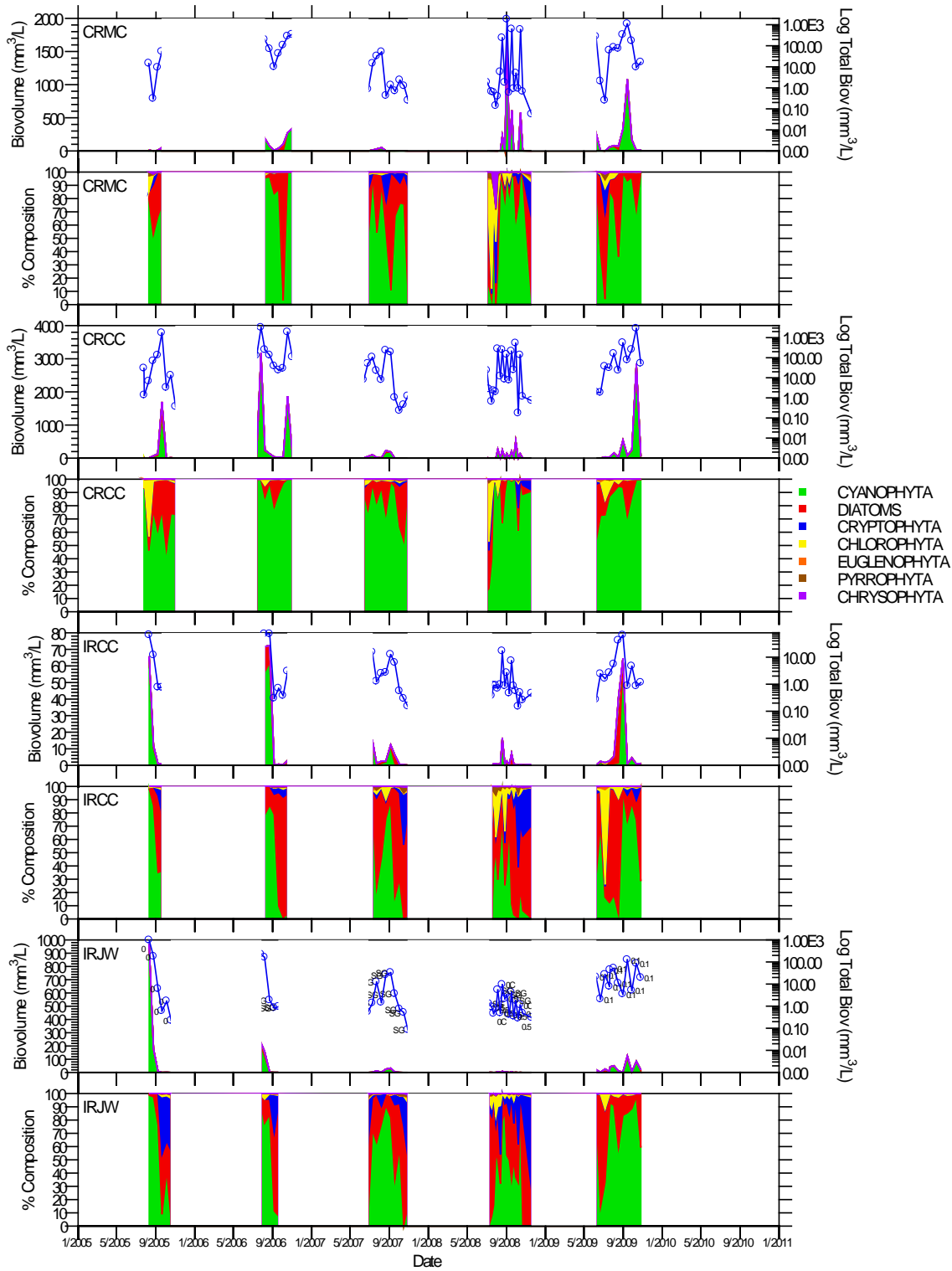


Figure E1. Biovolume and percent biovolume of major phytoplankton taxonomic groups at shoreline stations CRMC, CRCC, IRCC, and IRJW, 2005-2010. Notes: 1) the total biovolume (blue line) is shown with a log scale on the right axis.

Shoreline Stations

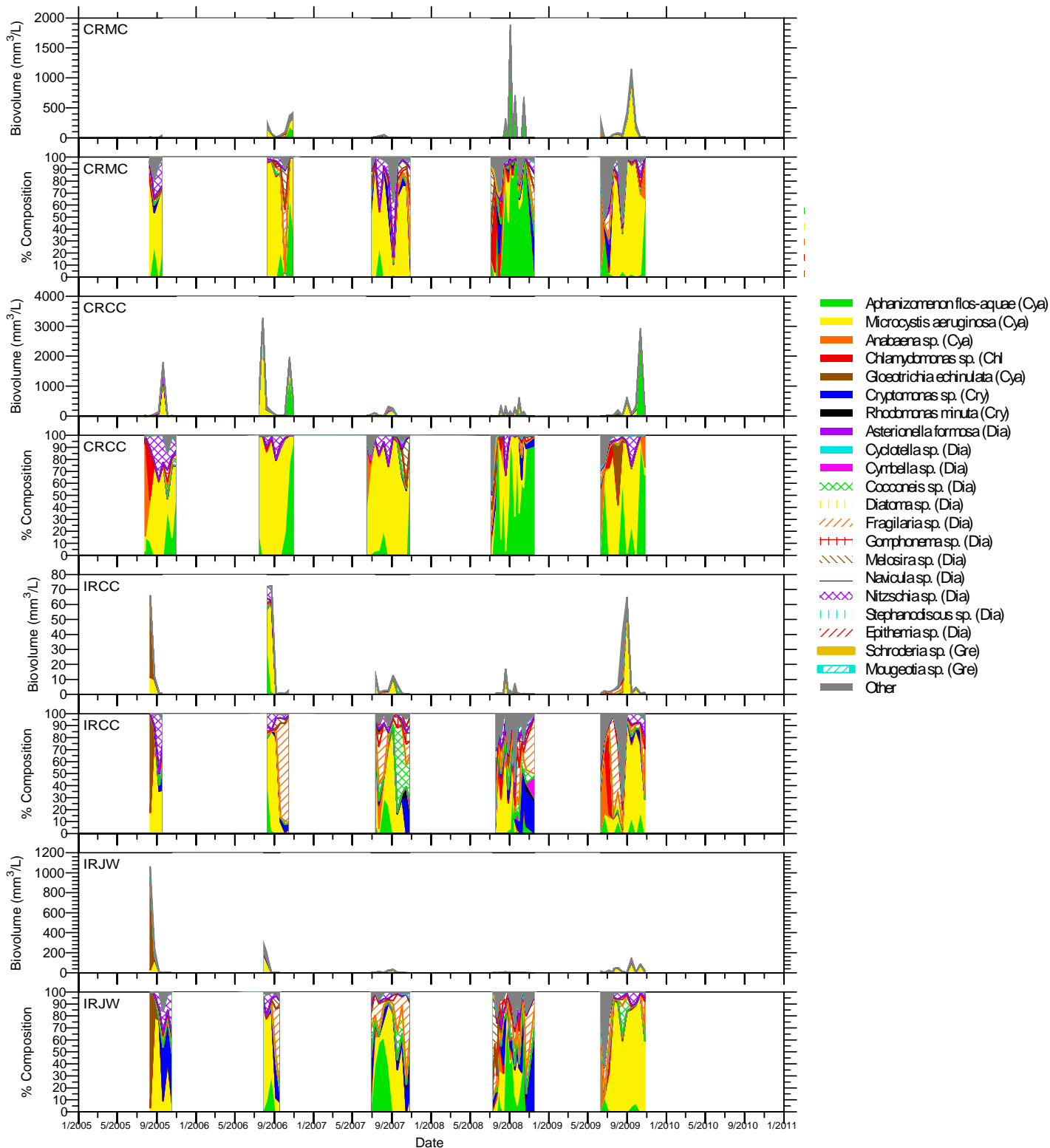


Figure E2. Biovolume and percent biovolume of dominant species of phytoplankton at shoreline stations CRMC, CRCC, IRCC, and IRJW, 2005-2010.

APPENDIX F:

Time Series of Seasonal Cyanophyta Dynamics for 0.5-1m Depth, for Each Year

Seasonal Patterns at CR01 0.5-1m depth, 2005-2010

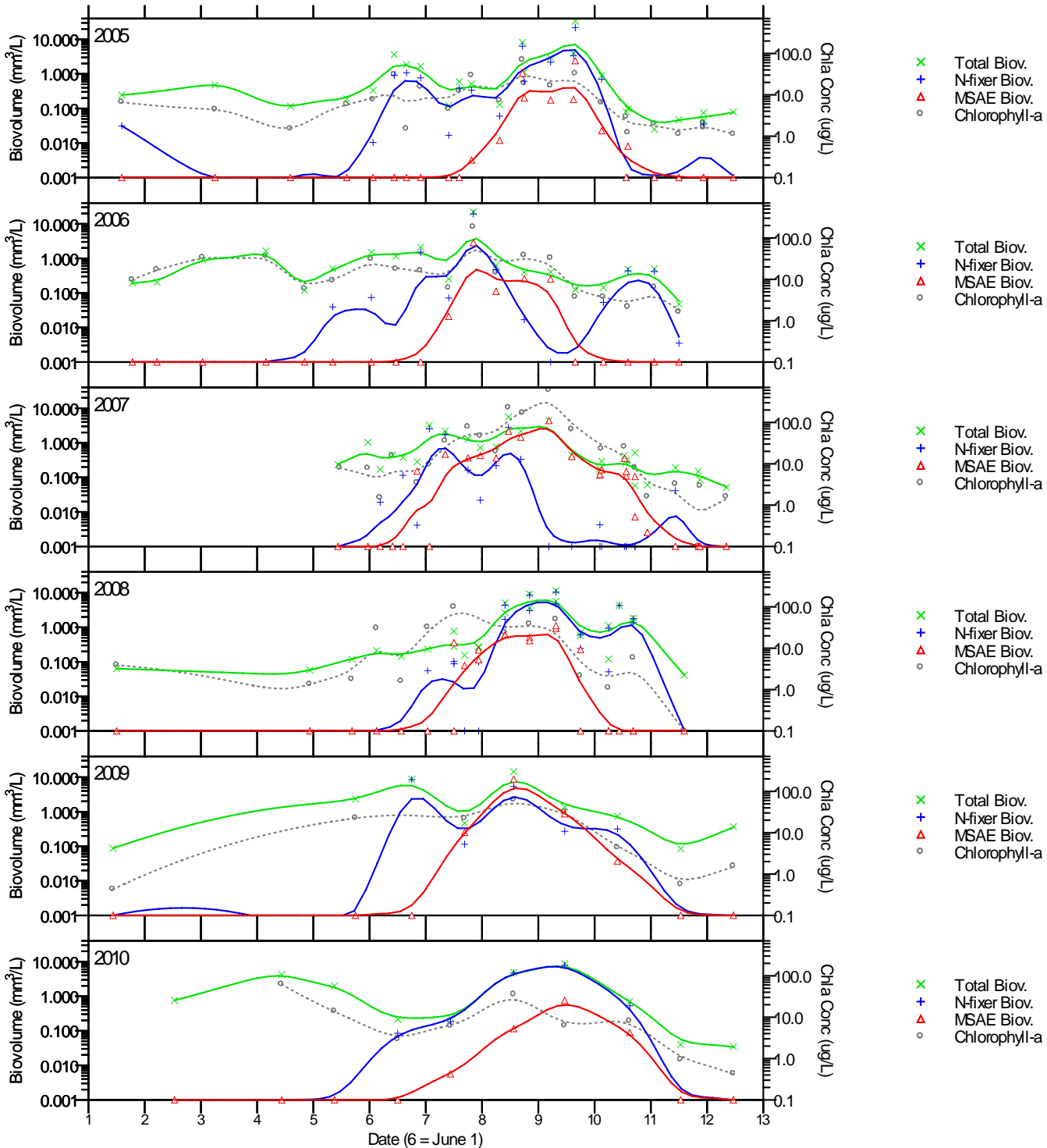


Figure F1. Time series of season phytoplankton dynamics for the 0.5-1m depth at Copco Reservoir station CR01 for each year 2005-2010, showing chlorophyll and the biovolume nitrogen-fixing species (vast majority is APFA), MSAE, and all phytoplankton. A Distance Weighted Least Squares (DWLS) smoother is displayed as a visual aid, note that the smoother under.

Seasonal Patterns at IR01 0.5-1m depth, 2005-2010

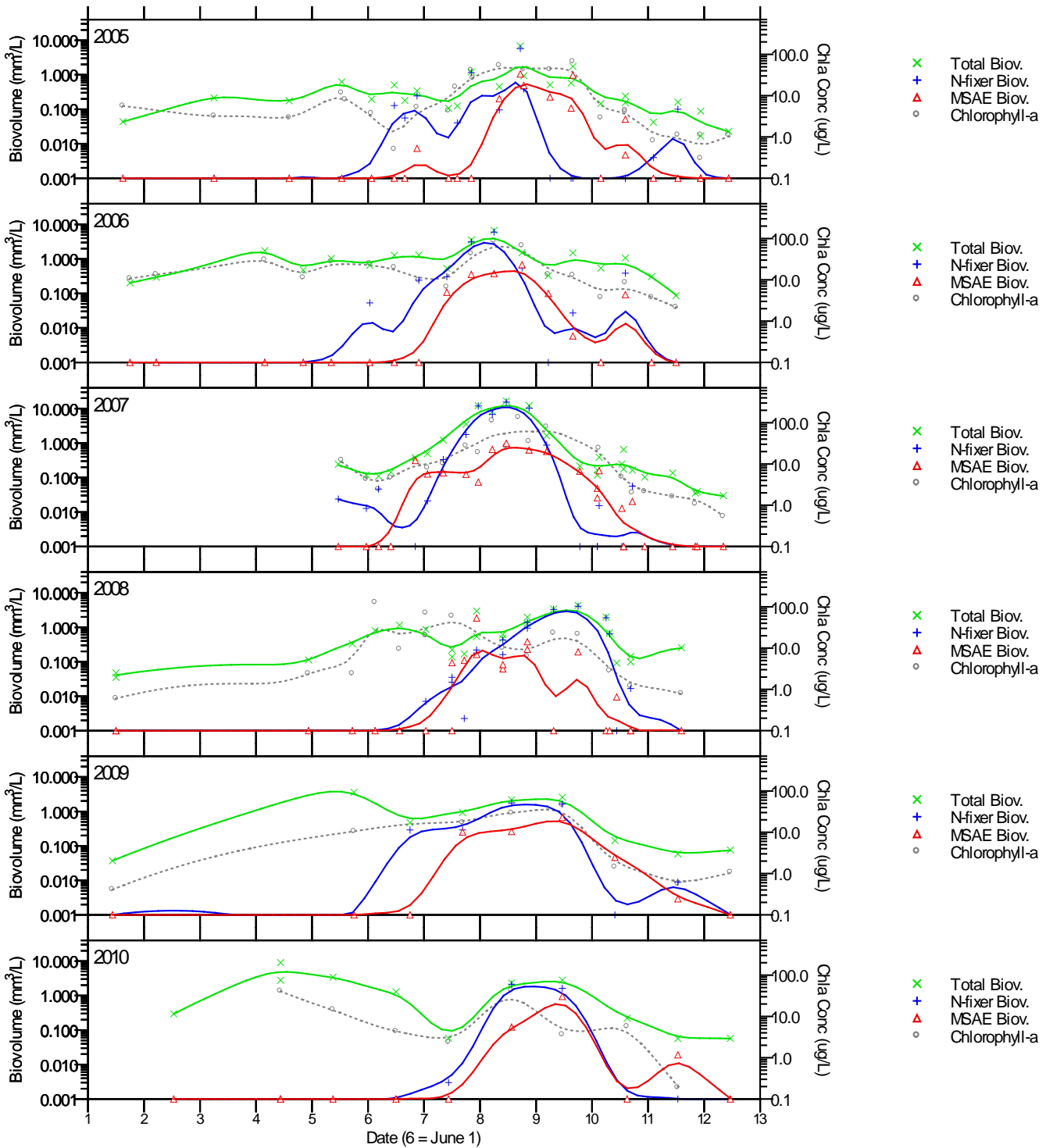


Figure F2. Time series of season phytoplankton dynamics for the 0.5-1m depth at Iron Gate Reservoir station IR01 for each year 2005-2010, showing chlorophyll and the biovolume of nitrogen-fixing species (vast majority is APFA except in 2005 when *Gleotrichia* dominated), MSAE, and all phytoplankton. A Distance Weighted Least Squares (DWLS) smoother is displayed as a visual aid.

APPENDIX G: Annual Time Series of Biovolume for 0.5-1m Depth and Nitrate Concentration

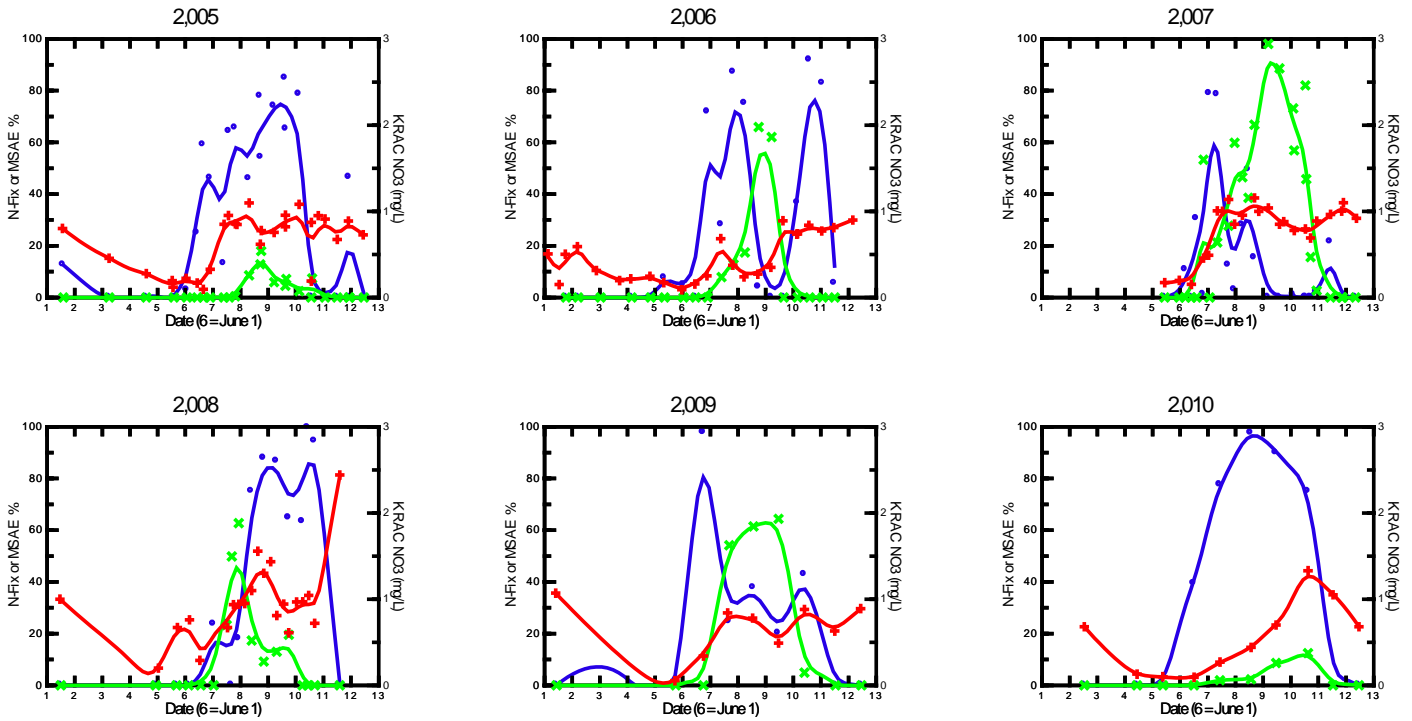


Figure G1. Annual time series of percent biovolume of nitrogen-fixing species and MSAE for the 0.5-1m depth at Copco Reservoir station CR01 for each year 2005-2010. Nitrate concentration of the reservoir inflow (station KRAC) is also shown. A Distance Weighted Least Squares (DWLS) smoother is displayed as a visual aid.

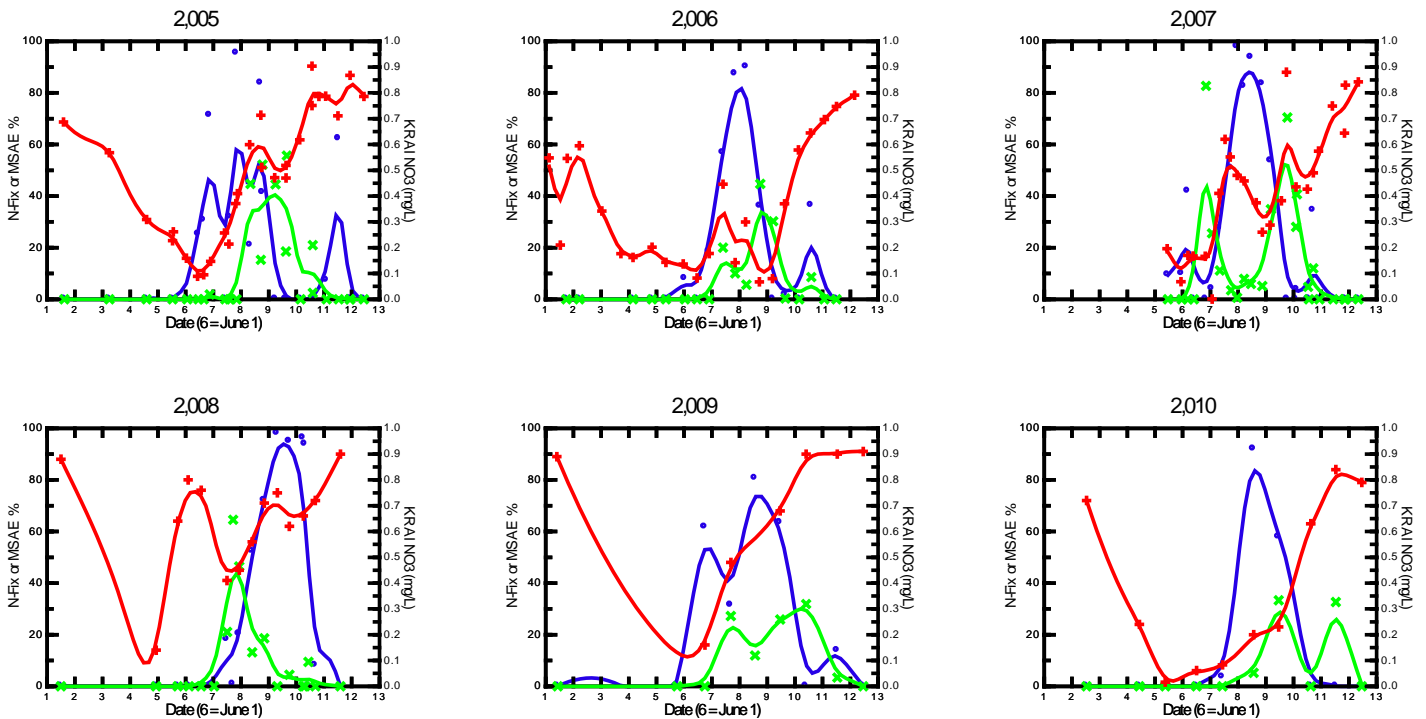


Figure G2. Annual time series of percent biovolume of nitrogen-fixing species and MSAE for the 0.5-1m depth at Iron Gate Reservoir station IR01 for each year 2005-2010. Nitrate concentration of the reservoir inflow (station KRAI) is also shown. A Distance Weighted Least Squares (DWLS) smoother is displayed as a visual aid.

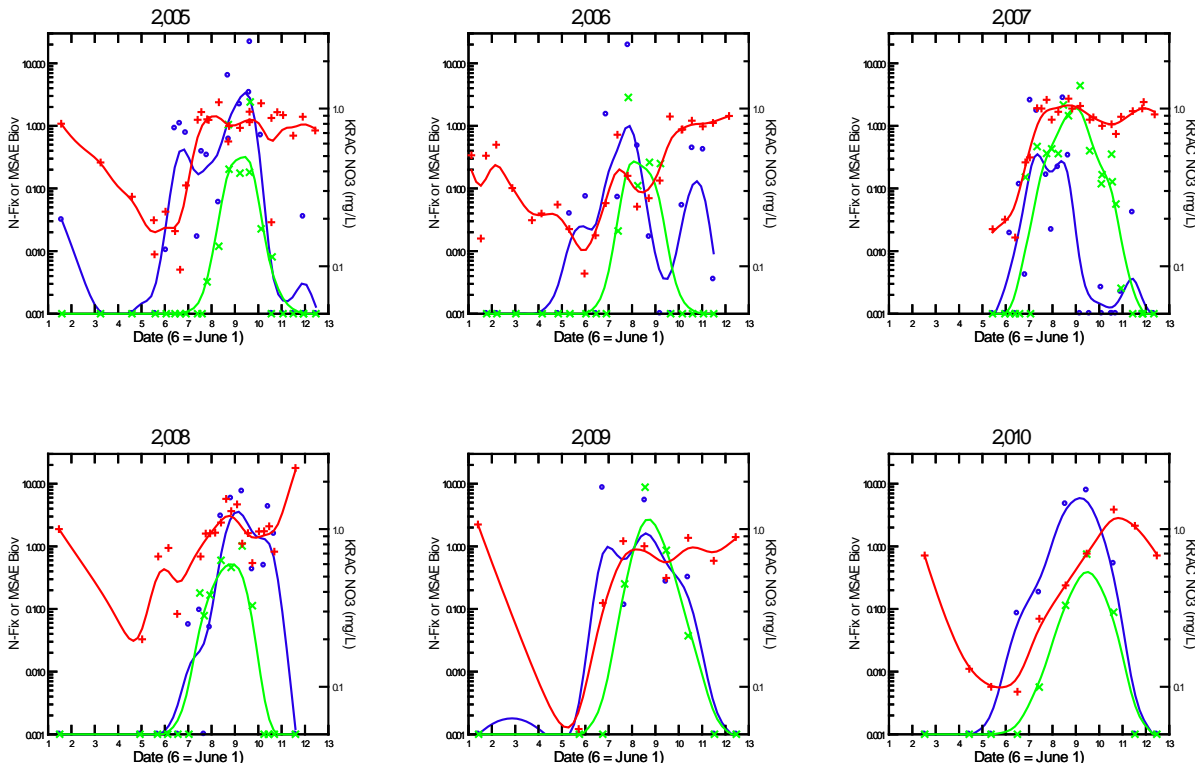


Figure G3. Annual time series of biovolume of nitrogen-fixing species and MSAE for the 0.5-1m depth at Copco Reservoir station CR01 for each year 2005-2010. Nitrate concentration of the reservoir inflow (station KRAC) is also shown. A Distance Weighted Least Squares (DWLS) smoother is displayed as a visual aid.

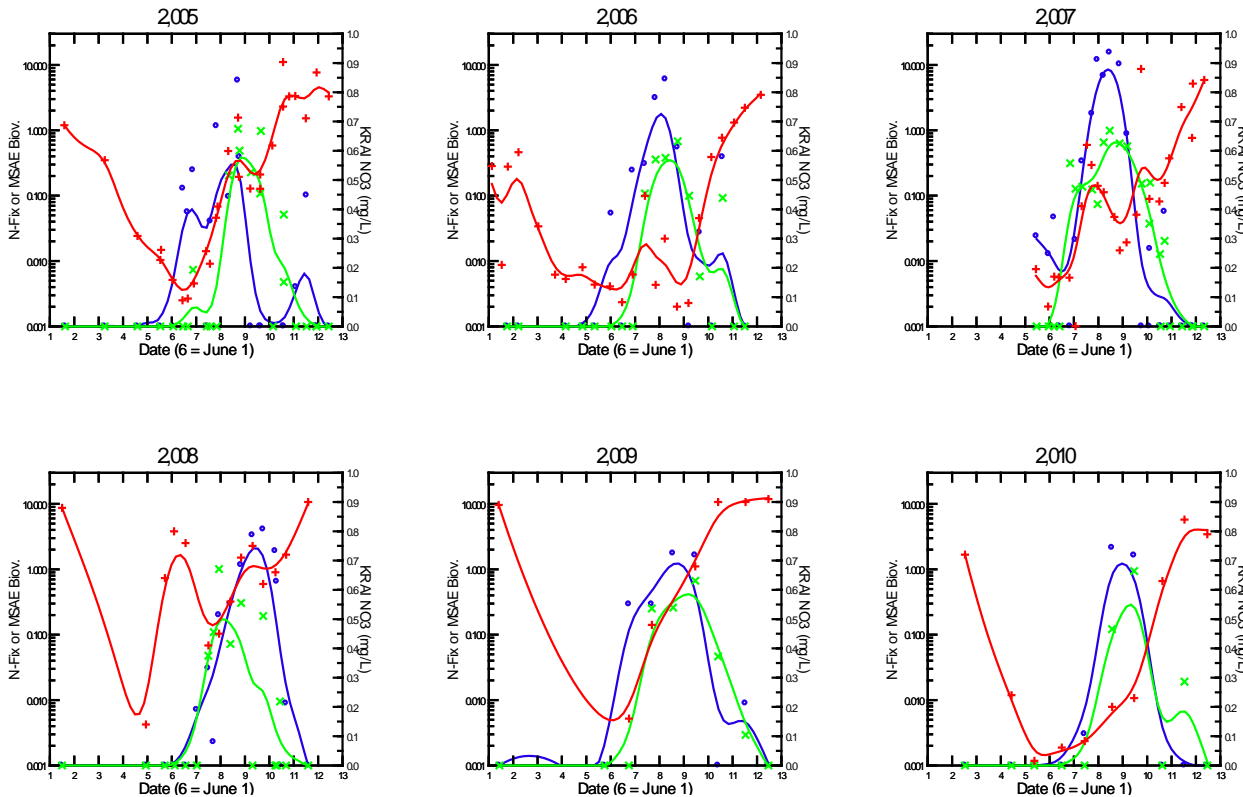


Figure G2. Annual time series of biovolume of nitrogen-fixing species and MSAE for the 0.5-1m depth at Iron Gate Reservoir station IR01 for each year 2005-2010. Nitrate concentration of the reservoir inflow (station KRAI) is also shown. A Distance Weighted Least Squares (DWLS) smoother is displayed as a visual aid.