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APPENDIX D

Linear model selection

The statistics of every model tested for both response variables (CPUE and Ctot) and the five lakes are presented below. Models were ranked according to the p-value and the coefficient of determination (R^2) of the linear regression. We also report the BIC and the F value also used to compare models.

Usual residual plots including the residual values compared to fitted values and the Q-Q residuals plot are presented for the statistically significant models.

The models using water level as an explanatory variable for Lake Aiguebelette were removed because they were ecologically inconsistent with the species' ecology and are likely related to a few outliers (Tabs. D9 and D10).

Tab. D1. Model statistics for Lake Geneva based on CPUE fish abundance proxy. Significant ($p < 0.05$) and ecologically consistent model is presented in **bold**.

Model	p-value of the coefficient	BIC	R^2	F value
CPUE ~ Daphnia	<0.01	123.8	0.51	16.65
CPUE ~ Copepods	0.05	125.5	0.23	4.48
CPUE ~ Stocking	0.05	132.5	0.21	4.16
CPUE ~ Sum Temp	0.34	135.6	0.06	0.97
CPUE ~ Water Level	0.57	136.2	0.02	0.34
CPUE ~ Spr Temp	0.63	136.3	0.01	0.32
CPUE ~ Win Temp	0.75	136.5	<0.01	0.24
CPUE ~ Cladocera	0.81	136.6	<0.01	0.06
CPUE ~ Wind Intensity	0.89	136.6	<0.01	0.02

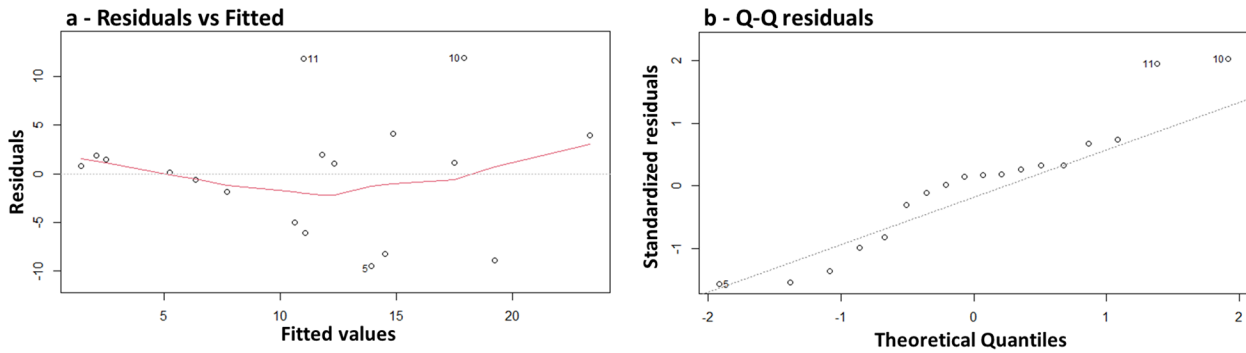


Fig. D1. Residual plots for the linear models between the proxy based on the CPUE in Lake Geneva and the *Daphnia* variable, with residuals values compared to fitted values (a) and Q-Q residuals plot (b).

Tab. D2. Model statistics for Lake Geneva based on the total annual landings (Ctot) fish abundance proxy. Significant ($p < 0.05$) and ecologically consistent models are presented in **bold**.

Model	p-value of the coefficient	BIC	R ²	F value
Ctot ~ Daphnia	<0.01	488.8	0.49	15.19
Ctot ~ Effort	<0.01	437.6	0.44	10.99
Ctot ~ Copepods	0.06	469.7	0.22	4.21
Ctot ~ Stocking	0.07	497.1	0.19	3.67
Ctot ~ Win Temp	0.44	500.0	0.04	0.64
Ctot ~ Sum Temp	0.45	500.1	0.04	0.60
Ctot ~ Cladocera	0.84	500.7	<0.01	0.04
Ctot ~ Wind Intensity	0.87	500.7	<0.01	0.03
Ctot ~ Water Level	0.93	500.8	<0.01	0.01
Ctot ~ Spr Temp	0.98	500.8	<0.01	0.01
Ctot ~ Daphnia + effort	0.08* for effort	434.6	0.60	10.16

*Highest p-value from the two coefficients.

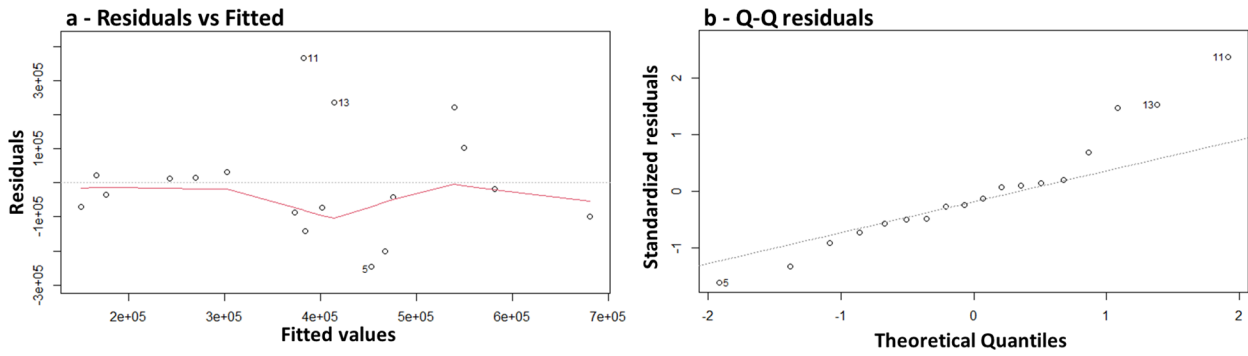


Fig. D2. Residual plots for the linear models between the proxy based on the Ctot in Lake Geneva and the *Daphnia* variable, with residuals values compared to fitted values (a) and Q-Q residuals plot (b).

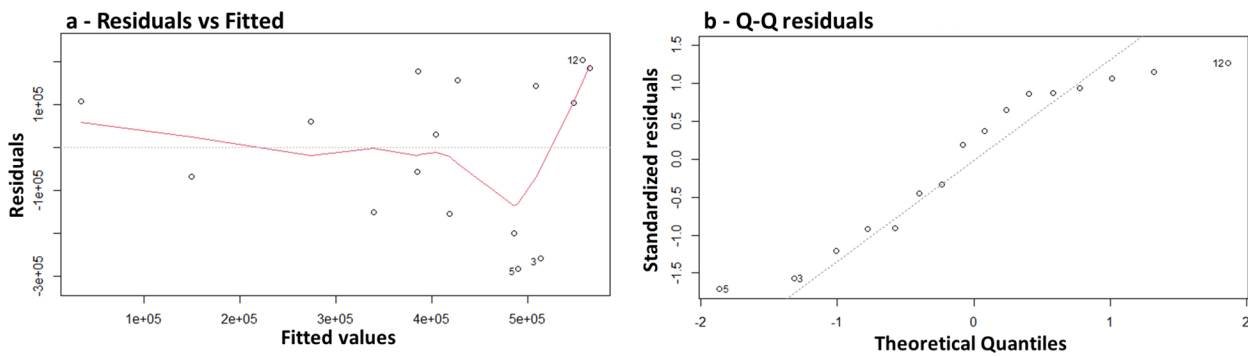


Fig. D3. Residual plots for the linear models between the proxy based on the Ctot in Lake Geneva and the fishing effort variable, with residuals values compared to fitted values (a) and Q-Q residuals plot (b).

Tab. D3. Model statistics for Lake Neuchâtel based on CPUE fish abundance proxy. Significant ($p < 0.05$) and ecologically consistent model is presented in **bold**.

Model	p-value of the coefficient	BIC	R ²	F value
CPUE ~ Win Temp	0.03	125.5	0.29	5.75
CPUE ~ Sum Temp	0.32	129.9	0.07	1.05
CPUE ~ Spr Temp	0.47	130.4	0.04	0.56
CPUE ~ stocking	0.54	123.3	0.03	0.39
CPUE ~ Daphnia	0.73	130.9	<0.01	0.12
CPUE ~ Cladocera	0.74	130.9	<0.01	0.12
CPUE ~ Copepods	0.77	131.0	<0.01	0.09
CPUE ~ Wind Intensity	0.85	131.0	<0.01	0.04
CPUE ~ Water Level	0.90	131.0	<0.01	0.01

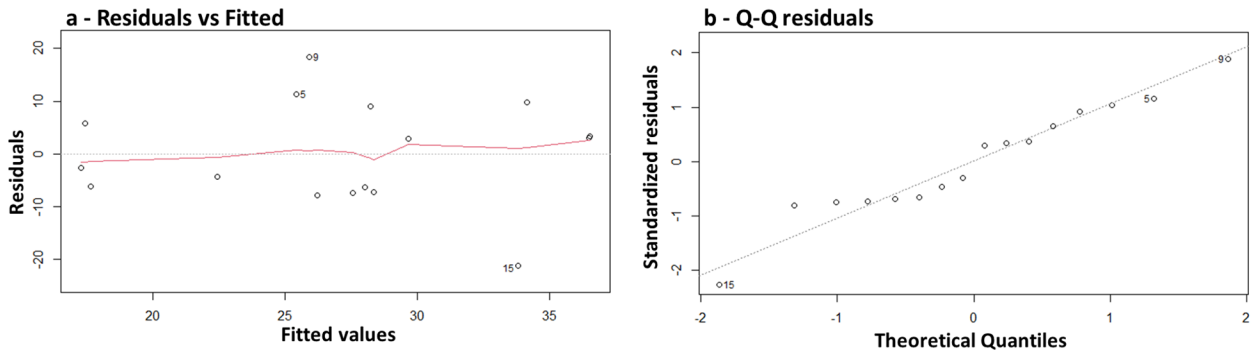


Fig. D4. Residual plots for the linear models between the proxy based on the CPUE in Lake Neuchâtel and the winter temperature variable, with residuals values compared to fitted values (a) and Q-Q residuals plot (b).

Tab. D4. Model statistics for Lake Neuchâtel based on the total annual landings (Ctot) fish abundance proxy. Significant ($p < 0.05$) and ecologically consistent model is presented in **bold**.

Model	p-value of the coefficient	BIC	R ²	F value
Ctot ~ Win Temp	<0.01	454.7	0.39	10.90
Ctot ~ Sum Temp	0.35	463.2	0.05	0.93
Ctot ~ Daphnia	0.47	463.6	0.03	0.55
Ctot ~ Water Level	0.60	463.8	0.02	0.29
Ctot ~ Stocking	0.63	370.5	0.02	0.25
Ctot ~ Copepods	0.65	463.9	0.01	0.21
Ctot ~ Cladocera	0.68	464.0	0.01	0.18
Ctot ~ Spr Temp	0.75	464.1	<0.01	0.10
Ctot ~ Wind Intensity	0.79	464.1	<0.01	0.07
Ctot ~ effort	0.95	323.5	<0.01	<0.01

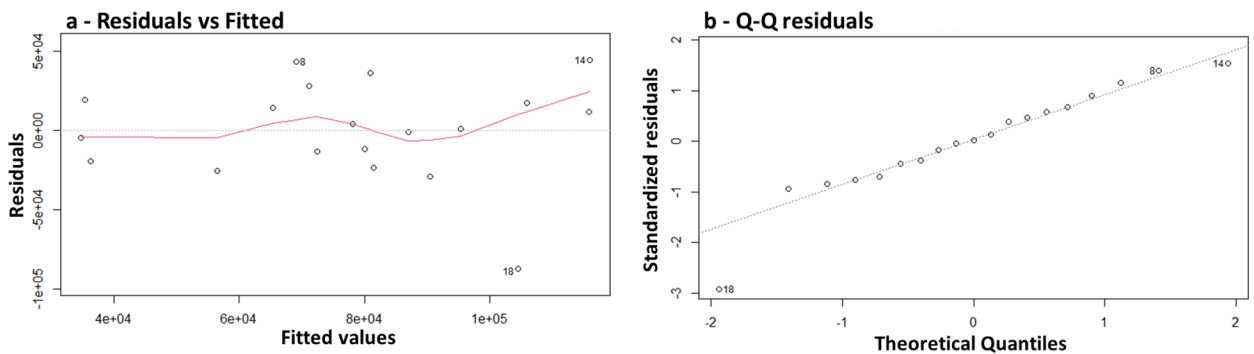


Fig. D5. Residual plots for the linear models between the proxy based on the Ctot in Lake Neuchâtel and the winter temperature variable, with residuals values compared to fitted values (a) and Q-Q residuals plot (b).

Tab. D5. Model statistics for Lake Bourget based on CPUE fish abundance proxy. Significant ($p < 0.05$) and ecologically consistent model is presented in **bold**.

Model	p-value of the coefficient	BIC	R ²	F value
CPUE ~ Daphnia	0.03	85.8	0.35	5.85
CPUE ~ Win Temp	0.09	110.8	0.19	3.29
CPUE ~ Water Level	0.16	111.8	0.14	2.21
CPUE ~ stocking	0.19	112.2	0.12	1.86
CPUE ~ Sum Temp	0.20	112.3	0.11	1.79
CPUE ~ Cladocera	0.24	89.6	0.12	1.43
CPUE ~ Wind Intensity	0.62	113.9	0.02	0.24
CPUE ~ Copepods	0.70	91.1	0.01	0.16
CPUE ~ Spr Temp	0.72	114.0	0.01	0.14

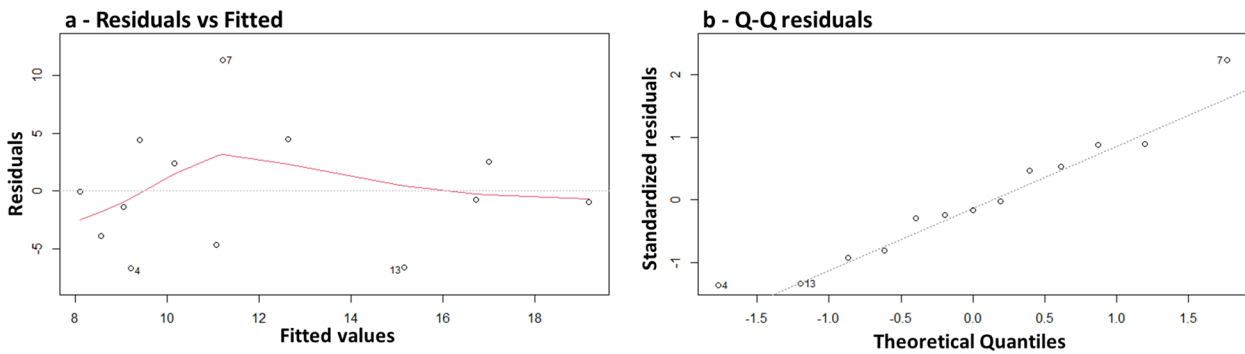


Fig. D6. Residual plots for the linear models between the proxy based on the CPUE in Lake Bourget and the winter temperature variable, with residuals values compared to fitted values (a) and Q-Q residuals plot (b).

Tab. D6. Model statistics for Lake Bourget based on the total annual landings (Ctot) fish abundance proxy. Significant ($p < 0.05$) and ecologically consistent model is presented in **bold**.

Model	p-value of the coefficient	BIC	R ²	F value
Ctot ~ Daphnia	<0.01	321.5	0.49	11.56
Ctot ~ effort	0.10	305.1	0.23	3.30
Ctot ~ Cladocera	0.13	328.2	0.18	2.65
Ctot ~ Sum Temp	0.25	424.9	0.08	1.44
Ctot ~ Win Temp	0.26	425.0	0.08	1.37
Ctot ~ Water Level	0.40	425.6	0.05	0.75
Ctot ~ Copepods	0.42	330.1	0.06	0.71
Ctot ~ stocking	0.44	425.7	0.04	0.64
Ctot ~ Wind Intensity	0.69	426.3	0.01	0.16
Ctot ~ Spr Temp	0.75	426.3	<0.01	0.10

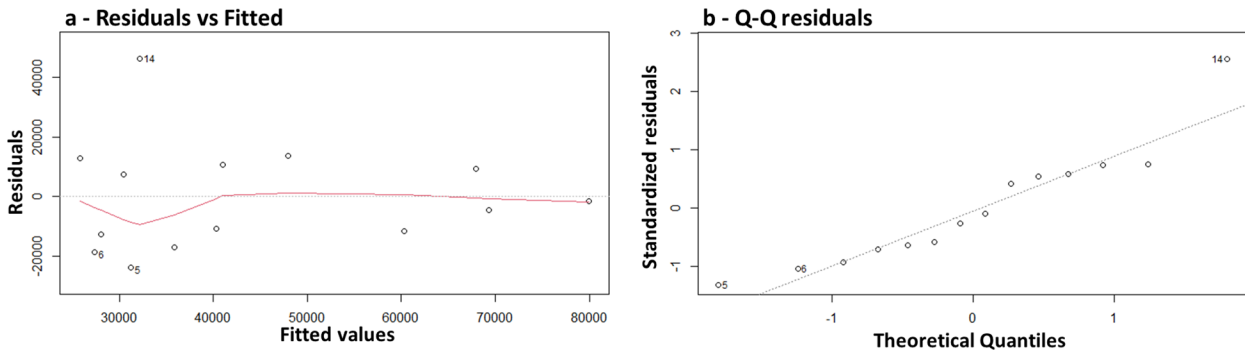


Fig. D7. Residual plots for the linear models between the proxy based on the Ctot in Lake Bourget and the winter temperature variable, with residuals values compared to fitted values (a) and Q-Q residuals plot (b).

Tab. D7. Model statistics for the Lake Annecy with the fishery indicator based on CPUE.

Model	p-value of the coefficient	BIC	R²	F value
CPUE ~ Water Level	0.18	100.8	0.13	1.99
CPUE ~ Daphnia	0.22	107.2	0.10	1.66
CPUE ~ Win Temp	0.32	107.8	0.07	1.05
CPUE ~ Spr Temp	0.33	107.8	0.07	1.04
CPUE ~ Wind Intensity	0.57	108.6	0.02	0.34
CPUE ~ Cladocera	0.84	108.9	<0.01	0.04
CPUE ~ Sum Temp	0.89	108.9	<0.01	0.02
CPUE ~ Copepods	0.91	108.9	<0.01	0.01

Tab. D8. Model statistics for Lake Annecy based on the total annual landings (Ctot) fish abundance proxy. Significant ($p < 0.05$) and ecologically consistent model is presented in **bold**.

Model	p-value of the coefficient	BIC	R²	F value
Ctot ~ effort	0.01	345.9	0.32	7.39
Ctot ~ Sum Temp	0.05	348.1	0.22	4.62
Ctot ~ Win Temp	0.15	350.3	0.13	2.30
Ctot ~ Wind Intensity	0.15	350.3	0.12	2.25
Ctot ~ Cladocera	0.22	351.0	0.09	1.63
Ctot ~ Copepods	0.40	351.9	0.05	0.75
Ctot ~ Daphnia	0.70	352.5	0.01	0.15
Ctot ~ Spr Temp	0.77	352.6	<0.01	0.09
Ctot ~ Water Level	0.92	334.3	<0.01	0.01
Ctot ~ effort + Sum Temp	0.06* for Sum Temp	344.2	0.47	6.63

*Highest p-value from the two coefficients.

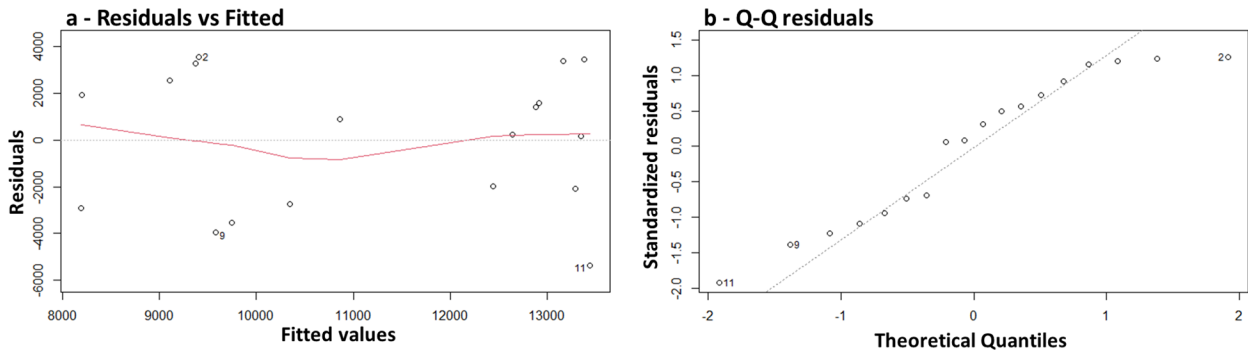


Fig. D8. Residual plots for the linear models between the proxy based on the Ctot in Lake Annecy and the fishing effort variable, with residuals values compared to fitted values (a) and Q-Q residuals plot (b).

Tab. D9. Model statistics for the Lake Aiguebelette with the fishery indicator based on CPUE.

Model	p-value of the coefficient	BIC	R ²	F value
CPUE ~ Water Level	0.04	8.3	0.27	5.40
CPUE ~ Win Temp	0.21	12.4	0.10	1.71
CPUE ~ Sum Temp	0.55	13.8	0.02	0.38
CPUE ~ Wind Intensity	0.84	13.9	<0.01	0.04
CPUE ~ Spr Temp	0.95	14.2	<0.01	0.01

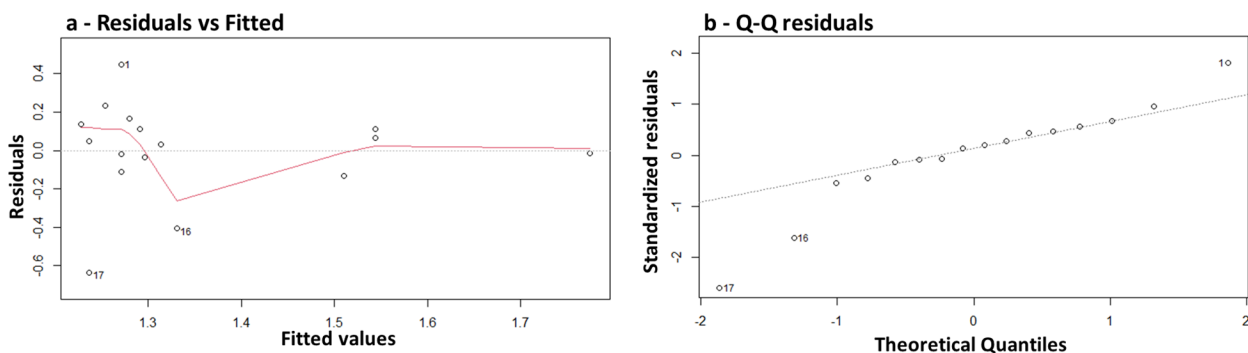


Fig. D9. Residual plots for the linear models between the proxy based on the CPUE in Lake Aiguebelette and the water level variable, with residuals values compared to fitted values (a) and Q-Q residuals plot (b).

Tab. D10. Model statistics for Lake Aiguebelette based on the total annual landings (Ctot) fish abundance proxy.

Model	p-value of the coefficient	BIC	R ²	F value
Ctot ~ Water Level	<0.01	281.3	0.45	10.66
Ctot ~ Win Temp	0.24	309.7	0.10	1.49
Ctot ~ Spr Temp	0.29	310.0	0.08	1.20
Ctot ~ effort	0.58	292.7	0.03	0.33
Ctot ~ Sum Temp	0.80	311.2	<0.01	0.07
Ctot ~ Wind Intensity	0.93	235.3	<0.01	<0.01

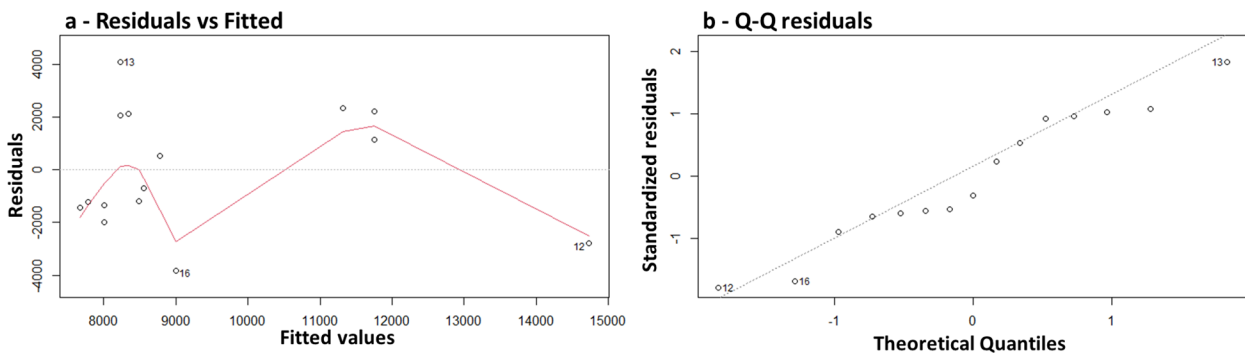


Fig. D10. Residual plots for the linear models between the proxy based on the Ctot in Lake Aiguebelette and the water level variable, with residuals values compared to fitted values (a) and Q-Q residuals plot (b).