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# Prehistoric pig and dog remains from Fais Island, Micronesia

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**Abstract** Pig and dog remains excavated from Fais Island in Micronesia were examined. The temporal distribution pattern of the excavated bones indicates that pigs and dogs have been kept on the island since at least 450 AD and possibly since around 220 AD. Both adult pigs and dogs were small in size. The majority of the excavated specimens were young or even juvenile. It is not clear if these animals were kept on Fais Island regularly or introduced from time to time. The possible source areas of pigs and/or dogs are the Philippines, Indonesia and northern Melanesia. The eastern Caroline Islands are another potential source area for the dogs.

**Key words:** Fais Island, Micronesia, Austronesians, prehistoric pig and dog, domesticated animal resources

## Introduction

There were no indigenous mammals in the Pacific islands during the Pleistocene except for some bats and rats distributed in the western islands. When Austronesian-speaking populations dispersed into the Pacific around 3000 BC, a set of domesticated animals—pig, dog, and chicken—was brought in from island Southeast Asia together with various domesticated plants (Bellwood, 1976; Kirch, 1997). As colonization proceeded eastwards, these domesticates were also transported. The distribution of domesticated animals was not, however, uniform. By the time of European contact, chickens were widespread, while dogs and pigs were distributed mainly in Melanesia and Polynesia. In Micronesia, no pigs were reported except for on the small island of Palau, and dogs were recorded only from eastern Micronesia at the time of European contact (Intoh, 1977, 1986).

Intoh conducted the first archaeological excavation on Fais Island in Micronesia in 1991 (Intoh, 1993). A rich cultural deposit was unearthed, including not only artificial remains but also a variety of natural remains. The results indicate that Fais has been inhabited by human populations since about 40–400 AD. A number of foreign materials were also excavated, such as pottery, metamorphic stones, animal remains, and so on. The unchanging distribution pattern of these imports indicates that contact with these volcanic islands has continued consistently throughout their habitation history (Intoh, 1996). This indicates that maintaining external contacts was an important living strategy for the people of such a resource-limited coral island (Intoh, 2003).

Among the imported materials, the most surprising discoveries were the faunal remains of domesticated animals.

The whole set of Austronesian domesticates (dog, pig, and chicken) was identified. A detailed analysis of chicken and other birds has been reported elsewhere (Steadman and Intoh, 1994). This paper reports the results of the examination of pig and dog remains and discusses the significance of the findings for Micronesian prehistory.

## Geological and Cultural Background

Fais is a raised coral island (about 20 m above sea level) situated at 9°46'N and 140°31'E in the Federated States of Micronesia (Figure 1). Fais Island is about 2.7 km in length and about 1.1 km in width, with a land area of about 2.8 km<sup>2</sup>.

The nearest island to Fais is Ulithi atoll, lying about 80 km to the west. Farther west of Ulithi, at about 180 km, is the Yap island complex which is the nearest high island to Fais. Next distant are the islands of Palau (600–700 km SW) and the Marianas (600–900 km NE). Within the Caroline archipelago, but even more distant, are the isolated volcanic islands of Chuuk, Pohnpei, and Kosrae, about 1000–2500 km to the east.

The population of Fais Island subsists on marine and land resources. The major crops are coconuts, banana, breadfruit, sweet potato, yam, and dry land taro (*Alocasia*) (Krämer, 1937). Among these, sweet potato was introduced by the Yapese at around 1850 AD (Krämer, 1937: p. 330), while the cultivation of the other five crops is a traditional aspect of Fais society. It should be noted out that the giant swamp taro (*Cyrtosperma*), the major crop of the surrounding atoll dwellers, does not grow well on Fais because of the high permeability of the soil. Some giant swamp taro is now grown in man-made concrete tanks.

There are not many recordings of animals on Fais by the early Europeans. In 1909, Krämer (1937: pp. 310, 331) recorded three pigs and numerous rats but no dogs. Chickens and pigs were recorded as favorite foods, while pigs also occurred in island myths (Krämer, 1937: pp. 331, 372).

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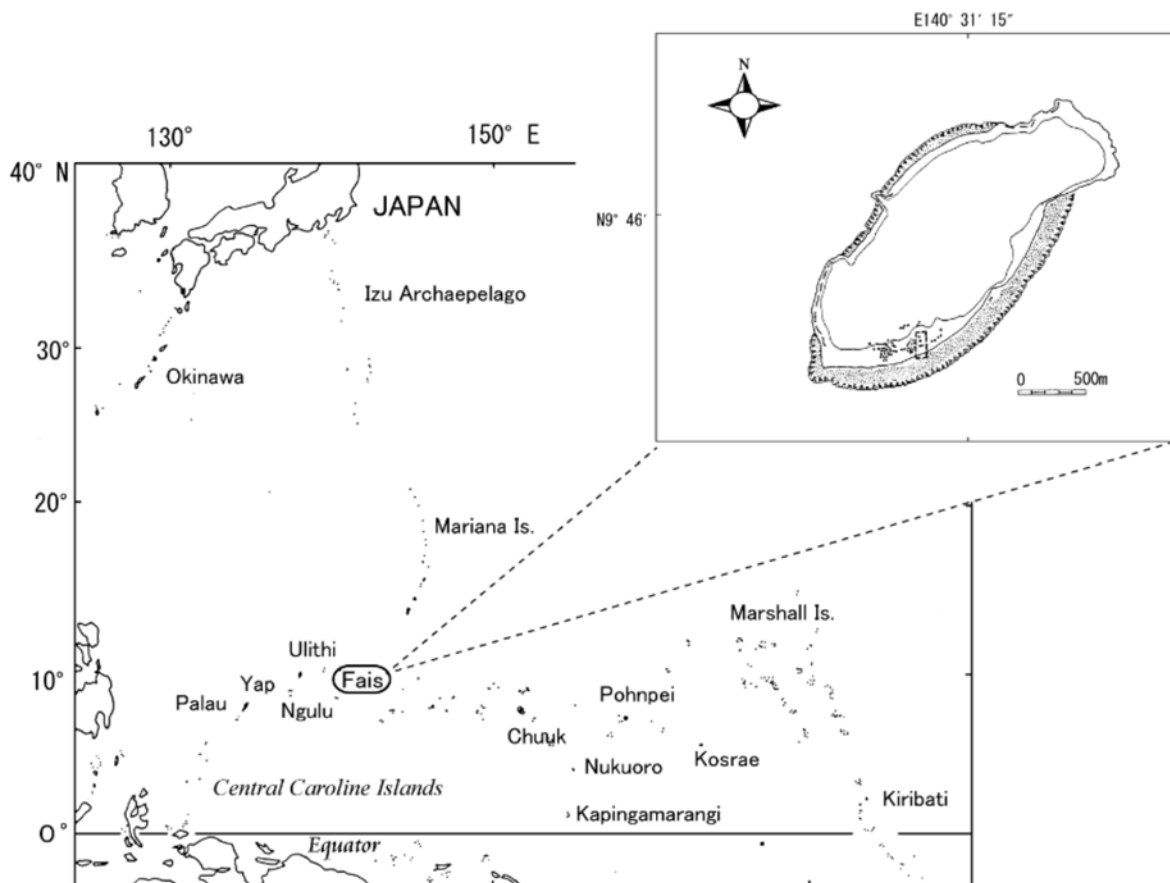


Figure 1. Map of Micronesia and Fais island. The surveyed area is squared.

The Fais islanders speak a nuclear Micronesian language like the other Central Caroline islanders. This language was probably derived from a language spoken in the southeastern Solomons (Blust, 1984) and has been spoken in central and eastern Micronesia (i.e. Central Caroline islands, Chuuk, Pohnpei, Kosrae, Marshalls, and Kiribati) but not in western Micronesia (i.e. Mariana, Yap, and Palau). The distribution pattern of this language is considered to illustrate the prehistoric human dispersal routes into Micronesia, indicating how the central and eastern Micronesian islands were settled by groups of people different from those who settled western Micronesia (Intoh, 1997). The language of Fais is, however, somewhat different from the other surrounding central Carolinian languages/dialects, particularly the words for pig and dog. This will be discussed later.

Despite the language difference, there was a large exchange network between the central and western Micronesian islands. Most of the islands in the central Caroline Islands are atolls that have limited resources and are vulnerable to natural disasters. Hence the atoll dwellers of the central Caroline Islands traded extensively with Yap in the west which is rich in natural resources. This trade network is called *sawei* and Fais also participated in it despite not being an atoll. Handicrafts were exchanged for various materials that are inaccessible on coral islands, such as pottery, mineral resources, plant resources, and so on (Alkire, 1965,

1978; Rubinstein, 1979).

### Archaeological Background

The central Caroline Islands have so far been the subject of only limited archeological research. Descantes (1998) carried out an extensive survey on Ulithi during 1994 and 1995 and found a number of Yapese potsherds, including the earliest CST pottery. It seems that Ulithi and Yap have maintained inter-island contacts since about 650 AD. Neither pig nor dog remains were excavated (Descantes, 1998).

Fujimura and Alkire (1984) carried out test excavations on Faraulep, Woleai, and Lamotrek, and also found a small quantity of an early type of Yapese CST pottery, as well as some lithic material possibly derived from Chuuk in the east. These potsherds date from around 1200–1350 AD. Two dog teeth were excavated and dated to about 1600 AD, possibly representing post-contact introductions. Although a pig tooth was also reported, it seems likely not to be from a pig judging from its photograph (Fujimura and Alkire, 1984: p. 86).

On Nukuoro atoll, south of Pohnpei, a number of dog remains were excavated and have been dated to about  $1237 \pm 55$  BP (650–750 AD) (Davidson, 1992: p. 294). It is interesting that dogs had died out by 450 BP (1500 AD). No pig remains were found.

One dog phalanx was found from the early pottery-bearing site on Fefan Island in Chuuk. The date is supposed to go back as early as 2000 years ago (Shutler et al., 1984: p. 23). No pig remains were found.

Archaeology in Yap, on the other hand, has revealed a little more than 2000 years of human occupation history. Three types of pottery have been made throughout the island's history (Intoh and Leach, 1985). Pollen analysis conducted in southern and northern locations in Yap revealed an even longer history of human occupation of the island (Dodson and Intoh, 1999). The pollen evidence suggests forest disturbance and grassland increase, and there is a sudden increase of charcoal particles from about 3500 years ago. This indicates the possibility that Yap has been inhabited for the last 3500 years.

One small rib bone of a young pig and a pig mandibular incisor were excavated from the Rungruw site at the southern end of Yap. The former (from layer 2 of square 1) was dated to  $507 \pm 133$  BP (NZ6625) and the latter (from layer 2 of square 2) to  $<250$  BP (NZ6647), both on charcoal (Intoh and Leach, 1985: p. 64). The latter layer was then redated on charcoal to  $820 \pm 30$  BP (NZ6978) (Intoh, 1990: p. 49). From these results, as well as the distribution pattern of pottery types, layer 2 is possibly prehistoric. However, as some modern intrusion was also recognized in the same layer in square 2, the status of prehistoric pigs on Yap is still ambiguous. No evidence of prehistoric dogs has been reported.

From Palau, several pig bone fragments were excavated from a cave site on a small raised coral island, Uchularois Island. They were dated to  $1160 \pm 85$  BP (820–970 AD)

(Masse, 1991: pp. 221–222). No pig remains have been reported from mainland Palau to date.

### Archaeological Research on Fais Island

In 1991, Intoh (1993) excavated three sites on Fais Island. The sites were situated on the southeastern coast of the island where the present village is located. The site area extends about 50 m from the present coastline to about 170 m inland (3.6–10.2 m above sea level). Five excavation units (FSYE, FSFA-1 and 2, FSPO-1 and 2) were set out and 28 cubic meters of sediments were excavated (Figure 2). The spit matrix was dry-sieved through a 3 mm mesh screen.

A variety of artifacts were found throughout the excavation units. These include potsherds, fishhooks made of shell and turtle carapace, shell adzes, various shell tools, shell ornaments, worked bones, and natural food remains. The dates associated with the cultural remains are early, and were obtained on charcoal samples:  $1794 \pm 152$  BP (35–381 calAD) (NUTA2167) from Layer 6 at FSFA-2 and  $1775 \pm 73$  BP (88–406 calAD) (NZ7885) from Layer 5 at FSFA-2 (Figure 3). Layer 6 contained a small number of cultural remains (potsherds, shellfish, dog and rat bones, etc.) in the top part but the lower part was sterile. Since the time span for Layers 5 and 6 clearly overlaps, these two layers seem to consist of one cultural phase (Phase I). The colonization of Fais probably occurred at around 40–400 AD (the midpoint of the suggested range is about 220 AD).

The second cultural phase (Phase II) can be set between 450 and 1000 AD based on the dates obtained from Layer 3



Figure 2. Layout of excavation units on Fais island.

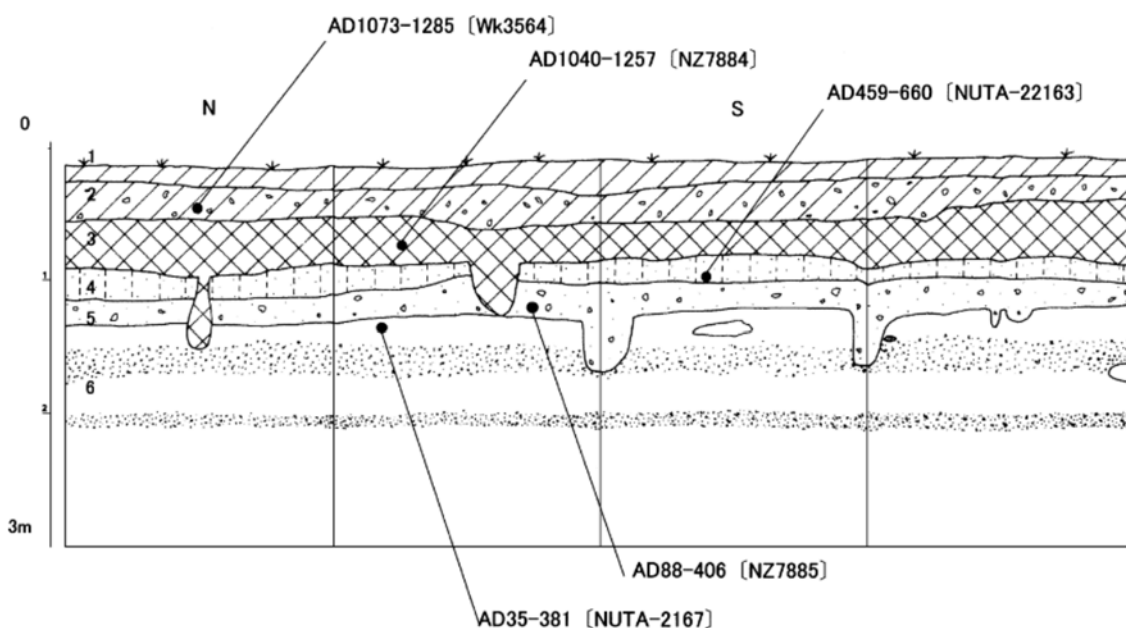


Figure 3. Stratigraphy of the FSFA-2 excavation unit and radiocarbon dates.

at FSFA-1 and 2 and Layer 9 at FSPO-2. Phase III can be set between 1000 and 1400 AD (Layers 2 and 3 at FSFA-2 and Layer 6 at FSPO-2), and Phase IV is after 1400 AD (see Table 1). The distribution pattern of the excavated artifacts indicates that the island has been continuously inhabited since 220 AD (Intoh, 1993).

The excavated natural remains included marine as well as terrestrial mammals, marine turtle, land and marine birds, and marine shellfish. Of these, a total of over 500 g of bone were from terrestrial mammals including dog, pig, and rat. The number of dog and pig bones increased from Phase I to Phase IV. Only 2.3% were from Phase I, 37.2% from Phase II, and 60.5% from Phases III and IV. The existence of dog and pig during Phase II is secure, but the possibility of initial introduction during Phase I is also conceivable.

The results of an analysis of dog and pig bones by one of us (N.S.) are presented below, while an examination of rat bones has been carried out separately (White and Flannery, unpublished).

### Analysis of Faunal Remains

About 90 bone fragments of mammals were identified as dog and pig (Table 1). Except for some teeth and short bones of the extremities, almost all the bones were broken into small pieces, about 5 cm long. These bones may have been broken in order to eat the bone marrow.

#### Dogs (*Canis familiaris*)

A total of 45 bone fragments and teeth were identified (Table 2, Figure 4). Judging from the distribution pattern among the excavation units, these were from more than a single dog. As tooth wear was not very advanced in any of the teeth excavated, all the dogs excavated in this survey are considered to be young. Some deciduous teeth are even

unworn. This may indicate that these belonged to a puppy, aged 2–3 months.

The size of the lower first molars was smaller than that of the recent Japanese Shiba breed (Shigehara et al., 1997) and of the prehistoric Jomon dogs from Japan (Shigehara and Onodera, 1984). The breadth of the distal end of the humerus was 24 mm, also smaller than that of the Shiba breed (male: 26.1 mm; female: 24.4 mm) and female Jomon dogs (28.4 mm). Wood-Jones (1929) reported the size of the upper carnassial tooth (P4) of the modern Papuan dog, although the sex is not certain. The maximum mesiodistal diameters were reported to be 15.5 mm and 16 mm in two specimens, and the maximum cranial lengths of these dogs were reported to be 162 mm and 158 mm, respectively. The size of the upper carnassial tooth excavated from Fais Island is 13.2 mm, which is smaller than that of the modern Papuan dog (Table 3).

The above observations indicate that Fais Island dogs were smaller than female Shiba dogs (maximum cranial length 130–140 mm) and were in the small size class of Hasebe's (1952) classification.

#### Pigs (*Sus scrofa*)

A total of 47 pieces of pig bones and teeth were identified (Table 4, Figure 5). Most of the remains were from young pigs. The enamel surface of these teeth was very rough, possibly due to some kind of nutritional defect during tooth formation.

Among the bones, many epiphyses of the metacarpal or metatarsal bones were identified. No instance of epiphyseal union with diaphyses was observed in these bones. According to Curgy (1965), the epiphyseal union of these bones is completed by the age of two years. There was one small humerus, estimated to be a newborn piglet. Tooth attrition was not heavy in the permanent or deciduous teeth. Enamel

Table 1. Distribution of excavated bones of pig, dog and chicken from Fais Island

Square/layer	Cultural phase	Date (calibrated at 95%)	Pig	Dog	Chicken <sup>1</sup>	Un-identified mammal
FSFA-1/1	IV		2	1	5	+
2	III	856–1023 AD	—	4	34	
3	II	454–879 AD	8	11	15	+
		564–879 AD				
4	II	348–632 AD	—	—	2	+
5	I		—	—	—	
total			10	16	56	
FSFA-2/1	IV		4	1	2	
2	III	1073–1285 AD	3	6	8	
3	III	1040–1257 AD	16	14	13	
4	II	459–660 AD	—	3	2	
5	I	88–406 AD	1	—	1	
6	I	35–381 AD	—	1	—	
total			24	25	26	
FSPO-1/1	IV		—	—	—	
2	III	1222–1385 AD	—	—	4	
3	III		—	—	2	
4	III	1073–1392 AD	—	—	1	
total			0	0	7	
FSPO-2/1	IV		—	1	2	
2			—	—	—	
3	III	1264–1389 AD	—	—	—	
4	III		—	1	—	
5	III		—	—	—	
6	III	1037–1409 AD	3	—	9	+
7	II–III	895–1205 AD	2	1	—	
8	II		—	—	—	
9	II	553–777 AD	1	1	2	+
10	II		—	—	—	
11	II		1	—	—	
12	II	369–827 AD	—	—	—	
total			7	4	13	
TOTAL			41	45	102	

<sup>1</sup> After Steadman and Intoh (1994)

hypoplasia was observed in some permanent teeth. These teeth are unworn and may belong to the same animal. Judging from tooth size, the Fais Island pigs were comparable to the smallest size group of Japanese wild boars and larger than modern Ryukyu wild boars (Table 5).

Some cut marks were observed on one bone. This is the lower margin of a left costal bone. These cut marks were very sharp and 2 mm long. As this bone was found in the post-European layer, the cut marks were possibly made by an iron knife.

## Discussion

A number of prehistoric pig and dog remains were identified. These specimens originated from a number of animals and were probably consumed as food. Judging from the wide distribution pattern of the remains in terms of space and time, pigs and dogs must have existed on Fais, either intermittently or continuously, since about 450 AD. If the spo-

Table 2. List of identified dog (*Canis familiaris*) bones excavated from Fais island

Square	Layer	Bone	Tooth	Side	U/L <sup>1</sup>	C/F <sup>2</sup>	Remarks
FA-1	1	tooth	dp2?	R	L	F	tooth under formation
	2	tooth	M1	L	L	C	slight attrition, same as 1510
	2	tooth	P4	L	L	C	slight attrition
	2	tooth	I	?	L	F	incisor root
	2	tooth	M3	R	L	C	
	2	vert.cer.				F	axis (proc.dentis)
	3	vert.th.				F	vert.arch
	3	tooth	P2	R	U	C	slight attrition, same as 1468
	3	tooth	C	R	L	C	
	3	tooth	C	R	U	C	medium attrition
	3	tooth	P3	R	L	F	distal half
	3	tooth	M1	L	U	F	no attrition, root under formation
	3	tooth	M2	L	L	C	medium attrition
	3	tooth	P4	L	U	C	slight attrition
	3	carpal		R		C	R•I•C
3	prox.phal.		?		C		
3	talus		L		C		
FA-2	1	femur		R		F	
	2	tooth	P2	L	L	F	
	2	prox.phal.		?		C	
	2	metacarpal		L		F	metacarpal II prox. half
	2	tooth	M1?	?	L	F	root
	3	tooth	P2	L	L	C	slight attrition
	3	tooth	M1	R	L	C	slight attrition
	3	tooth	M2	R	L	F	
	3	tooth	dp3	R	U	F	slight attrition
	3	tooth	dp4	L	L	F	no attrition
	3	tooth	P3	L	U	F	mesial half
	3	tooth	M1	R	L	C	
	3	tooth	I3	R	U	C	no attrition, root under formation
	3	tooth	P4	L	U	F	slight attrition
	3	metacarpal		L		F	metacarpal IV prox. half
3	med.phal.		?		F	distal end loss	
3	tooth	dp3	R	U	F	root under formation	
3	vert.cer.				C	cervical vertebrae III	
3	ulna		R		F	proximal end	
3	metatarsal		R		F	metatarsal IV, distal end loss	
4	tooth	I3	L	U	C	medium attrition	
4	vert.cer.				C	axis	
4	dist.phal.		?		C		
6	tooth	I2	R	L	C	slight attrition	
PO-2	1	tooth	dc	R	U	F	no attrition
	4	metacarpal		R		C	metacarpal II
	7	prox.phal.		?		C	
9	humerus		L		F	distal end (adult)	

<sup>1</sup> U, upper; L, lower.

<sup>2</sup> C, complete; F, fragmentary.

radic appearances in the earlier layers are accepted, an earlier date of about 200 AD is also possible. This is the earliest evidence of pig and dog in Micronesia. When combined with the evidence of prehistoric chicken remains (Steadman and Intoh, 1994), it is obvious that the whole set of Austro-nesian domesticated animals (dog, pig, and chicken) has existed on Fais since about 450 AD (or 220 AD) (Table 1). This is unexpected for such a small, resource-limited coral island.



Figure 4. Teeth and bones of the dogs excavated from Fais Island. 1, upper left M1; 2, upper left P4; 3, lower left M1; 4, lower left M1; 5, proximal end of right ulna; 6, distal end of left humerus; 7, second cervical vertebra (axis); 8, third cervical vertebra; 9, right metatarsal IV (distal end broken); 10, right metacarpal II; 11, left metacarpal IV (distal end broken); 12, left talus.

Table 3. Measurements of dog bones from Fais Island and comparative data

	Square: layer	Fais	Shiba		Tagara		
			♂	♀	♂	♀	
Upper	P4 Max. m-d	FA-1: 3	13.2	17.6	16.3	17.6	16.9
	Lateral m-d		13.5	16.8	15.7	17.4	16.8
	M1 Max. b-l	FA-1: 3	15.3	14.9	14.1	15.3	15.0
Lower	M1 Max. m-d	FA-2: 2	17.2	18.6	17.4	19.5	18.5
		FA-2: 3	16.9				
		FA-2: 3	17.0				

Values are in mm; m-d, mesiodistal diameter; b-l, buccolingual diameter.

Comparative data from Shigehara et al. (1997)

The size of the excavated bones indicates that most of the animals were slaughtered when young. This raises the following questions:

- (1) Was it because young pigs and/or dogs were favored for food?
- (2) Was it because it was difficult to keep pigs when they become adult?

We consider possibility (1) to be less likely. Pigs and dogs were not killed as daily foods in the Pacific. It is likely that they were served only on special occasions as indispensable offerings. In ethnographic records, in general, large mature individuals are valued higher.

We consider possibility (2) to be more probable. As has been mentioned before, Fais is a raised coral island, and the plant resources necessary to feed pigs are limited. Although pigs are fed mainly with copra, it may not have been easy to keep a large pig population. Apparent evidence of nutritional defects observed on the enamel surface of teeth as mentioned above indicates such a situation in which food for pigs was insufficiently available. On the other hand, dogs are easier to maintain than pigs. It is obvious from available evidence that a reasonable number of dogs have been kept even on the isolated Nukuoro atoll in the eastern Caroline islands for about 800 years (Davidson, 1971, 1992).

If most of the pigs and/or dogs were slaughtered when young, further questions arise:

- (3) Were pigs and/or dogs introduced to Fais from time to time?
- (4) Were pigs and/or dogs kept on Fais on a regular basis?

Considering the active external contacts of Fais islanders throughout their occupation history (Intoh, 1999; Intoh and Dickenson, 2002), possibility (3) seems to be high. However, it is not easy to transfer small pigs (and particularly piglets) alive in a little canoe. If they had to travel more than two days in such a small canoe, the chances of piglets surviving the voyage would be reasonably low.

On the other hand, Austronesian-speaking people transported pigs from island to island in Melanesia and Polynesia, except for Easter Island and New Zealand among others (Bellwood, 1978). The reason why pigs did not reach some of the islands could have been related to the large distance from the nearest island and the frequency of voyages (for example, from central Polynesia to New Zealand).

Table 4. List of identified pig (*Sus scrofa*) bones excavated from Fais Island, Micronesia

Square	Layer	Bone	Tooth	R/L	U/L <sup>1</sup>	C/F <sup>2</sup>	Remarks	
FA-1	1	tooth	C	?	L	F		
	1	tooth	C	L	L	F		
	3	tooth	?	?		F		
	3	tooth	?	?		F		
	3	vertebra				F	epiphysis	
	3	humerus		L		F	caput epiphysis (young)	
	3	tooth	I3	R	L	F	slight attrition	
	3	med.phal.		?		F	proximal epiphysis (young)	
	3	mc/mt		?		F	distal epiphysis (young)	
	3	mc/mt		?		F	distal epiphysis (young)	
	3	humerus		R		F	caput epiphysis (young)	
	3	prox.phal.		?		F	proximal epiphysis (young)	
	3	prox.phal.		?		F	proximal epiphysis (young)	
	FA-2	1	tooth	M3	L	U	F	mesial half, no attrition
		1	tooth	di1	L	U	F	strong attrition
1		coste		?		F	cut mark	
1		mandible		L		F	condyle	
2		vert.				F	vertebral body	
2		mc/mt		?		F	proximal epiphysis (young)	
2		tooth	M1	R	U	C	enamel defect	
2		vert.lum.				F	vertebral body (young)	
3		tooth	dp3	L	U	C		
3		tooth	M1	L	U	F	root broken	
3		maxilla					alveolar proc. (molar)	
3		tooth	dp4	R	L	C	root no absorption	
3		tooth	P3	L	U	C	enamel defect, not erupted	
3		tooth	M3	L	U	C	enamel defect	
3		mc or mt		?			distal diaphysis, not fused	
3		tooth	C	L	U	F	buccal part	
3		tooth	M2	R	L	C	enamel defect, root under formation	
3		tooth	dp4	L	U	C		
3		tooth	P3	R	U	C	strong attrition	
3		tooth	dp4	L	U	C	root absorption	
3	tooth	P3	R	L	F	distal half		
3	tooth	di1	R	U	C	root slight absorption		
3	maxilla		L		F	alveolar proc. (M1-M2)		
3	IV mc		L		F	proximal end		
5	tooth	I2	R	U	C	no attrition		
?	tooth	?	?		C	small tooth		
?	humerus		R		F	distal diaphysis (young)		
PO-2	6	tooth	M1	L	L	C	medium attrition	
	6	tooth	dp4	L	L	C		
	6	tooth	dp2	L	L	C	no attrition, root slight absorption	
	7	tooth	M3	R	L	C	root under formation	
	7	temporal		L		F	temporal bone (bulla)	
9	tooth	M2	R	L	C	slight attrition		
11	tooth	dp4	L	U	F	root absorption		

<sup>1</sup> U, upper; L, lower.

<sup>2</sup> C, complete; F, fragmentary.

In the case of (4), it is clear that more than one pair of animals must have been left to maintain the stock on the island constantly. If only a small population of pigs, in particular, was kept without extirpation, management of the animals must have been done very carefully. Whichever the case,



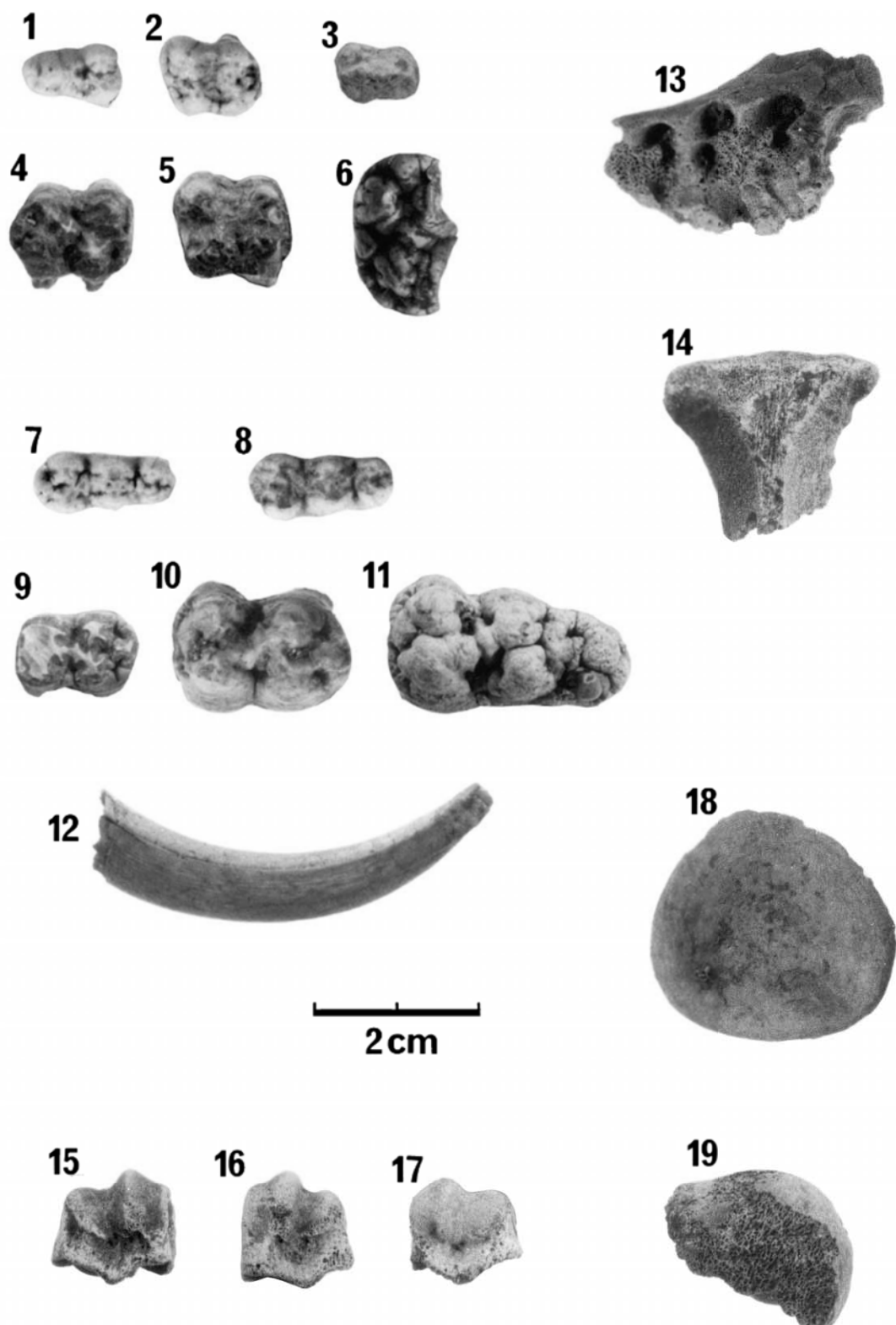


Figure 5. Pig teeth and bones excavated from Fais Island. 1, upper left dp3; 2, upper left dp4; 3, upper left P3; 4, upper right M1; 5, upper left M1; 6, upper left M3; 7, lower left dp4; 8, lower left dp4; 9, lower left M1; 10, lower right M2; 11, lower right M3; 12, lower canine; 13, maxilla; 14, left mandibular condyle; 15–17, distal epiphysis of the metacarpal or metatarsal bone; 18, vertebral epiphysis; 19, epiphysis of femoral head.

Table 5. Measurement of pig teeth excavated from Fais Island

Fais Island			Japanese wild boar average <sup>1</sup>		Ryukyu wild boar average <sup>2</sup>	
Square: layer			m-d	b-l	m-d	b-l
FA-2: 3	Upper	dp3	11.9	7.7	—	—
FA-2: 3		dp4	12.7	9.9	—	—
FA-2: 2		M1	15.3	12.9	—	—
FA-2: 3	Lower	dp4	17.4	7.8	—	—
PO-2: 6		dp4	17.6	8.3	—	—
PO-2: 6		M1	15.1	9.9	16.0	10.2
PO-2: 9		M2	21.7	15.9	20.4	13.7
PO-2: 7		M3	30.4	17.2	32.2	15.6
					27.1	13.3

Values are in mm; m-d, mesiodistal diameter; b-l, buccolingual diameter.

<sup>1</sup> After Anezaki (2004), data from Mie Prefecture.

<sup>2</sup> After Matsui (1997).

pigs and/or dogs were certainly brought to Fais from other islands sometime between about 40 AD and 400 AD at the earliest.

The eastern Micronesian islands from where Fais was considered to have been colonized did not have pigs. Some interaction with other islands must be considered. The islands with which Fais islanders are known to have kept regular contact with were Yap and possibly Palau as mentioned before. Neither Yap nor Palau is known to have possessed dogs during prehistoric times although the presence of pigs is uncertain. Further excavations on these islands are needed to determine whether they could be the source of the Fais pigs. With the available data at this stage, however, other islands must be considered. DNA studies of prehistoric pigs in the Pacific, currently in progress, is certainly promising in the search of the origin of the Fais pigs (Allen et al., 2001).

As for dogs, the eastern Caroline Islands are one of the possible sources. Prehistoric evidence of dogs has been reported from Kosrae (at least from the 10–15th century AD until European contact) (Athens, 1995: p. 99) and from Nukuoro atoll (between 650–750 and 1500 AD) (Davidson, 1971, 1992). Also, one prehistoric dog skeleton has been reported from the western Caroline Islands. This specimen was excavated from the Ngulu atoll between Yap and Palau and was dated to about 1300 AD (Intoh, 1981). This example was a burial of a young dog that had not been consumed as food like most other examples.

The above examples indicate that the distribution of prehistoric dogs in Micronesia is wider than that of pigs. It is possible that dogs were brought to Fais from other islands in Micronesia independently of pigs. On the other hand, as the date associated with the excavated dog from Fais is relatively early, the possibility that dogs were brought from outside of Micronesia should not be ruled out. Moreover, no pigs were known elsewhere in Micronesia as early as 40–400 AD. It is thus reasonable to look for other areas as the source for both. Two areas can be pointed out as tentative source areas: the islands of northern Melanesia and the Philippines.

The first possibility arises from the early connection with northern Melanesia at the colonization stage. The name for

dog on Fais, *pesi* or *pes*, is unique in Micronesia. This seems to be related to \*pasi, the reconstructed word for dog in northern Melanesia. The word \*pasi is considered to be of some antiquity and has a narrow distribution in the Solomon Islands and the northern New Hebrides (Lynch, 1991). This may indicate that the early colonizers from this area came to Fais either directly or via other eastern Caroline islands.

On the other hand, cultural contacts between Fais and the northern islands of Melanesia have been recognized by the various cultural traditions the two areas have in common, such as using *Terebra* sp. shells for adze making, kites for fishing, the back-strap loom for weaving, etc. (Intoh, 1999). Among these, weaving technology on a back-strap loom seems to have spread from Indonesia to central Micronesia and to some Polynesian outlier islands in Melanesia and western Polynesia (Rubinstein, personal communications). Pigs and/or dogs could also have been transported in inter-island contacts of this kind although pigs have been recovered neither from Nukuoro nor Kapingamarangi.

The second possibility is through accidental contacts. Drifting was not uncommon in Micronesia and once people lost control of a canoe, it would drift mostly to the west, pushed by ocean currents.

In 1664 alone, Father Andrea Serrano recorded 30 canoes that had drifted from the Carolines to the Philippines. In 1697, Clain illustrated a total of 29 Carolinians on Samar in the Philippines who had been blown to the west in two canoes. These Carolinians had become lost when trying to return to Lamotrek from Fais, to which they had gone in two canoes (Neri, 1979; Hezel, 1983). In 1907, six Woleai men landed on Taiwan after drifting for five months (Inou, 1908). These records must be only a small portion of the entire number of such cases. On their return, it was likely that pigs and/or dogs were brought back.

In sum, the introduction of domesticated animals to Fais was not accidental. The whole set of Austronesian domesticates must have been put on canoes, crossed the ocean and reached Fais as early as 220 AD. The earliest introduction could have been done by the early settlers to Fais, possibly from the northern Melanesian islands directly. The animals were kept continuously on the island (or at least did not completely die out) and must have been a part of the subsistence of the island population although they were not the daily source of food. When the prehistoric society of Fais is examined, the association of animal resources in their social context is indispensable. The social value of these animals is, however, beyond the scope of this paper and will be discussed in a separate paper.

It is likely that such contacts are not limited to the Fais islanders. Other atoll islanders in the central Caroline Islands could also well have had similar opportunities. The possibility of finding prehistoric evidence of pig and/or dog from the other Caroline Islands still remains.

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