Craniological Characteristics of the Indians of South America and Their Comparison with the Populations of the Old World

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Introduction

The origin and processes of formation of the indigenous po-pulation of the New World have long been of interest to various researchers. There are quite a lot of works devoted to the study of the morphology of skulls from these territories. Some of these works are of a generalizing, summary nature.

One of the earliest hypotheses about the origin of the indigenous populations of America was that it was settled by people who had features of an unformed Asian complex of characters (Roginsky 1937; Howells 1940). According to some bioanthropological and linguistic evidence, the settlement of America began between 35 000–30 000 years ago, with protomorphic Asian populations that had features similar to the Western Siberian populations

(such as Kets, Khanty, Mansi). Later, perhaps not finding any competitors on the American continent, they underwent an adaptive radiation that led to the occupation of all ecological niches, including Tierra del Fuego (Rodríguez 1987). Following, presumably, from the more northern regions of Asia, some other populations — native speakers of the Na-Dene language — penetrated the American continent. As a result of evolutionary processes that had already taken place in Asia, these populations were estimated to be about 85% Mongoloid. This gene flow influenced the genetic structure of the Indians of North America and parts of Central America, increasing the Mongoloids proportion. the third wave of migrations from the territory of Asia is the one of the 100% Mongoloid Eskimo-Aleutian populations (Rodríguez, 1987, p. 35). "The whole process of the formation of Americanoids is unique, although at different stages it reveals features that later developed in the Old World into the Australoid and Mongoloid complexes. in the modern classification, Amerindians should take a special place" (Zubov 1999: 42–43).

In later works, this assumption is refined. First, it is said that the skull morphology of the early inhabitants of South and Mesoamerica (and, possibly, North America) was very different from that which can be observed in more recent series (Neves and Hubbe 2005). While the skulls of the modern indigenous population are characterized by a short and wide rearly Southern and Mesoamericans was different. They had a long and narrow brain region, a low and protruding face, and low orbits and nose (Neves and Hubbe 2005). Two different scenarios have been proposed to explain these morphological changes: (a) the penetration of two very different biological populations into the New World during the final Pleistocene/Early Holocene through Beringia, and (b) a local microevolutionary process mimicking that which occurred in East Asia at that time. the first hypothesis seems more likely to the authors (Neves et al. 2007).

Another work also states that, apparently, several migration waves had taken place in different periods. the first wave mainly formed the population of Central and South America, the second — the population of the Northwest coast of the United States, and the third — the Aleuts and Eskimos. the first people who settled the New World were more similar to the Pacific populations than to the Australo-Melanesian ones (Rodríguez 2007).

These conclusions are supported by another work, which shows that, based on a comparison of the total characteristics of the Amerindian cranial series, they are most similar to the populations of East and Southeast Asia (Pestryakov, Grigorieva 2009). Apparently the first main wave of the ancient settlement of America came from the territory of East Asia. Groups from the territory of America are distinguished by significant craniological diversity: "The earliest groups of migrants to America, who best preserved their special craniotype, are territorially the most distant from Beringia. These are the Indians of the extreme south of South America (central pampas, Patagonia and Tierra del Fuego). They are distinguished by a huge size of the skull, close to the maximum in the modern population of the Earth" (Pestryakov, Grigorieva 2009). According to the results of this study, the eastern groups have features indicating similarities with the Australo-Melanesian groups, which is interpreted as an indication of an older formation. There is a tendency to brachycephalization among the agricultural population.

Quite a long time ago, a clear geographical division of skull sizes was shown: the largest heads in the East and Southeast, and the smallest ones in the West and Northwest (Newman, Stewart 1950). At the same time, it was shown that over time, microevolutionary processes took place on the American continent, which were accompanied, among other things, by a change in the morphological features of the skull. According

to one of the hypotheses, the main cause of these changes are climatic factors, the influence of which is described by the Bergman rule (Newman 1962). Basically, these conclusions are based on changes in growth: "It seems that the tall modern Indians in colder regions are descended from shorter ancestors. on the contrary, shorter modern Indians from areas with warmer climates had taller ancestors." (Ibid.: 253). Almost all the skulls of the ancient 'Paleo-Indian', as well as the skulls of the 'Archaic' period, which have not been subjected to artificial deformation, are moderately dolichocranial. But in every area of the New World, there is a trend towards brachycrania. This trend begins in the archaic period and is expressed in an average increase in the cranial index. by all indications, brachycrania and the associated changes in the cranial vault, base, and face are evolutionary in nature, although the mechanism of this phenomenon is not understood" (Ibid.: 253). in some works, the same process is associated with the transition of the population to settled agriculture, at least for the populations of Mesoamerica and the Central Andes (Rodríguez 1987).

The relatively modern population of North America is classified roughly as follows:

1. Circumarctic (Eskimos and Aleuts);

2. Pacific, including the Na-Dene language group (Atabaskan, 3. Tlingit, Haida, Apache, Pueblo);

4. North Atlantic, "Algonquian" (Sioux, Blackfoot, Ponca, Arikara, Huron, Cheyenne);

The Central-South American complex is also divided into options:

1. Central American (including part of the Indians of the modern southern regions of the USA);

2. Circumcaribbean (Indians of modern territories of northern Colombia, Venezuela, Guyana, Suriname, Antilles);

3. Andean regions of Colombia, Ecuador, Peru, Bolivia, Chile;

4. Southern variant (Argentine pampa, Tierra del Fuego, part of Chile, Bolivia and the Amazonian basin;

5. The Amazonian variant, the material on which is very scarce, so that one can only judge a significant heterogeneity and influx of genes from the Circum-Caribbean, Andean and southern regions (Rodriguez 1983, cited in: Rodriguez 1987)

The purpose of this work was to create the most reliable and complete generalization of the available craniometric data on the Indians of South America and the comparison of these data on a wide scale of intergroup variability. For this, comparative data from the territory of North America, as well as from the eastern regions of the Old World (Asia, Australia, Oceania) were used.

Materials

Materials from the territory of North America

For this study, data were drawn on 16 groups from the territory of North America from A. Hrdlicka (1927, 1940). the groups and number of individuals in each one are listed in Table 2.

Materials from the territory of South America

In total, 17 ethno-territorial groups from the territory of South America were studied (Table 1). Three from Argentina, two from Brazil, one from Venezuela, five from Peru, two from Chile and four from Tierra del Fuego.

Argentina

From Argentina, we studied two groups of Patagonians, one from the territory of Rio Negro, and one from Rio Chubut (Marelli 1913). the Rio Negro series of skulls consists of ancient Patagonian skulls, to which are added Martin's measurements of other Patagonians (Martin 1896), as well as copies of the

Museum of Natural History of Buenos Aires, which Dr. Florentino Ameguinho allowed measured in 1910. the second series included 100 Patagonian skulls, exhumed from the cemeteries of the Chubut River Valley, which entered the collection of the La Plata Museum in 1893.

Brazil

From Brazil, 2 series were included in the analysis.

1) The first one is the measurements of skulls of the Botocudo people taken from 3 sources.

From the work of Philippe Marius Rey (1880), we got data on 6 Botocudo skulls, where 2 male skulls belong to individuals of the Potons village tribe, Mucuri river valley. These 2 skulls, along with the skeleton of Botocudo and many other Brazilian aboriginal skulls, were sent by the Emperor of Brazil to the Museum of Natural History. the other 4 Botocudo skulls (where 2 are of females) were exhumed by the author from the right bank of the Doce River, belonging to a tribe that disappeared after colonization. These 4 skulls have been donated to the Anthropological Society. All skulls are in excellent condition.

J. Rodrigues Peixoto (1885) also studied the Botocudo tribe and their mestization with Europeans. We used only the data of the not mixed-breed males (6 skulls), kept at that time in the National Museum of Brazil. They are of different origin — one from San Matheus (Espirito Santo), given to the author by a friend who dug it out of an old Indian cemetery. Two are from the Dosi river valley — one of an old man, and one of an adult. Another 3 skulls were collected by the geologist Carlos Hartt in the Mucuri river valley, but he left no geological context that could allow us to understand the period in which these people lived. Nonetheless, it is believed that these skulls are quite ancient, as they are characterized by "archaic" (or classical) features, which are smoothed out in later groups due mestization.

The third source of Botocudo data comes from the work of Dr. Paul Ehrenreich (1887). He studies 13 skulls that he found from 3 sources, but, unfortunately, besides the place of origin not much information is given.

2) The second group studied from Brazil is the Lagoa Santa series (Rivet 1908). the studied series consists of 17 skulls, 15 of which belong to the Zoological Museum of Copenhagen, 1 to the Museum of Natural History in London and 1 to the Museum of Rio de Janeiro. Unfortunately, the exact dating of the human remains found by Lund (these are those in Copenhagen) is impossible. it was collected in 1843 in a cave in the province of Minas Gerais (Brazil), not far from Lagoa Santa. For the other 2 skulls no information was provided.

Venezuela

We used data on 53 skulls (Zamakona de Arechavaleta, Lagrange de Castillo 2007) from two states of Venezuela: Aragua and Carabobo, which are currently stored in the Adolfo Ernst Center at the Museum of Natural Sciences of Caracas. Eight cranioscopic features were analyzed, which noted the degree of development and prominence of different areas, as well as the overall stoutness of each skull, in order to determine the existing differences in terms of sexual dimorphism. Sex was determined for 49 skulls, of which 24 were male and 25 females. For the remaining 4 skulls, gender could not be assigned. the skulls of both sexes tend to be brachycephalic. Most of the undeformed skulls were classified as low to medium height, and the deformed skulls were all of low height. Prognathism is more pronounced in non-deformed skulls than in the deformed ones. the volume of the skull, as practice has shown, does not depend on the deformation. Both undeformed and deformed skulls were of small volume, with a tendency to microcephaly.

Table 1. Arithmetic mean values of craniometric traits in different groups from the territory of South America.

№	Region	Group	Source	n
1	Argentina	Patagonians (Rio Negro)	Martin, 1896	117
2		Parana		44
3		Patagonians (Rio Chubut)		56
4	Brazil	Botocudos	Rey, 1880; Peixoto, 1885; Ehreinreich, 1887	19
5		Lagoa Santa	Rivet, 1980	11
6	Venezuela	Valencia lake	Zamakona de Arechavaleta, Lagrange de Castillo, 2007	24
7	Tierra del Fuego	Ona	Hernandez, 1997	50
8		Yagan		42
9		Alakalufe	Own data	22
10			Hernandez, 1997	15
11	Peru	Calca	Ericksen, 1962	29
12		San Damian	Newman, 1943	67
13		Maqui maqui	Ericksen, 1962	8
14		Paucarcancha		117
15		Chicama	Stewart,1943	65
16	Chile	Araucano	Latcham, 1904	14
17		Mapuche	Own Data	16

* For explanation refer to the “Methods” section.

Table 1. Arithmetic mean values of craniometric traits in different groups from the territory of South America.

	Craniometric feature (by Martin's numeration) *										
	M.1	**M.8**	**M.17**	**M.5**	**M.9**	**M.10**	**M.40**	**M.48**	**M.45**	**M.54**	**M.55**
	182,8	141,3	143	100,6	94,1	110,2	102,4	74,5	140,1	25,1	53,7
	186,2	142,7	146,9	104,0	95,0	–	102,0	76,7	144,6	26,1	55,8
	185,5	146,2	141,5	105,9	97,7	115,8	104,8	75,9	148,8	25,6	54,1
	183,6	136,3	139,9	103,5	92,4	98,0	–	71,5	137,7	24,8	52,9
	182,0	129,7	134,6	101,4	93,9	112,6	–	67,9	136,6	25,6	49,6
	177,0	142,3	127,1	96,6	95,4	106,2	100,6	73,3	137,6	24,6	57,3
	191,3	143,1	136,6	103,7	–	116,2	101,3	–	143,5	–	55,4
	186,3	142,9	136,0	102,8	–	116,9	101,8	–	143,3	24,9	54,0
	184,7	142,3	134,6	–	93,9	116,6	–	75,5	139,6	–	–
	188,3	142,1	137,9	102,8	–	115,2	101,9	–	141,0	–	56,1
	175,1	135,4	134,9	97,6	90,5	–	94,5	66,8	135,0	24,8	52
	177,6	139,7	132,2	94,8	90,8	–	92,0	72,0	135,7	24,0	50,3
	182,4	135,4	131,0	98,0	94,1	–	96,7	68,2	137,8	24,1	48,8
	179,4	135,5	137,1	98,6	92,3	–	96,1	67,8	133,9	24,3	49
	176,1	139,7	135,3	98,5	92,1	–	97,1	67,4	135,3	24,6	48,7
	175,5	140,7	137,2	–	98,5	120,6	–	–	136,3	25,4	52,6
	175,2	143,6	134,8	–	91,6	116,9	–	68,2	141,9	–	–

Peru

Skulls from the territory of Peru have previously been studied by several researchers. the series used in these works have proper archaeological documentation, exclude skulls with artificial deformations, and are comparable in measurement methods with the ones used in the Russian anthropological school. the groups used are the following:

• Maqui-Maquis (Ericksen 1962) Eight male and six female skulls are from the site of Los Corredores de los Maqui-Maquis, 6 km northeast of the town of San Pablo. the pottery found near the remains puts them in the Cajamarca I or II culture in the years 100 BC — 400 AD.

• Paucarcancha (MacCurdy 1923). Late period male and female series from a series of caves such as Paucarcancha along the Urabamba drainage in the southern Peruvian highlands.

• Calca (Ericksen 1962).

• San Damian. Late period male and female series from the vicinity of the village of San Damian, Department of Huarochiri, in the central part of the Peruvian Highlands (US National Museum series measured by M.T. Newman (Newman 1943).

In terms of their location, the Paucarcancha and Calca samples are from the South Sierra, over 700 air miles south of Cajamarca. the San Damian sample is from the area of the Sierra just southeast of Lima, less than 500 air miles from Cajamarca.

• Chicama. Male and female series from the coastal Chicama Valley in northern Peru (Stewart 1943).

Hrdlicka (1911, 1914) was one of the first to distinguish the Coastal brachycephals from the more long-headed crania of the Sierra, and noted the occasional presence of the latter in Coastal cemeteries. Later, Newman (1948: 18) studied additional data and came to the conclusion that there are two racial varieties in the Sierra: the Central Intermontane, represented by the Paucarcancha sample and typified as “dolicho — low

mesocephalic [...] high vaulted, medium-short faces, medium broad nasal apertures, very high orbits. Most characteristic is an oval vault contour, a low pinched occiput, flat temporals, low frontal, and rather low nasal root." (2) the Western Sierra, represented by the San Damian sample, and typically "mesocephalic [...], medium-vaulted, medium face, medium nasal aperture, barely high orbits. Most characteristic is the low pinched occiput, without the ovoid vault contour, flat temporals, and scaphocephaly of the Paucarcancha group." However, later works (Ericksen, 1962) show that the Calca sample is added to Newman's Central Intermontane variety and the Cajamarca samples are considered, they tend to blur any real sharpness of distinction between Newman's two Sierra varieties. If the suggestion that the Paucarcancha sample is pre-Inca were more secure, the differences with Calca which are the points of resemblance with San Damian could be attributed to time. Regretfully, since the dating of any of the samples is not reliable, these suggestions can only be taken as hypotheses.

Chile

From Chile, we used materials from Southern-Central groups: one from literature — the Araucanos (Latcham 1904), — and one group was measured by us: the Mapuche. There might be a bit of a confusion, because the Mapuche are part of the Araucanos. the race, to which the name of Araucano has been given, formerly populated the whole of Chile from the desert of Atacama, in the north, to the Island of Chiloe in the south. However, shortly after the Spanish conquest these groups were confined to the southern part of the country. the origin of the term Araucano is unknown, but it includes several smaller groups of peoples: *Moluches*, people of war, in the north; *Mapuches*, people of the land, in the provinces of Malleco and Cautin; *Pehuenches*, people of the pines, in the Andes valleys; and *Huilliches*, people of the south, in the provinces of Valdivia and Llanquihue. Latcham obtained

his data by living for three years in the province of Malleco and Cautin, where he was able to obtain abundant material for a closer study. Artificial deformation of the skull is unknown among these Indian. As a rule, they are sub-brachycephalic or brachycephalic, hypsi- and akrocephalic in a high degree, phaenozygous, chamaeprosopic, platyopic, mesoseme, mesorhine, prognathous, and ellipsoid. the first thing that one notices, at a casual glance, is the broad face and trochocephalic form of the skull, which looked at from any position presents a series of rounded surface. There is also a narked prognathism, especially sub-nasal, and the supraciliary ridges and glabella are very pronounced.

Author data on the Mapuche group was collected at the National Museum of Natural History in Santiago de Chile (Museo Nacional de Historia Natural, Santiago, Chile). Craniological material relating to the Mapuche tribe was collected in the regions of Araucania and Bio-Bio, in the central part of Chile. it mainly comes from the communes of Traiguén, Temuco, Arauco, and Mulchen. This series approximately dates to the 10th–15th centuries. the series measured by the author includes 17 male and 16 female skulls.

Tierra del Fuego

From Tierra del Fuego, we included three groups. These are the Alakalufs (also known as Kaweskar or Halakwulup), the Onas (also known as Selk'nam), and the Yahgans (also known as Yamana). Data on the three groups was taken from Hernandez et al. (1997). All groups were hunter-gatherers that inhabited Tierra del Fuego before European contact. the Yahgan and the Alakalufs lived on islands and channels of the Chilean Pacific coast and maintained occasional contacts with each other and also with the Patagons who lived in the area north of the Magellan Straits. However, the geographically marginal position of the Fueguian aborigines with respect to the South American continent seems to have kept

them apart from northern migratory movements. the samples from Tierra del Fuego used by the authors of the work include 180 skulls preserved at 14 different institutions, nine of them in South America and five in Europe. it is difficult to assign some Fueguian skulls to a specific aboriginal group, as was found during the 1880s and later with the appearance of interethnic mating. However, more than 90% of the skulls of Fueguians from European collections have individual information stored in museum records and are assigned to a specific aboriginal group. the percentages are similar for collections in South America, although it cannot be excluded that some specimens could be misplaced. From the authors' point of view, the distinct morphological pattern of Fueguians can be regarded as the consequence of both climatic and biomechanic adaptations and the geographic isolation of these groups may have contributed to the maintenance of a general morphological homogeneity within the Fueguian samples.

We also included data on the Alakalufs that was obtained by us at the National Museum of Natural History in Santiago de Chile. the skulls belonging to the representatives of the Alakaluf tribe come from the territory of the Tierra del Fuego archipelago, mainly from the island of Doson. However, there are also single finds from other islands of the archipelago — Navarino and Isla Grande (or Tierra del Fuego proper), — and also from the islands of the province of Magallanes. the skulls are tentatively dated to the 10^{th}–15^{th} centuries AD. This craniological series has been, apparently, repeatedly described, data on it were published by different authors (Newman 1943; Newman, Stewart 1950), and it is even included in the previously mentioned work (Hernandez, 1997), but for some reason the authors included data on only 15 males, while we obtained data on 22 males. Therefore, we decided to include this data in the study as well.

As a comparative material, 42 series from the territory of Asia and Oceania were used (Table 2). From the territory of East,

Central, and North Asia, 27 series; 11 series, from Southeast and South Asia; 4 series, from Australia and Oceania.

Table 2. List of groups used in the analysis and their affiliation to geographical communities (macroregions).

Macro-region	№	Ethno-territorial group	n	Source
North, Central, and Central Asia	1	Kazakhs	119	Ismagulov, 1970
	2	Telengits	55	own data
	3	Chukchi	15	own data
	4	Eskimos (Chukotka)	28	own data
	5	Aleuts	31	own data
	6	Buryats	228	archived data of N.N. Mamonova
	7	Kirghiz	21	own data
	8	Mongols	59	own data
	9	Khanty	99	own data
	10	Eskimos (Alaska)	111	Debets, 1986
	11	Yakuts	20	own data
		Total	786	

Macro-region	№	Ethno-territorial group	n	Source
Eastern Asia	12	Tibetans	47	Morant, 1924
	13	Nepalese	32	Morant, 1924
	14	Hokien	36	Harrower, 1924
	15	Taiyuan	69	Wang, Sun, 1988
	16	Japanese Hokuriku	30	Goro Shimabukuro, 1933 (In Chinese)
	17	Hailam Chinese	39	own data
	18	Peking-Chinesen	27	own data
	19	Kilung-Chinesen	47	own data
	20	Peking-Chinesen	86	own data
	21	Fukien Chinesen	36	own data
	22	Peking-Chinesen	19	own data
	23	Koreaner	137	own data
	24	Fuschun-Chinesen	77	own data
	25	Kinai-Japaner	30	own data
	26	Dairen-Chinesen	20	own data
	27	Formosa-Chinesen	14	own data
		Total	79	

Macro-region	№	Ethno-territorial group	n	Source
Southeast Asia	28	Aeta Agta, or Dumagat	33	Bonin, 1931a
	29	Bantam	22	Bonin, 1931a
	30	Burmese	60	Tildesley, 1921
	31	Dayaks	41	Bonin, 1931a
	32	Jakarta	33	Bonin, 1931a
	33	Madura Island	15	Bonin, 1931a
	34	Tagalog	31	Bonin, 1931a
	35	Javanese (1)	35	Bonin, 1931a
	36	Javanese (2)	29	Bonin, 1931a
		Total	299	
South Asia	37	Andamans	22	Bonin, 1931a
	38	Tamils	35	Harrower G. 1924
		Total	57	
Oceania	39	New Britain	127	Bonin, 1936
	40	Easter Island	54	Bonin, 1931b
	41	North New Guinea	87	Hambly, 1940
	42	South New Guinea	38	Hambly, 1940
		Total	306	

Macro-region	№	Ethno-territorial group	n	Source
North America	43	Belle Glade Indians	17	Hrdlicka 1927
	44	San Francisco Bay Indians	31	Hrdlicka 1927
	45	Kentucky Indians	34	Hrdlicka 1927
	46	Cape Canaveral Indians	52	Hrdlicka 1940
	47	New Jersey Indians	12	Hrdlicka 1927
	48	San Nicolas Island Indians	11	Hrdlicka 1927
	49	Santa Cruz Indians	64	Hrdlicka 1927
	50	Santa Rosa Indians	20	Hrdlicka 1927
	51	Manhattan Island Indians	11	Hrdlicka 1927
	52	St. Johns River Indians	16	Hrdlicka 1940
	53	Santa Barbara County Indians	48	Hrdlicka 1927
	54	North Dakota Indians	13	Hrdlicka 1927
	55	Florida Indians	9	Hrdlicka 1940
	56	Massachusetts Indians	14	Hrdlicka 1927
	57	New York State Indians	19	Hrdlicka 1927
	58	Northwest New York state Iroquois	33	Hrdlicka 1927
		Total	404	

Methods

The study of Latin American populations was carried out according to 11 craniological features of the standard program (Broca 1875; Martin 1928; Debets 1935; Alekseev and Debets 1964). Six features are of the *cerebral region*: longitudinal diameter (M.1), transverse diameter (M.8), height (M.17), length of the base of the skull (M.5), the smallest forehead width (M.9), the largest forehead width (M.10). Five features are of the *facial region*: the length of the base of the face (M.40), the upper height of the face (M.48), the zygomatic diameter (M.45), the width of the nose (M.54), the height of the nose (M.55). For easier interpretation, a schematic representation of craniometric features is shown in the Figure 1.

All data used were taken from the literature and of course many of the published works provide a larger amount of craniometric data with other features. However, some features were not analyzed by us due to the fact that one cannot be sure of the comparability of measurement methods, for example, with the size of the eye sockets, which has an extremely high inter-research discrepancy.

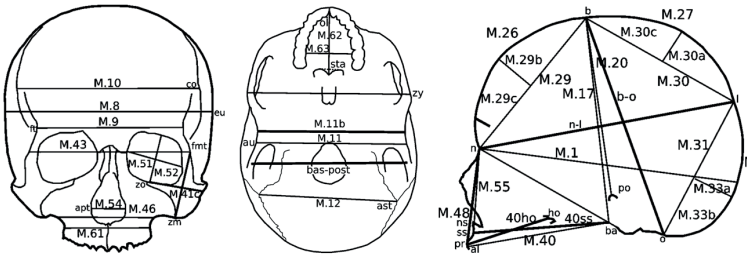


Figure 1. Schematic representation of craniometric features.

Results

Morphological description of South American groups

The first stage of the study was a morphological description of the groups from the territory of South America. it was made using categories of craniometric sizes. the categories were assigned according to the generally accepted craniometric constants which were calculated on the basis of the global variability in the size of the skull (Alekseev, Debets 1964). All feature values were assigned to one or another size category, from very small (1) to very large (5). For example, if the mean value of a certain feature of a group fell into the interval of very small values, it was assigned category 1. the values that fell into the interval of small values, 2, and so on up to very large values, which were assigned the value 5. Thanks to these categories, we can compare data for different groups more clearly, since there is some generalization of the data.

Only 4 out of 17 groups are characterized by a short (category 2) cerebral region of the skull (Figure 2). These are two groups from the territory of Peru (Calca and Chicama) and two from the territory of Chile (Mapuche and Araucano). Two more groups have a short brain region, on the border with a medium long one: a group from San Damian (Peru) and a group from the territory of Venezuela (lake Valencia). Four groups have long skulls (category 4), two from Patagonia and two from Tierra del Fuego, and the Ona series of Indians from Tierra del Fuego have a very long brain region (category 5). the remaining six groups, from the territories of Brazil, Argentina and Peru, have a medium-long braincase.

Almost all series (11 out of 17) have an average width of the brain region (Figure 3). Narrow skulls are characteristic of three series from the territory of Peru and of Botocudos from the territory of Brazil; the Lagoa Santa series from Brazil has a very narrow

skull. the only series that is characterized by a wide brain region of the skull is the Patagonians of Rio Chubut.

The variation in skull height is more interesting (Figure 4). All the Patagonian skulls from the territory of Argentina have a very high or close to very high brain region. Four series are characterized by a high skull, all coming from different territories: Alakalufs (Tierra del Fuego), Paucarcancha (Peru), Araucans (Chile), and Botocudos (Brazil). Onas and Yagans from the territory of Tierra del Fuego have close to high values of the cerebral region height. the rest of the series from the territories of Peru, Chile, and Brazil are characterized by a medium-high cranial region, with the exception of the low skulls of the Indians of Venezuela and the Maqui-Maqui series from the territory of Peru. the geographic localization of low skulls in northern South America has been previously noted (Newman and Stewart 1950).

All series from Peru and Venezuela have a short cranial base (Figure 5). Groups from the territory of Brazil and Tierra del Fuego, as well as one group from the territory of Argentina, are characterized by a medium-long cranial base. And only two series from Argentina (Patagonians from Rio Chubut and Paraná) have a long skull base.

Interestingly, the forehead in the region of the postorbital constriction is narrow in most groups (Figure 6). a medium wide minimal forehead width can be found in some groups — all series from the territory of Argentina, as well as Araucanos from Chile, Maqui-Maqui from Peru and a series from the territory of Venezuela. High values of this feature are not observed. the same can be said about the width of the frontal bone in the region of the coronal suture (Figure 7). the Botocudos, the Lagoa Santa series, the Indians of Venezuela, the Patagonians of Argentina, and the Alakalufs from the territory of Tierra del Fuego have a very-narrow or narrow forehead. Five series, three from the territory of Tierra del Fuego and two from the territory of Chile,

have a medium-wide forehead. For the groups from the territory of Peru, the size of the frontal bone at the coronal suture is unfortunately unknown.

The facial area of the Indian skulls from the territory of South America is quite variable in height (Figure 8). the skulls of the Peruvian series (with the exception of one), as well as the Lagoa Santa series, have a low face. Argentinean skulls and skulls of one of the Alakaluf series from Tierra del Fuego have a high facial region. the rest of the series are characterized by an average face height. Woefully, for the other series of Tierra del Fuego, as well as a series of Araucanian skulls, the height of the face is unknown.

The faces of South American Indians are generally wide or very wide (Figure 9), but there are six groups whose faces are of medium width. These are the Araucanians, the Lagoa Santa group and the four Peruvian series.

The nose is mostly medium wide (Figure 10), narrow only in three series from the territory of Peru.

The scatter is greater for the height of the nose (Figure 11). the Indians of Venezuela have a very high nose. the Indians of Tierra del Fuego and Argentina are characterized by a high nose. Most of the series from the territory of Peru, as well as the Lagoa Santa series, have a short nose. the four remaining series — ones from Brazil, Chile, Peru, and Argentina — are characterized by a medium high nose.

Figures ----›

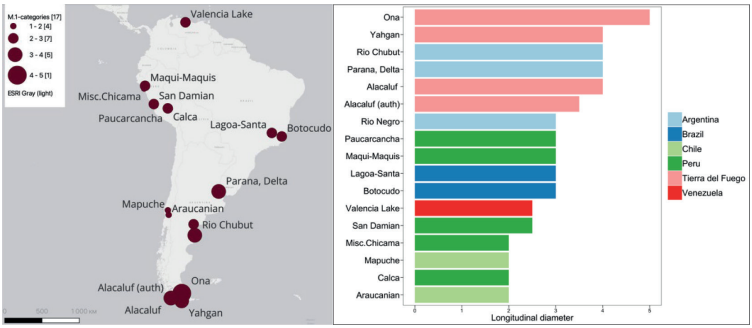


Figure 2. Categories of longitudinal diameter in different ethno-territorial groups.

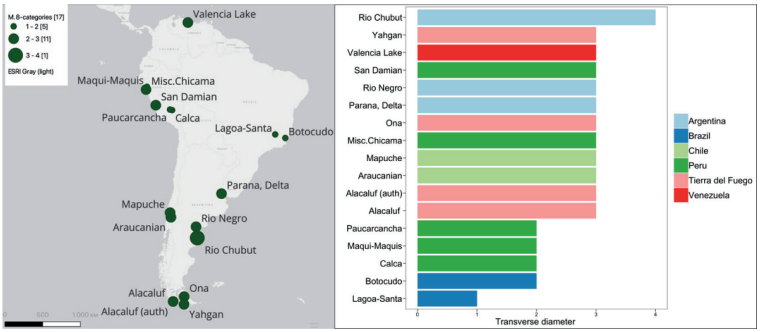


Figure 3. Categories of transverse diameter in different ethno-territorial groups.

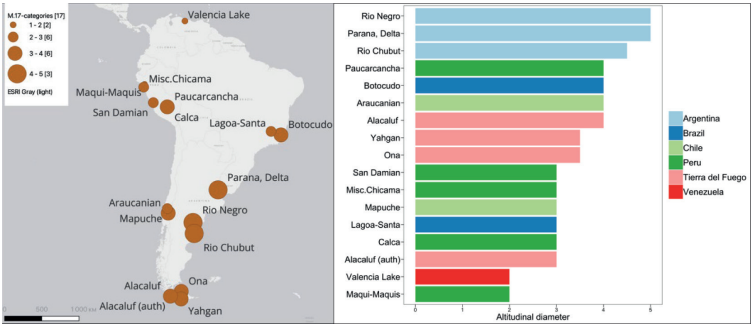


Figure 4. Categories of altitudinal diameter in different ethno-territorial groups.

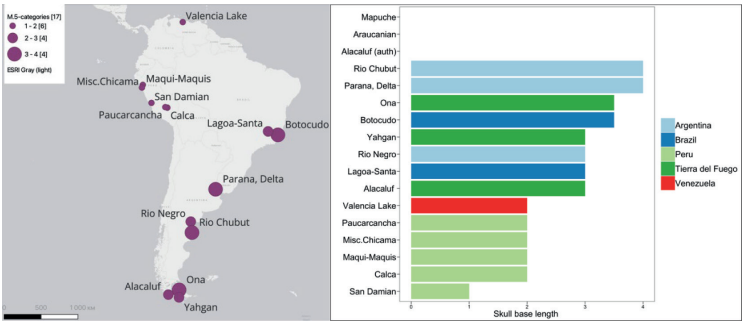


Figure 5. Categories of skull base length in different ethno-territorial groups.

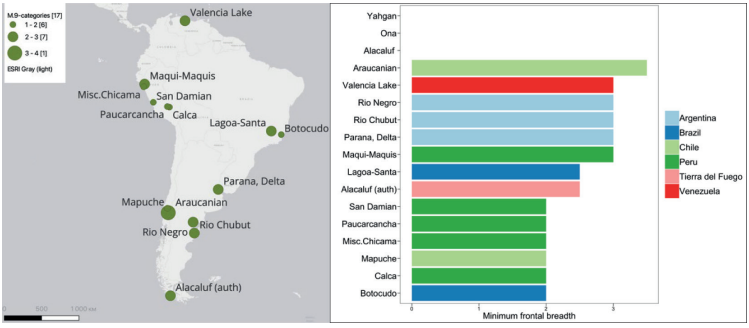


Figure 6. Categories of smallest forehead width (at the postorbital constriction) in different ethno-territorial groups.

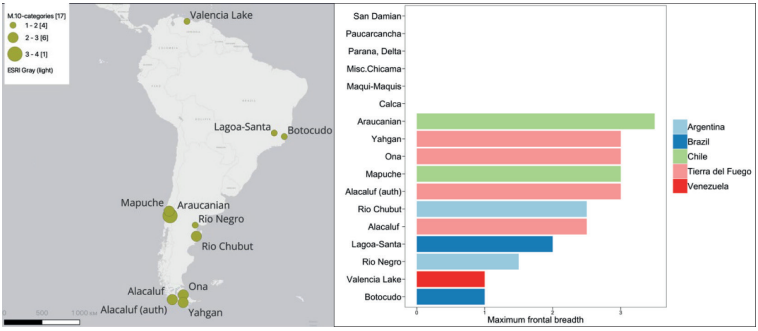


Figure 7. Categories of the width of the forehead at the coronal suture in different ethno-territorial groups.

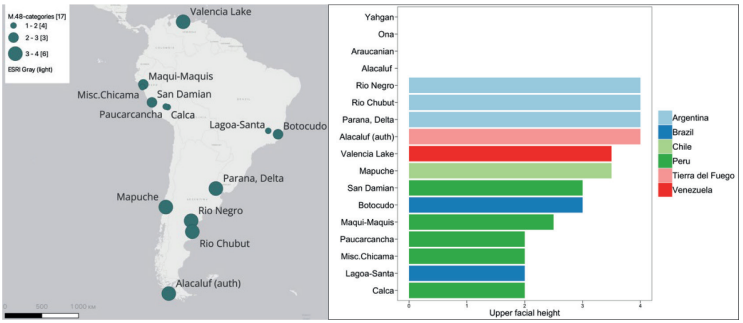


Figure 8. Categories of upper face height in different ethno-territorial groups.

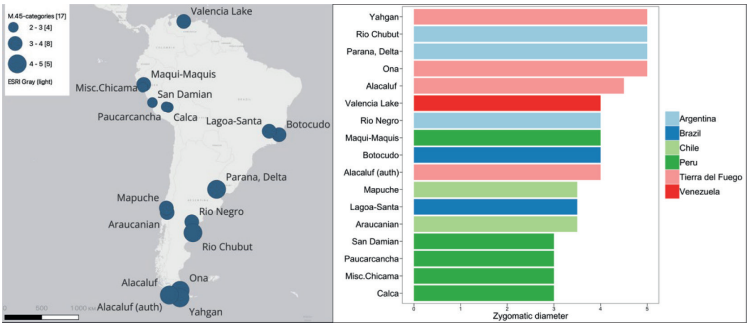


Figure 9. Categories of zygomatic diameter in different ethno-territorial groups.

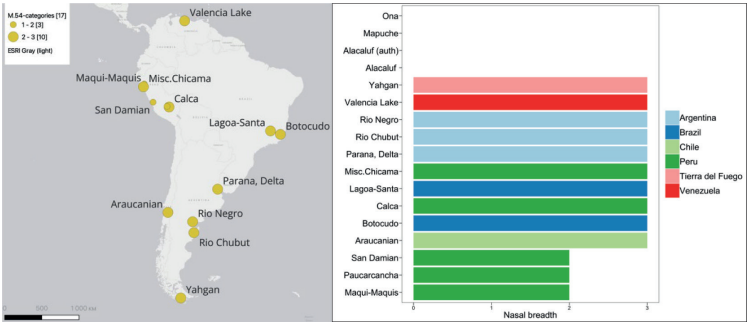


Figure 10. Categories of nose width in different ethno-territorial groups.

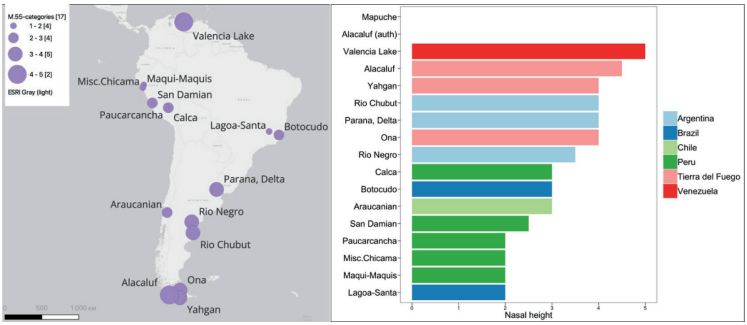


Figure 11. Categories of nose height in different ethno-territorial groups.

Intercontinental comparison

Multivariate analysis was carried out only on seven craniometric features: longitudinal, transverse and height diameters, upper face height, zygomatic diameter, nose height and width. Such a decrease in the number of features is associated with the mosaic nature of the initial data. Many groups, American as well as Asian, had a very limited set of features by which they were measured. We had to leave only those features that were present in all groups, since missing values cannot be analyzed in multivariate analyses. Several groups were also removed, for a total of 77 groups included in the analysis. For them, a canonical discriminant analysis was carried out by means, using general species constants (correlation coefficients and standard deviations). the differentiation of the groups turned out to be quite distinct (Figure 12). the division according to the first canonical vector was observed according to the features of the facial region: the height of the face, and the height and width of the nose (Table 3). in the area of high values, we have individuals with a high face and a wide and relatively short nose. in the second canonical vector, the transverse and height diameters of the brain region, as well as the height of the nose, turned out to be

significant. in the area of high values, there are individuals with a low and wide skull, and with a narrow nose. From the data presented, it can be noted that an unusual intergroup correlation is observed. Face height and nose height are negatively correlated, although their biological correlation in human populations is high and positive.

Table 3. Standardized coefficients of discriminant functions obtained as a result of canonical discriminant analysis by means.

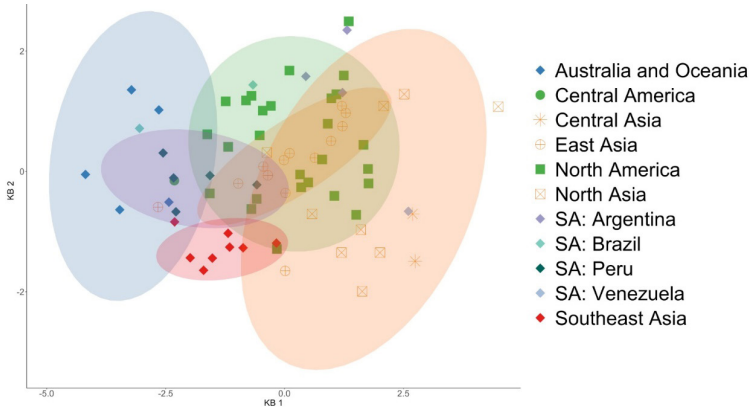
Cranial Features	1st canonical vector	2nd canonical vector
% Variation Explained	53,898	18,57
Longitudinal diameter M.1	-0.16	0.18
Transverse diameter M.8	0.42	-0.71
Height diameter M.17	-0.22	0.64
Upper face height M.48	0.84	0.52
Cheekbone diameter M.45	0.04	0.28
Nose height M.55	-0.74	-0.76
Nose width M.54	0.71	0.13

In the left area of the graph groups from the territory of Australia and Oceania are located. on the opposite side, rather scattered, are groups from the territory of North Asia. Thus, we observe a separation according to the height of the face and the width of the nose. Groups from other regions were distributed among them. the groups of East Asia are close to the generality of North America, which is consistent with the results of previous studies. At the same time, it can be seen from the distribution plot that the area occupied by the North American series includes almost completely the area occupied by the East

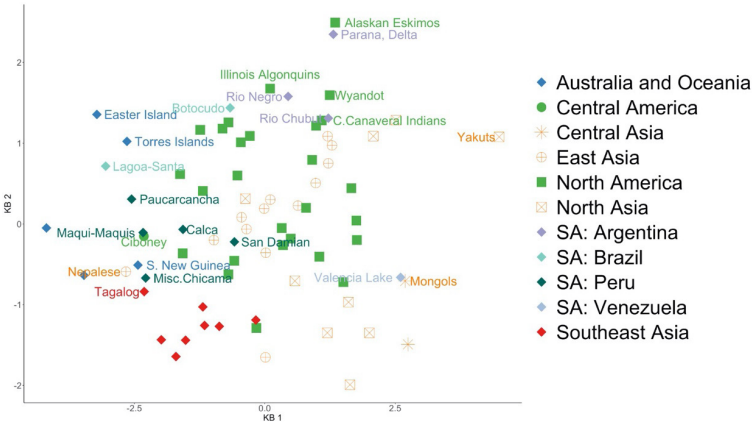
Asian groups. At the same time, the area occupied by the groups of North Asia is the most extensive and is shifted from the other two in the direction of increasing the height of the face and the width of the nose, and some heterogeneity in the second canonical vector can be seen. the Southeast Asian groups are as compact as the East Asian groups. They ended up at the bottom of the graph, with relatively high noses and a low and wide skull.

Nearby (in the upper part of the distribution) are the series from the territory of Argentina, as well as Botocudos from the territory of Brazil. the Peruvian series are located at the bottom of the distribution, closer to the Southeast Asia and Oceania series. the Lagoa Santa group is in the area of distribution of the groups from the territory of Australia and Oceania, closest to the series from the territory of Easter Island and the Torres Islands. it is believed that this series is rather ancient. This location in the graph may indicate that the ancient population of America had a connection with the populations of Australia and Oceania. the series from the territory of Venezuela stands out from the general distribution, being close to the series of the Mongols from the territory of Central Asia.

Figures ----›



a)



b)

Figure 12. a) the distribution of groups in the space of the first and second canonical vectors with ellipses representing the 90% confidence interval; b) the distribution of groups in the space of the first and second canonical vectors, on which the South American series and series close to them from other territories are indicated.

Conclusion

Taking into account everything abovementioned, it can be concluded that some heterogeneity can be observed on the territory of South America. Even in this mosaic material, it is clear that there are skulls with larger sizes of the brain region and those that have smaller sizes. the first group includes one series from the territory of Argentina based on some features, and one from the territory of Brazil — both from the east coast. on the other hand, small sizes of the brain section can be found in series of the north and northeast: Peru, Venezuela. We notice as well a north-south increase in the forehead width. the overall dimensions of the face also increase from north to south.

At the same time, multivariate analysis shows that the groups from the territory of Peru are isolated. a series of Parana stands out, approaching the Eskimos of Alaska (Figure 12). the Patagonians and Botocudos from the east coast are isolated as well. the series from the territory of Venezuela is also separated from other South American series, towards the groups of Central and North Asia.

Of course, such disparate data include many unpredictable factors that affect the results, starting with the fact that the features could be measured differently by different authors and ending with the fact that some series may include skulls with artificial deformation or be of very different antiquity. All this does not allow us to draw final conclusions. it is necessary to re-collect data, as well as to study other groups from these territories, which could describe in more detail the morphological variability of the indigenous population of Latin America.

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