

Science of Copper Metallurgy in third Millennium B. C.

(With Special Reference to Ganeshwar - Jodhpura Culture)

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Abstract

This paper deals with the science of copper metallurgy of the Ganeshwar-Jodhpura culture existed during the period between the third and second millennium BC. The north-east Rajasthan witnessed the earliest emergence and local development of settled community life based on copper metallurgy and farming based economy around the 2800 BC.

Keywords: Protohistory, Copper, Science, Ancient Rajasthan

Introduction

The site of Ganeshwar (27°40.87' North Lat, 75°49.1' East Long.) was discovered on 30th November 1977 by R.C. Agrawala and Vijai Kumarⁱ. The state department of archaeology carried out excavations at the site for several seasons between 1979 and 1987ⁱⁱ. The village is located in the Neemkathana tehsil of Sikar district, lies 15 km southwest of Neemkathana railway station. The site is with a deposit of 4.15 meter thick belonging to two different cultural periods namely Mesolithic and Chalcolithic. The excavations at Ganeshwar have yielded both two cultural periods without any hiatus betweenⁱⁱⁱ. Another site named Jodhpura (27° 31' N; 76° 5' E) is located in the district of Jaipur in the tehsil of Kotputli, which is a large site (5-10 hectares) located 98 km from Jaipur on Jaipur-Delhi highway. This site is situated on the right bank of the Sahibi (Sabi) river near its source. At Jodhpura^{iv} the cultural deposit varies from 1 m to 2.10 m. this deposit is free from water logging and other types of disturbances and five cultural periods, extending from proto-historic period to the end of Sunga-Kushan. Period I is represented by the occurrence of Chalcolithic pottery.

Copper Metallurgy and Artifacts

Excavations and explorations at Ganeshwar have proved to be a landmark in Indian archaeology in the form of discovery of about 1000 copper objects, all of Indus complex including arrow heads, fish hooks, numerous chisels, rods, pins, beads, blades, spear heads, balls, flat celts etc. Copper implements from period I very few, and include five arrow heads, three fish hooks, one spear head and an awl. Small implements of copper, bone and beads of semi precious stones, terracotta and steatite and bangles of clay and shale were found from this level while period II is

characterized by fully developed copper technology. The copper implements are most profuse accounting 99% of the total material. Several hundred copper arrowheads, rings, bangles, spearheads, chisels, balls, celts razor blades, fish hooks, hair pins, double spiral headed pins and antimony rods were found. Copper arrow heads were analyzed by Dr. K.K. Tripathi of the Geological survey of India, Jaipur. His results are as: copper 96.5 percent, silver 0.3 percent, arsenic 1 percent, lead 0.03 percent, tin 0.2 percent, nickel 0.04 percent, zinc 0.25 percent, iron 0.2 percent^v. The copper celts from Ganeshwar measure 8 to 10 inches in length which contains very nominal quantity of tin is quite evident from the following details furnished by the chemical laboratory of the Geological Survey of India, Jaipur: copper 97 percent, silver 0.2 percent, arsenic 0.3 percent, lead 1 percent, tin 0.1 percent, nickel 0.6 percent, zinc 0.1 percent. The Ganeshwar copper fish hooks numbering about fifty are usually not provided with a tang in centre. These fish hooks were excavated both as Harappa and Mohenjodaro in the earlier levels. Fish hooks without tangs are in sufficiently quantity in Ganeshwar though a few are also reported from Harappa, Mohenjodaro, Banawali and Budha Pushkar. During the exploration, a small smelting site was^{vi} (Kharkwal *et al.* 2002) discovered on the hill slope, dotted with huge mica quartzite boulders, facing towards east, about 1.5 kilometer towards the northeast of Ganeshwar I, which is located on the western margin of the modern Ganeshwar village on the right bank of Raotyora Nala. A small roughly circular terrace was chosen for smelting activity during protohistoric period. Large slag heaps were found on the edge of the terrace. Some highly burnt clay lumps were found along with slag, which were perhaps broken parts of the furnace. This furnace was made of clay to which sand was added to make it solid and the thickness varies from 10 to 15 cm. The northern portion of the furnace is thicker compared to southern one and it was protected by stone pecking on exterior. It looked like a barrel shaped pit after exposing half portion of the deposit inside. It is flat on the base and contains a solid layer of slag. It has very small semi-circular opening on the eastern part, at the base, which is flared. The height of the opening at the entrance was found to be 18cm and width 12 cm.

Conclusion

The inhabitants of Ganeshwar were making profuse use of thin bladed copper arrow heads for hunting purposes;

they were still partly nomadic. The shapes of these arrow heads are fantastic and bear testimony to the artistic and aesthetic sense of the contemporary people in this part of our country. These arrow heads were fastened between wooden shafts with the help of an adhesive paste which is still visible on the specimens recovered from Ganeshwar and its vicinity. In Rajasthan, the copper mining areas are mostly along the eastern flank of the Aravallis, extending from Bharatpur, Alwar and khetri regions in the northeast to the south of the Udaipur In the southeast reaching as far as Amba Mata on the border of Rajasthan and Gujarat. The

Khetri belt is the most well known copper bearing belt in Rajasthan and equally well known for its old workings. In khetri old workings are found near the top of a ridge, some 500 feet above the surrounding plain country. There is an underground gallery known to be more than two miles long, following the strike of the formations. Some deep shafts connect with the underground gallery. The presence of specialized craft items like arrowheads, celts, fish hooks, bead material and different types of pottery suggest a ranked society.

ⁱ Agrawala, R.C. 1978a. Archaeological Discoveries at Ganeshwar, Rajasthan. *Archaeological Studies* III: 72-75; Agrawala, R.C. 1978b. Copper Celts and an Indus Arrow Head from Kulhade ka Johad, District Sikar, Rajasthan. *Man and Environment* II: 123; Agrawala, R.C. 1979a. More Copper Finds from Rajasthan. *Man and Environment* III: 91-92; Agrawala, R.C. 1979b. Three Copper Objects from Ganeshwar. *Journal of the Oriental Institute* XXVIII, No. 3-4: 159-60; Agrawala, R.C. 1981a. Recent Explorations in Rajasthan. *Man and Environment* Vol. V: 59-63; Agrawala, R.C. 1981b. Protohistoric Copper Objects from Rajasthan: New Parameters. In *Cultural Contours of India*, ed. Vijai Shankar Srivastava, 25-31. New Delhi: Abhinav Publications; Agrawala, R.C. 1984. Ganeshwar Culture-A Review *Journal of the Oriental Institute* XXXIV, No. 1-2: 89-96; Agrawala, R.C. 1985. Proto-Historic Copper Bowls From Rajasthan. *The Researcher* XIV-XV: 1-3; Agrawala, R.C. and Vijay Kumar. 1993. Ganeshwar-Jodhpura Culture: New Traits in Indian Archaeology. In *Harappan Civilization: A Contemporary Perspective*, ed. Gregory L. Possehl, 125-135. Delhi: Oxford & IBH Publishing Co; Kumar, Vijai. 1985. Ganeshwar-Jodhpura Culture The Antecedents of Copper Age in India. *The Researcher* XIV-XV: 5-15.

ⁱⁱ Agrawala, R.C. 1979b. *ibid*; Agrawala, R.C. and Vijay Kumar. 1993. *Ibid*; Indian Archaeology-A Review: 1988-89: 76-78.

ⁱⁱⁱ Indian Archaeology-A Review: 1981-82: 61-62; Indian Archaeology-A Review: 1983-84: 71-72, 95-98; Indian Archaeology-A Review: 1987-88: 101-102; Indian Archaeology-A Review: 1988-89: 76-78

^{iv} Kumar, Vijai. 1977. Excavations at Jodhpura. *Journal of the Rajasthan Institute of Historical Research* 15(1): 28-33; Indian Archaeology-A Review: 1972-73: 29-30.

^v Agrawala, R.C. and Vijay Kumar. 1993. *Ibid*

^{vi} Kharakwal, J.S.; Sharma, M.L.; Meena, M.L. 2002. Discovery of Ancient Smelting Sites near Ganeshwar, Dist. Sikar, Raj. *Shodh Patrika* 53: 92-104