Quebrada Jaguay: Early South American Maritime Adaptations

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Excavations at Quebrada Jaguay 280 (QJ-280) (16°30′S) in south coastal Peru demonstrated that Paleoindian-age people of the Terminal Pleistocene (about 11,100 to 10,000 carbon-14 years before the present or about 13,000 to 11,000 calibrated years before the present) in South America relied on marine resources while resident on the coast, which extends the South American record of maritime exploitation by a millennium. This site supports recent evidence that Paleoindian-age people had diverse subsistence systems. The presence of obsidian at QJ-280 shows that the inhabitants had contact with the adjacent Andean highlands during the Terminal Pleistocene.

Because rising sea level between 18,000 and 5000 years ago submerged extensive coastal plains, archaeologists have found little evidence of how the earliest people in South America (or elsewhere in the Americas) adapted to living along the shore. The available records have tended to show "the use of maritime resources (sea mammals, fish, and shellfish) beginning only after about 10,000 years ago . . . after the Paleoindian adaptation [was] already in decline" (*1*). Terminal Pleistocene dates from two sites showing a predominant reliance on marine foods, the Ring Site in southern Peru (*2*) and the Amotape Campsites in northern Peru (*3*), were obtained from marine shell and may be unreliable as indicators of a settlement age. These sites are preserved where the continental shelf is narrow and rising sea level did not substantially displace the shoreline (*4*). A third site, Quebrada Jaguay 280 (QJ-280) (Figs. 1 and 2), had yielded a single Terminal Pleistocene date on charcoal of 10,200 ± 140 ^{14}C years before the present (yr B.P.) (*5*). We have now obtained an additional 12 Terminal Pleistocene dates on charcoal, ranging from 11,105 ± 260 to 9850 ± 170 ^{14}C yr B.P. [circa 13,000 to 11,000 calibrated years B.P. (cal. yr B.P.)], along with eight dates defining two Early Holocene components (Table 1). Here we describe these ages and the QJ-280 site. Similar dates have also recently been recovered from another coastal site, Quebrada Tacahuay (*6*).

Site QJ-280 lies on an alluvial terrace on the north bank of the Quebrada Jaguay (Jaguay Canyon), about 2 km from the modern shoreline at 40 m above sea level (masl) (Figs. 1 and 2). At circa 11,000 yr B.P., the site would have been about 7 to 8 km from the coast (*7*). The local environment today is typical of the western South American coastal desert; there is little rainfall except during some El Niño years. A seasonal stream flows for a few days to a few weeks during the austral summer in the quebrada adjacent to the site. Local vegetation includes a variety of species in the quebrada bottom and xerophytic (fog-based) lomas plants on the western slopes of the foothills between 200 and 1000 masl. The marine species found at the site are typical of the modern, warm-temperate, Humboldt Current–dominated regime, which suggests that Terminal Pleistocene and Early Holocene ocean conditions in this region were similar to those of today.

Remains of the Terminal Pleistocene and Early Holocene occupations include abundant bones and shells of fish, crustaceans, and marine mollusks. The only terrestrial animal remains are a few bones of small rodents that probably represent animals that died accidentally on site (*8*). The Early Holocene part of the site contains a few specimens of knotted cordage that may be parts of fishnets. Most of the Terminal Pleistocene and Early Holocene fish bones are from a single genus (*Sciaenae*, or drums) and are from fish with a small modal standard length of 172 mm, calculated from 534 otoliths. Thus, the site's inhabitants seem to have had a netfishing strategy focused on drums (Table 2). The

Table 1. Radiocarbon dates from QJ-280, by sector. All dates are on charcoal. EH II, Early Holocene component II; EH I, Early Holocene component I; TP, Terminal Pleistocene component. All dates were run by the Brock University Earth Sciences Radiocarbon Lab (BGS). Cal. yr B.P. were calculated with method A of (*15*), with a 1σ range and a 40-year Southern Hemisphere correction.

Stratum	^{14}C yr B.P.	Cal. yr B.P.	Lab no.	Component
		Sector I		
1992, level 1b	7,500 ± 130	8,366– 8,118	1700	EH II
I-3-B, level 1b	7,690 ± 100	8,491– 8,334	1959	EH II
I-3-B, level 1e	7,620 ± 100	8,413– 8,203	1958	EH II
I-3-B, level 1f	8,053 ± 115	8,994– 8,603	1944	EH II
I-2-B, level 2a	9,657 ± 220	10,996–10,369	2023	EH I
I-3-B, element I-9	9,597 ± 135	10,950–10,381	1960	EH I
1992, level 3	9,120 ± 300	10,365– 9,689	1701	EH I
I-2-D, level 3b	10,274 ± 125	12,265–11,663	1943	TP
1970, layer 4	10,200 ± 140	12,175–11,124	[(*5*), p. 45]	TP
I-2-B, level 4c	11,088 ± 220	13,183–12,749	2024	TP
I-2-D, level 4c	11,105 ± 260	13,240–12,728	1942	TP
		Sector II		
II-1-D, level 1b M	10,190 ± 220	12,271–11,008	1957	TP
II-1-C, element II-5bii	9,850 ± 170	11,199–10,890	1956	TP
II-1-D, element II-5bi	10,475 ± 125	12,502–12,144	1936	TP
II-I-D, level 2c	10,700 ± 300	12,885–12,234	1940	TP
II-I-D, level 2c2	10,600 ± 135	12,638–12,312	1939	TP
II-1-D, level 2c3	10,560 ± 125	12,590–12,271	1938	TP
II-1-D, level 2c4	10,725 ± 175	12,794–12,419	1937	TP
1992, level 3	10,770 ± 130	12,797–12,515	1702	TP
		Sector IV–Engel Pit C		
1992, level 4	9,020 ± 170	10,044– 9,862	1703	EH I
		Sector IV–Unit IV-1-C		
IV-1-C, level 2c	10,507 ± 125	12,536–12,195	2025	TP

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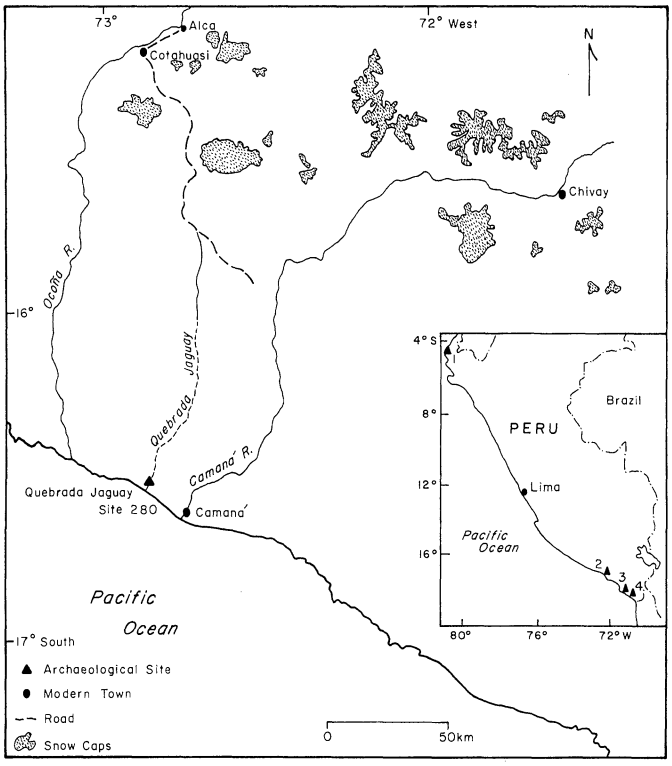

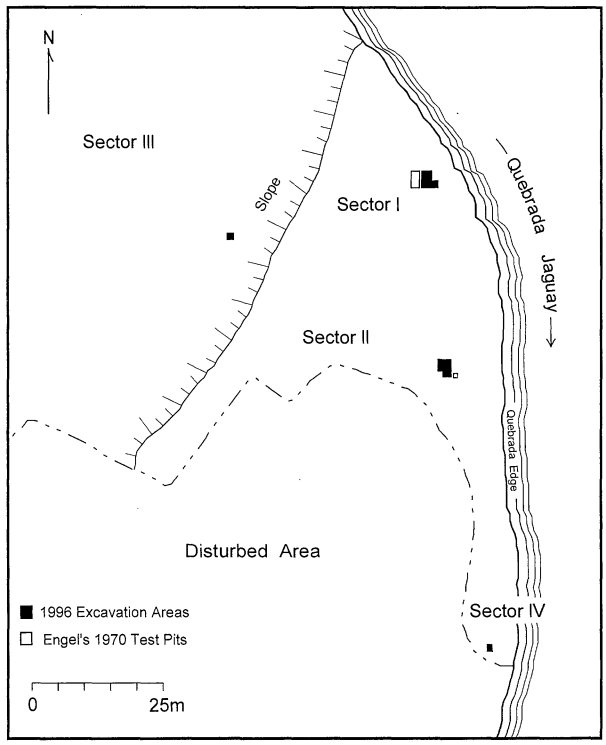

Fig. 1 (left). Map of southern Peru showing site QJ-280 and other geographic features and archaeological sites mentioned in the text. In the inset: 1, Amotape Campsites; 2, Quebrada Jaguay; 3, Quebrada Tacahuay; 4, Ring Site. **Fig. 2 (right).** Plan of QJ-280 site.

molluscan assemblage is also monospecific: Over 99% of remains are from the wedge clam *Mesodesma donacium*. This focus on two marine taxa suggests that the Terminal Pleistocene and Early Holocene inhabitants of the site employed a specialized maritime subsistence strategy while resident at QJ-280.

Evidence for plant use at QJ-280 is minimal, probably because of poor preservation of uncarbonized soft tissue rather than nonuse of plants by the inhabitants. Plant remains from the Terminal Pleistocene deposit consist only of burnt pieces of dicotyledonous stems and branches. In the Early Holocene deposits, plant remains also include three gourd rind fragments.

Lithic remains include chipping debris and a few broken or unfinished tools ex-

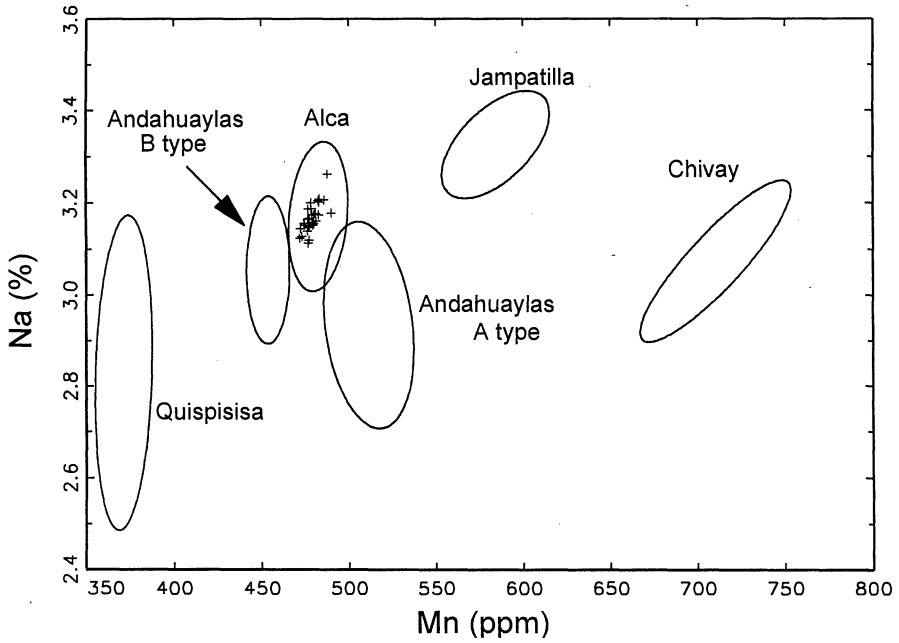

Fig. 3. Plot of Mn versus Na content for QJ-280 obsidian artifacts, compared with 95% confidence ellipses indicating known southern Peruvian obsidian sources and chemical types whose geological sources are not yet identified; ppm, parts per million.

Table 2. Vertebrate faunal remains from QJ-280. NISP, number of identified specimens; asterisk indicates less than 0.1%.

Animals	NISP	% of NISP
Totals		
Fish	5996	96.5
Bird	16	0.3
Mammals	200	3.2
Site total	6212	100.0
Fish by taxon		
Sciaenidae	206	3.4
Sciaena deliciosa	673	11.2
Sciaena gilberti	150	2.5
Sciaena sp.	24	0.4
Paralonchurus peruanus	12	0.2
Engraulis ringens	11	0.2
Arridae	3	0.1
Mugil sp.	1	*
Cheilodactylus variegatus	1	*
Paralabrax humeralis	1	*
Anisotremus sp.	1	*
Serranidae	1	*
Unidentified fish	4912	81.9

hibiting bifacial workmanship, but no projectile points. Lithic raw materials in both the Terminal Pleistocene and Early Holocene deposits include some petrified wood and small pieces of obsidian. To identify the likely sources of obsidian, we analyzed 30 obsidian flakes using Instrumental Neutron Activation Analysis. Twenty-six of the flakes came from the Terminal Pleistocene component and one from the Early Holocene II component (three could not be assigned to a component). The trace element data indicate that all 30 specimens from QJ-280 probably came from the Alca source (Fig. 3) (*9*). At 2850 masl, Alca is the closest source to QJ-280 and can be reached by traveling up the Quebrada Jaguay to its head, crossing a series of passes to the Cotahuasi River, and then moving upstream 16 km—a total distance of 130 km (Fig. 1). Another source, near Chivay at 4900 masl, is less than 20 km further (*10*); the absence of Chivay obsidian at QJ-280 may indicate that this source was covered by a glacial readvance during the Younger Dryas (circa 11,000 to 10,000 ^{14}C yr B.P.).

At the base of sector II and covered by levels dating between about 10,500 and 10,800 years B.P., a series of circular holes may be evidence of posts for a building. The Early Holocene II deposit in sector I contained part of a circular semisubterranean house, about 5 m in diameter, with a central hearth.

We have found 55 smaller sites in the immediate vicinity of QJ-280, and we dated samples from 17 of them. No date fell in the Terminal Pleistocene, but many sites have basal dates in the Early Holocene (Table 3); these sites contain *Mesodesma* clams, have bifacially worked stone, and tend to occur below 250 to 300 masl. Other sites contain a wider variety of mollusk species, have basalt grinding stones, and tend to occur above 250 masl; a date on one of these sites was 3895 ± 80 ^{14}C yr B.P.

The evidence from QJ-280 demonstrates that its Paleoindian-age inhabitants relied on ocean resources while resident at the site. This conclusion supports other recent studies showing early diversification of subsistence beyond an economy based on the hunting of large game (*11*). In North America, comparable dates for maritime resource use are from Daisy Cave, on an island off the California coast (*12*). It has been suggested that some early inhabitants of the Americas migrated along the Pacific coasts of North and South America, separately from those who moved through the interior (*13*). As the earliest well-dated maritime occupation in South America, QJ-280 offers insight into that issue. We suggest, with caution, that the initial Terminal Pleistocene inhabitants of QJ-280 were transhumant foragers who spent part of their time in the highlands and part of the time on the coast exploiting marine resources—an idea that T. F. Lynch proposed almost 30 years ago, though he did not suspect such great antiquity (*14*). The absence of any other Terminal Pleistocene sites in the region, the location of QJ-280 on the banks of a quebrada offering an easy travel route to the highlands, the seasonal nature of local waterflow, and the presence of highland obsidian in the Terminal Pleistocene component all support this hypothesis. By the early Holocene, coastal occupation may have become year-round, as suggested by the near absence of obsidian, the more substantial structures, and the explosion of local sites dating to this time. Thus, building on the achievements of their Terminal Pleistocene predecessors, the Early Holocene inhabitants of southern Peru seem to have developed a fully maritime adaptation.

Table 3. Radiocarbon dates from sites located near QJ-280. Cal. yr B.P. were calculated with method A of (*15*), with a 1σ range, using dataset 1 and a 40-year Southern Hemisphere correction for atmospheric samples and dataset 3 for marine samples (reservoir correction ΔR = 190 ± 40) (*16*). All dates were run by BGS except as noted.

Site	Stratum	^{14}C yr B.P.	Cal. yr B.P.	Lab no.	Material
P. Chira	Level 1–7	8,730 ± 115	9,323– 8,966	1961	Shell
P. Chira	–	8,765 ± 160	9,906– 9,493	(*17*)	Soil
QJ-1	Level 3–2	8,906 ± 115	9,976– 9,659	1963	Charcoal
QJ-1	Level 1–2	9,385 ± 140	10,536–10,138	1998	Charcoal
QJ-1	Level 1–4	9,227 ± 110	10,296–10,026	1962	Charcoal
QJ-3	Level 1–4	8,275 ± 130	9,896– 9,522	1990	Charcoal
QJ-4	Level 1–3	9,155 ± 130	10,283– 9,974	1993	Charcoal
QJ-5	Level 1–2	7,300 ± 105	8,129– 7,928	1992	Charcoal
QJ-8	Level 1–2	9,015 ± 120	10,034– 9,885	1991	Charcoal
QJ-16	Level 1–4	9,200 ± 115	9,830– 9,481	1967	Shell
QJ-17	Level 1–3	7,540 ± 110	7,890– 7,636	1999	Shell
QJ-19	Level 1–3	8,615 ± 135	9,788– 9,439	1995	Charcoal
QJ-20	Level 1–3	8,765 ± 180	9,917– 9,489	1996	Charcoal
QJ-21	Level 1–5	9,105 ± 115	10,081– 9,955	1997	Charcoal
QJ-22	Level 1–3	9,340 ± 340	10,898– 9,966	1965	Charcoal
QJ-31	Level 1–1	9,393 ± 160	10,781–10,050	1966	Charcoal
QJ-32	Level 1–1	3,895 ± 80	3,703– 3,477	1945	Shell
QJ-37	Level 1–3	9,039 ± 110	9,553– 9,372	2020	Shell
QJ-43	Level 1–3	8,757 ± 110	9,347– 8,986	2021	Shell
QJ-45A	Level 1–3	8,704 ±115	9,263– 8,952	2022	Shell

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