Lambé bee wɔra.	Keyia gbɔŋ só nɛ làmbé bee wɔra eè.
Kakelíyà só nɛ è bá naa wɔra eè,	Keyia gbɔŋ só aà,
Lambé è lá wàne.	Keyia gbɔŋ só nɛ làmbé (bee) wɔra eè.
Keyia gbɔŋ só nɛ làmbé bee wɔra,	Keyia gbɔŋ só aà,
Lambé è lá wàne.	Keyia gbɔŋ só nɛ làmbé (bee) wɔra eè.
Kakelíyà só nɛ làmbé bee wɔra,	Keyia gbɔŋ só aà,
Lambé è lá wàne.	Keyia gbɔŋ só nɛ làmbé (bee) wɔra eè.
Keyia gbɔŋ só nɛ làmbé bee wɔra,	Keyia gbɔŋ só aà,
Lambé è lá wàne.	Keyia gbɔŋ só nɛ làmbé bee wɔra eè.
Lambé tà má kòshí nɛ m̀ bá naa la to,	Keyia gbɔŋ só aà,
Lambé è lá wàne.	Keyia gbɔŋ só nɛ làmbé bee wɔra eè.

Kantor:	Chor:
Es ist wegen des Kapokbaums, daß der Habicht so groß ist,	Weil der Baum so groß ist?
Nein, der Habicht ist es.	Wegen des großen Baums ist der Habicht so stolz.
Er nimmt meine Hühner, und ich sage nichts dazu.	Weil der Baum so groß ist?
Ich sage nichts dazu.	Wegen des großen Baums ist der Habicht so stolz.
Wenn der Baum nicht so groß wäre, was wäre dann der Habicht?	Weil der Baum so groß ist?
Der Habicht ist stolz.	Wegen des großen Baums ist der Habicht so stolz.
Es ist wegen des Kapokbaums, daß der Habicht so ist.	Weil der Baum so groß ist?
Nein, der Habicht ist es.	Wegen des großen Baums ist der Habicht so stolz.
Es ist wegen des großen Baums, daß der Habicht so groß ist.	Weil der Baum so groß ist?
Nein, der Habicht ist es.	Wegen des großen Baums ist der Habicht so stolz.
Es ist wegen des Kapokbaums, daß der Habicht so groß ist.	Weil der Baum so groß ist?
Nein, der Habicht ist es.	Wegen des großen Baums ist der Habicht so stolz.
Es ist wegen des großen Baums, daß der Habicht so ist.	Weil der Baum so groß ist?
Nein, der Habicht ist es.	Wegen des großen Baums ist der Habicht so stolz.
Der Habicht nimmt meine Hühner, und ich sage nichts dazu.	Weil der Baum so groß ist?
Nein, der Habicht ist es.	Wegen des großen Baums ist der Habicht so stolz.

A Reanalysis of Galapagos Ceramics Data

By

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A limited archeological survey was undertaken in the Galapagos Islands in 1953 for the purpose of checking on reports of the presence of prehistoric, archeological remains (Heyerdahl and Skjölsvold, 1959). A small pottery collection was made: it was concluded that the island had been visited frequently in prehistoric times by Peruvian and Ecuadorian Indians as far back as the Tomaval Period of the Peruvian North Coast Sequence, and possibly earlier (ibid., pp. 56—62). These results and conclusions have been questioned, on historical and archeological grounds (Plischke, Ryden, 1961, 1958).

The present paper represents a further critical analysis of the reported data and conclusions. Consideration will be given to collection techniques, size, ceramic associations, and dating techniques.

The ceramic collections were made on thirteen sites. According to the reports, soil at all of these sites was disturbed; therefore, no stratigraphic superposition of artifacts could be observed. Although the soil at sites was trowelled through in order to recover the largest number of specimens, the collections are therefore to be considered as nonexcavated collections. The collections, however, cannot be handled as are surface collections in classical ceramic studies (i.e., the Viru Valley survey). First, they are not random samples. The necessity of random sampling of surface remains for valid chronological ordering of sites, has been stressed by ceramicists (Ford, 1949). The Galapagos sites, however, were carefully searched for aboriginal sherds, all of which were collected, regardless of size. Further, recognizably Post-European contact potsherds of Indian or European origin, found in association with the aboriginal sherds at *all sites* (see Heyerdahl and Skjölsvold, 1956, pp. 13—22) were collected and tabulated in only seven cases.

The sizes of the collections in about 50 % of the cases are well below that normally used in surface collection surveys.

These methodological observations are basic to the remainder of analysis. They indicate that the entire foundation of the Galapagos work is questionable.

The authors' use of these data on aboriginal pottery deserves careful consideration. Table 1 shows the raw and percent frequencies of identified aboriginal potsherds by type for the thirteen sites. The sites were dated by matching the relative frequencies of the pottery types found on each with the sherd frequencies reported by Ford and Willey in their Viru Valley survey. Direct frequency comparison was not used however. The frequencies of the eight pottery types in the Viru survey were converted into a gross frequency classification: very rare 1 %, rare 1—5 %, slight 5—10 %, frequent 20—40 %, abundant 50—70 %. In such a classification a type may obviously double or triple in percent frequency and still remain within the same classification.

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Further differences between type frequencies in successive periods are in some cases less than 20 % on the smoothed scale (Ford, 1949 Ch. 4), while actual observed frequencies of types within a period may vary by far more than 20 %. The classification is inadmissible; but examination indicates further that only ten of the forty pottery type frequency cells have been classified correctly. Of the ten so identified, six have been cases in which a type was completely absent. (See Table 2 for a matching of the actual Viru data with Heyerdahl's version of the Viru data.)

(The present writer's classification was based on *actual observed type frequencies* from the sites within each period, rather than on the smoothed frequency curves superimposed on the chart. However, if Heyerdahl's classification is compared to the *smoothed* frequency curve, then there are fifteen correct identifications out of forty.)

The pottery type frequencies obtained on the Galapagos sites were classified by the present author, according to the Heyerdahl-Skjölsvold classification system. These frequencies were then matched to: a) Heyerdahl's erroneous frequency classification of the Viru data; and b) the correct frequency classification of the Viru data. The Heyerdahl classification of the Galapagos frequencies only matched the Viru data on eight out of twenty-four points. The corrected frequency classification matched only seventeen out of twenty-four points. This extent of "matching", however, is due to nothing more than the unwarranted frequency "classification" which consistently exaggerates, producing similarities where none exist. For example, Tomaval plain appeared at Site K as 1 % of the collection. This would fall into Heyerdahl's category of "rare". In the Viru observed-site frequencies, Tomaval plain varied from "rare" (1—5 %) to "abundant" (50—70 %) during the same period. Obviously, any observed frequency from 1 % to 70 % would have "matched".

A detailed examination of the bases for the dating of the sites brings out further specific difficulties:

a) Sites D, E, and F are assigned to the Tomaval period, yet are completely lacking in any kind of datable ceramic remains of that period or any other (Heyerdahl and Skjölsvold, 1956, pp. 20—27). At Site F, a single nondiagnostic stone artifact of debatable significance was found, lacking associations with any ceramics. This was also assigned to the Tomaval Period.

b) Site J is assigned to the Tomaval Period on the basis of a single sherd of San Nicholas molded pottery—a type that appears in low frequencies in excavations and surface collections over a period of more than a millennium from the Gallinazo Period up to the Estero (Inca-Chimu) Period.

c) Site A is placed in the Estero or La Plata periods on the basis of five sherds of three different types. Site B was also placed in the same time period, but contained only pottery of types not found on Site A.

d) Site C is dated in the Tomaval Period by eighty-six sherds of Tomaval plain ware, *all probably from a single pot.* Tomaval plain ware occurs throughout the Peruvian North Coast sequence in excavations and surface collections from the Puerto Moorin (Salinar) Period to European contact, and dominates from the Tomaval Period on. The same observation applies to Buccaneer Bay which is dated in the Tomaval Period on the basis of twenty-two sherds of Tomaval plain.

e) Sites H, I, and K were assigned to the Tomaval Period apparently on the basis of a predominance of Castillo plain pottery as opposed to Tomaval plain. However, Tomaval plain is dominant in the Tomaval Period (Ford and Willey, 1949, p. 66).

f) Site G contains 85 % Castillo Plain and some Queneto Polished Plain, but is assigned to the Tomaval Period. Tomaval Plain dominates in this period and the appearance of Queneto Polished Plain is out of order.

g) The Site L collection consists mostly of Queneto Polished Plain (75 %) and is assigned to the Estero or La Plata Periods. This type does not appear in any such quantity in the period in question.

It is obvious that Galapagos data bear no *qualitative* resemblance to that of the Viru. In order to obtain an objective measure of the lack of similarity between the Galapagos sherd frequencies and the Peruvian North Coast data, however, a *quantitative comparison* was made. The Spearman r_s was selected (Seigel, 1956). This is a nonparametric statistic which measures the extent of correlation or dependence between samples regardless of the nature of their distributions in the sampling universe. The Galapagos pottery-type distributions were combined for all sites assigned to a given period, in order to give a better and fairer basis for comparison. Thus, the frequencies of the James Bay A, B, L. Whale Bay and Buccaneer Bay assigned to the Estero-La Plata Periods were combined, and those of James Bay C-K assigned to the Tomaval Period were combined. In this way, it was believed that sampling problems might be at least reduced.

The Galapagos distributions were compared to the Viru Valley pottery-type distributions for the Estero, La Plata, and Tomaval Periods. Average values for each type in each Viru Period were obtained from the smoothed curve on Ford's seriation chart (Ford and Willey, 1949, Ch. 3). It was assumed that this average would be representative of the midpoint of the distribution of the particular type frequency during the period in question. The hypothesis to be tested was that there was no correlation between the Galapagos and Viru samples, the typical null hypothesis for correlation statistics. Computations (see Table 3) yield the following correlations between Galapagos and Viru data:

Galapagos "Estero-La Plata" — Viru Estero $r_s = .35$

Galapagos "Estero-La Plata" — Viru La Plata $r_s = .04$

Galapagos "Tomaval" — Viru Tomaval $r_s = .49$

None of these correlations are significant, indicating that the null hypothesis (no correlation between the Viru and Galapagos samples) must be accepted. Thus under *any* distribution of sherd frequencies, in the Galapagos or Viru Valley sites, it can be concluded that the two samples arise from different populations.

It may be objected that the large number of missing types in the Galapagos sample unfairly biases the comparison in favor of a no-correlation verdict. However, computation of the correlations based only on types shared by the two areas produced lower correlations than those obtained by the present method. For example, $r_s = -.05$ for the Galapagos "Estero-La Plata" and Viru La Plata samples. Further, the highly biased collection procedure has probably tended to magnify the correlation, as low as it is. Had normal sampling been made, an even lower correlation would have been obtained.

It has been claimed that the association of the various types of aboriginal potsherds in the Galapagos was too unusual to be by chance alone (Evans, 1958). It is now quite clear that association of aboriginal types is *only* attributable to chance, unless there is some method of qualitatively judging pottery associations which exceeds the Spearman test in power.

The authors failed to consider the association aboriginal and historical wares on all thirteen pottery-bearing sites. According to Heyerdahl (1956, p. 52), all identifiable modern material was removed from the collection before analysis, thus excluding from consideration the obvious association of aboriginal and historical wares. In any normal distribution of sites, it would be expected to find some possessing only historical ware (A), others only aboriginal ware (B), and some both (AB). The Galapagos situation is thus one in which thirteen associations of A and B are observed. The exact probability of such a run of occurrences in random association may be determined by the binomial expansion:

$$p(k) = \frac{n}{k!\,(n-k)!}\, p^k q^{n-k}$$

Where $n = 13$, $k = 13$, $p = 1/3$, $q = 2/3$

Thus, $p(k) = (1/3)^{13}$ or $\frac{1}{1{,}594{,}323}$

This most extreme value indicates that such an association would be expected only once out of *1,594,323 series of 13 sites* in a normal situation of random association. That it has occurred, however, is evidence that historical and aboriginal pottery are, in fact, definitely associated in a nonrandom, nonchance fashion. This indicates that they were both brought to the Galapagos by the same individuals. It would be most unusual to expect that Peruvians and Europeans broke pots in precisely of same places over a period of several centuries. This interpretation is further supported by the fact that no stratigraphy was detected on any of the sites. While this was attributed to soil disturbance in all cases by the authors, it appears likely that it was also due to the fact that no stratigraphy had ever existed and historical and aboriginal sherds were mixed naturally as they had been deposited.

In addition to the ceramic evidence, historical, botanical, and archeological evidence is available to illuminate the question of prehistoric occupations of the Galapagos.

The islands were uninhabited when discovered in 1535; no evidence of early aboriginal occupation was noted by the discoverers or any of the subsequent visitors. The islands were largely uninhabitable: navigation among them was very difficult, due to peculiar currents. In the late 1600's, British buccaneers began to visit the islands, ultimately establishing a base there, having found water at James Bay on Santiago. From then on, traffic increased in the Galapagos.

Heyerdahl relies (1956, pp. 10—12) the legend of the visit of Inca Tupac Yupanqui to islands off the Peruvian coast, implying that these islands were the Galapagos. However, reports indicate that the Inca brought back a number of darkskinned prisoners, gold and silver, a copper throne, and skins of horse-sized animals. Obviously, gold, silver, copper, etc. was not available on the Galapagos; nor was it available in the Pacific islands. We must therefore conclude that the Inca possibly visited nearer off-shore islands, possibly Puna in the Gulf of Gayaquil, that he sailed up the coast to Panama, or that the legend is either garbled or nonhistorical.

In a review of the Galapagos report, Ryden pointed out that the aboriginal pottery could actually have been brought to the Galapagos by Europeans who frequented the island from the late 1600's on. Independently, Plischke (1961) published a study of historical documents indicating that aboriginal pottery

was in frequent use on European vessels of the 17th—19th centuries for collecting and storing water, for storing gunpowder, and alcoholic beverages, and for crude bombs. The amount of pottery ware carried on vessels for various reasons was great: Plischke mentions one ship with 280 pots of water, another with 50 pots full of powder, and others with 1500 to 2000 pots of Pisco wine. Spanish ships are described with water vessels hung from rigging and arms (Plischke, 1961, pp. 305—306). There is no doubt that pottery was much in use by the European visitors to the Galapagos, for very practical purposes. Many American navigators of this period brought back aboriginal and historical pottery and various other artifacts to the U.S.: these have found their way into museums. The historical records therefore offer the best explanation for the origin of the Galapagos aboriginal pottery, its consistent association with historical ware, and the lack of similarity between the type distributions in the Galapagos and on the mainland.

European introduction of aboriginal pottery is futher supported by the variety of regional types found (Northern and Southern Peru, Ecuador) as well as the "flint objects" which are actually gun flints or strike-a-lights. Parenthetically, it should also be noted that the use of pottery on European vessels undoubtedly resulted in a very wide distribution of sherds of various types. On the basis of probability alone, there, it is not to be unexpected that some sherds of aboriginal pottery might turn up in Oceania or elsewhere in the Pacific. These must, however, be judged by their context.

The appearance in the Galapagos of the domestic New World cotton, *Gossypium barbadense darwinii,* was hailed as supporting the view that the Galapagos was visited in prehistoric times. Recent archeological and botanical studies show that the speciation and spread of New World cotton in South America, Hawaii and the Galapagos took place well before man, *by natural agencies* (Smith and McNeish, 1964).

A final matter concerns comparison of the purported prehistoric remains in the Galapagos with those of Easter Island. Heyerdahl wishes to prove that the settlement of Polynesia took place from Peru, and often refers to his Galapagos and Easter Island work as mutually corroborating evidence (1958, pp. 3, 4). If the Galapagos evidence represented a real aboriginal occupation there is still absolutely no comparison between the kinds of remains found there and those found on Easter Island (Heyerdahl and Ferdon, 1962). If one is to be accepted as proof of Peruvian contact, then the other must be rejected. A choice is required.

It is concluded that the hypothesis of aboriginal visits to the Galapagos must be rejected. Both the data and the non-scientific analytic techniques used as the basis for that hypothesis are inadmissible. Quantitative analyses of the ceramic data and consideration of historical, botanical, and archeological evidence strongly indicate that the aboriginal pottery was introduced by Europeans.

ABSTRACT

Quantitative methods are applied to the Galapagos ceramic data. Resemblances between the Galapagos and Viru Valley sherd frequencies are seen as insignificant and explainable by chance. Association of historic and prehistoric wares indicates a high mathematical probability of simultaneous arrival. Evidence of pre-Spanish visits is seen as an artifact of faulty use to archaeological techniques and methods. Present archaeological evidence fails to support the hypothesis of aboriginal visits to the Galapagos.

Table 1: Sherd Frequencies and % Frequencies in Galapagos Sites.
(* Figures in parantheses are probable identifications.)

	James Bay A	B	C	D	E	F	G	H	I	J	K	L	Black Beach	Whale Bay
Castillo Plain	30 % 2						85 % 159	60 % 3	75 % 78(23)		61 % 108(2)			4 % (12)
Gloria Polished Plain														4 % 11
Queneto Polished Plain		67 % 39					6 % 12				17 % 30	75 % 12		
Tomaval Plain	20 % (1)*		100 % 86				8 % 2(13)	40 % 1(1)	25 % 10(23)		1 % 2		100 % 3(19)	92 % 262(12)
La Plata Molded	50 % 3											25 % 4		
San Juan Molded		33 % 19												
San Nicholas Molded										100 1				
Tiahuanaco							1 % 1				21 % 38			
Totals	5(1)	58	86				174 (13)	4(1)	88(46)	1	178(2)	16	3(19)	273 (24)
Types per site	4	3	1	0	0	0	4	3	3	2	5	3	2	4

Table 2: Comparison of Heyerdahl and Skjölsvold's Classification of Viru Valley Caramic-Type Frequencies with Actual Viru Frequencies. (H & S version underlined).

Period \ Type	Castillo Plain	Gloria Polished Plain	Queneto Polished Plain	Tomaval Plain	La Plata Molded	San Juan Molded	San Nicholas Molded	Tiahu-anaco
Estero	SL	VR	SL—FR	AB	R	SL	0	0
	SL—R	R	R—FR	FR—AB	R*	R—SL	0*	
La Plata	SL	R	SL—FR	AB	R	SL	0	+
	SL—R	R*	R—FR	AB*	VR	R—SL	0*	
Tomaval	FR—AB	R	SL—FR	AB	R	SL	R	+
	R—AB	VR—SL	R—FR	AB—R	R—O	R—SL	R*	
Huancaco	AB	SL	R—SL	FR	0	SL	0	0
	FR—AB	R—SL	VR—SL	R—FR	VR	O—SL	0*	
Gallinazo	AB	SL	R	R—FR	0	0	0	0
	FR—AB	VR—SL	VR—R	VR—FR	0*	0*	0*	

* Classification and actual data coincide

Symbols:

VR = Very Rare = 1 %
R = Rare = 1—5 %
SL = Slight = 5—10 %
FR = Frequent = 20—40 %
AB = Abundant = 50—70 %

Table 3: Rank Order Comparison of Galapagos and Viru pottery

Type Frequency

Types	Galapagos				Viru*					
	%	r	%	r	%	r	%	r	%	r
Castillo plain	2.5	9	66	12	2.5	6	2.5	3.5	21.25	11
Gloria polished plain	0	4	0	4.5	1	3	4.5	7	1	3
Queneto polished plain	63.75	12	9.5	10	10	10	10	10	7.5	8.5
Tomaval plain	1.7	8	24.4	11	47.5	12	56	12	37.5	12
La Plata Molded	8.75	10	0	4.5	1	3	1	2.5	1	3
San Juan Molded	23.75	11	0	4.5	5	8.5	4	6	4	6
San Nicolas Molded	0	4	.001	9	0	1	0	1	0	1
Estero plain	0	4	0	4.5	4.5	7	5.5	8	5.5	7
Viru plain	0	4	0	4.5	14.5	11	12	11	12	10
Rubia plain	0	4	0	4.5	5	8.5	2.5	3.5	2.5	5
Valle plain	0	4	0	4.5	2	5	7.5	9	7.5	8.5
Inca painted	0	4	0	4.5	1	3	1	2.5	1	3

* Column totals 100 % — Entries are averages of period frequency ranges.

$$r_s = \frac{\Sigma x^2 + \Sigma y^2 - \Sigma d_i^2}{2\sqrt{(\Sigma x^2)(\Sigma y^2)}}$$

Values for Spearman Computation

Comparisons	Σdi^2	Σx^2	Σy^2
Galapagos "Estero-LaPlata" — Viru Estero	165.50	115	140.5
Galapagos "Estero-LaPlata" — Viru LaPlata	244-25	115	142
Galapagos "Tomaval" — Viru Tomaval	123.0	100-5	14-5

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