

**Table S1.** Technical details for amplification of ten microsatellite loci for Ghanaian tilapias (*Oreochromis* spp.) collected from eight rivers and one coastal lagoon from December 2014 to July 2017 in Ghana.

Locus	Primer Sequences (5' to 3')	Size Range (Base-Pairs)	Annealing Temp (°C)	GenBank Accession Number
UNH123	F: CATCATCACAGACAGATTAGA R: GATTGAGATTTTCATTCAAG	171–245	54	G12276.1
UNH130	F: AGGAAGAATAGCATGTAGCAAGTA R: GTGTGATAAATAAAGAGGCAGAAA	164–242	58	G12283.1
UNH178	F: GTCACACCTCCATCATC R: AGTTGTTTGGTCGTGTAAG	114–144	58	G12330.1
UNH180	F: GCAACTAATCACACAATTTT R: GTTTAAGTTAAAAACAAATTCGTTT	121–187	58	G12332.1
UNH203	F: CACAAAGATGTCTAAACATGT R: GAATTTGACAGTTTGTGTTTAC	65–97	56	G12354.1
UNH858	F: TTCAAACAGCTTCACGGTCA R: CTATGCCATGGCTAAAGTCAC	196–252	58	G68194.1
UNH898	F: GATGTCCCCACAAGGTATGAA R: TAATCCACTCACCCCGTTTC	214–292	58	G68215.1
UNH925	F: GTAGCTGCTGGGTCTGAAG R: TAGCACTCTGCCACTTGTCC	172–252	58	G68234.1
UNH934	F: ACTGCAATGAAATGCTGCTT R: CCATTCCTCAGAGCACAACA	214–246	58	G68240.1
UNH991	F: AAGCCTTGCATAAAACAGCA R: AAAGTTTGCTGCCCTCAGTG	150–182	58	G68271.1

**Table S2.** Allele frequencies (%) across 8 nuclear microsatellite DNA loci for wild *O. niloticus* populations sampled from 11 sites (9 river basins) in Ghana from 2014 to 2017. AF = Afram, WB = White Volta–Binaba, WK = White Volta–Kulugu, OT = Oti, AN = Ankobra, TA = Tano–Asuhyea, TE = Tano–Elubo, JU = Juen, BV = Black Volta, and LV = Lower Volta. Private alleles are indicated in Bold.

Locus	Populations										
<i>UNH123</i>	AF	WB	WK	OT	PR	AN	TA	TE	JU	BV	LV
171	6.67	8.62	5.00								
173						1.67			4.17	10.26	6.06
175	28.33	22.41	43.33	26.67	40.00	61.67	20.00	16.67	29.17	38.46	42.42
179			<b>1.67</b>								
181								<b>2.78</b>			
187										<b>1.28</b>	
189	1.67		1.67	5.00	1.67						3.03
191		5.17	1.67					11.11			
193								<b>2.78</b>			
195	10.00	17.24	10.00	1.67	25.00	18.33	40.00	19.44	8.33	10.26	6.06
197	10.00	17.24	10.00	1.67	3.33	13.33	35.00	16.67	33.33	3.85	1.52
199								5.56			1.52
201	<b>6.67</b>										
203			1.67	3.33	10.00	1.67	1.67		8.33	2.56	
207	18.33	24.14	6.67	33.33	13.33	1.67		5.56			27.27
209	8.33	3.45	8.33	13.33	6.67			2.78	4.17	3.85	6.06
211	6.67	1.72	10.00	11.67			1.67	13.89		23.08	3.03
213									<b>4.17</b>		
215							1.67		8.33		
217										<b>1.28</b>	
219	3.33			3.33		1.67				3.85	3.03
235										<b>1.28</b>	
245								<b>2.78</b>			
<i>UNH178</i>	AF	WB	WK	OT	PR	AN	TA	TE	JU	BV	LV
114						3.33			4.17		1.52
120	33.33	40.00	50.00	50.00	51.67	50.00	10.00	41.67	20.83	19.23	36.36
122									<b>4.17</b>		
124	5.00					1.67		8.33		3.85	9.09
126	16.67	8.33	23.33	3.33	8.33	15.00	8.33	11.11		5.13	12.12
128	3.33	16.67	3.33	6.67	5.00	23.33	5.00	5.56	12.50	3.85	3.03
130	13.33	1.67	1.67	5.00	21.67	5.00	11.67	11.11	4.17	16.67	15.15
132	21.67	11.67	3.33	11.67	11.67	1.67	16.67	2.78	25.00	1.28	9.09
134				15.00						2.56	
136	<b>1.67</b>										
138										<b>3.85</b>	
140	3.33	15.00	16.67	8.33	1.67		23.33	5.56	12.50	41.03	12.12
142			1.67				25.00	13.89	16.67		
144	1.67	6.67								2.56	1.52

<i>UNH180</i>	AF	WB	WK	OT	PR	AN	TA	TE	JU	BV	LV
121					1.67			23.53			
125	10.00	1.72		5.00				5.88		11.54	4.84
127	1.67		1.67					2.94		19.23	
129				<b>1.67</b>							
135	1.67			1.67							
137	46.67	39.66	20.00	41.67	81.67	90.00	83.33	47.06	87.50	17.31	66.13
139	6.67		6.67	16.67							
141											<b>1.61</b>
143	25.00	8.62	15.00	3.33	1.67	8.33	3.33	20.59	8.33	46.15	
145				<b>1.67</b>							
149					<b>1.67</b>						
155	8.33	50.00	56.67	18.33	11.67		13.33		4.17	3.85	17.74
165						<b>1.67</b>					
169				1.67							3.23
171				<b>1.67</b>							
177				5.00	1.67						4.84
179										<b>1.92</b>	
187				1.67							1.61
<i>UNH203</i>	AF	WB	WK	OT	PR	AN	TA	TE	JU	BV	LV
65	38.33	33.33	23.33	30.00	18.33	28.33	43.33	41.67	54.17	15.38	25.76
67	55.00	45.00	65.00	68.33	38.33	55.00	45.00	27.78	20.83	75.64	33.33
79								<b>8.33</b>			
81											<b>1.52</b>
85								<b>16.67</b>			
89										<b>8.97</b>	
91	3.33	1.67									
93					<b>3.33</b>						
95	3.33	20.00	10.00	1.67	38.33	16.67	11.67	5.56	20.83		39.39
97			1.67		1.67				4.17		
<i>UNH858</i>	AF	WB	WK	OT	PR	AN	TA	TE	JU	BV	LV
196	1.67		3.33	1.67				11.11	8.33		
198			<b>5.00</b>								
200										<b>1.28</b>	
204	1.67			1.67						2.56	
208	3.33		1.67		1.67				4.17	2.56	10.00
210	11.67	8.93	3.33	10.00						3.85	
212					3.33	5.00		5.56			15.00
214		3.57								1.28	
216	1.67				1.67		8.33	2.78	4.17	11.54	3.33
218	5.00		3.33	1.67	18.33		1.67	8.33	4.17	6.41	5.00
220	11.67	7.14	5.00	30.00				2.78	12.50	1.28	
222	1.67				3.33	1.67	8.33	11.11			1.67

224		5.36	5.00		16.67	26.67	56.67	25.00	33.33	1.28	
226		10.71	16.67	1.67			6.67	5.56			
228						3.33		8.33		1.28	1.67
230		3.57	3.33		5.00	6.67	1.67	2.78			3.33
232	8.33	7.14	11.67	5.00			3.33			1.28	1.67
234		1.79		3.33							1.67
236			5.00		1.67	6.67		5.56		6.41	
238		5.36			10.00	26.67	6.67		4.17	15.38	15.00
240	10.00	14.29	3.33	10.00	3.33	3.33	6.67	2.78	20.83	6.41	18.33
242	15.00	8.93	8.33	15.00	11.67	3.33		8.33	4.17	35.90	11.67
244	10.00	5.36	16.67	1.67	20.00	16.67				1.28	6.67
246	13.33	7.14	6.67	11.67	3.33				4.17		3.33
248	5.00	10.71	1.67	5.00							1.67
252				<b>1.67</b>							
<hr/>											
<i>UNH898</i>	AF	WB	WK	OT	PR	AN	TA	TE	JU	BV	LV
214										<b>2.70</b>	
232	1.67	1.67					1.67	8.33	4.17		7.58
234	16.67	16.67	13.33	1.72	1.79	1.67		2.78		4.05	1.52
236	1.67	25.00	30.00	20.69		1.67					
242		1.67			7.14	1.67		19.44	29.17	39.19	27.27
244	36.67	35.00	35.00	29.31	51.79	71.67	36.67	25.00	4.17	13.51	28.79
246	5.00						16.67	2.78		10.81	4.55
250	5.00	1.67									
252		5.00	3.33								3.03
254				1.72				2.78			1.52
256	1.67					3.33	3.33		4.17	6.76	
258			1.67	1.72			1.67		4.17		
260		10.00	1.67	1.72	3.57	3.33	11.67	5.56		1.35	6.06
262									4.17	1.35	
264	1.67				1.79			5.56	8.33		
266	3.33			1.72	3.57				4.17		
268	1.67		1.67	1.72	1.79		13.33		8.33	12.16	4.55
270	1.67						1.67	5.56		1.35	3.03
272	1.67	1.67	1.67	5.17	1.79			5.56	4.17	5.41	
274	11.67		3.33	15.52	5.36	11.67	11.67	13.89	8.33	1.35	1.52
276			<b>3.33</b>								
278	1.67				1.79						
280	8.33			5.17	5.36			2.78	8.33		6.06
282		1.67		12.07	3.57						3.03
284			5.00		1.79	1.67			4.17		
286				1.72	8.93	3.33	1.67				1.52
292									<b>4.17</b>		
<hr/>											
<i>UNH934</i>	AF	WB	WK	OT	PR	AN	TA	TE	JU	BV	LV

214	43.33	70.69	51.67	56.67	45.00	51.67	61.67	55.56	33.33	57.69	43.94
216			5.00		3.33	8.33	36.67	13.89	25.00	5.13	
218								8.33		11.54	
220		1.72	3.33								1.52
222	1.67			1.67	25.00	5.00		2.78			4.55
226				1.67						1.28	
228											<b>3.03</b>
230	10.00	1.72			3.33	5.00			4.17		3.03
232	3.33	1.72	15.00	5.00	6.67						
234					1.67	1.67			16.67	1.28	3.03
236	3.33	13.79	1.67		3.33	25.00		2.78		2.56	
238	3.33				1.67						1.52
240	26.67	10.34	15.00	33.33	10.00			8.33	16.67	1.28	33.33
242	8.33		8.33	1.67				8.33		1.28	3.03
244									4.17	15.38	
246						3.33	1.67			2.56	3.03
<i>UNH991</i>	AF	WB	WK	OT	PR	AN	TA	TE	JU	BV	LV
150										2.56	3.03
152	20.00	34.48	38.33	23.33	6.67	6.67	16.67	19.44	16.67	39.74	16.67
154											<b>1.52</b>
156									<b>4.17</b>		
160	5.00	1.72	3.33	1.67						10.26	1.52
162									<b>8.33</b>		
166									<b>8.33</b>		
168	1.67		1.67		1.67	1.67					1.52
170	1.67	3.45			3.33	16.67	16.67	5.56	12.50	15.38	7.58
172	71.67	44.83	50.00	70.00	76.67	53.33	6.67	44.44	37.50	30.77	65.15
174						1.67	1.67	5.56			
176				1.67	3.33		15.00	13.89	4.17		
178		13.79	3.33	3.33	3.33	1.67					1.52
182		1.72	3.33		5.00	18.33	43.33	11.11	8.33	1.28	1.52

**Table S3.** Locus-by-locus genetic diversity metrics for all populations. Values in bold are significantly different from each other ( $P < 0.05$ ).

Population	Locus	N	<i>H<sub>o</sub></i>	<i>H<sub>e</sub></i>	<i>A</i>	Range	<i>M</i> -Ratio	<i>F<sub>IS</sub></i>
Afram River	<i>UNH123</i>	30	0.90	0.86	10	24	0.40	-0.05
	<i>UNH178</i>	30	0.83	0.80	9	12	0.69	-0.04
	<i>UNH180</i>	30	<b>0.60</b>	<b>0.71</b>	7	15	0.44	0.16
	<i>UNH203</i>	30	0.63	0.56	4	15	0.25	-0.14
	<i>UNH858</i>	30	0.93	0.91	14	26	0.52	-0.02
	<i>UNH898</i>	30	0.93	0.82	15	24	0.60	-0.14
	<i>UNH934</i>	30	0.77	0.73	8	14	0.53	-0.05
	<i>UNH991</i>	30	0.43	0.45	5	10	0.49	0.04
	Mean	30.00	0.75	0.73	9.00	15.55	0.49	-0.03

White Volta–Binaba	SD	0.00	0.17	0.15	3.674	0.125	0.13	0.10
	UNH123	29	<b>0.66</b>	<b>0.83</b>	8	20	0.38	0.22
	UNH178	30	0.73	0.78	7	12	0.54	0.06
	UNH180	29	0.45	0.60	4	15	0.25	0.25
	UNH203	30	0.60	0.66	4	15	0.25	0.09
	UNH858	28	<b>0.86</b>	<b>0.93</b>	14	19	0.70	0.08
	UNH898	30	<b>0.83</b>	<b>0.79</b>	10	25	0.38	−0.06
	UNH934	29	0.45	0.48	6	13	0.43	0.06
	UNH991	29	<b>0.62</b>	<b>0.67</b>	6	15	0.38	0.08
	Mean	29.25	0.65	0.72	7.38	16.75	0.41	0.10
White Volta–Kulugu	SD	0.71	0.15	0.13	3.12	4.02	0.14	0.10
	UNH123	30	<b>0.67</b>	<b>0.78</b>	11	20	0.52	0.15
	UNH178	30	<b>0.63</b>	<b>0.68</b>	7	11	0.58	0.06
	UNH180	30	0.53	0.62	5	14	0.33	0.14
	UNH203	30	0.60	0.52	4	16	0.24	−0.15
	UNH858	30	0.93	0.92	16	26	0.59	−0.02
	UNH898	30	<b>0.53</b>	<b>0.78</b>	11	25	0.42	0.32
	UNH934	30	0.60	0.69	7	14	0.47	0.13
	UNH991	30	0.57	0.61	6	15	0.38	0.07
	Mean	30	0.63	0.70	8	17.63	0.44	0.09
Oti River	SD	0	0.12	0.12	4	5.12	0.12	0.14
	UNH123	30	<b>0.77</b>	<b>0.79</b>	9	22	0.39	0.04
	UNH178	30	0.70	0.71	7	10	0.64	0.02
	UNH180	30	<b>0.63</b>	<b>0.77</b>	12	31	0.38	0.18
	UNH203	30	0.43	0.45	3	15	0.19	0.04
	UNH858	30	0.90	0.86	14	28	0.48	−0.05
	UNH898	29	0.83	0.84	13	26	0.48	0.01
	UNH934	30	0.60	0.57	6	14	0.40	−0.05
	UNH991	30	0.47	0.46	5	13	0.36	−0.01
	Mean	29.88	0.67	0.68	9	19.88	0.41	0.02
Pra	SD	0.35	0.15	0.15	4	7.37	0.12	0.07
	UNH123	30	0.80	0.76	7	17	0.39	−0.06
	UNH178	30	0.67	0.67	6	10	0.55	0.01
	UNH180	30	0.30	0.32	6	28	0.21	0.07
	UNH203	30	0.73	0.68	5	16	0.29	−0.08
	UNH858	30	0.97	0.88	13	19	0.65	−0.10
	UNH898	28	0.68	0.72	14	26	0.52	0.06
	UNH934	30	0.80	0.73	9	13	0.64	−0.10
	UNH991	30	0.43	0.41	7	15	0.64	−0.06
	Mean	29.75	0.67	0.65	8	18	0.46	−0.03
SD		0.71	0.20	0.17	3	5.79	0.15	0.07
Population	Locus	N	Ho	He	A	Range	M-ratio	Fis
Ankobra	UNH123	30	0.63	0.58	7	23	0.29	−0.10
	UNH178	30	<b>0.57</b>	<b>0.68</b>	7	9	0.70	0.17
	UNH180	30	0.20	0.19	3	14	0.20	−0.08
	UNH203	30	0.53	0.60	3	15	0.19	0.11
	UNH858	30	0.90	0.83	10	16	0.59	−0.09
	UNH898	30	0.50	0.48	9	26	0.33	−0.05
	UNH934	30	0.77	0.67	7	16	0.41	−0.15
	UNH991	30	0.67	0.66	7	15	0.44	−0.01
	Mean	30	0.60	0.58	7	16.75	0.39	−0.02
	SD	0	0.19	0.18	2	4.99	0.17	0.11

Tano–Asuhyea	UNH123	30	0.77	0.69	6	20	0.29	−0.12
	UNH178	30	<b>0.73</b>	<b>0.84</b>	7	11	0.53	0.12
	UNH180	30	0.27	0.29	3	9	0.30	0.09
	UNH203	30	0.80	0.61	3	15	0.19	−0.33
	UNH858	30	0.70	0.66	9	12	0.69	−0.06
	UNH898	30	0.80	0.80	10	27	0.36	0.01
	UNH934	30	0.43	0.49	3	16	0.18	0.12
	UNH991	30	0.73	0.74	6	15	0.38	0.01
	Mean	30	0.65	0.64	6	15.63	0.37	−0.02
	SD	0	0.18	0.17	3	5.34	0.17	0.15
Tano–Elubo	UNH123	18	1.00	0.89	11	35	0.31	−0.13
	UNH178	18	0.83	0.79	8	11	0.67	−0.06
	UNH180	17	0.82	0.70	5	11	0.42	−0.19
	UNH203	18	0.83	0.73	5	15	0.31	−0.14
	UNH858	18	0.89	0.90	13	23	0.54	0.02
	UNH898	18	0.89	0.88	12	24	0.48	−0.01
	UNH934	18	0.56	0.67	7	14	0.47	0.17
	UNH991	18	0.72	0.75	6	15	0.38	0.03
	Mean	17.88	0.82	0.79	8	18.50	0.45	−0.04
	SD	0.35	0.12	0.09	3	7.75	0.01	0.12
Juen	UNH123	12	0.92	0.81	8	21	0.36	−0.14
	UNH178	12	0.83	0.87	8	14	0.53	0.04
	UNH180	12	0.25	0.24	3	9	0.30	−0.06
	UNH203	12	0.58	0.64	4	16	0.24	0.10
	UNH858	12	0.75	0.85	10	25	0.38	0.12
	UNH898	12	0.92	0.91	14	30	0.45	−0.01
	UNH934	12	0.75	0.80	6	15	0.38	0.07
	UNH991	12	<b>0.50</b>	<b>0.83</b>	8	15	0.50	0.41
	Mean	12	0.69	0.74	8	18.13	0.39	0.07
	SD	0	0.22	0.20	3	6.33	0.09	0.16
Black Volta	UNH123	39	<b>0.69</b>	<b>0.78</b>	11	31	0.34	0.12
	UNH178	39	<b>0.54</b>	<b>0.77</b>	10	12	0.77	0.30
	UNH180	26	<b>0.69</b>	<b>0.72</b>	6	27	0.21	0.04
	UNH203	39	<b>0.28</b>	<b>0.40</b>	3	12	0.23	0.30
	UNH858	39	<b>0.74</b>	<b>0.83</b>	16	22	0.70	0.10
	UNH898	37	<b>0.59</b>	<b>0.80</b>	12	30	0.39	0.26
	UNH934	39	<b>0.54</b>	<b>0.63</b>	10	16	0.59	0.15
	UNH991	39	0.72	0.72	6	16	0.35	0.01
	Mean	37.13	0.60	0.71	9	20.75	0.45	0.16
	SD	4.55	0.14	0.13	4	7.33	0.20	0.12
Lower Volta	UNH123	33	<b>0.58</b>	<b>0.74</b>	8	21	0.36	0.23
	UNH178	33	0.82	0.81	8	14	0.53	−0.01
	UNH180	31	<b>0.48</b>	<b>0.53</b>	3	9	0.30	0.09
	UNH203	33	0.67	0.68	3	16	0.24	0.02
	UNH858	30	0.97	0.90	10	25	0.38	−0.07
	UNH898	33	0.73	0.83	14	30	0.45	0.13
	UNH934	33	0.67	0.70	6	15	0.38	0.05
	UNH991	33	0.58	0.55	8	15	0.50	−0.05
	Mean	32.38	0.69	0.72	8	18.13	0.39	0.05
	SD	1.19	0.14	0.12	3	6.33	0.09	0.10

**Table S4.** Pairwise  $F_{ST}$  values from nuclear microsatellite DNA sequences for wild *O. niloticus* populations sampled from 11 sites (nine river basins) in Ghana from December 2014 to July 2017. All  $F_{ST}$  values were significant.

	AF	WB	WK	OT	PR	AN	TA	TE	JU	BV	LV
AF	-										
WB	0.033	-									
WK	0.031	0.021	-								
OT	0.019	0.041	0.038	-							
PR	0.045	0.063	0.062	0.076	-						
AN	0.078	0.073	0.068	0.111	0.046	-					
TA	0.143	0.113	0.137	0.182	0.151	0.125	-				
TE	0.044	0.039	0.053	0.071	0.056	0.074	0.066	-			
JU	0.070	0.072	0.095	0.109	0.093	0.116	0.068	0.023	-		
BV	0.094	0.088	0.077	0.106	0.130	0.135	0.143	0.083	0.105	-	
LV	0.034	0.050	0.059	0.057	0.030	0.082	0.156	0.049	0.060	0.091	-

AF = Afram, WB = White Volta-Binaba, WK = White Volta-Kulugu, OT = Oti, AN = Ankobra, TA = Tano-Asuhyea, TE = Tano-Elubo, JU = Juen, BV = Black Volta, and LV = Lower Volta.

**Table S5.** AMOVA for 8 nuclear DNA microsatellites loci in wild tilapia populations collected from 11 sites in Ghana from December 2014 to July 2017.

Source of Variation	d.f.	Sum of Squares	Percentage of Variation
Among populations	10	149.28	8.24
Within populations	613	1509.61	91.76
Total	623	1658.89	

**Table S6.** Genetic divergence statistics for each locus of a given sample size ( $n$ ). Genic differentiation ( $G$ ) from Fisher's exact test, Hendrick's  $G_{ST}$ , and Jost's  $D$  are compared with  $F_{ST}$  values.

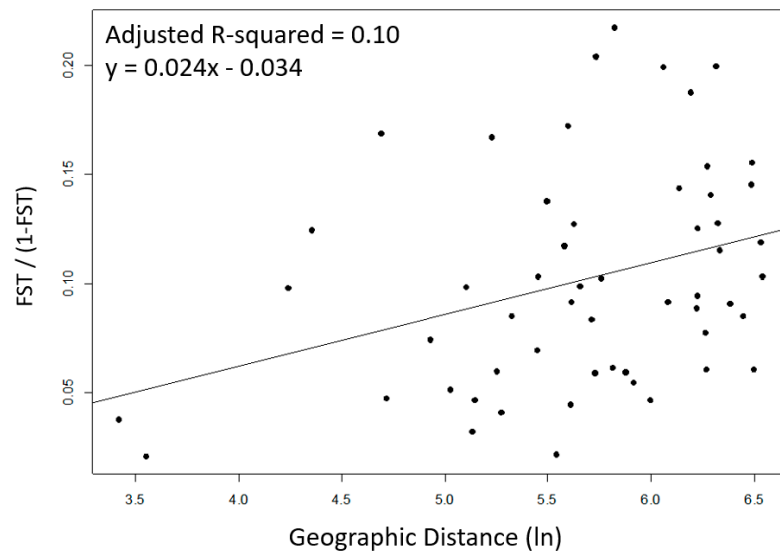
Locus	$F_{ST}$	$G_{ST}$ (Hedrick)	$D$ (Jost)	$G$ (Fisher's Exact Test) $p$ -Values
UNH123	0.069	0.220	0.185	0.000
UNH178	0.067	0.189	0.156	0.000
UNH180	0.197	0.377	0.250	0.000
UNH203	0.083	0.159	0.106	0.000
UNH858	0.084	0.484	0.454	0.000
UNH898	0.087	0.330	0.287	0.000
UNH934	0.073	0.147	0.106	0.000
UNH991	0.115	0.224	0.159	0.000

**Table S7.** STRUCTURE results with estimates for probable  $K$  clusters for *O. niloticus* from Ghana.  $K = 10$  as the most likely number of clusters is indicated in bold.

Run number	$K$	Est. Ln prob. of data	Mean value of Ln likelihood	Variance of Ln likelihood
21	1	-9554.4	-9518.7	71.5
20	1	-9553.8	-9518.4	70.8
23	2	-9106.2	-9025.1	162.2



24	2	-9105.8	-9031.7	148.2
22	2	-9111.8	-9028.1	167.4
25	3	-8795.1	-8690.6	209
27	3	-8789.3	-8684.8	209
26	3	-8789.1	-8684.5	209.1
29	4	-8571.9	-8435.9	271.9
30	4	-8697.9	-8544.8	306.1
28	4	-8556.5	-8427.9	257.3
33	5	-8452.5	-8280	345
32	5	-8452.9	-8283.1	339.7
31	5	-8451.7	-8289.4	324.6
34	6	-8335.2	-8134.9	400.5
36	6	-8345.9	-8135.1	421.5
35	6	-8350.3	-8154.1	392.4
37	7	-8252.8	-8015	475.5
39	7	-8235.7	-8013.3	444.7
38	7	-8248.8	-8014.6	468.5
41	8	-8209.3	-7963.4	491.6
40	8	-8224	-7961.1	525.7
42	8	-8182.1	-7951.9	460.5
43	9	-8198.9	-7895	607.8
45	9	-8173.1	-7892.1	562
44	9	-8176.7	-7891.4	570.6
47	10	-8190.9	-7881	619.8
46	10	-8151.2	-7847.8	606.7
<b>48</b>	<b>10</b>	<b>-8118.8</b>	<b>-7830.1</b>	<b>577.5</b>
50	11	-8187.9	-7804.1	767.5
49	11	-8207.8	-7785.8	844
51	11	-8134.6	-7780.5	708.1



**Figure S1.** Relationship between genetic distances and logarithm of geographic distances among *Oreochromis niloticus* collected from 11 sites in Ghana from December 2014 to July 2017.