Morphometric Conversion for Red Snapper (*Lutjanus campechanus*)

Matthew Vincent

SEDAR90-DW-29

2 May 2025

Please cite this document as:

Vincent, Matt. 2025. Morphometric Conversion for Red Snapper (*Lutjanus campechanus*). SEDAR90-DW-29. SEDAR, North Charleston, SC. 19 pp.

Morphometric Conversion for Red Snapper (*Lutjanus campechanus*)

Matthew Vincent[1]

SEDAR90-DW

April 2025

[1] National Marine Fisheries Service, Southeast Fisheries Science Center, Beaufort Laboratory, 101 Pivers Island Drive, Beaufort, NC 28516

Introduction

Morphometric conversions are an important, but often over looked component of stock assessment models. They are used to convert various measurements of length into a common preferred length for use in length composition data. These compositions can be used directly in the stock assessment and are used to weight the age composition data. Some morphometric conversions are used directly within the assessment to convert number of individuals at age to biomass.

Methods

Length measurements of red snapper by maximum total length, natural total length, standard length, fork length in millimeters and whole weight and gutted weight in grams. Measurements were collected from the age files provided by the NMFS-SEFSC, Florida Fish and Wildlife Research Institute, Georgia Department of Natural Resources, and South Carolina Department of Natural Resources. Additional size information was also compiled from the southeast regional headboat survey (SRHS), the commercial trip interview program (TIP), and the marine recreational information program (MRIP). The data bases were merged to remove duplicate entries based on the day of collection, fishery, and all available length and weight measurement categories. A total of 123,388 red snapper observations were used in the morphometric conversions. Linear regressions were performed for individual conversions and significance of each covariate was examined. Only regression coefficients significantly different from zero were included in the final conversion factor.

All morphometric conversions examined here, including model specifications and units, are shown in Table 1.

Results and Discussion

Most linear regressions had very high R^2 values and very low variability in conversions. The least amount of variability observed in the plot of the conversion to maximum total length occurred when converting from natural total length (Figure 1) but the highest R^2 occurred when converting from fork length (Table 1). Potential outliers observed in the length weight conversions that appeared to have a different trend, particularly on the log scale, were identified to be from a variety of different sampling programs. Further identification of these individual data points and correction in the corresponding databases is recommended for future research.

Tables

Table 1. Morphometric conversions for Red Snapper derived from available length and weight data provided during SEDAR 90.

EQUATION FORM	SAMPLE SIZE	MIN_X	MAX_X	TYPE_X	UNIT_X	MIN_Y	MAX_Y	TYPE_Y	UNIT_Y	VALUE_A	VALUE_B	VALUE_R2
Y = a + (b * X)	2175	301	925	Total Length natural	Millimeters	302	957	Total Length maximum	Millimeters	5.603226	1.015619	0.995258
Y = a + (b * X)	2175	302	957	Total Length maximum	Millimeters	301	925	Total Length natural	Millimeters	-2.71299	0.979952	0.995258
Y = a + (b * X)	38251	33	955	Fork Length	Millimeters	36	1116	Total Length maximum	Millimeters		1.076004	0.999846
Y = a + (b * X)	38251	36	1116	Total Length maximum	Millimeters	33	955	Fork Length	Millimeters	0.667677	0.928034	0.998373
Y = a + (b * X)	34331	26	865	Standard Length	Millimeters	36	997	Total Length maximum	Millimeters	16.20926	1.232462	0.995499
Y = a + (b * X)	34331	36	997	Total Length maximum	Millimeters	26	865	Standard Length	Millimeters	-11.3526	0.807732	0.995499
Y = b * X	9313	204	970	Total Length natural	Millimeters	191	930	Fork Length	Millimeters		0.938831	0.999448
Y = a + (b * X)	9313	191	930	Fork Length	Millimeters	204	970	Total Length natural	Millimeters	7.058047	1.052163	0.98719
Y = a + (b * X)	3267	236	925	Total Length natural	Millimeters	189	792	Standard Length	Millimeters	-17.0682	0.825166	0.952889
Y = a + (b * X)	3267	189	792	Standard Length	Millimeters	236	925	Total Length natural	Millimeters	47.16298	1.154785	0.952889
Y = a + (b * X)	35487	26	865	Standard Length	Millimeters	33	955	Fork Length	Millimeters	15.34129	1.145498	0.995385
Y = a + (b * X)	35487	33	955	Fork Length	Millimeters	26	865	Standard Length	Millimeters	-11.5365	0.868954	0.995385
Y = a + (b * X)	1354	87	14710	Gutted Weight	Grams	91	15850	Whole Weight	Grams	-17.3899	1.106655	0.99677
Y = a + (b * X)	1354	91	15850	Whole Weight	Grams	87	14710	Gutted Weight	Grams	24.05048	0.900705	0.99677
Y = a * (X ^ b)	33373	59	1116	Total Length maximum	Millimeters	20	16200	Whole Weight	Grams	1.02E-05	3.054782	

ln(Y) = ln(a)+b ln(X)	33373	4.077537	7.017506	Total Length maximum	Millimeters	2.995732	9.692767	Whole Weight	Grams	-10.639	2.917783	0.980306
Y = a * (X ^ b)	33373	20	16200	Whole Weight	Grams	59	1116	Total Length maximum	Millimeters	42.60684	0.328624	
ln(Y) = ln(a)+b ln(X)	33373	2.995732	9.692767	Whole Weight	Grams	4.077537	7.017506	Total Length maximum	Millimeters	-10.639	2.917783	0.980306
Y = a * (X ^ b)	16570	59	1025	Total Length natural	Millimeters	80	25500	Whole Weight	Grams	1.39E-05	3.011744	
ln(Y) = ln(a)+b ln(X)	16570	4.077537	6.932448	Total Length natural	Millimeters	4.382027	10.14643	Whole Weight	Grams	-10.8518	2.957706	0.956939
Y = a * (X ^ b)	33373	80	25500	Whole Weight	Grams	59	1025	Total Length natural	Millimeters	43.32641	0.324807	
ln(Y) = ln(a)+b ln(X)	16570	4.382027	10.14643	Whole Weight	Grams	4.077537	6.932448	Total Length natural	Millimeters	-10.8518	2.957706	0.956939
Y = a * (X ^ b)	56404	47	955	Fork Length	Millimeters	20	17642.68	Whole Weight	Grams	2.04E-05	2.979603	
ln(Y) = ln(a)+b ln(X)	56404	3.850148	6.861711	Fork Length	Millimeters	2.995732	9.778076	Whole Weight	Grams	-10.6505	2.954529	0.983053
Y = a * (X ^ b)	56404	20	17642.68	Whole Weight	Grams	47	955	Fork Length	Millimeters	39.30606	0.329881	
ln(Y) = ln(a)+b ln(X)	56404	2.995732	9.778076	Whole Weight	Grams	3.850148	6.861711	Fork Length	Millimeters	-10.6505	2.954529	0.983053
Y = a * (X ^ b)	31239	20	16200	Standard Length	Millimeters	46	813	Whole Weight	Grams	4.74E-05	2.92323	
ln(Y) = ln(a)+b ln(X)	31239	3.828641	6.700731	Standard Length	Millimeters	2.995732	9.692767	Whole Weight	Grams	-9.42505	2.833216	0.978198
Y = a * (X ^ b)	31239	20	16200	Whole Weight	Grams	46	813	Standard Length	Millimeters	30.86878	0.339075	
ln(Y) = ln(a)+b ln(X)	31239	2.995732	9.692767	Whole Weight	Grams	3.828641	6.700731	Standard Length	Millimeters	-9.42505	2.833216	0.978198

Figures

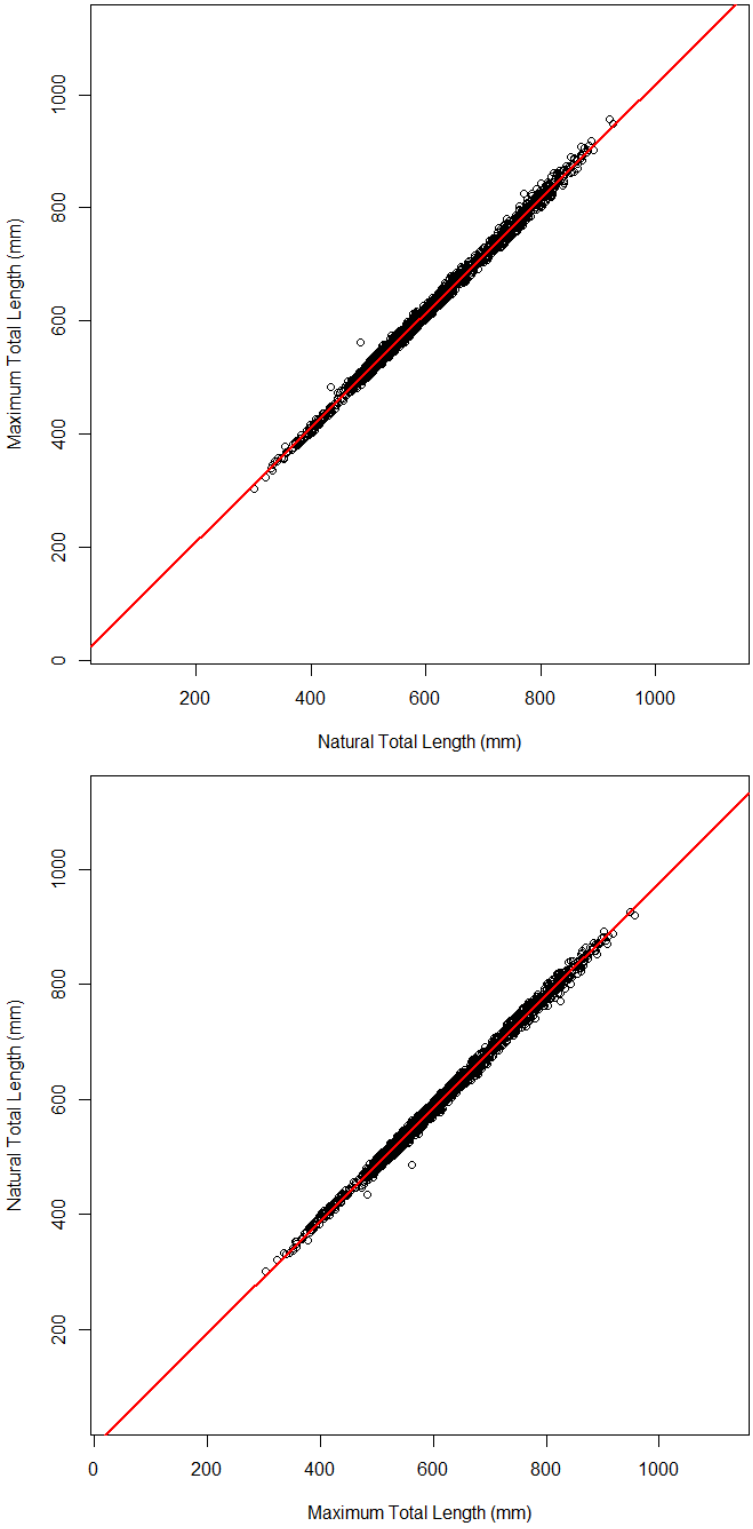

Figure 1. Measured natural total length in millimeters vs maximum total length in millimeters and vice versa with the linear regression line plotted in red.

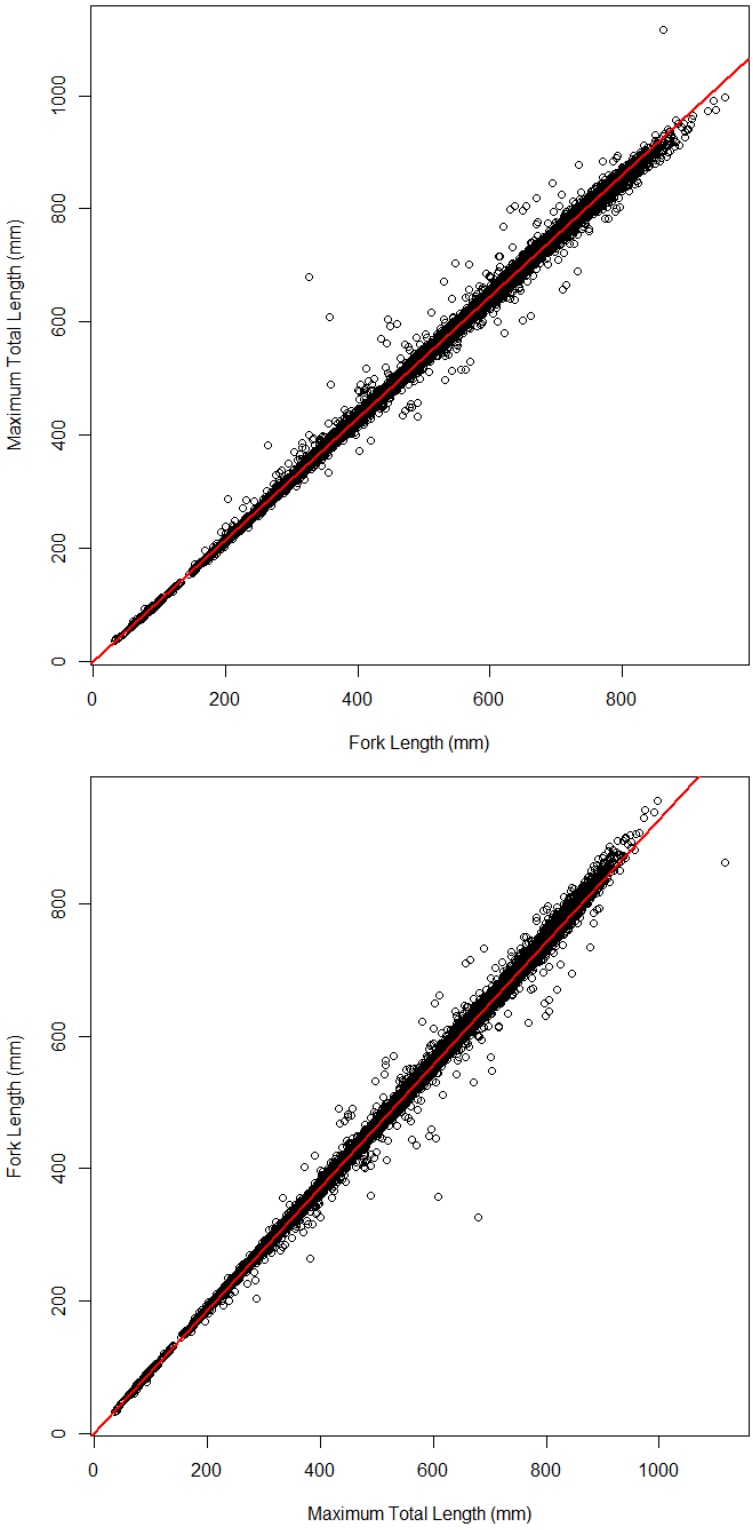

Figure 2. Measured fork length in millimeters versus maximum total length in millimeters and vice versa with the linear regression line plotted in red.

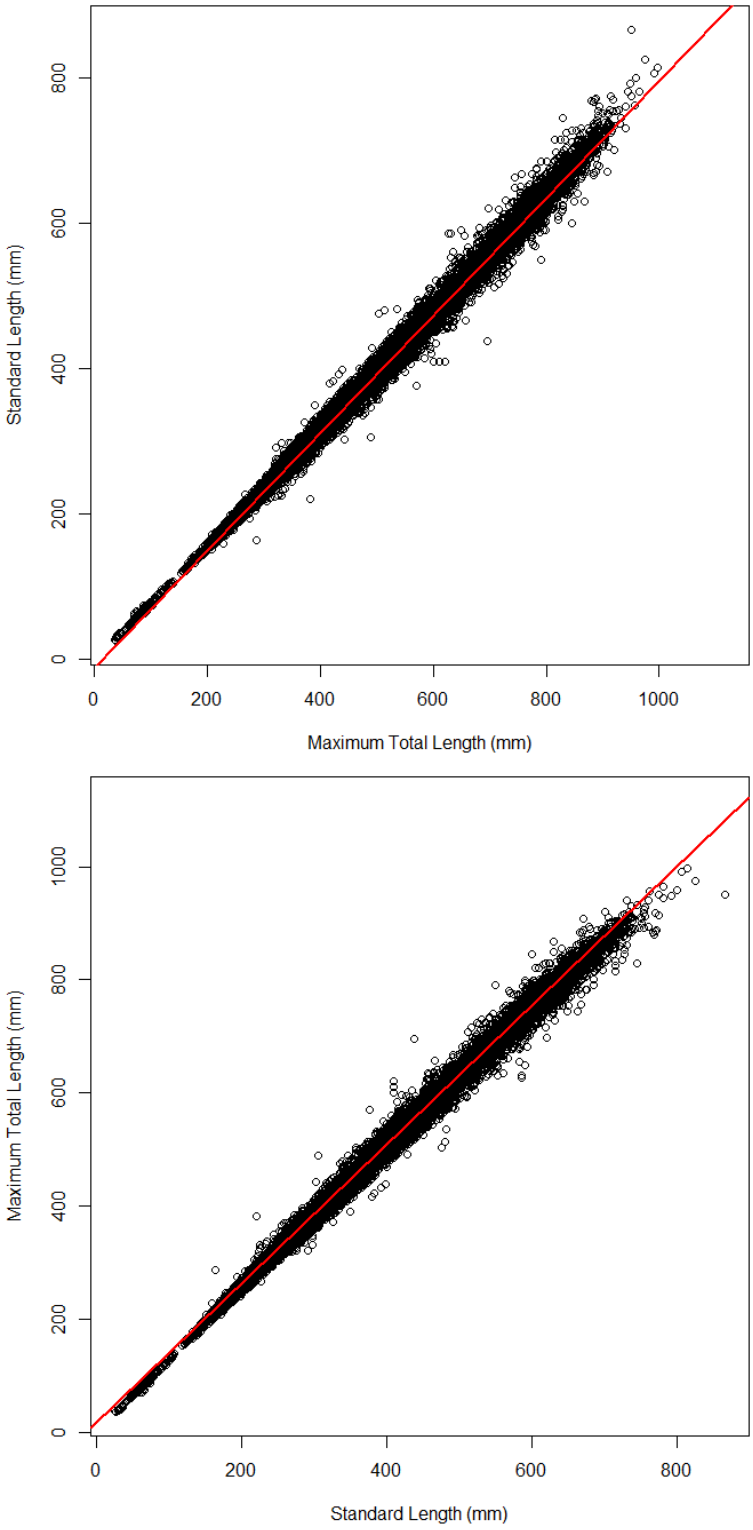

Figure 3. Measured maximum total length in millimeters versus standard length in millimeters and vice versa with the linear regression line plotted in red.

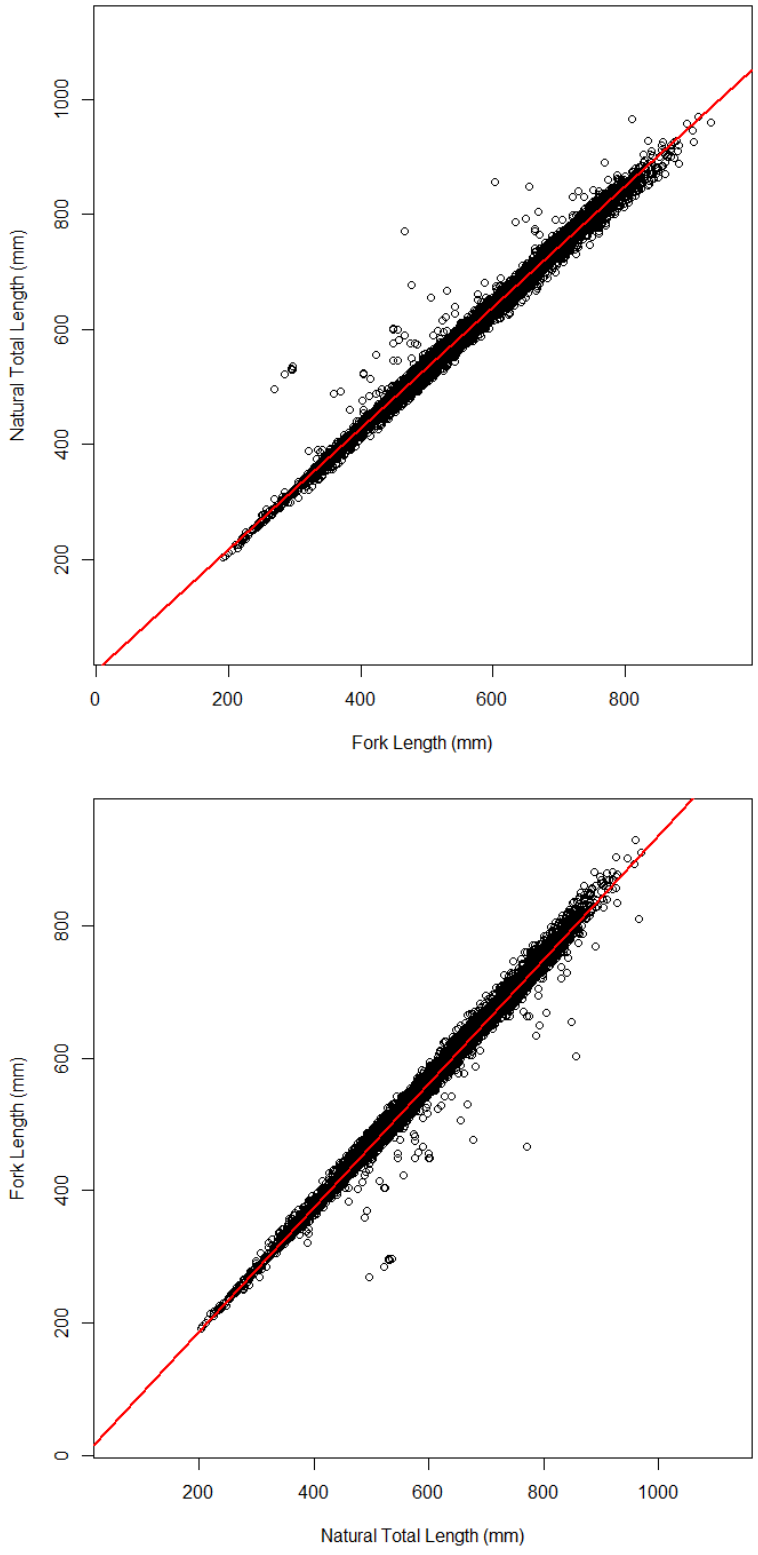

Figure 4. Measured fork length in millimeters versus natural total length in millimeters and vice versa with the linear regression line plotted in red.

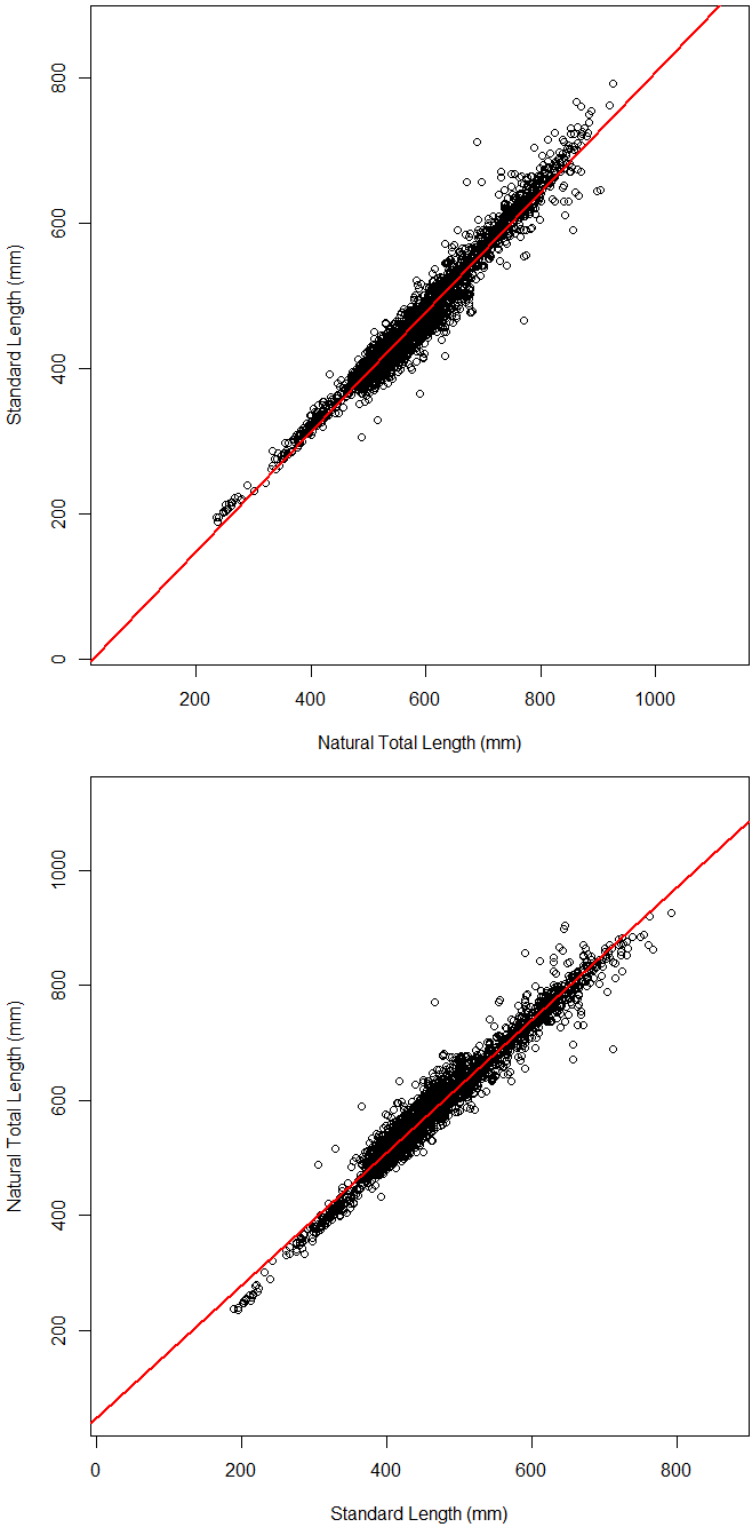

Figure 5. Measured Natural total length in millimeters versus standard length in millimeters and vice versa with the linear regression line plotted in red.

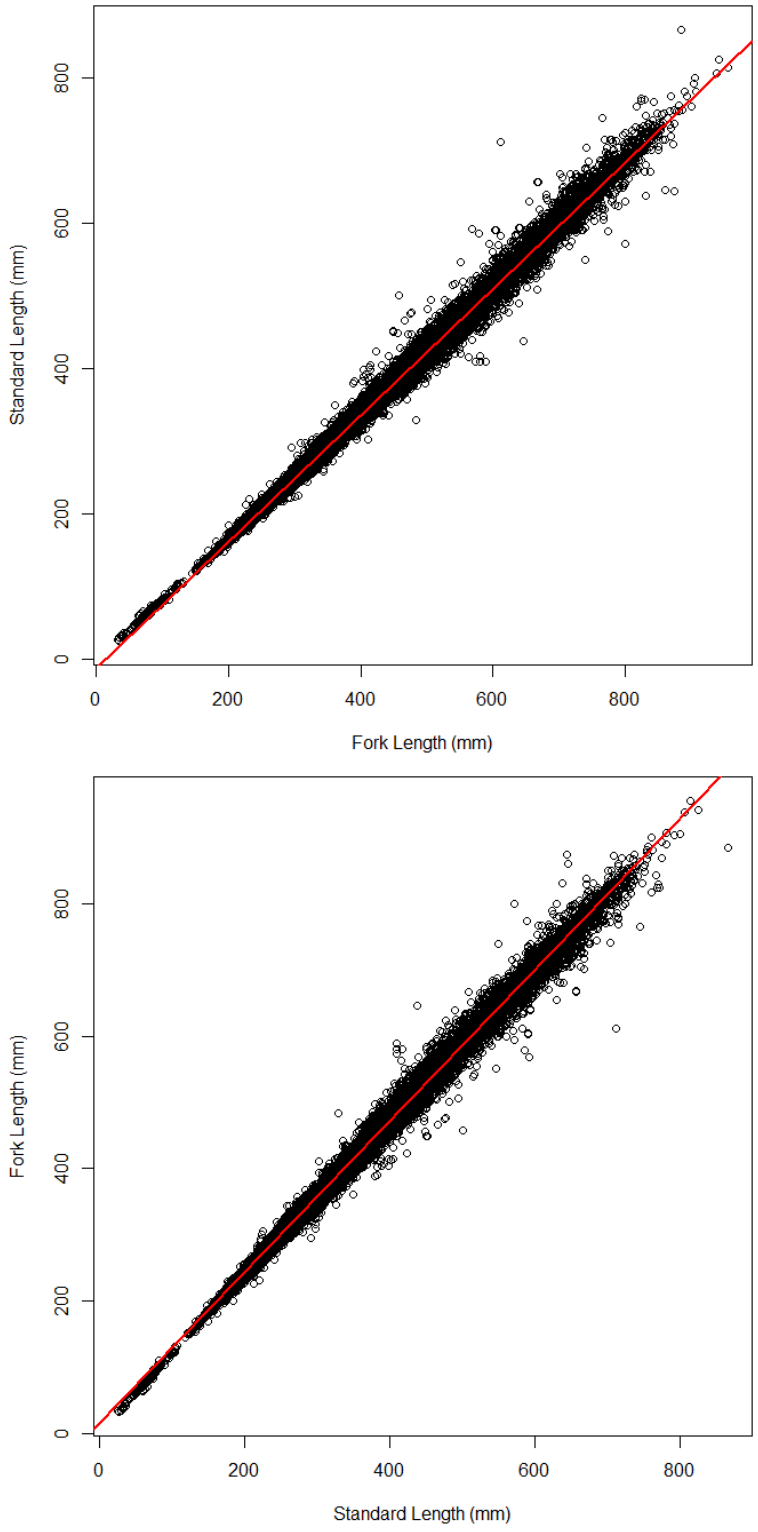

Figure 6. Measured fork length in millimeters versus standard length in millimeters and vice versa with the linear regression line plotted in red.

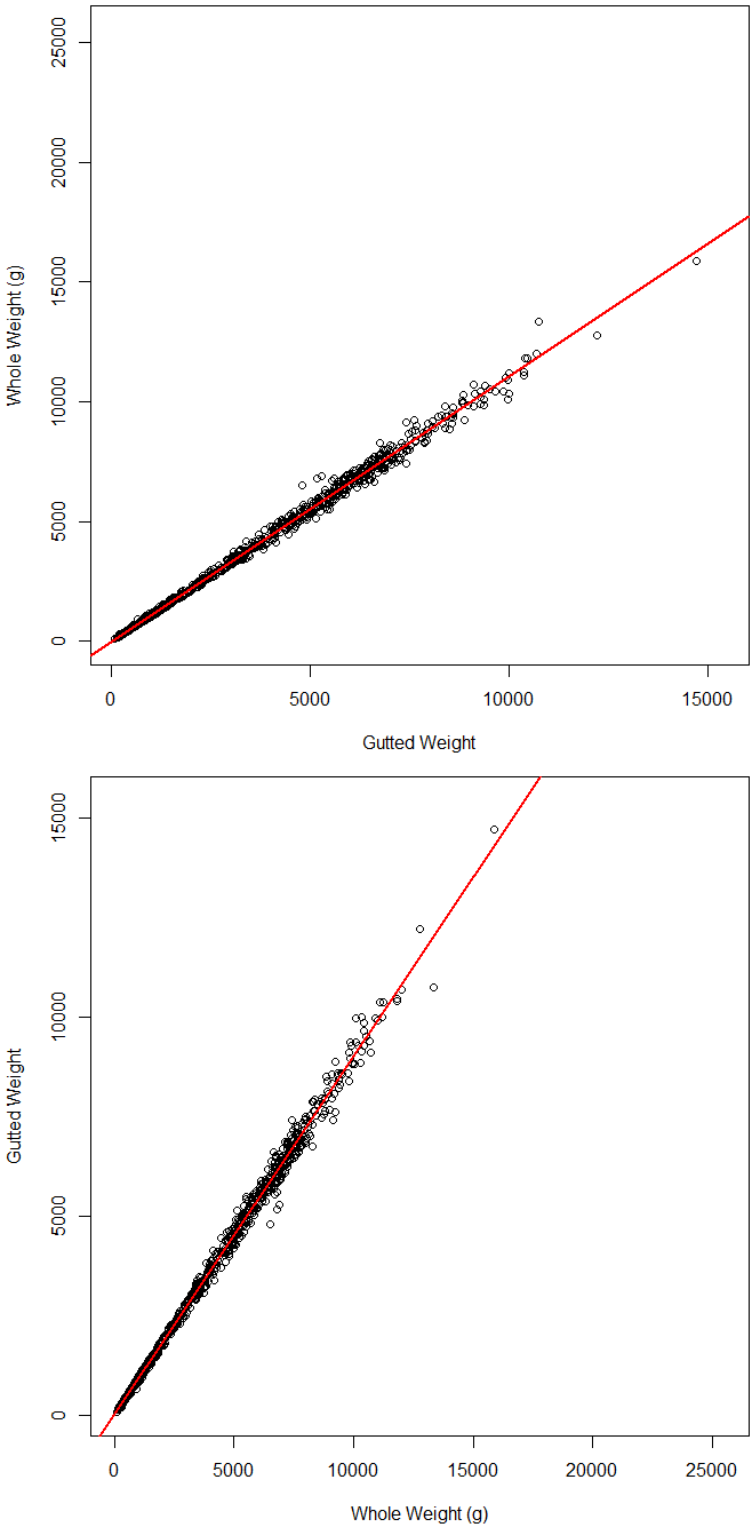

Figure 7. Measured gutted weight in grams versus whole weight in grams and vice versa with the linear regression line plotted in red.

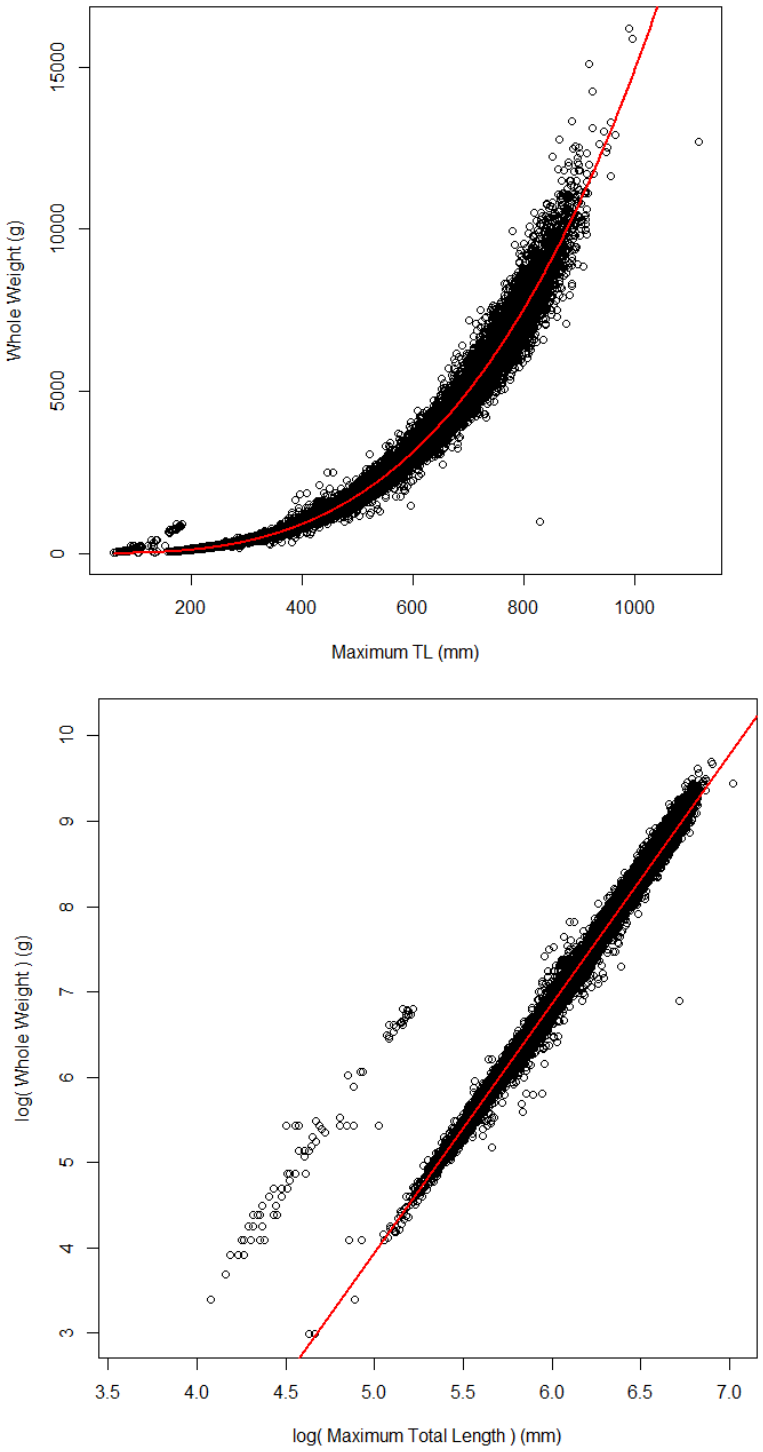

Figure 7. Measured maximum total length in millimeters versus whole weight in grams with estimated exponential line in red (top panel) and on logarithmic scale with linear fit in red (bottom panel).

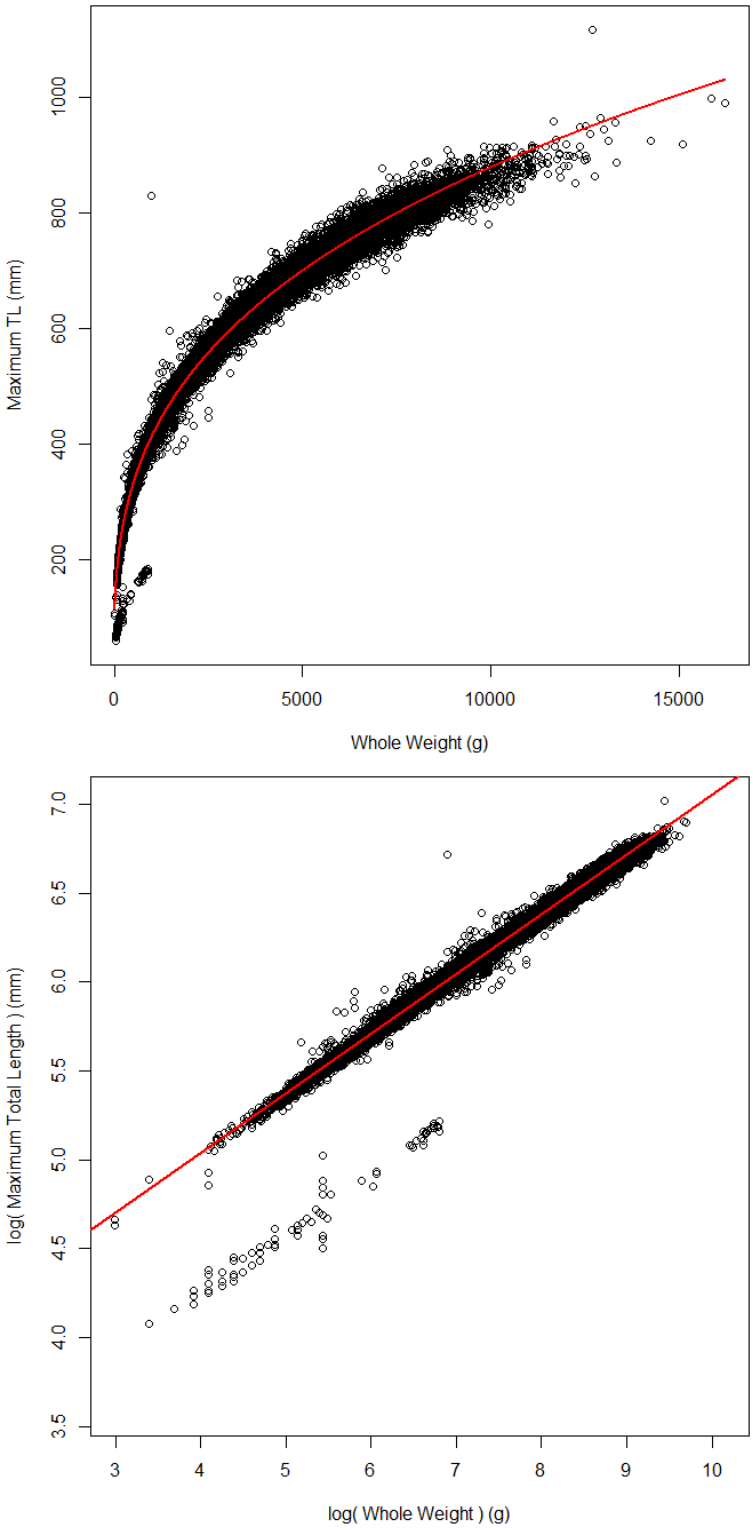

Figure 8. Measured whole weight in grams versus maximum total length in millimeters with estimated exponential line in red (top panel) and on logarithmic scale with linear fit in red (bottom panel).

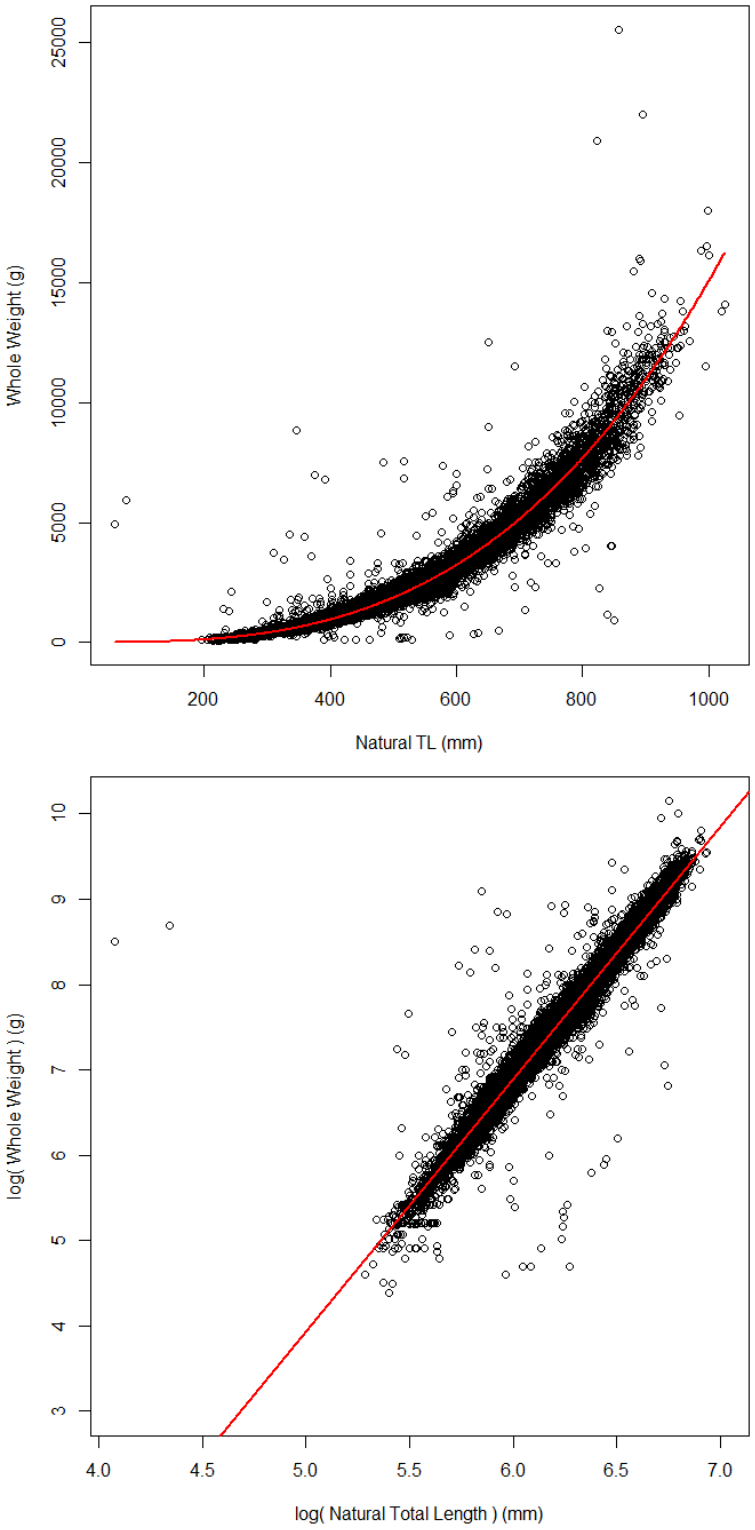

Figure 9. Measured natural total length in millimeters versus whole weight in grams with estimated exponential line in red (top panel) and on logarithmic scale with linear fit in red (bottom panel).

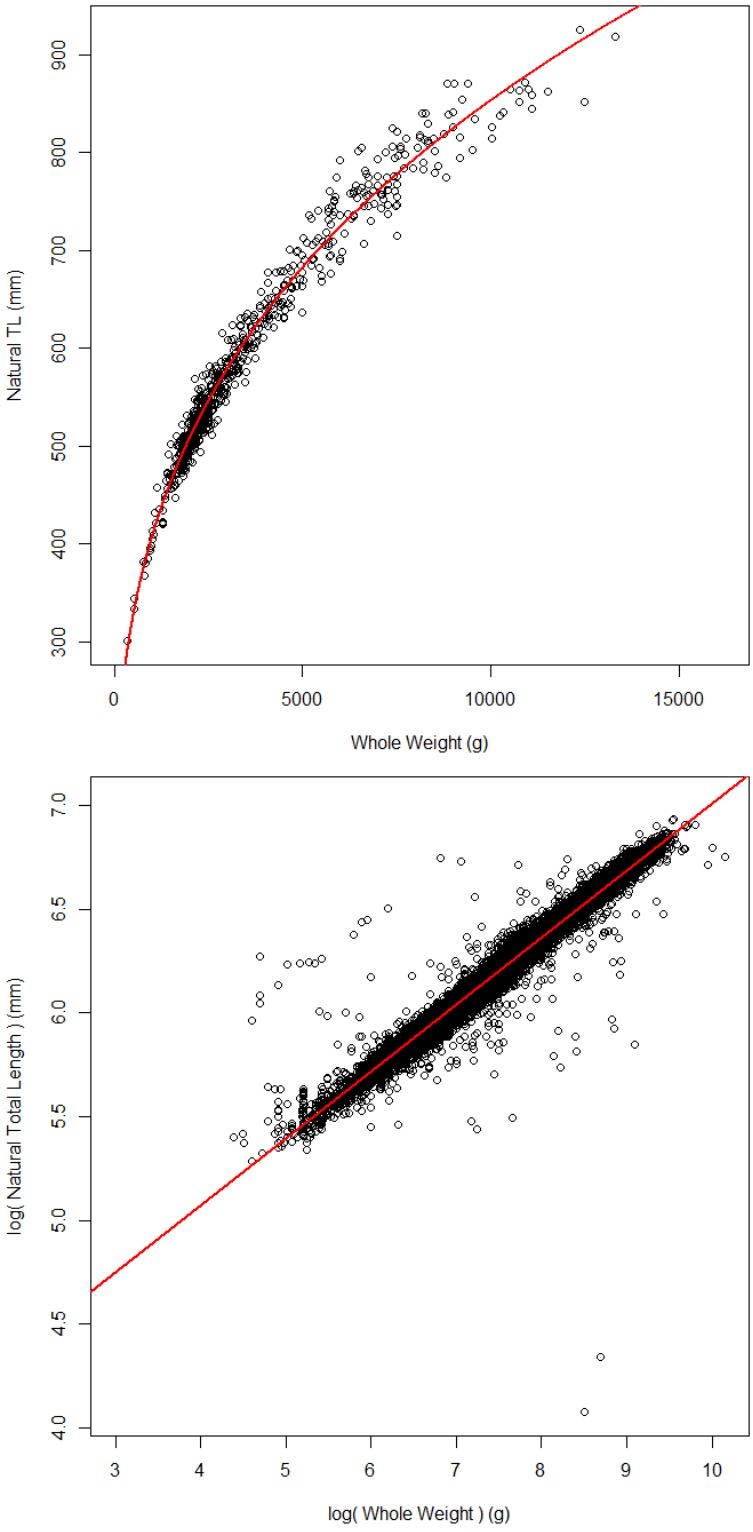

Figure 10. Measured whole weight in grams versus natural total length in millimeters with estimated exponential line in red (top panel) and on logarithmic scale with linear fit in red (bottom panel).

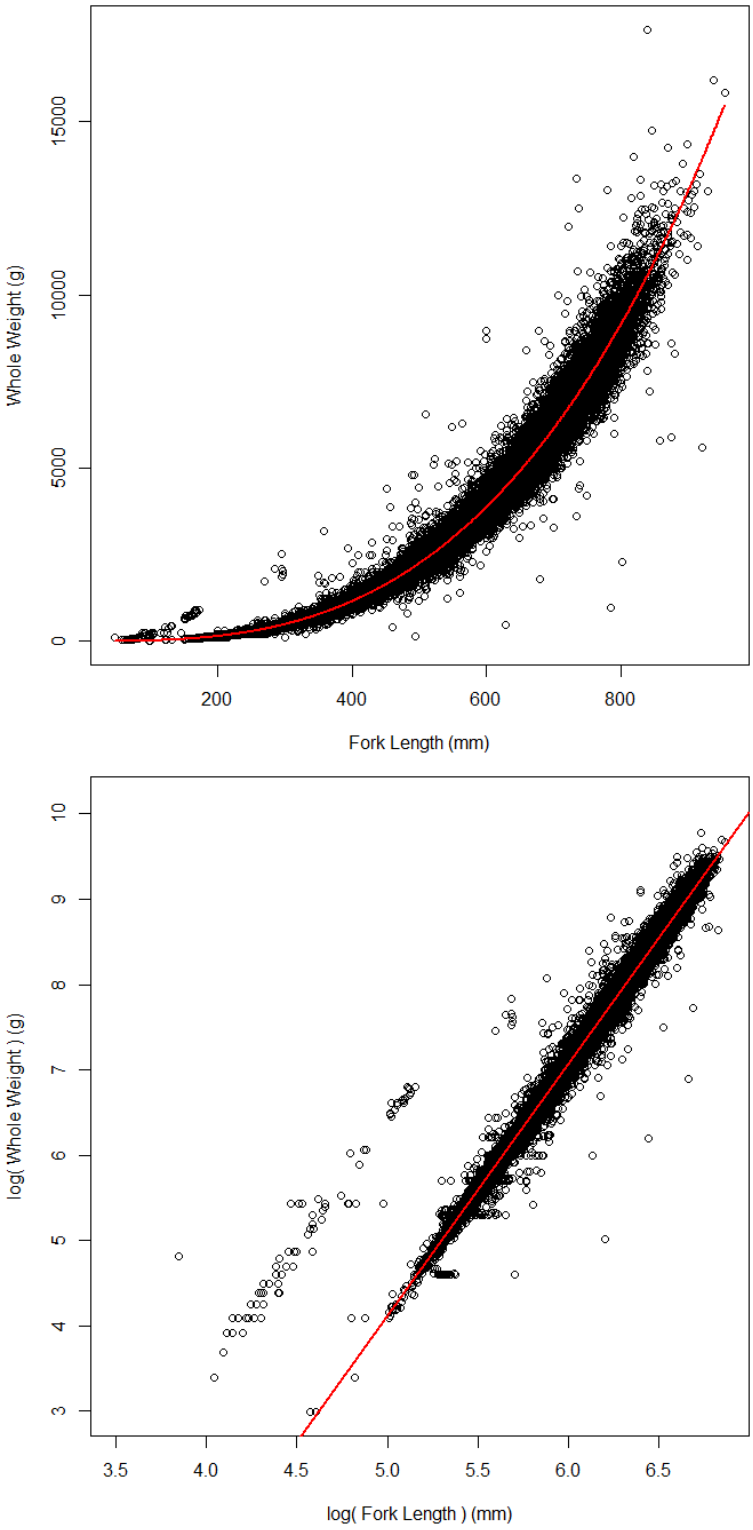

Figure 11. Measured fork length in millimeters versus whole weight in grams with estimated exponential line in red (top panel) and on logarithmic scale with linear fit in red (bottom panel).

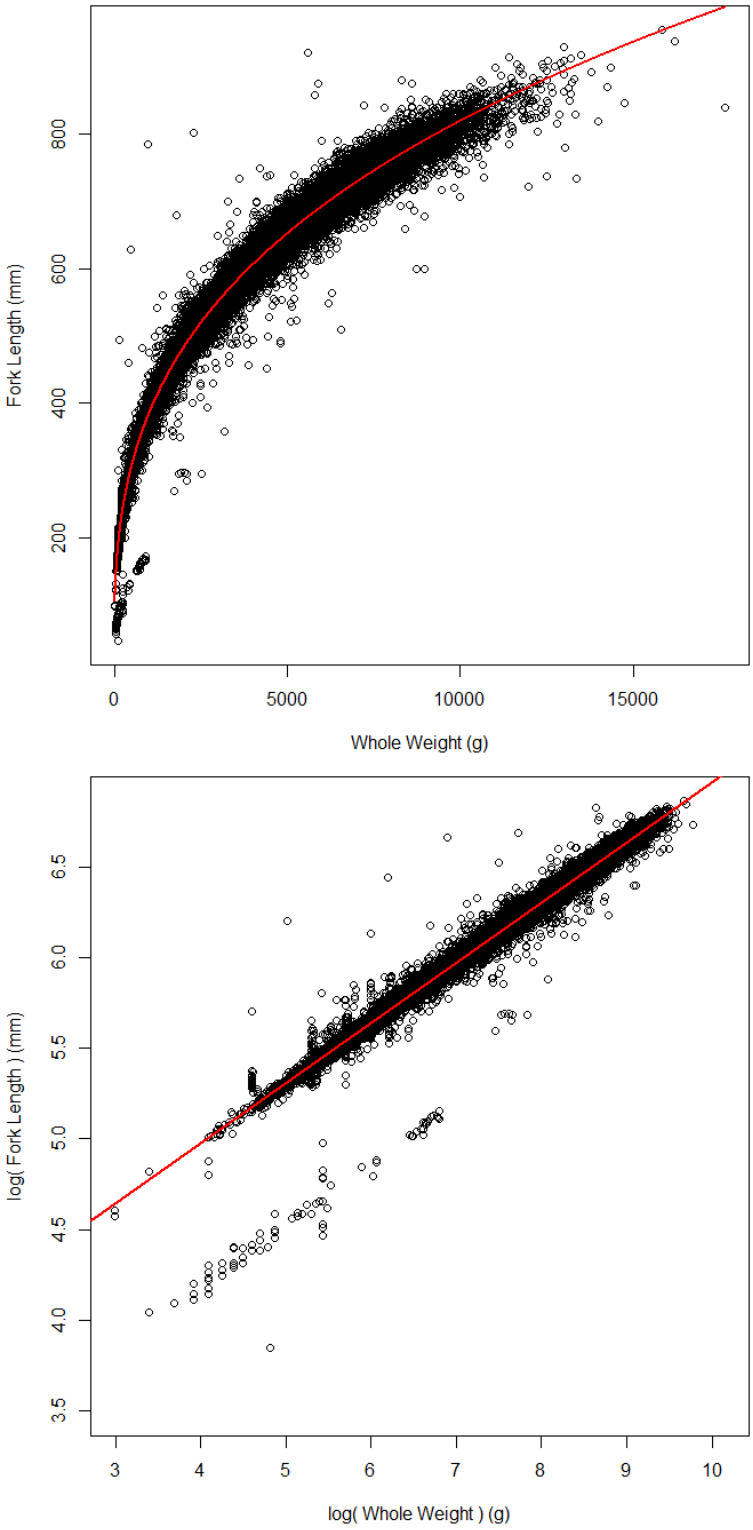

Figure 12. Measured whole weight in grams versus fork length in millimeters with estimated exponential line in red (top panel) and on logarithmic scale with linear fit in red (bottom panel).

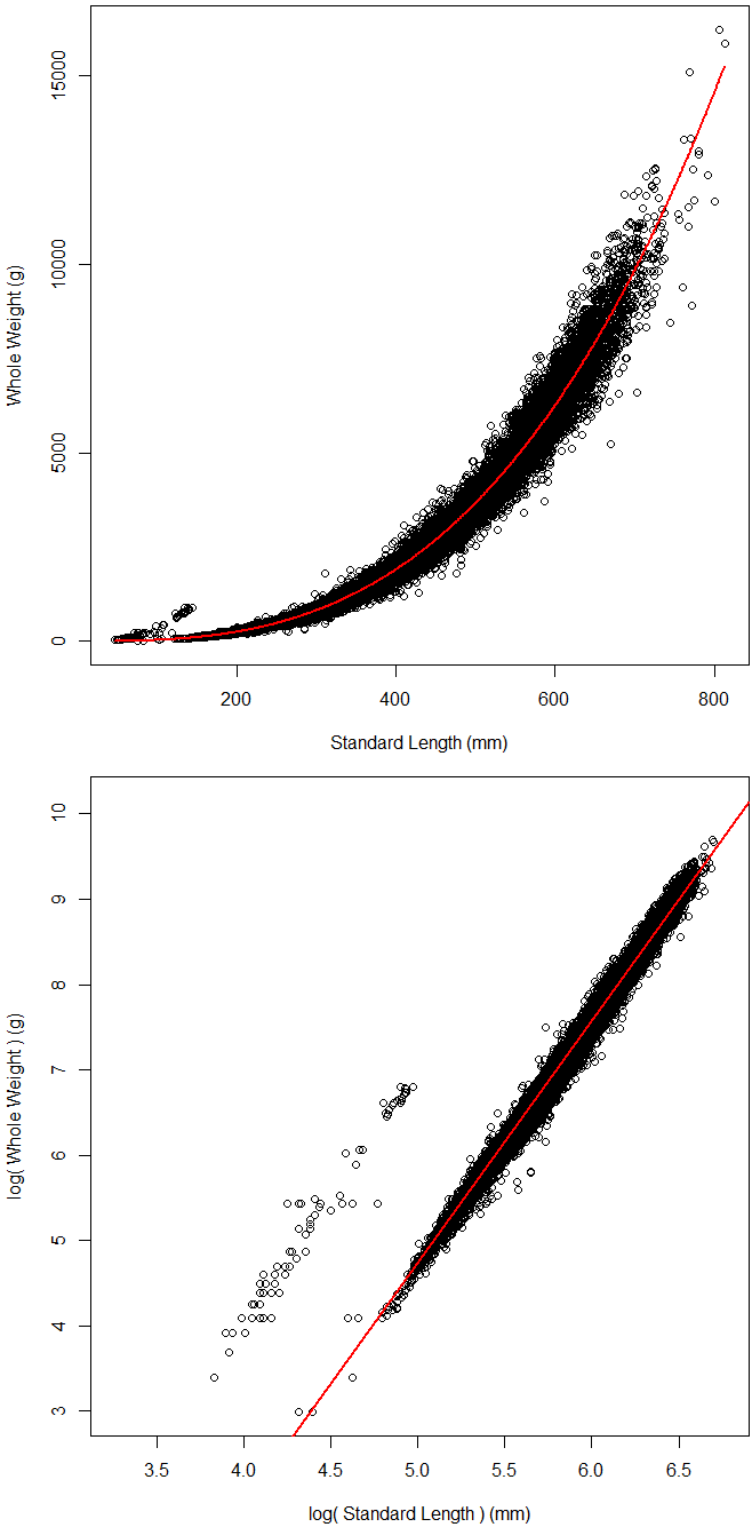

Figure 13. Measured standard length in millimeters versus whole weight in grams with estimated exponential line in red (top panel) and on logarithmic scale with linear fit in red (bottom panel).

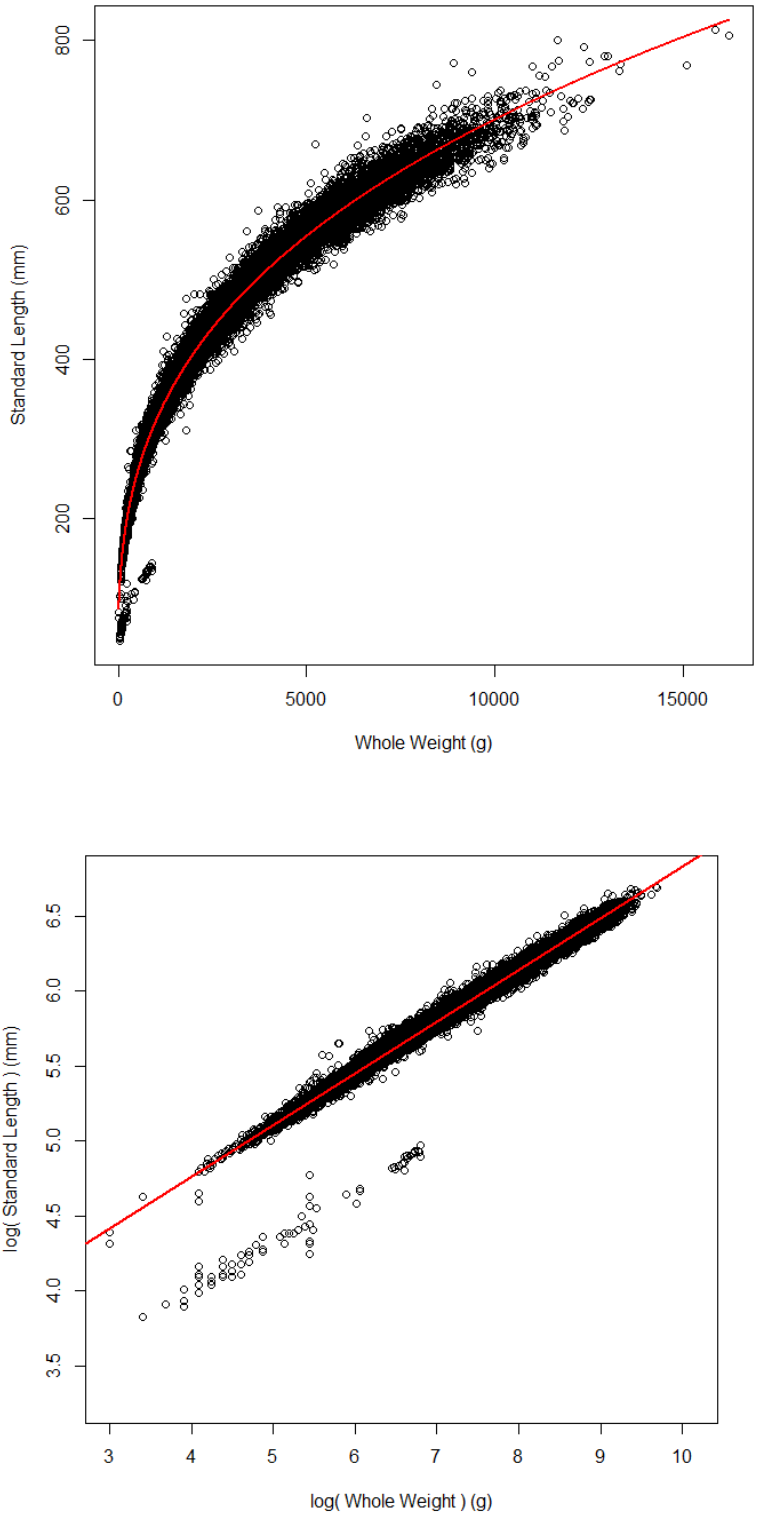

Figure 14. Measured whole weight in grams versus standard length in millimeters with estimated exponential line in red (top panel) and on logarithmic scale with linear fit in red (bottom panel).