Introduction

The historical-biological relationships among several earlier and near modern inhabitants of Northeast Asia and Southeast Asia are explored through the application of multivariate statistical procedures. The hypotheses tested include the dual-structure hypothesis (Hanihara, 1991), which postulates a major influx of new people (and culture) entering the Japanese Islands during the Yayoi Period ca. 300 B.C., and another that hypothesizes that the Ainu and Ryukyu Islanders are the living descendants of the prehistoric Jomon. Further tested are the agricultural colonization model (e.g., Bellwood, 1997) and the continuity model (e.g., Turner, 1987) that attempt to explain population history of the indigenous inhabitants of Southeast Asia.

Materials and Methods

- 39 male cranial series totaling 1765 specimens from Japan, mainland East Asia, and Southeast Asia (see map)
- Japanese cranial series: late to latest Jomon, Yayoi, Kofun, Medieval, and more recent Japanese, Ainu, and Ryukyu Islanders
- Chinese and Northeast Asian series: Korea, Manchuria, Shanghai, Chingha, Hangzhou etc.
- 24 standard craniometric landmark measurements following Martin and Saller (1973) and Howells (1973)
- Stepwise discriminant function analysis (BMDP-7M)
- Jackknifed classification results
- Two-dimensional and three-dimensional plots were made using SYSTAT
- Mahalanobis’ Generalized Distance
- UPGMA for dendrogram construction using NYSYS-pl

Stepwise Discriminant Function Results

The major purpose of discriminant function, or canonical, analysis is to maximize differences between groups by producing a linear array of weighted variables, referred to as discriminant functions or canonical variates, from the original measurements. Typically, the first few functions, or canonical variates, account for most of the variation among groups.

Stepwise Discriminant Function

In this plot cranial series from mainland and island Southeast Asia combine to form a cluster that is well separated from one that contains the Chinese cranial series. Manchuria, and Hong Kong. The post-Yayoi Japanese, Anyang, and Korea cranial series occupy the third distinct clusters. Jomon and Ainu form a marginal cluster.

Mahalanobis’ Distance Results

Mahalanobis’ generalized distance, or the sum of squared differences, provides a single quantitative measure of dissimilarity (distance) between groups using several variables while removing the correlation between the variables.

Conclusions

The main points of the present craniometric analysis are as follows:

- The prehistoric Jomon and modern Ainu are related and the most differentiated cranial series from the Japanese Archipelago.
- Biological connections between post-Yayoi cranial series from the Japanese Archipelago and several mainland northern Asian cranial series support a major intrusion of people from the Asian mainland beginning in Yayoi times approximately 400 B.C.
- The Ryukyu Island cranial series are most similar to the Yayoi, Kofun, and Kamakura cranial series and not closely related to either the Jomon or Ainu cranial series, suggesting a major intrusion of immigrants from the north commencing with the Yayoi Period
- All cranial series from Japan, including modern Japanese, Ryukyu Islanders, Ainu, and Jomon, are members of a greater East Asian/North Asian grouping, their presumed homeland.
- The marked separation of East/North Asian and Southeast Asian cranial series supports long term continuity in both regions and does not support models of population intrusion or replacement in Southeast.

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Biological Connections Across the Sea of Japan: A Multivariate Craniometric Study of Ancient and More Modern Crania from Japan, China, and Korea

Michael Pietrusewsky
Department of Anthropology, University of Hawai’i at Manoa, Honolulu, HI 96822

mikep@hawaii.edu