

Potteries of the Kalibangan Community

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ABSTRACT The potters of Kalibangan made domestic vessels for the changing requirements of the community. Shapes of the vessels was a legacy of their antecedent aceramic culture but they added new shapes in ceramic as a legacy for the posterity. Use of ceramics was necessitated by intensification of pastoralism in Kalibangan. Pots in fabric A were made for routine use. The fabric B was made for cooling water. The fabric C enabled serving to the visitors in style. Sturdy wares in fabric D were made for storage, while the fabric E contained water rich chemicals. Rarely occurring sherds in fabric F were made of saline mud. Intensification of the use of copper changed the needs of the community constraining the variety in pottery but incorporated shapes in vessels which were the legacy of the newly arrived Harappans in the later period of the Kalibangan history.

INTRODUCTION

Kalibangan was famous for its potteries prior to its urbanization as a Harappan metropolis in third mellenium B.C. The potters making the potteries were enabled by the community of the Kalibangans who lived on the western of the two levees on the left bank of the Ghaggar river flowing through Ganganagar district of Rajasthan. The range of wares made in mud included carts, bulls and bangles but potters were essentially those who made domestic vessels for individuals of the community. Populations of a community are coinhabitants of a habitat and are internally undifferentiated. Routine acts of a population make its individuals dependent on other populations of the community. The community of the Kalibangans had the requirements for the potteries made by the potters but the potters could make only those pots which were required by the gradually transforming community of their habitat. The potters of the prehistoric Period I of Kalibangan made potteries in six fabrics (IAR, 1962-63) which was replaced by different potteries in Period II (IAR, 1963-64) of the mature Indus Valley (Harappan) culture. Speculation on potteries in context of the community needs is highly

desirable (Lal, 1969; Khare, 1969). The context relevant to potteries is the legacy and the necessities of the changing community. The context was the necessary and sufficient conditions for the change from the aceramic to the ceramic culture and transformation of the potteries from Period I to Period II in Kalibangan, constrained by increasing use of copper.

THE LEGACY

The origin of potteries all over the world lies in hand moulding of mud on a basket or a piece of cloth. Wheel thrown potteries was a revolution though initially wheel was rotated slow. Slow wheel pottery is carelessly potted yielding uneven surface with irregular striation marks, using ill-levigated clays which are not rid of coarse impurities. Vessel made is somewhat porous and unsteady. Improved technology requires well levigated, clayrich mud rotated on fast wheel. It gives thin, polished, strong and sturdy pots having regular striation marks (Manchanda, 1972).

Kalibangan is not known for its hand made potteries, unlike Amri and Kot Diji where more than 80% of the Period I potteries is hand made (Manchanda, 1972). However, excavation of a

single piece of hand-moulded pot, bearing textile impressions, from the deposits of Period I in Kalibangan (IAR, 1961-62, plate, LXVII A) suggests that more of them could have been thrown on the eastern levee which was not inhabited till Period II, but bears remains of Period I potteries (IAR, 1962-63). The pots would have been dissolved in rain water and washed down with the Ghaggar water, as is common on slopes (Butzer, 1983). Other remains could have been baked to make terracotta nodules and cakes filling foundation of some of the dwellings raised on the eastern levee in Period II.

The instance of the hand-made pot, even though singular, suggests exposure of ceramic to the people living in aceramic culture. They inhabited Kalibangan prior to the potteries of Period I. The aceramic culture constrained people to use vessels made in leather, stone and bones, predominantly in cold climates, and of vegetation, predominantly in warm-humid climates (Blake, 1970). Coconut and dried skins of melons and gourds were used for making trough-cum bowl, *kamandal*. Simple broad leaves were made to a plate or a *pattal* and a cup or a *donā*. These leaves are moderately rich in sap so that they do not wither soon on plucking, nor do they yield thick latex on slight scratch. Fibrous stems of dry sedges or hard grasses, coiled to a rope, are woven to make *tokari* or a basket and *bohiā* or a smaller basket without loop handle. These baskets are arc-shaped troughs, unlike flat-base *pitāri* made of slit bamboo or cane. These are the traditional vessels of India. A tradition comes from habit, even though the act may be repeated out of necessity. Recursive acts become a habit (Bhaskar, 1979) like automation mind of an actor, proposed by Pitts River.

The aceramic culture of the prehistoric Kalibangans constrained them to use vessels made of plants which grew in their habitat. The cucurbits growing in the north, and the sedges and the coarse grasses growing in the south of

the levee (Mamatamayee, 1991) were used to make *kamandal* and *tokari* or *bohiā*. Banana leaves could be used as a plate though climate constrained growth of other broad leaves in Kalibangan. The potteries of Kalibangan in Period I replicated *bohiā*, *tokari* (Fig. 1.1) and *kamandal* (Fig. 1.2) as troughs and bowls made in mud. The gourd-*kamandal* has a spherical body and outflaring lips on narrow neck. One cannot drink from a *kamandal* without spilling the contents if the vessel is touched by lips. Instead, liquid is poured in an open mouth or a palm folded as a cup. The *bohiā*-like bowl has a round base. A round base, curved body, narrow necks and outflaring lips were shaped in mud by the potters of Kalibangan in Period I (Manchanda, 1972). The base was more flattend and body elongated with angles during the Harappan contact of Period II (Manchanda, 1972). In return, the Harappans replicated a *kamandal* in mud, complete with loop handle (cf. Manchanda, 1972, Fig. 191, p. 90).

Absence of a pedestal base constrained increase in the height of the vessel used for serving food by placing it on a *Patarā*. *Patarā* is a low stool made of rectangular wooden plank with wedges attached to its width. The stool raised the food to elbow height of the eater who squatted on an *āsan*, or a mat made of dry grasses, leaves or skins. Use of *patarā* eliminated the need of pedestal base of vessels. Pots were made in round base for routine use of the people. Incipient base, similar to an inverted *kamandal*, was attached to unsteady vessels, such as to serve to children. Tall stands with broad base (Manchanda, 1972) were attached to pots meant to serve visitors. Tall stands raised the food to elbow height without cumbersome spread of a *patarā*. These tall stands were shorter than still taller and slender stands of the Harappan pottery (Manchanda, 1972) which enabled a person in standing posture to reach to the contents of the pot on stand. Abulation and squatting are ritualistic in partaking of food in the traditions of the people east of the Indus,

therefore such tall stands were redundant to the Period I community of the Kalibangans. *Patarā* was not used west of the Indus. The Harappans learnt to make a *patarā* in mud (cf. Manchanda, 1972, Fig. 340, p. 140), which is interpreted as a stand but unlike the other stands used for placing jars. In exchange, the Kalibangans added tall stands to the Harappan pottery of Period II.

The use of *patarā* constrained pedestal base and stands in pottery but was enabled by carpentry of Kalibangan in Period I. The carpenters were skilled enough to make carts which were modelled in terracotta toy (Thapar, 1975). They could not only make wooden rafts and doors but also a *kamandal* and a *patarā*, eliminating their make in mud.

The aceramic culture was the legacy of the potters of Period I but they added vessels in shape and size which are legacy for us. Women in India tend to carry a medium sized goblet on hips such as to jettison girth of the vessel in the cavity around waste. An outflaring beaded rim on medium sized neck enables grip of the goblet with bend of an arm. Goblets are carried as a head load to enable translocation of larger volume, or of two different liquids carried simultaneously. Narrowing of the vessel towards the base enables easy grip of the head load with extended palms. Difference in the size of the girth and the base is reduced to secure balance of the pots stacked as a column. These are more elongated and smaller in size (Fig. 1.4) than spherical goblets (Fig. 1.7). The mode of carrying the pot is a matter of culture (Gupta, 1969) but carrying of pots as a head load is perhaps more common west of the Indus while carrying goblets on hips is more prevalent in India. The association is reflected in highly elongated pots of the Indus and the Mesopotamian valleys. The burial pots of a Kalibangan in Period II are elongated similarly (IAR, 1963-64), replacing the accent on angles characteristic of Period I (Manchanda, 1972).

THE NECESSITY

The legacy of the vessels made in plant material had shortcomings which necessitated use of pots made in some other medium. The aceramic vessels tended to be soiled with use of heavy and wet solids. A *kamandal* alone was efficient in carrying of liquids but could carry only small quantity at a time and the contents could not be warmed without burning the vessel. These conditions were necessary but not sufficient for initiating pottery in Kalibangan.

The inability of the vessels to contain liquids and the limited carrying capacity of the vessels constrained the early Kalibangans to live in proximity of their only source of water in the Ghaggar river. They lived on hill top or levee flank in the north of the levee to facilitate hunting and gathering from the river side north (Mamatamayee, 1991). Animals trapped in riverside marshes were rescued and domesticated which transformed the gatherers to pastoralists (Mamatamayee, 1992a). Tending the animals took the pastoralists to the southern grazing grounds, far from the northern dwellings. This constrained some dwellings to be translocated to the south-eastern flank of the levee but distanced them from their source of water. The capacity constraint of *kamandal* required repeated trips to the Ghaggar in the north, eroding in their working time required for prolonged movement to the southern grazing grounds. The necessity of the vessel which could translocate larger quantities of water became a precondition triggering initiation of pottery in Kalibangan.

The necessity became more acute with intensification of pastoralism in Kalibangan. The pastoralists stall fed their animals on fodder crops which included oil giving mustard (Mamatamayee, 1992b). Use of oil required a vessel which could pour thinner streak of the liquid than was possible from a broad mouthed *kamandal*. Milk could be churned with wood to get butter and butter milk, but required protec-

tion against animals and other unwarranted encroachers. The contents could be protected using a *chhinkā*, a rope suspension, or by tying a rope around the neck of the vessel. The variety of the liquids could be stored or translocated simultaneously by stacking them in a column. The food hunted or gathered was eaten raw in its natural temperature, or was roasted on fire to eat the food at its desired temperature. If not curdled, milk had to be taken cold even in winters, unless a fire resistant vessel was available. The pastoralists tending the animals came in contact with other nomads reaching to their territory. Exchange of items of non-local origin was effected through the contact. These items were given the status of precious goods. Safe custody of the items required a vessel which could stuff the contents easily but withdrawal was difficult. The Period I people had copper and beads to store, while Period II people had many more things to add including sea shells and semi-precious stones. A *tokari* or a *bohīā* could not contain these solids without some loss of the items. Non-porous and sturdy vessels in mud overcame the shortcomings of the aceramic pots.

The Kalibangan of Period I made potteries in six fabrics (IAR, 1962-63) common to the Sothi Wares of the Ghaggar basin (Ghosh, 1952). These fabrics are labelled from A to F according to decreasing frequency of their occurrence and differentiated on technical grounds. The fabric A is most carelessly potted while the fabric C is made carefully on a fast wheel but the fabrics bear no connotation of their evolution (Thapar, 1969).

THE FABRICS

A, For Routine Use

The Kalibangans of Period I made pots in fabric A for rough use in their routine life. The fabric was carelessly potted on slow wheel but included a range of size and shape of goblets, troughs and bowls for daily needs of the people.

The vessels could store, translocate, cook and serve liquids and solids.

The goblets were multipurpose. The shape of their necks varied with required mode of withdrawal. Wide mouthed goblets (Fig. 1.3) were made for easy withdrawal such as a water. Narrow necks were made for constricted withdrawal (Fig. 1.4), which eased pouring out its liquid content or could be suspended from a rope and also be used for stacking them in a column, such as for head load, or for saving of floor space. Hole-mouthed pots (Fig. 1.5) gave constricted withdrawal, such as required for oil. Withdrawal was constricted from medium-sized spherical goblets with narrow mouths (Fig. 1.6), likely to be used for storing precious items. Withdrawal required upturning of the pot. The goblets similar in girth but with medium sized mouths (Fig. 1.7) enabled their translocation on hips.

The troughs of Kalibangan were *bohīa* or *tokari* made in mud (Fig. 1.1). Smaller of these had rounded base like a *bohīa*. The larger ones were made sturdier by adding an incipient base. The troughs could be used for solids without getting soiled or damaged. They could also be used for mixing solids and liquids, such as fruits with honey, or for pickles made in oil. Pickling was a device for storing uncooked food in absence of cooking ovens and vessels. *Chāti*, a wide mouthed pot, is still used for mixing of pickles in India. The Kalibangans of Period I had the ingredients required for making of pickles. *Kair* (sp *Capparis*), widespread in Rajasthan since the Holocene (Vishnu-Mittre, 1978) is still eaten as a vegetable, or is made to a pickle in mustard oil for which the early Kalibangans could use their troughs.

The bowls were made in a variety of size and shape to enable drinking, as a supplement vessel to a *kamandal*. They were small (Fig. 1.2) or big (Fig. 1.8) but without loop handles which is attached to a wooden *kamandal*. Larger bowls were made in more cylindrical body (Fig. 1.9) to balance with their base. The small bowls could be used for serving viscous matter which could be scooped out with fingers, as in case of

honey or butter. These bowls were decorated tastefully. Some of the bowls made in fabric A could be kept on fire, or buried in hot ash for serving its contents warm. These were flanged near their base (Fig. 1.10) for their placement in an oven.

The Kalibangans of Period I possessed oven similar to modern *tandoor* (Thapar, 1975) but which were different from their current use. There were no cereals in Period I which could give flour necessary for making a *roti* in a *tandoor*. These prehistoric ovens were akin to a *hārā* used all over north-western India. A *hārā* is made of mud or bricks plastered with mud and dung. Fire, generally of dung cakes, is kept lit continuously in it. Ready fire eliminates use of match sticks or fire stones. Food is buried in its hot ashes for slow roasting or for keeping it warm. Milk is thickened in this way for curds and butter. Lit fire also enables scaring off marauding animals. A *hārā* is placed in a courtyard though under some protective covering. The courtyard is also used for tying of animals which shortens translocation of a milk pot to a *hārā*. The Kalibangans placed their oven and tied their animals in their courtyard. Tying of animals is suggested by excavation of troughs, perhaps used for watering the animals. The lime plastered cylindrical pit, similarly placed in a courtyard, was too unprotected for storage of grains but could have been used for watering the animals in the same courtyard where *hārā* was placed for warming of milk. The Kalibangans placed their flanged pot in the *hārā* to keep and serve the milk warm. The flanges served the same purpose as the pointed base, elongated jars of the Harappans (Manchanda, 1972), firmly securing the pot in otherwise slippery ashes of the *hārā*.

B, The Fabric for Cooling

The only vessel made in fabric B were jars made to cool the contents (Thapar, 1969, 1975). Their surface below the girth was roughened with cord impressions and by smearing of shin-

ing sand on raw pot before baking and painting it. The shine could be caused by powdered water shells (Thapar, 1969, 1975) but, more probably, these were sheets of mica or silica which abound in coarse grained sand of Rajasthan. The roughened surface diversify air channels, increase evaporation, thereby cooling the contents. The sheets make the mud porous, enabling capillary rise of the contents to the exterior of the pot, increasing evaporation and cooling.

Some of the jars made in fabric B were meant for storage and easy withdrawal. These were wide-mouthed, medium in size and were painted less elegantly than the others made for display during translocation. The dwellers of the southern cluster had to pass through the northern clusters to fetch water from the Ghaggar. Pots were painted below the girth as the upper portion was hidden under bend of an arm. The painted motifs were the objects common to the river side (Fig. 2.1). These included motifs of stags, turtles, ducks, and flowering creepers (of melon?). The motifs were arranged in panels for individualistic effect, analogous to putting name-labels of the owners on individual pots.

C, The Display Fabric

The fabric in C provided more enduring display of pots than the translocation jars in fabric B. The display fabric was made in the finest technology using well levigated clay which was finer than the other fabrics. Some of these could be stacked atop each other as they tapered towards their neck. These could make tall columns near doorways, as if to welcome visitors. Medium to small S-shaped jars, which could be stacked in a column, were more common. Bowls were more straight than curved. Their liquid content could be reached without necessitating pouring it to a mouth or folded palms. The speciality of the fabric were troughs and bowls on stand. These facilitated serving food to visitors without cumbersome

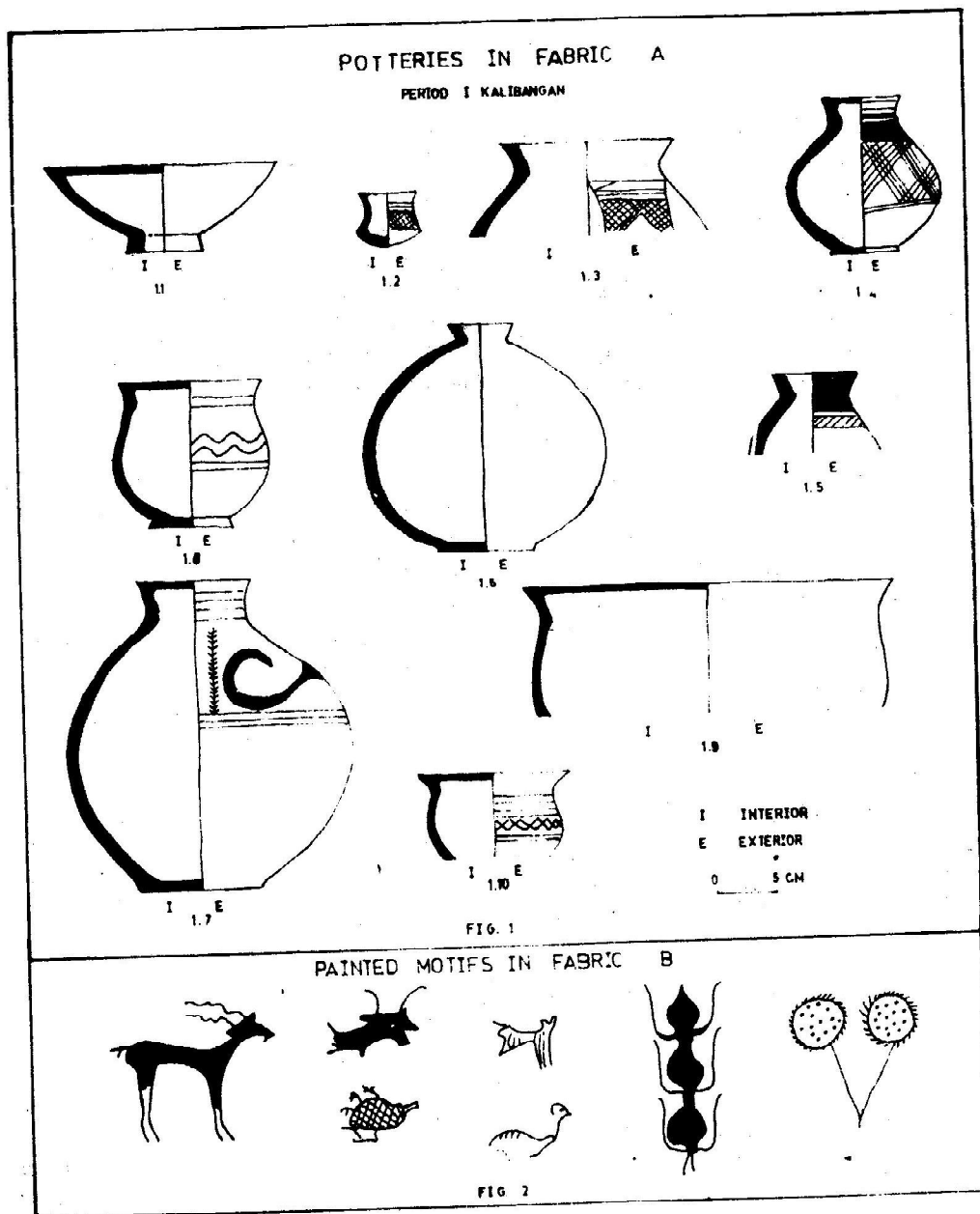


Fig.

use of a *patarā*. These pots were kept on display, so were painted in intricate geometric designs of plants and animals in their naturalistic surroundings.

D, The Storage Fabric

The earthen pots in fabric A, B and C enabled translocation and serving of the liquids and solids. Both the acts were occasional, necessitating storage of the translocated material till its withdrawal for use. The act required privacy and security of the contents. The storage vessels were made for such purpose in fabric D. The ability to store was contingent on strength and capacity of the vessel. The pots were made large to medium in size but were thick in cross section which made them heavy. Weight was of little constraint as not the pots but only its contents were translocated. These jars were incised with cord impressions from outside and comb impression from inside (Fig. 3.1) to allow more even drying and baking of the thick vessels.

The fabric included deep troughs which could store heavy solid food like fruits or slaughtered animals. These were pans, like a modern *karhāi* used for frying and saughting. The ensemble included a large flanged trough (Fig. 3.1) which was perhaps on stand (Fig. 3.2). Food could be saughted by lighting fire around the stand. The trough and the stand had cracked forming sloping edges along the sherds. A solid surface cracks with straight edges under sudden impact of a hard object, like a bullet piercing through a glass pane. Surface cracks along sloping edges if heated from one side and cooled from the obverse, like pouring of hot liquid in a cold glass tumbler. The flanged jar must have cracked on pouring of some cold matter when the pot was on fire.

The unique in fabric D was a cylindrical jar which was about 60 cm long and 10 cm in diameter. The shape was similar to a *garhbarha*, a perforated jar used for protecting a burning lamp against wind in the north-western India

and common to the Harappan pottery of the Indus valley. The unperforated cylinder was made to store its contents. The contents could be a chemical mixture, such as used for medicines, which was a well advanced science of Kalibangan.

E, The Fabric for Water Chemicals

The pots in fabric E were made for chemicals which required abundant water. They were in buff colour and exposed their body fabric. Buff colour is natural to soils rich in hydrous ferric oxide ($2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$). Iron sesquioxide (Fe_2O_3) in mud gradually break down silicate lattices, cementing the residue in sand like aggregates, as in laterite of warm humid or wet regions. The sesquioxides are irreversibly cemented to each other breaking away from any other matter that fills the pores between the aggregates. The sesquioxides could wash down to the Ghaggar from the Indian plate near Kalibangan but also could have formed along water channel of the Ghaggar. The pots made from the mud from the river side could be rich in sesquioxides which eventually disintegrated the pots to sherds exposing buff colour of their body fabric.

Using mud from the Ghaggar could be ritualistic in making of these pots. The ritual required using water from the Ghaggar, as water from all the rivers in India have ritualistic use in the traditions of the people. Pots made of river-side mud were broad-mouthed, with flanges near the opening (Fig. 4.1). Matching with it was a broad lid with knob (Fig. 4.2) which could rest on the mouth of the jar (Manchanda, 1972). Small lid with knob (Fig. 4.3) could be inserted over the narrow-necked jars made like an inverted funnel (Fig. 4.4) or over hole-mouthed mini jar (Fig. 4.5) which could be used as a strainer. The jars were used for making some chemicals using the Ghaggar water as the base. The chemical could be some perfume (Manchanda, 1972), medicines or wines. The ensemble in the fabric included bowls on stand which were less than, or slightly larger than, 5

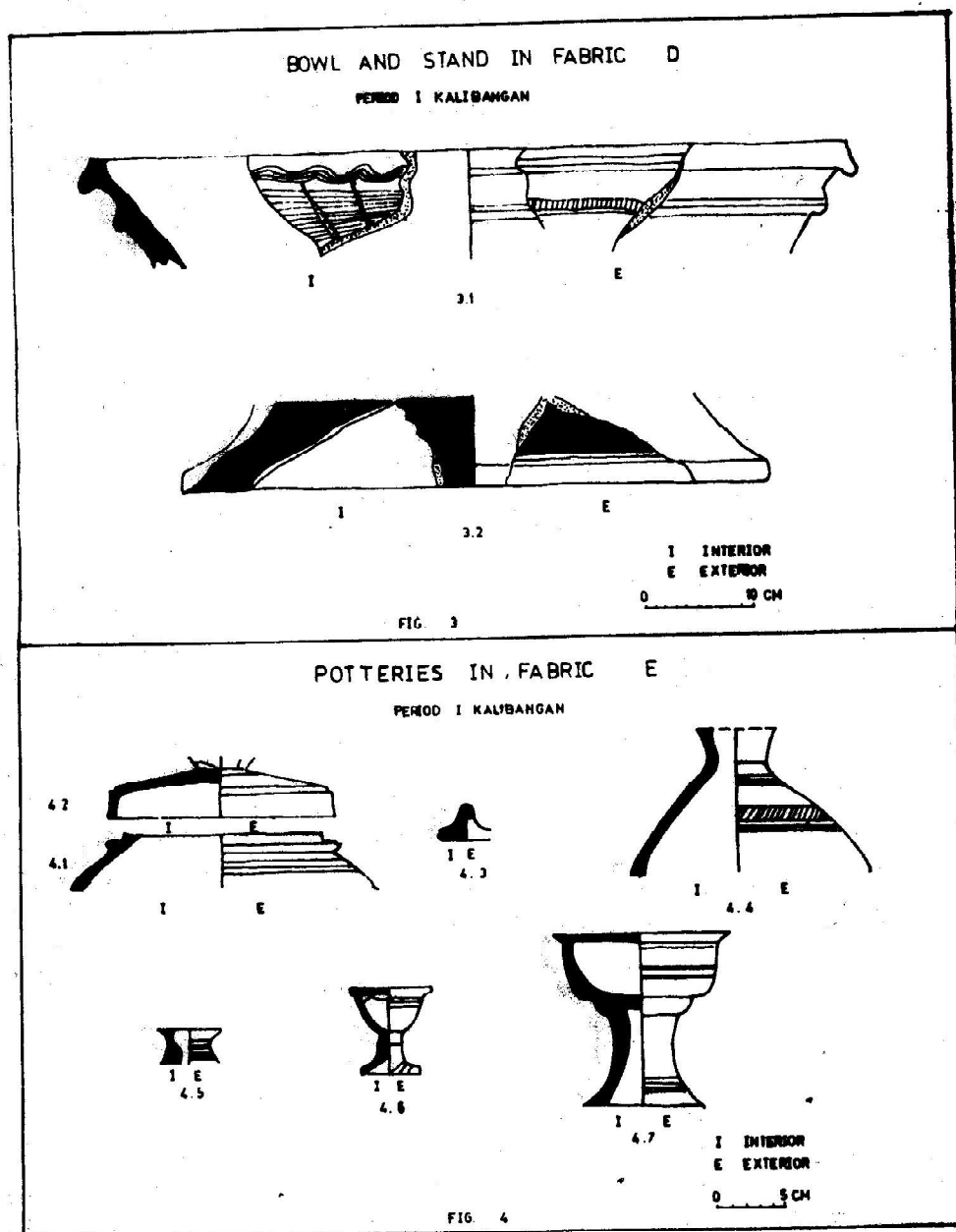


Fig.

cm deep, similar to a chalise (Fig. 4.6) or a wine cup (Fig. 4.7). The jars tapered towards their openings so they could be stacked to allow fermentation of the liquid. Lids allowed occasional checks on the state of the chemical. The large jars were wide-mouthed for easy withdrawal, such as by dipping a bowl in the jar, or by upturning it. Troughs were made on stand for offering ritual food, such as *prāsad*. The pots were painted in motifs of fish, fowl and lotus-like flowers, perhaps used in the rituals.

F, The Fabric in Saline Mud

The pots made in fabric F were common to other fabrics, but had spots of grey and were rare in occurrence. These pots were made of mud rich in gypsum, suggested by recovery of a crystal from inside of a sherd (Vishnu-Mittre and Savithri, 1982). The salts occur in form of *reh* soil surrounding Kalibangan and as *mittha* or *khara chuna*, which is widespread around the area (DGoG, 1972). *Chuna* was perhaps used as a white pigment in paintings on potteries of Period I which is conspicuous by its absence on the Harappan pottery. The salts accumulate in soils due to evaporation after a brief supply of soil water, such as, at some distance from channel after flood subsides in it. *Reh* could develop in the south of the levee in any pit used by the potters. *Reh* appears as a grey patch on the pot made of the salt rich mud peeling off anything coated above it. Once the deformity was noticed the pit was abandoned, causing rarity of the fabric in Kalibangan.

THE TRANSFORMATION

The potteries were made for the needs of the community. Use of ceramics enabled the graziers to graze their animals far to the south of their dwellings bringing them in contact of others who could give them copper for use. The Kalibangan of Period I used copper for celts (Thapar, 1975) but also for toy bullocks in Period II. The artisans who cast the metal to a toy also moulded it to make

domestic vessels. Use of metallic wares reduced the frequency and variety in the ceramics of Period II.

The Harappan pottery of Period II (IAR, 1963-64) includes highly elongated jars recovered from the cemetery area of Kalibangan. Burial was a new practice coinciding with the arrival of the Harappans in Kalibangan. Confined to the cemetery area, these pots could have been brought by those who were buried there. The Harappan pottery of Period II is made using the finest technology which gives thin and polished surface. It is made of silty clay which is sticky, soapy and gives a silky touch. It moulds well to give non-porous wares with polished surface which produce a metallic sound on touch. Silt abounds in water that drains through thickly vegetated basin, such as the Indus reaching Harappa. The Harappan wares are made of silty clay which must be of non-local origin at Kalibangan. Mud local to Kalibangan was dominated by sand which was blown from the dunes of Rajasthan and from silt-scarce Ghaggar which was only a short distance from its source before reaching Kalibangan. Local mud caused inferiority in appearance of the pottery of Period I in Kalibangan.

The smooth-surfaced pottery of Period II could have been locally made in Kalibangan (Thapar, 1969) but the potters had to search far and wide for the silty clays. The search was fruitless as ceramics were getting replaced by metallic wares. This constrained the potters to move away from the spread of the Harappan wares. The potters dispersed to make mud wares for the small settlements where use of metal was still not prevalent. They moved as far east as Alamgirpur in Ghaziabad district of Uttar Pradesh before the spread of the chalcolithic culture brought an end to the Sothi Wares of the Ghaggar basin by the end of the post Harappan culture in the region.

CONCLUSION

The potters of Kalibangan in Period I made domestic vessels for the community which lived

by vessels made of plants. The shortcomings of the plant vessels and intensification of pastoralism in Kalibangan necessitated use of ceramics in Kalibangan in Period I. The ceramics enabled the pastoralists to graze their animals far from their dwellings, bringing them in contact of the nomads coming from the south and east. The contact gave copper to the Kalibangan which was used to make metallic wares by Period II. Use of metal constrained the potters to practise their skill in smaller settlements upstream of the Ghaggar till the chalcolithic culture brought an end to the Sothi Ware culture of the Ghaggar basin.

REFERENCES

- Bhaskar, R. : *The Possibility of Naturalism*. The Harvester Press, London (1979).
- Blake, H.G. : *Plants and Civilization*. Macmillan, London, 2nd Edition (1970).
- Butzer, L.W. : *Archaeology as Human Ecology*. Cambridge University Press, London (1983).
- D Go G. : *District Gazetteer of Ganganagar*. Govt. of Rajasthan, Jaipur (1972).
- Ghosh, A. : *Bulletin of National Institute of Sciences in India* : 37-42 (1951).
- Gupta, S.P. Sociology of pottery : Chirag Dilli, A case study pp 15-26. In : *Potteries of Ancient India*. B.P. Sinha (Ed.). University of Patna, Patna (1969).
- IAR : *Indian Archaeology - A Review* : 39-44 (1961-62).
- IAR : *Indian Archaeology - A Review* : 20-31 (1962-63).
- IAR : *Indian Archaeology - A Review* : 30-39 (1963-64).
- Khare, M.D. : Study of pottery : A new approach: pp. 27-29. In : *Potteries in Ancient India*, B.P. Sinha (Ed.). University of Patna, Patna (1969).
- Lal, B.B. : Potteries in Ancient India : Inaugural Address pp. 3-8, In : *Potteries in Ancient India*. B.P. Sinha (Ed.). University of Patna, Patna (1969).
- Mamatamayee, C. : Pioneers of the settlement at Kalibangan. *J. Hum. Ecol.*, 2 : 159-164 (1991).
- Mamatamayee, C. : The pastoralists of Kalibangan. *J. Hum. Ecol.*, 3 : 271-278 (1992).
- Mamatamayee, C. : Dry farming in Kalibangan. *J. Hum. Ecol.*, 4 : 29-38 (1993).
- Manchanda, Omi. : *A Study of the Harappan Pottery*. Oriental Pub., Delhi (1972).
- Thapar, B.K. : The pre-Harappan pottery of Kalibangan : An appraisal of its interrelationships; pp. 251-256. In : *Potteries of Ancient India*, B.P. Sinha (Ed.), University of Patna, Patna (1969).
- Thapar, B.K. : Kalibangan : Harappan metropolis beyond the Indus valley. *Expedition*, 17 : 19-32 (1975).
- Vishnu-Mittre. : Palaeobotany of Rajasthan desert during the last 10000 years. *Palaeobotany*, 25 : 549- 558 (1978).
- Vishnu-Mittre and R. Savithri. : Food economy of the Harappans. pp. 205-221. In : *Harappan Civilization: A Contemporary Perspective*. G.I. Possehl (Ed.). Oxford and EBM, New Delhi (1982).