Dentition of Nansei Islanders and Peopling of the Japanese Archipelago: The Basic Populations in East Asia, IX

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Abstract The dental features of 4 geographical samples from the Nansei Island chain were compared with those of East and Southeast Asian samples. The series from Amami-, Okinawa-, and Sakishima-Islands exhibit inter-regional difference in both metric and non-metric dental features, pointing to some clinal variation in the Nansei Island chain. The original morphology is supposed to be represented by Jomonese. This clinal variation may reflect the post-Yayoi biocultural microevolution and admixture with the sinodont populations from main-island Japan. The sundadont ancestors of Jomonese have likely arrived from Sundaland via the now-submerged East Asian continental shelf in and after the late Pleistocene. One of the main routes for peopling of the Japanese Archipelago might have been through the Nansei Island chain.

Key Words Nansei Island chain, Jomonese, Sundadont, Sundaland, Peopling of the Japanese Archipelago

Introduction

A dual structure model for the population history of Japanese proposed by HANIHARA, K. (1991) explains the geographical variation of modern Japanese physical characteristics under a single hypothesis. Marked differences in the physical traits of the Neolithic Jomon people, or Jomonese, and those of some Aeneolithic Yayoi populations as represented by the skeletal remains excavated from Doigahama site in the westernmost part of Honshu and Kanenokuma and Mitsu-Nagata sites in the northern part of Kyushu, show that modern Japanese have separate primary origins. However, during the period from the Yayoi to early historic ages, or

from 2,300 years B.P. to 1,300 years B.P., admixture between the aboriginal Jomonese and the incoming Yayoi people from Northeast Asia blurred the distinction of the two population systems. The impact of the migrants after the Yayoi age is unexpectedly large, so that a majority of modern Japanese carry a large amount of the Northeast Asian characteristics (HANIHARA, K., 1985, 1987, 1991; TURNER, 1987; DODO and ISHIDA, 1990). However, some geographically isolated Japanese, *e.g.* Ainu, the residents of Okinawa, Tokunoshima, etc., are clearly descended from Jomonese (HANIHARA, T., 1989a, b, c, 1990a, b, c, 1991a, b, c, n.d. a, b).

TURNER (1976, 1979, 1987, 1989, 1990) supposed that the sundadont ancestors of

Jomonese could be traced back to the hypothetical populations of the late Pleistocene Sundaland. In a series of my previous studies, I have suggested that the physical characteristics of the 'generalized Asiatic populations', as represented by Negritos of Philippines, Dajaks of Borneo, and some Lesser Sunda Islanders, may have been similar to those of the hypothetical late Pleistocene Sundaland populations. Moreover, the generalized Asiatic populations may be linked with Jomonese (HANIHARA, T., 1991a, b, c).

Based on such findings, the next study should be focused on the geographical source, or routes for extension of the ancestral populations in the Japanese Archipelago. The dental and cranial

affinities between the Palaeolithic Minatogawa man from Okinawa (ca. 17,000 years B.P.) and the Neolithic Jomonese provide an evidence that the latter migrated from the south into main-island Japan through the Nansei Island chain (SUZUKI and HANIHARA, 1982; TURNER, 1987, 1990). In the present study, the major purposes are to describe the dental characters of Nansei Islanders and to provide an additional origin and route hypothesis for the peopling of the Japanese Archipelago.

Materials and Methods

The materials consist of prehistoric and near contemporary samples from the Japanese Archi-

Table 1. Materials used (N: male)

Sample name	N	Preservation	Provenience
Amami Islands	122	Univ. Tokyo Kyoto Univ. etc. Kagoshima Univ.	Amamioshima-, Kikai-, Yoro-, Yoron-, Okinoerabu-, Tokunoshima-island
Okinawa Islands	34	Univ. Tokyo Kyoto Univ.	Okinawa island
Sakishima Islands	39	Univ. Tokyo Kyoto Univ. etc.	Miyako-, Ishigaki-, Hateruma-, Yonaguni-island
Hirota	21	Kyushu Univ.	Hirota site, Tanegashima island (2,300–1,700 years B.P.)
Comparative samples			
Jomonese	106	Univ. Tokyo Nat. Sci. Museum	Late and the latest Jomon period (3,500–2,300 years B.P.)
Honshu Japanese	30	Univ. Tokyo Jichi Med. Sch.	Mainly from Kanto region including western part of Honshu
Kyushu Japanese	58	Kagoshima Univ.	Bonotsu, South end of Kyushu, Kagoshima Prefecture
Kanenokuma	27	Kyushu Univ.	Kanenokuma site, Fukuoka Pref., Kyushu (2,300–1,700 years B.P.)
Chinese	87	Univ. Tokyo Kyoto Univ.	Near contemporary Manchurian Liaoning and Kirin Pref.
Korean	26	Univ. Tokyo Kyoto Univ.	Near contemporary Koreans
Negrito	21	Univ. Tokyo	Aeta tribe, Bataan Peninsula, Luzon
Filipino	14	Univ. Tokyo	Near contemporary Filipinos, Marcos village, Luzon

pelago and East as well as Southeast Asia. Table 1 shows the numbers of individuals studied, the locations where the materials are curated and the

provenience of each sample. Fig. 1 shows the approximate source locations of the samples of Nansei Islanders. The present study includes more

Fig. 1. Map showing approximate locations for the samples of the Nansei Island chain.

than 300 individuals from the Nansei Island chain including prehistoric skeletal remains from Hirota site at Tanegashima Island. Using geography and culture as the primary sorting criteria, the individuals from the Nansei Island chain are divided into 4 groups, Hirota, Amami-, Okinawa-, and Sakishima-Islands. The comparative data consist of 7 samples from main-island Japan, East and Southeast Asia. One Aeneolithic Yayoi sample excavated from Kanenokuma site, the northern part of Kyushu, Fukuoka Prefecture, is now believed to be the immigrant from Northeast Asia (*e.g.* HANIHARA, K., 1987, 1991; DODO and ISHIDA,

1990).

All the data were recorded by myself. The metric data were recorded on male specimens. The mesiodistal crown diameters were measured on all the teeth except for the maxillary and mandibular third molars. The non-metric observations were recorded on both male and female specimens since sexual dimorphism was insignificant in most of the samples observed. The sample size for non-metric observations varies depending on the specimen's state of preservation. The exact sample sizes of Nansei Islanders for each trait are given in Table 2. The traits recorded are: shovelling (upper 1st incisors);

Table 2. Frequency distributions of discrete crown traits in each sample from the Nansei Island chain (in %; parenthesis, the numbers of teeth observed)

Sample name	Shovel (UI1)				CARABELLI (UM1)				Hypocone (UM2)		
	++	+	-		+	-			+	-	
Amami Isl.	36.9	46.9	16.2	(111)	10.9	89.1	(183)		85.0	15.0	(173)
Okinawa Isl.	40.6	50.0	9.4	(64)	9.1	90.9	(66)		79.7	20.3	(59)
Sakishima Isl.	16.7	50.0	33.3	(12)	5.0	95.0	(20)		82.4	17.6	(17)
Hirota	4.4	52.2	43.4	(23)	13.0	87.0	(23)		87.5	12.5	(24)

Sample name	6th cusp (LM1)				7th cusp (LM1)				Defl. Wrink. (LM1)		
	+	-			+	-			+	-	
Amami Isl.	29.5	70.5	(122)		4.7	95.3	(129)		30.5	69.5	(105)
Okinawa Isl.	20.3	79.7	(64)		3.1	96.9	(64)		29.7	70.3	(64)
Sakishima Isl.	22.1	77.9	(68)		1.4	98.6	(74)		25.4	74.6	(63)
Hirota	27.8	72.2	(36)		5.4	94.6	(37)		6.1	93.9	(33)

Sample name	Dist. Tri. Cr. (LM1)				Protostylid (LM1)				4 cusp pattern (LM2)		
	+	-			+	-			+	-	
Amami Isl.	10.9	89.1	(101)		7.8	92.2	(115)		37.9	62.1	(145)
Okinawa Isl.	1.6	98.4	(63)		10.9	89.1	(64)		57.6	42.4	(59)
Sakishima Isl.	14.1	85.9	(64)		5.6	94.4	(72)		27.3	72.7	(55)
Hirota	0.0	100.0	(34)		5.6	94.4	(36)		43.6	56.4	(39)

CARABELLI's cusp (upper 1st molars); hypocone (upper 2nd molars); the 6th cusp, the 7th cusp, deflecting wrinkle, distal trigonid crest, and protostylid (lower 1st molars); and 4 cusp pattern (lower 2nd molars). The information of the criteria for classification of discrete characters was given elsewhere (HANIHARA, T. 1990b, 1991b, c, n.d. a, b). Metric and non-metric traits were scored per individual, not per side.

With the computer program coded by K. HANIHARA, distance analysis based on Q-mode correlation coefficients between every pair of samples was applied to the dental measurements, and B-square distance analysis developed by BALAKRISHNAN and SANGHVI (1968) was applied to a data set based on the discrete crown traits. Dendrograms and two dimensional expressions were constructed from the distance matrices by applying cluster analysis and multidimensional scaling method, respectively.

Results

In the metric analysis, inter-group relationships of 3 prehistoric and 9 near-contemporary samples described in the previous chapter were analyzed. Fig. 2 is a dendrogram of relationship based on a cluster analysis, and Fig. 3 shows a two dimensional scattergram obtained by a multidimensional scaling method, accounting for 88.3% of the total variance. In these representations, 4 samples from the Nansei Island chain, 2 Southeast Asian samples, and Jomonese sample form a cluster. The samples of Honshu and Kyushu Japanese, Chinese, Koreans, and Kanenokuma comprise another cluster. In the first cluster, the sample from Sakishima Islands is closely related to those of Jomonese and Hirota. Two Southeast Asian samples, Negritos and Filipinos, occupy an intermediate position between Amami-Okinawa Island group and Sakishima-Hirota-Jomonese one in Fig. 3.

Fig. 2. Cluster analysis applied to Q-mode correlation coefficients based on M-D crown diameters.

Fig. 3. Two-dimensional expression of multidimensional scaling applied to the same distance matrix used in Fig. 2, expressing 88.3% of total variance.

Fig. 4 shows the result of cluster analysis applied to the B-square distance coefficients based on 9 discrete crown traits for 11 samples. Two main clusters are evident. One contains samples of sinodont dental groups, namely, Honshu Japanese, Chinese, Koreans, and Kanenokuma. All the Nansei Island samples, Kyushu Japanese, and Negritos are included in another cluster, corresponding to the sundadont dental groups. With the exception of Kyushu Japanese, the two major clusters correspond to the association implied in Figs. 2 and 3. Fig. 5 shows a two dimensional expression drawn by a multidimensional scaling method on the basis of the same distance coefficients used in Fig. 4. In

this figure, 84.1% of the total variance is expressed. The scattering pattern of each sample in this figure is to some extent in agreement with that in Fig. 3. In Fig. 5, two major constellations are also evident. The samples of Jomonese, Hirota, and Sakishima Islands form a single sub-branch in the sundadont dental group. Amami- and Okinawa-Island samples form another sub-branch.

The findings presented here is almost in full agreement with a 'dual structure model' for the population history of Japanese (HANIHARA, K., 1991).

Fig. 4. Cluster analysis applied to B-square distance coefficients based on 9 discrete crown traits.

Fig. 5. Multidimensional scaling method applied to B-square distance values used in Fig. 4, in which 84.1% of total variance is expressed.

Discussion

The approximate congruency of the metric and non-metric results obtained in the present study may be sufficient to allow some general statements concerning the possible origins and microevolution of Nansei Islanders.

The physical features and affinities of Nansei Islanders have so far been described (OYAMA, 1956; HIRATA, 1958; NAKANO, 1958; HIROZAWA, 1959; IWAI, 1959; KIKUCHI, 1959; OYADOMARI, 1968; SAKIHARA, 1968; TOMIZAWA, 1969; NAITO, 1973; TAGAYA and IKEDA, 1976). Recent investigations affirm that Nansei Islanders retain some physical features linked with those of Ainu and Jomonese (HANIHARA, K. *et al.*, 1973; IKEDA, 1974; OMOTO, *et al.*, 1973, 1975; HANIHARA, K., 1983, 1991; TURNER, 1987; HANIHARA, T., 1989a, b, c, 1990a, b, c, 1991a, b, c, n.d. a, b; KOZINTSEV, 1990). However, the geographical variation of the physical characteristics of Nansei Islanders are still incompletely documented.

The present findings provide an extensive base for viewing human variation within the region. All the Nansei Islanders' dental samples are similar to each other, Jomonese, and Southeast Asians than they are to Honshu Japanese, the immigrant Yayoi people (Kanenokuma), Chinese, and Koreans. The dental variation within the island chain shows a south-north gradient. Amami- and Okinawa-Islands show closer relationship to main-island Japanese than Sakishima Islands do. This regional variation may reflect the biocultural microevolution and the difference of the amount of admixture with sinodont main-island Japanese through the time from the prehistoric to recent ages. The sample of Sakishima Islands and prehistoric Jomonese-Hirota group have sufficient metric and non-metric dental similarity to suggest that the former may have retained some archaic dental characters

even to the present day. Moreover, the dental characteristics of 2 Southeast Asian samples from the Philippines have something in common with those of 4 Nansei Island groups and Jomonese.

The archaeological records may substantiate this south-north physical division. The prehistoric Nansei Islands contain three distinct ceramic cultural groups (CHINEN, 1990). The prehistoric culture of Osumi Islands, including Tanegashima and Yakushima, is classified into the northern cultural group, one which is most closely related to that of South Kyushu. Amami- and Okinawa-Islands are referred to as the central cultural group. This group shares the cultural ties with the northern group. On the other hand, the prehistoric culture of Sakishima Islands is linked with those of Taiwan and the Philippines, not with those of Okinawa, Amami, and Kyushu (CHINEN, 1990).

TURNER's dental hypothesis confirms that the sundadont ancestors of Jomonese could have arrived from Southeast Asia, or Sundaland, via the now-submerged East Asian continental shelf in the late Pleistocene and early Holocene times (TURNER and SWINDLER, 1978; TURNER, 1979, 1987, 1989, 1990). Taking the association of TURNER's hypothetical late Pleistocene Sundaland populations and the aboriginal Southeast Asians, or tentatively termed as 'generalized Asiatic populations' (HANIHARA, T. 1991a, c), in combination with the cultural and physical findings presented here into account, it is probable that one of the main routes for the northern extension of the ancestors of Jomonese, or the members of the late Pleistocene Sundaland populations, might have been through the Nansei Island chain. This route and origin hypothesis is supported by the craniofacial and dental affinities between Minatogawa man from Okinawa and Jomonese (SUZUKI and HANIHARA, K., 1982; TURNER, 1987, 1990; WU, 1990; HANIHARA, T.

1991b, c).

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抄 録

南西諸島民の歯冠形態と縄文人の日本列島への拡散

埴原恒彦

縄文人が後期更新世から完新世初期にかけて日本列島に拡散していったことはほぼ間違いないであろう。彼らの人種的、地理的起源に関しても、筆者は、後期更新世にスングランドで進化してきた集団が、今は水没してしまった東アジアの大陸棚づたいに北上してきたとする、C. G. ターナーの仮説を支持する分析結果を示してきた。それでは、日本列島への拡散ルートについては、どのように考えられるのか。港川人の発見によって、南西諸島がこのルートの一つと考えることが可能になったと思われるが、他の形質人類学的追証は殆どなされていない。本研究では、この問題へのアプローチの一つとして、先史時代を含む南西諸島のほぼ全域から歯冠形質に関するデータを収集し、縄文人、東アジア及び東南アジア諸集団との比較分析を試みた。

分析は、南西諸島集団を4つの地理的グループ（広田遺跡集団－種子島、奄美諸島、沖縄諸島、先島諸島）に分けておこなった。その結果、南西諸島諸集団、とくに、最南端に位置する先島諸島集団は、今日でも縄文人の形質をかなり濃厚に受け継いでいることが明かとなった。それと同時に、これらの諸集団の歯冠形質には、地理的勾配が認められた。これらの結果から、近世の南西諸島民の歯冠形質は、縄文人のそれを基盤とし、過去数千年間にわたり、環境及び文化的影響、また、本土の集団からの遺伝的寄与を受けながら、小進化してきたものと考えられる。全体としては、南西諸島民の歯冠形質は、本州日本人、朝鮮人、中国人よりも東南アジア集団（フィリピン人、ネグリト）に類似する。

以上のことから、スングランドから拡散していった集団は、南西諸島をその北上ルートの一つとして、日本列島に拡散していった可能性があるものと思われる。

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