Exploring the genetic diversity and population structure of *Mobula birostris* in two key aggregation zones in the Eastern Tropical Pacific

Supplement: Table S1 and Figures S1-S6

Table S1. *Mobula birostris* samples collection sites and data in mainland Ecuador and Galapagos

Location	Year	Number of samples	Date	Pigmentation	Sex	Sample type	Sample ID	Dive Site	Coordinates	
									Latitude	Longitude
Mainland Ecuador	2013	24	8/24/13	Normal	Male	Tissue	1	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/24/13	Normal	Male	Tissue	2	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/26/13	Normal	Female	Tissue	3	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			9/2/13	Normal	Male	Tissue	4	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			9/3/13	Normal	Male	Tissue	5	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/3/13	Normal	Male	Tissue	6	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/12/13	Melanistic	Male	Tissue	7	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			9/18/13	Melanistic	Male	Tissue	8	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/19/13	Normal	Female	Tissue	9	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			9/19/13	Normal	Male	Tissue	10	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			9/22/13	Normal	Male	Tissue	11	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/22/13	Normal	Female	Tissue	12	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			10/1/13	Melanistic	Male	Tissue	13	Bajo Cope, Seco II	1°50'9.97"S	81° 5'2.09"W
			10/1/13	Variagated	Male	Tissue	14	Bajo Cope, Seco II	1°50'9.97"S	81° 5'2.09"W
			10/2/13	Melanistic	Male	Tissue	15	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			10/2/13	Normal	Male	Tissue	16	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			10/2/13	Normal	Male	Tissue	17	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			10/2/13	Variagated	Male	Tissue	18	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			10/4/13	Normal	Male	Tissue	19	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			10/5/13	Melanistic	Male	Tissue	20	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			10/6/13	Melanistic	Male	Tissue	21	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			10/6/13	Normal	Male	Tissue	22	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			10/6/13	Normal	Male	Tissue	23	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			10/6/13	NA	NA	Tissue	24	Isla de La Plata, La Pared	NA	NA
	2014	26	8/14/14	Normal	Male	Tissue	72	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/16/14	Normal	Male	Tissue	73	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			8/21/14	Normal	Female	Tissue	74	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/23/14	Melanistic	Male	Tissue	75	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/23/14	Normal	Male	Tissue	76	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/24/14	NA	Female	Tissue	78	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W

			8/24/14	NA	Male	Tissue	79	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/25/14	NA	Male	Tissue	80	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/25/14	Normal	Female	Tissue	81	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/25/14	NA	Male	Tissue	82	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/25/14	Normal	Male	Tissue	83	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/25/14	Normal	Female	Tissue	84	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/26/14	NA	Female	Tissue	85	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			8/26/14	NA	Male	Tissue	87	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			8/26/14	NA	Female	Tissue	88	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			8/28/14	NA	Male	Tissue	89	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/28/14	NA	Female	Tissue	90	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/28/14	NA	Female	Tissue	91	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/28/14	NA	Male	Tissue	92	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/27/14	Normal	Male	Tissue	93	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			8/27/14	Normal	Male	Tissue	94	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			8/30/14	NA	NA	Tissue	96	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/30/14	NA	NA	Tissue	97	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/31/14	Normal	Female	Tissue	98	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			9/1/14	Melanisitic	Male	Tissue	102	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			9/1/14	Normal	Male	Tissue	103	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
	2015	26	8/11/15	Normal	Female	Tissue	144	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/14/15	Melanistic	Female	Tissue	148	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/14/15	Melanistic	Female	Tissue	149	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/17/15	Melanistic	Female	Tissue	150	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			8/18/15	Normal	Female	Tissue	151	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/18/15	Melanisitic	Female	Tissue	152	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/19/15	Melanistic	Female	Tissue	153	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			8/21/15	Melanistic	Male	Tissue	154	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			8/28/15	Normal	Male	Tissue	156	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/28/15	Normal	Male	Tissue	157	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/28/15	Normal	Male	Tissue	158	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/29/15	Normal	Male	Tissue	159	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			8/29/15	Normal	Female	Tissue	160	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			8/30/15	Normal	Male	Tissue	161	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/30/15	Normal	Male	Tissue	162	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/31/15	Normal	Female	Tissue	163	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/31/15	Variagated	Male	Tissue	164	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/31/15	Normal	Male	Tissue	165	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/31/15	Normal	Male	Tissue	166	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/31/15	Normal	Male	Tissue	167	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W

			8/31/15	Normal	Male	Tissue	168	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/31/15	Melanisitic	Female	Tissue	169	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/1/15	Melanisitic	Male	Tissue	171	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			9/1/15	Variagated	Male	Tissue	172	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			9/1/15	Normal	Female	Tissue	173	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			9/2/15	Normal	Male	Tissue	174	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
	2016	11	8/26/16	Melanistic	Male	Tissue	194	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/26/16	Normal	Male	Tissue	195	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/26/16	Variagated	Male	Tissue	196	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/28/16	Leucistic	Male	Tissue	197	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			9/5/16	Normal	Female	Tissue	198	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			9/7/16	Melanistic	Male	Tissue	199	Bajo Cope, Seco II	1°50'9.97"S	81° 5'2.09"W
			9/7/16	Variagated	Male	Tissue	200	Bajo Cope, Seco II	1°50'9.97"S	81° 5'2.09"W
			9/7/16	Normal	Male	Tissue	201	Bajo Cope, Seco II	1°50'9.97"S	81° 5'2.09"W
			9/7/16	Normal	Male	Tissue	202	Bajo Cope, Seco II	1°50'9.97"S	81° 5'2.09"W
			9/8/16	Leucistic	Male	Tissue	203	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/8/16	Normal	Male	Tissue	204	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
	2017	14	8/10/17	Normal	Female	Tissue	205	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/10/17	Melanisitic	Female	Tissue	206	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
			8/18/17	Normal	Male	Tissue	207	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/18/17	Variagated	Male	Tissue	208	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/18/17	Normal	Male	Tissue	209	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/18/17	Normal	Male	Tissue	210	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/26/17	Normal	Female	Tissue	211	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/26/17	Leucistic	Male	Tissue	212	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/26/17	Normal	Male	Tissue	213	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/31/17	Normal	Male	Tissue	214	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/31/17	Melanisitic	Female	Tissue	215	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/31/17	Normal	Male	Tissue	216	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/1/17	Normal	Female	Tissue	217	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/9/17	Melanisitic	Female	Tissue	218	Isla de La Plata, Roca Honda	1°15'28.73"S	81° 4'30.00"W
	2018	26	8/27/18	Normal	Male	Tissue	219	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/27/18	Normal	Male	Tissue	220	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/27/18	Melanistic	Female	Tissue	221	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/27/18	Melanistic	Female	Tissue	222	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/27/18	Normal	Female	Tissue	223	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			8/29/18	Normal	Male	Tissue	224	Isla de La Plata, Punta El Faro	1°15'30.15"S	81° 4'21.94"W
			9/2/18	Melanistic	Male	Tissue	225	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/2/18	Normal	Female	Tissue	226	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/3/18	Normal	Male	Tissue	227	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W

			9/4/18	Normal	Female	Tissue	228	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/4/18	Variagated	Male	Tissue	229	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/4/18	Normal	Female	Tissue	230	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/5/18	Leucistic	Male	Tissue	231	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/5/18	Melanistic	Female	Tissue	232	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/6/18	Melanistic	Male	Tissue	233	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/6/18	Normal	Female	Tissue	234	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/7/18	Normal	Male	Tissue	235	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/7/18	Normal	Male	Tissue	236	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/7/18	Normal	Female	Tissue	237	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/7/18	Normal	Male	Tissue	238	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/10/18	Normal	Female	Tissue	239	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/10/18	Normal	Female	Tissue	240	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/10/18	Leucistic	Male	Tissue	241	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/10/18	Normal	Female	Tissue	242	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/10/18	Melanistic	Male	Tissue	243	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
			9/10/18	Variagated	Male	Tissue	244	Isla de La Plata, La Pared	1°15'35.92"S	81° 4'52.26"W
Galapagos	2019	21	3/31/19	NA	Female	Tissue	SC00030	Isabela, Isla Tortuga	1°0'18.3"S	90° 54'52.5"W
			3/31/19	NA	NA	Tissue	SC00037	Isabela near the tunnels	1°3'28"S	91° 10'23.5"W
			3/31/19	NA	NA	Tissue	SC00038	Isabela near the tunnels	1°3'24.2"S	91° 10'20"W
			3/31/19	NA	NA	Tissue	SC00041	Isabela near the tunnels	1°3'7.52"S	91° 9'43.7"W
			3/31/19	NA	NA	Tissue	SC00048	Isabela near the tunnels	1°3'14.1"S	91° 9'53.7"W
			5/26/19	NA	Female	Tissue	SC00105	Isabela, La Unión	1°01'42,9"S	91°02'40,6"W
			5/26/19	NA	Female	Tissue	SC00108	Isabela, La Unión	1°02'37,4"S	91°04'43,8"W
			5/25/19	NA	Male	Tissue	SC00111	Isabela, La Unión	1°02'41,5"S	91°04'34,7"W
			5/25/19	NA	Male	Tissue	SC00112	Isabela, La Unión	1°02'40,2"S	91°04'35,4"W
			5/25/19	NA	Male	Tissue	SC00113	Isabela, La Unión	1°02'40,3"S	91°04'35,4"W
			5/25/19	NA	Male	Tissue	SC00118	Isabela, La Unión	1°02'40,4"S	91°04'35,4"W
			5/25/19	NA	Male	Tissue	SC00119	Isabela, La Unión	1°02'40,5"S	91°04'35,4"W
			5/25/19	NA	Female	Tissue	SC00120	Isabela, La Unión	1°02'40,6"S	91°04'35,4"W
			5/25/19	NA	Female	Tissue	SC00121	Isabela near the tunnels	1°02'40,7"S	91°04'35,4"W
			5/25/19	NA	Female	Tissue	SC00122	Isabela near the tunnels	1°02'40,8"S	91°04'35,4"W
			5/25/19	NA	Female	Tissue	SC00123	Isabela near the tunnels	1°02'40,9"S	91°04'35,4"W
			5/25/19	NA	Female	Tissue	SC00124	Isabela near the tunnels	1°02'40,10"S	91°04'35,4"W
			5/25/19	NA	Female	Tissue	SC00125	Isabela near the tunnels	1°02'40,11"S	91°04'35,4"W
			5/25/19	NA	Male	Tissue	SC00126	Isabela, La Unión	1°02'40,12"S	91°04'35,4"W
			5/25/19	NA	Male	Tissue	SC00127	Isabela, Punta Negra	1°02'40,13"S	91°04'35,4"W
			5/25/19	NA	NA	Tissue	SC00130	Isabela near the tunnels	1°02'40,14"S	91°04'35,4"W

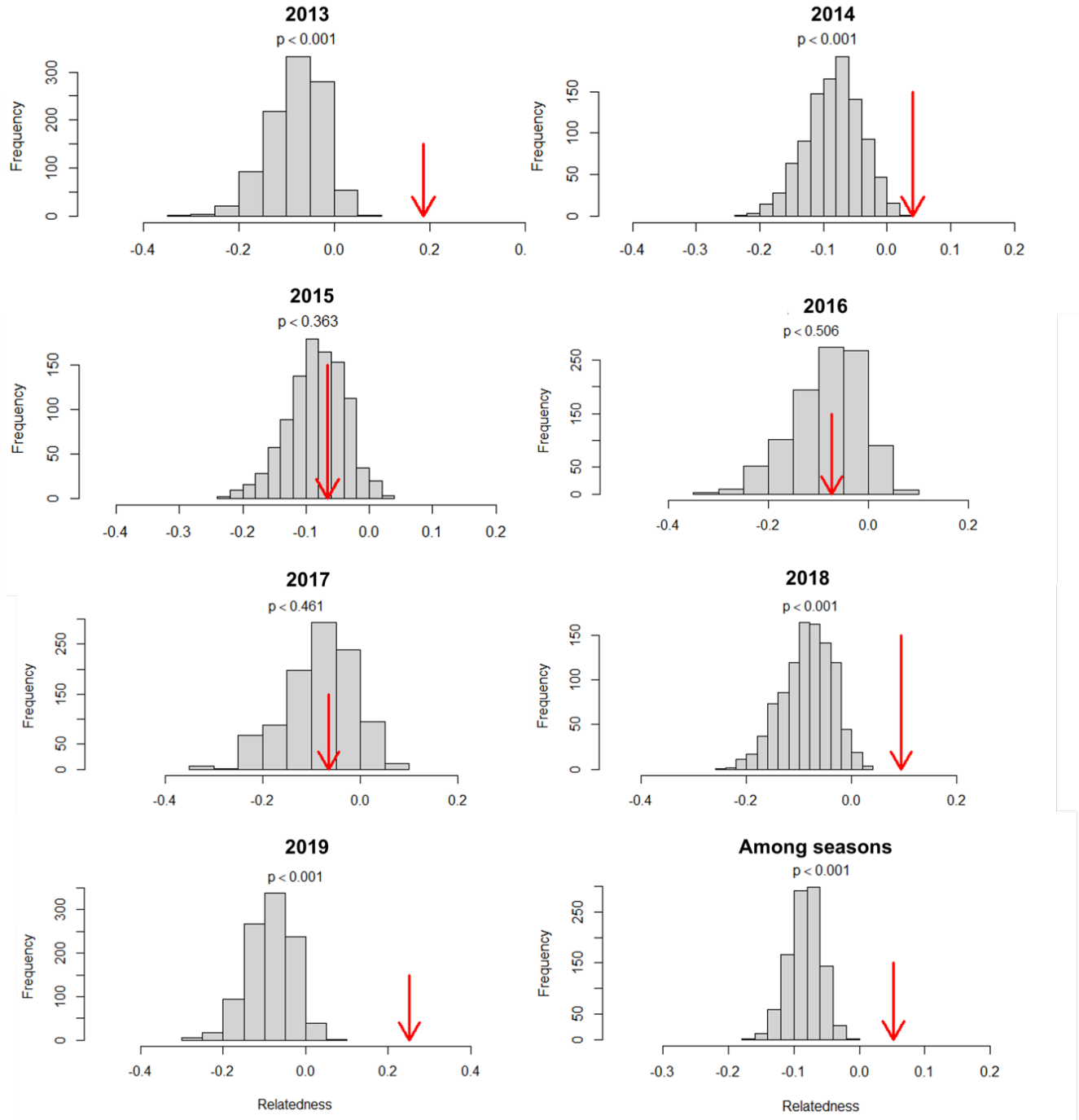

Figure S1. Histogram of expected relatedness distribution within each group (2013-2019) and among seasons for *Mobula birostris* (n=136) calculated by MC simulation (1000 iterations). The red arrow indicates where the observed values are located. P-values are displayed at the top of each histogram and indicate the percentage of random iterations in which the expected values are greater than or equal to the observed value.

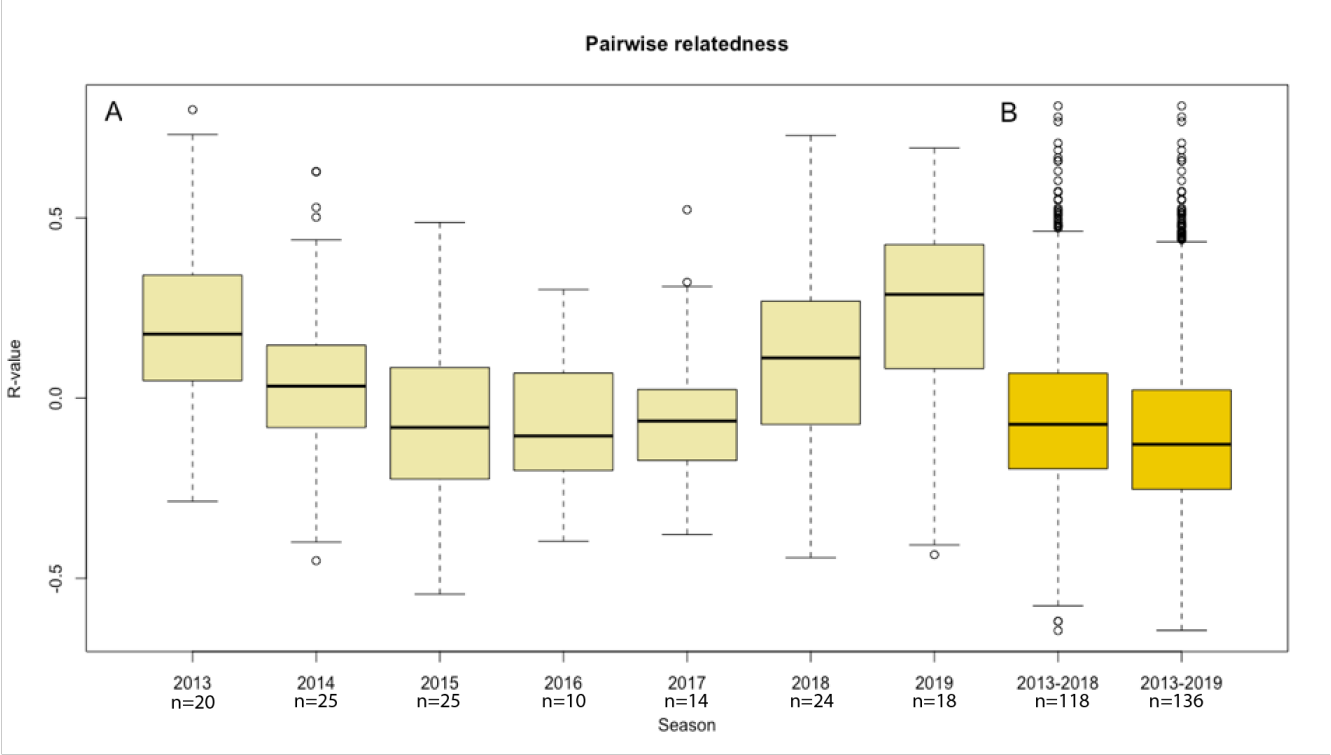

Figure S2. Boxplots illustrating the relatedness indexes corresponding to *Mobula birostris* individuals (n=136) based on Wang estimator. A) Indexes obtained for each season in mainland Ecuador (2013-2018) and Galapagos (2019) B) Indexes obtained considering all individuals from mainland Ecuador (seasons 2013-2018) and all the individuals from both localities (2013-2019). Box plots show the median value (horizontal line), the interquartile range (25 to 75%; box), the maximum and minimal value excluding outliers (whisker), and the outliers (dots).

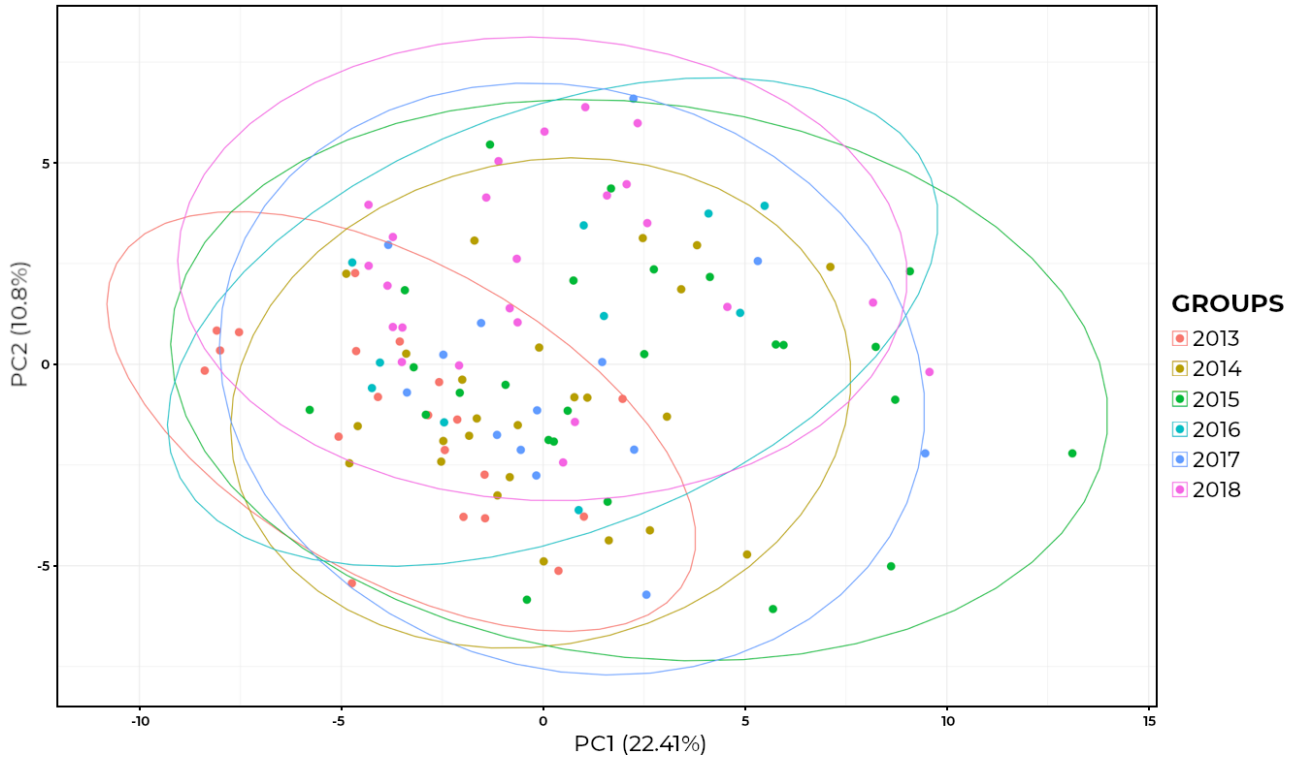

Figure S3. Principal coordinate analysis (PCoA) based on the Euclidian genetic distances of *Mobula birostris* (n=118) using 8 SSR markers for mainland Ecuador (seasons 2013-2018). The first two components represent 33.21% of the total variation. There was not a clear population structure for *Mobula birostris* for seasons 2013-2018.

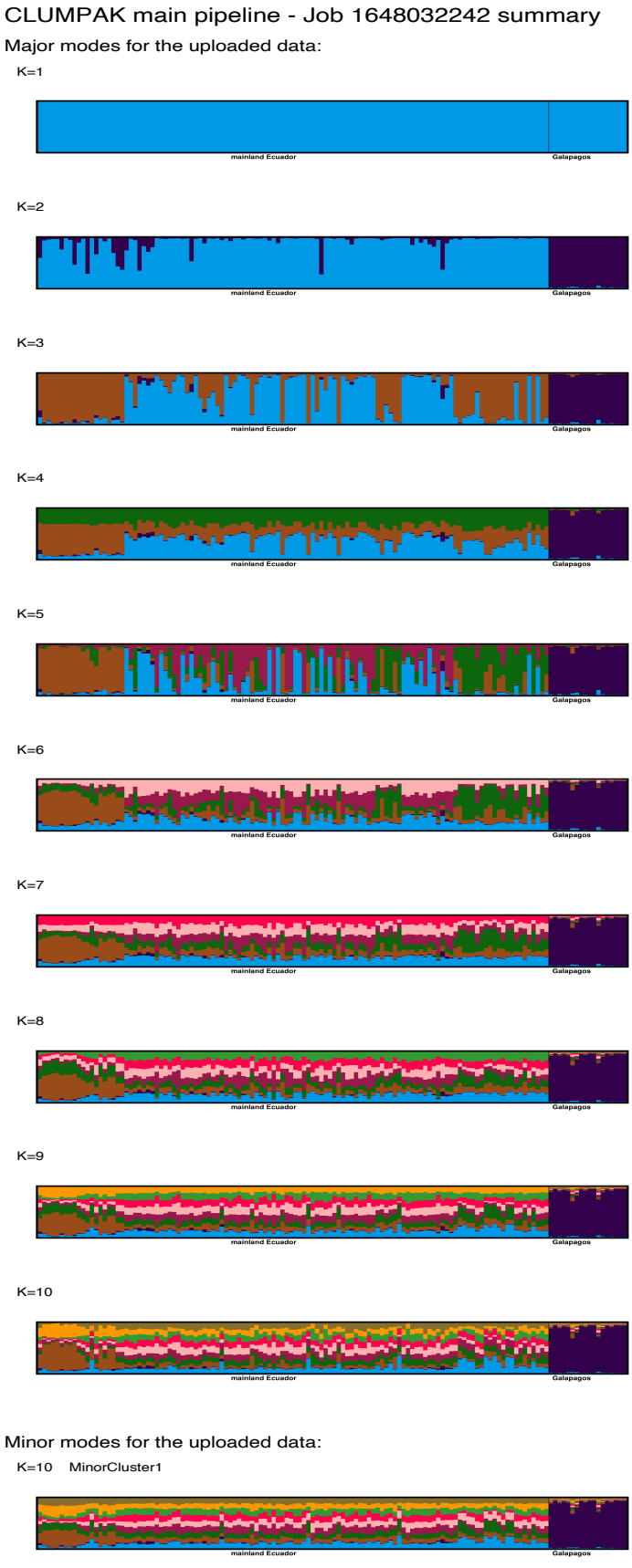

Figure S4. Results of the Bayesian analysis of population structure under the Admixture model for *Mobula birostris* through seasons 2013-2019 using 10 K values. Each vertical bar represents one individual, and the color proportion of each bar corresponds to the probability of assignment of each individual to a different lineage (K).

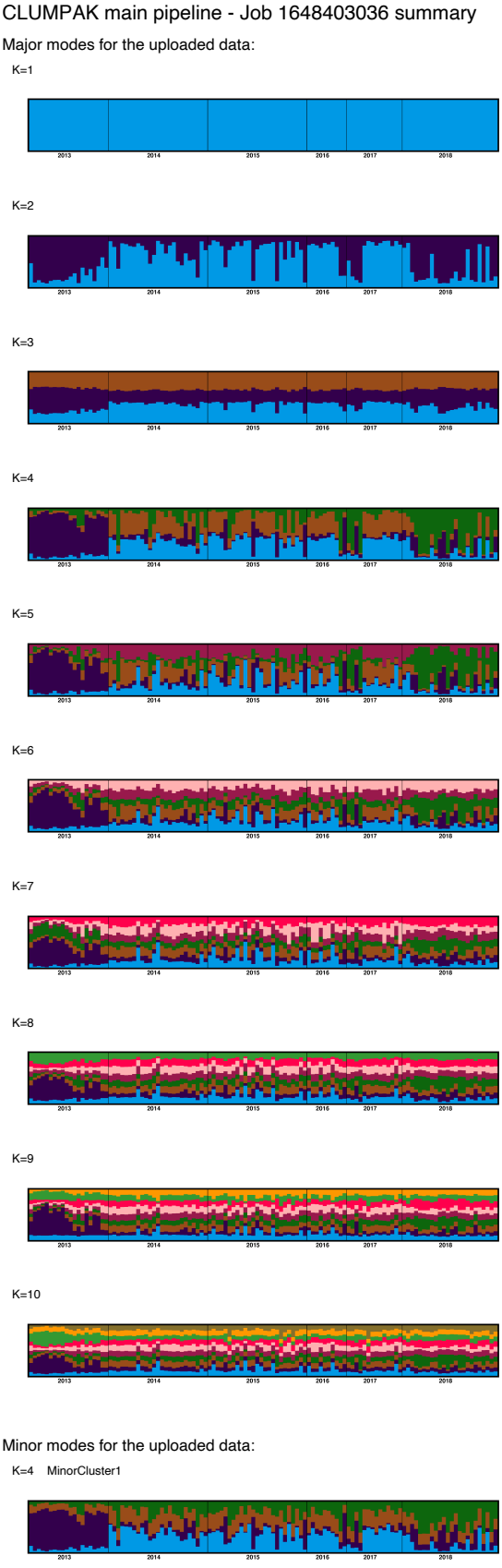

Figure S5. Results of the Bayesian analysis of population structure under the Admixture model for *Mobula birostris* through seasons 2013-2018 using 10 K values. Each vertical bar represents one individual, and the color proportion of each bar corresponds to the probability of assignment of each individual to a different lineage (K).

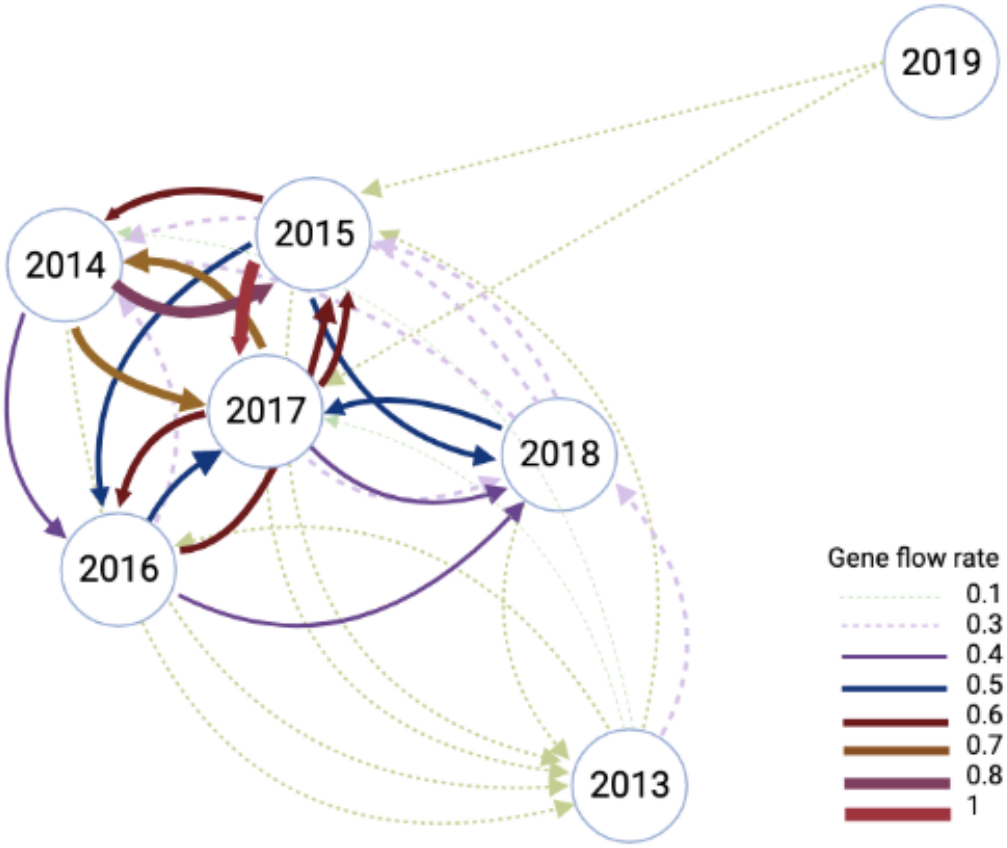

Figure S6. Relative migration network diagram for *Mobula birostris* from six sighting seasons (2013-2018) (n=118) in mainland Ecuador and Galapagos (2019) (n= 18). The network was visualized with divMigrate using Alcala's with relative migration rates below 0.1 filtered out. The figure was edited in Inkscape. Line colors and numbers indicate gene flow rate (scaled 0-1), line thickness is proportional to the relative migration rate between groups.