NOTES ON:
"FURTHER INQUIRIES INTO THE CASE OF THE ARAPA-THUNDERBOLT STELA"

Sergio Jorge Chávez

In the preceding issue of Ñawpa Pacha (Chávez and Jorgenson, 1981, p. 77), I estimated the size of a totora raft which would have been required to carry the Thunderbolt Stela. This calculation, however, did not take into account the weight of the raft itself, as cogently pointed out by Dr. Henning Bischof, Director of the Ethnographic collections of the Mannheim Reiss-Museum, in a letter of October 11, 1981, to Patricia J. Lyon.

Nevertheless, the additional thickness added to the dimensions of the hypothetical raft as a "safety factor" (p. 77) would theoretically support additional weight, possibly enough for the weight of the raft itself. That is, the hypothetical raft would be 300 x 100 x 50 cm. or 1,500,000 $cm.^3$, which would support 1500 kg., but the top of the raft would then be level with the surface of the water. Subtracting 998 kg. for the weight of the Thunderbolt Stela, 502 kg. could still be supported. Even if the additional 502 kg. were not enough to account for the weight of the raft (along with persons on board and the necessary height above water level), the dimensions of the raft need only be increased accordingly. What is in question is simply the hypothesized dimensions of the raft. The major point of this portion of the article still stands: heavy weights comparable to the Thunderbolt Stela can be transported by rafts made of locally available totora. The photograph we published in fig. 6 of the article clearly confirms this point.

Bischof's comment was based on the form, dimensions and capacity of a totora raft in the Mannheim collections actually tested in water (Mannheimer-Morgen, 1975; Rhein-Neckar-Zeitung, 1975). He therefore suggested that our hypothetical raft would have to be much larger to carry the Thunderbolt Stela. The raft in their collections was about 3.6 m. long, maximum width 1.1 m., maximum height 60 cm., and would hold about 300-400 kg. (Bischof letter to Chávez, November 11, 1981). Such rafts are a common form produced today on Lake Titicaca and frequently illustrated (fig. 1). They usually have a narrow, bi-peaked form with both ends elevated above the water and are made of 3 fusiform bundles at the bottom with 2 smaller bundles, one at each side, enclosing the space for passengers. This form is used primarily for transportation of small numbers of people or things and for fishing (Šolc, 1969, pp. 134-135). Both the prow and stern peaks and the gunwales are designed to be above water level. Šolc recorded rafts on the islands of Lake Titicaca in Bolivia ranging from 4.7 to 5.3 m. long, weighing from 250 to 300 kg., and transporting about 300 to 400 kg.

It is necessary here, however to draw a distinction between two forms of totora raft. The narrow, bi-peaked forms used on Lake Titicaca to transport light loads differ from the flat, bargelike rectangular platforms used on the Ramis River for heavy loads (fig. 2). Both

the photograph we published (Chávez and Jorgenson, 1981, fig. 6) and my own observations made at Taraco on the Ramis River document this point. There is, however, virtually no published mention of rafts of this rectangular platform shape. The important point here is that the amount of surface in contact with the water, in proportion to the overall dimensions, differs noticeably between the two shapes. A rectangular raft 300 cm. long, 100 cm. wide and 50 cm. thick, hypothetically envisioned for the transport of the Thunderbolt Stela, would have a greater potential for water displacement than would a bi-peaked raft with gunwales, 300 cm. long with a maximum width of 100 cm. and a maximum thickness of 50 cm., and therefore could carry more weight. Including the weight of the raft, the former would support 1200 kg., with 40 cm. under water, while the latter would support no more than, very roughly, 500 kg. (approximate volume would be something less than 500,000 $cm.^3$, if about 25 cm. is beneath the water).

One further comment regarding these two shapes relates to Ponce Sanginés' discussion of the relative stability of totora rafts and balsa wood almadías (see Chávez and Jorgenson, 1981, pp. 76-77). While I agree that the essentially rectangular platform shape of the almadía would be more appropriate for heavy transport than the bi-peaked totora raft, as I have documented, a rectangular platform shape can also be made of totora.

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KEY TO ILLUSTRATIONS

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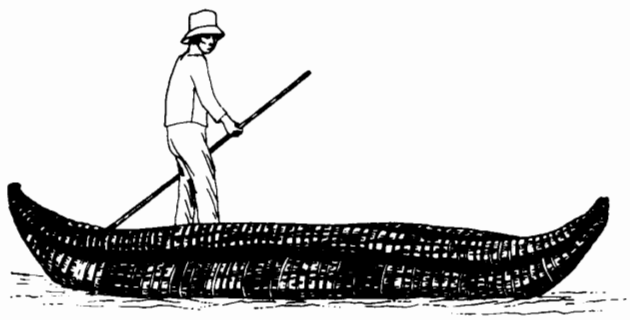
Figs. 1 and 2 were drawn by Jane Becker on the basis of pencil sketches from his own photographs made by the author. The photo upon which fig. 2 is based was taken on the Ramis River.

1



2

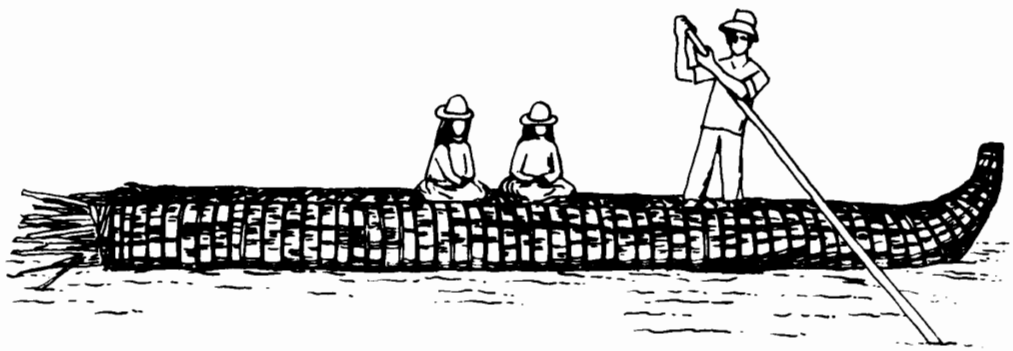


Fig. 1, narrow, bi-peaked totora raft. Fig. 2, flat, rectangular platform of totora used on the Ramis River to transport heavy loads. See Key to Illustrations.