SHELL WORKING INDUSTRIES OF THE INDUS CIVILIZATION : A SUMMARY

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J. M. KENOYER

ABSTRACT. — The production and use of marine shell objects during the Mature Indus Civilization (2500-1700 B.C.) is used as a framework within which to analyse developments in technology, regional variation and the stratification of socio-economic systems. Major species of marine mollusca used in the shell industry are discussed in detail and possible ancient shell source areas are identified. Variations in shell artifacts within and between various urban, rural and coastal sites are presented as evidence for specialized production, hierarchical internal trade networks and regional interaction spheres. On the basis of ethnographic continuities, general socio-ritual aspects of shell use are discussed.

RÉSUMÉ. — Production et utilisation d'objets confectionnés à partir de coquilles marines pendant la période harappéenne (2500-1700) servent ici de cadre à une analyse des développements technologiques, des variations régionales et de la stratification des systèmes socio-économiques. Les principales espèces de mollusques marins utilisés pour l'industrie sur coquillage et leurs origines possibles sont identifiées. Les variations observées sur les objets en coquillage à l'intérieur des sites urbains, ruraux ou côtiers sont autant de preuves des différences existant tant dans la production spécialisée que dans les réseaux d'échange hiérarchisés et dans l'interaction des sphères régionales. Certains aspects socio-rituels de l'utilisation des coquillages sont également discutés en prenant appui sur les données ethnographiques.

INTRODUCTION

In recent years the Indus Civilization of Pakistan and Western India has been the focus of important new research aimed at a better understanding of the character of protohistoric urban centers as well as rural towns and villages. With the accumulation of new and varied types of data many of the misconceptions regarding the rigid social structure and unimaginative material culture are being replaced by a new appreciation of the complex and varied nature of this civilization. However, it has been difficult to relate much of the newer data to the important collections made by the earlier excavators because of a disparity in the levels of analysis and interpretation and we are still confronted with many unanswerred questions. Our basic understanding of this civilization is still quite general and this is particularly evident in the very broad dates that are generally accepted for the urban or Mature Indus period, from 2500 B.C. to about 1700 B.C. This urban period is represented by the rise of large urban centers, such as Mohenjo Daro and Harappa, which were located at strategic points along trade and exchange networks within the greater Indus or Sindhu/Nara River valley (1).

These large urban centers were connected with outlying rural communities and distant resource areas by complex internal trade networks. Evidence for this unity is seen in the presence of uniform styles of plain and painted pottery, similar types of tools and utilitarian objects, fairly standardized weights and measures and a common, but as yet undeciphered writing system. The presence of certain diagnostic artifacts in the neighboring regions of Afghanistan, the Persian Gulf, and Mesopotamia indicates that the Indus peoples also had contacts with other contemporaneous civilizations. Again, due to a lack of detailed studies on the primary data excavated from widely distributed sites, attempted reconstructions of the structure of internal or external trade have been quite conjectural (2). Fortunately, certain groups of artifacts excavated from the large urban sites are still available for analysis and shell artifacts, particularly marine shell, comprise one of the most important sources of information for understanding the development of various socio-economic systems.

Shell is one of the most durable materials in the archaeological record after stone and terra cotta, and most Indus sites have significant amounts of shell artifacts. Because of its use as a raw material to produce a variety of utilitarian and ornamental objects, it has been possible to trace the development of shell working technologies and specialized industry from the early Neolithic (7th to 6th millennia) to the 3rd millennium B.C. (3). More important, however, is the fact that many of the shell species used by the Indus craftsmen occur only in specific coastal habitats, thereby allowing for a general reconstruction of marine adaptation and exploitation by coastal communities, as well as the trade and exchange networks connecting the coastal resource areas to inland sites. In addition to these socio-economic aspects, shell artifacts appear to have been important in specific socio-ritual contexts and can

(1) FLAM, 1981; KENOYER, 1983.

(2) i. e. RATNAGAR, 1981.

(3) KENOYER, 1983.

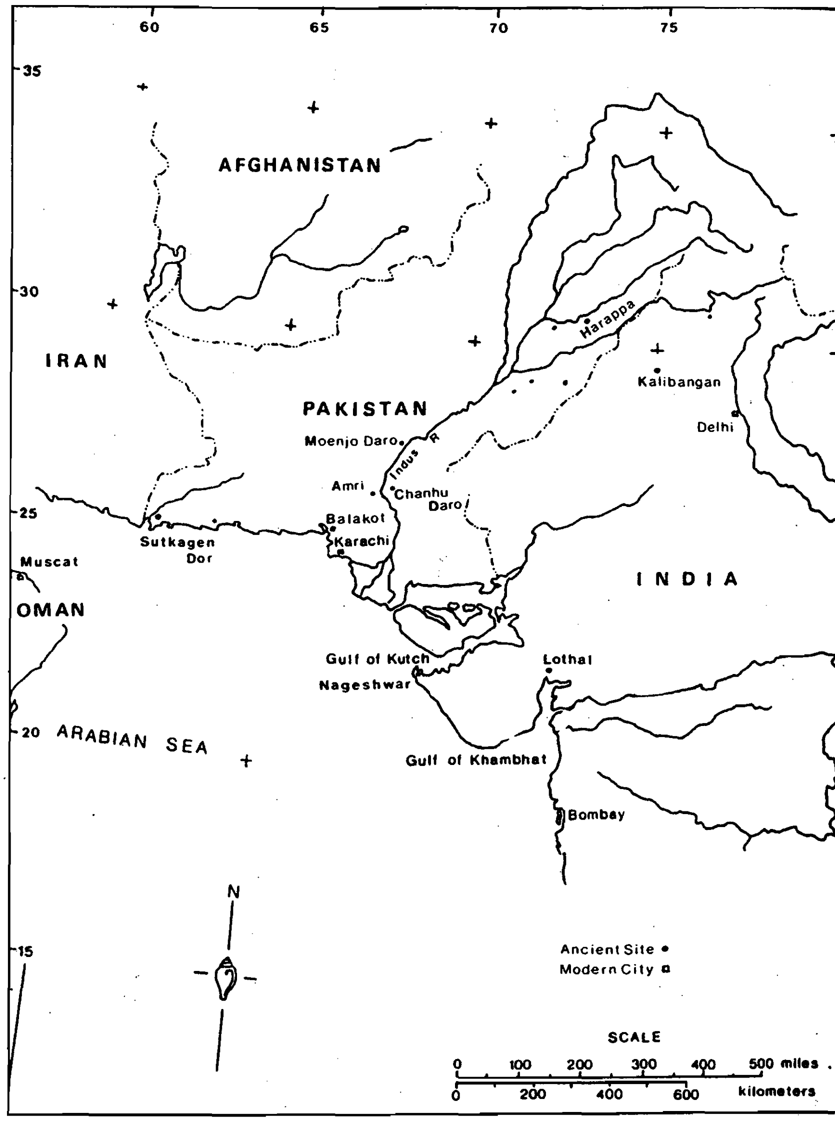

FIG. 1. — Major sites of the Indus civilization.

provide important insights into the socio-religious beliefs and customs of the Indus Civilization.

Many different species of marine and fresh water mollusca have been recovered from sites of the Mature Indus period, but the shells of only a few of the larger marine gastropods and bivalves were used as a raw material for the manufacture of ornaments, utensils and other special objects (4).

All of the species used as raw materials are still found in the Arabian Sea and come from different areas of what used to be the coastal regions of the Indus Civilization, which extend from Sutkagen-dor on the Makran coast of Pakistan, to Lothal on the Gulf of Khambhat (Cambay) in Western India (fig. 1).

Each species is characterized by unique features in terms of shell structure, habitat area and distribution in various ocean regions. By understanding the diagnostic physical characteristics of a particular species or family, it is often possible to make positive identifications of the types of shells found at a site on the basis of even small fragments. The ancient source areas for these species can generally be reconstructed on the basis of major coastal changes and our present knowledge of the distribution and particular habitats of these species.

MAJOR MARINE SPECIES

GASTROPODA (Univalves) :

Turbinella pyrum, (Linnaeus)
Chicoreus ramosus, (Linnaeus)
Lambis truncata sebae, (Rõding)
Fasciolaria trapezium, (Linnaeus)
Pugilina buchephala, (Lamarck)

(4) Natural shells that have simply been perforated for use as ornaments are not included in this present discussion.

PELECYPODA (Bivalves) :

Tivela damaoides, (Gray)
Meretrix meretrix, (Linnaeus)
Callista impar, (Lamarck)

Turbinella pyrum was the species most commonly used as a raw material at Mohenjo Daro. In its natural form, the shell is ovate with a well balanced spire and a smooth globose body whorl that has no external protuberances (fig. 2). Underneath the protective exterior covering or periostracum the white shell is extremely hard and sturdy. Its structure is quite massive, with thick walls spiraling around a solid columella, joined together by thick, reinforced sutures (fig. 2). This columella can be distinguished from that of other large gastropods by the presence of 3 or 4 prominent ridges, to which the major muscles are attached. Average adult specimens can reach 150 to 200 mm in length and 100 to 150 mm in breadth. Because of its ovate shape and well joined sutures, this shell provides a unique structure that is suitable for the manufacture of several circular bangles from a single shell, and large solid objets from the central columella.

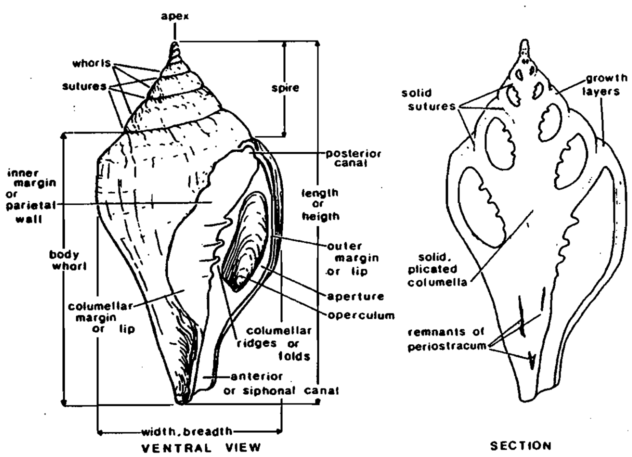

FIG. 2. — Parts of the Gastropods : *Turbinella pyrum.*

Being a gregarious species, it tends to form colonies on sandy bottoms or in sandy areas between coral reefs or rocky areas. Occasionally specimens are washed up on the reefs, but they generally live in the shallow littoral zone, to depths of 20 meters (5).

Turbinella pyrum has a fairly restricted distribution, occurring only in the protected bays of the Indian subcontinent. This limited distribution makes it possible to trace the movement of the shells from their source areas to distant inland markets. Major concentrations of this species are found in the shallow bays of South India and Sri Lanka, in the Gulf of Kutch and then again near Karachi, along the Sindh and Makran coasts. Harappan shell collectors probably used the sources in the Gulf of Kutch and those just west of Karachi to supply inland manufacturing centers (fig. 5). The westernmost occurrence of this species is reported from Pasni, on the Makran coast (6), but it is not found in the Arabian/Persian Gulf itself (hereafter referred to as the Gulf).

In studying the various coastal changes that have occurred over the last 5000 years in western India and Pakistan, we see that the most drastic changes have taken place in delta regions or rocky coasts, where the species does not normally live. Snead's study of the Makran coast indicates that there has been some tectonic uplift, about 2 meters along the Karachi coast and increasing westerly to as much as 30 meters near Ras Jiwani near the Iranian border (7). Some of the uplifted marine banks may have emerged as late as the 17th or 18th century A.D. while others were probably uplifted during the 3rd or 2nd millennium B.C. (8). Even if specific dates are not yet available for these local tectonic movements, it is evident that for the past 5000 years or more, the Makran coast has been tectonically active, with increasing instability towards the west. Unstable conditions on the coast result in drastic changes in coastal marine habitats, a situation that is not suitable for the development of major concentrations of the species of gastropods used in the Indus shell industry. The absence of sub-fossil examples of *T. pyrum* and the other large gastropods in the uplifted beaches may indicate that, as is the case today, there were no major concentrations of these species along the western Makran coast or in the Gulf itself. In the east, however, the coast has been more stable and there has been relatively little silting. In view of these factors, we can assume that there has been little change in the marine habitats of this region during the last 5000 years, and that the *Turbinella pyrum* beds found west of Karachi were probably located in the same general areas during the 3rd millennium B.C.. In Kutch and Saurashtra, recent changes have been primarily due to silting and minor fluctuations in sea levels, and not due to major tectonic activity. On the basis of preliminary dating of inland coral and shell banks, Gupta suggests that the sea level along the Saurashtra coast at about 6000 B.C. was from 2 to 6 meters higher than the present day mean sea level (9). In view of this data and calculations of annual sedimentation within the Rann of Kutch, Gupta has calculated that as late as 2000 years ago, the Little Rann of Kutch was about 4 meters deep and was inundated throughout the year (10). Major silting has now completely changed the ecology of this region and has probably obliterated many of the shell beds in the area of the Greater Rann and the inner portions of the Gulf of Kutch. However, this silting has not drastically effected the shell beds on the southern

(5) MAHADEVAN and NAGAPPANNAYAR, 1974 : 118-119.

(6) KHAN and DASTAGIR, 1971 : 56-57.
(7) SNEAD, 1967 : 564-565.
(8) *Ibid.*
(9) GUPTA, 1977 a.
(10) GUPTA, 1977 b.

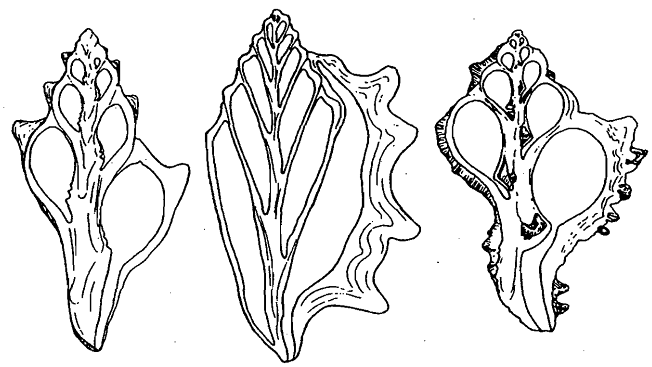

FIG. 3. — Internal structure of other large Gastropoda.

shore and nearer the mouth of the Gulf, and it is probable that the distributions of shell beds as we see them today is very similar to the distribution during the 3rd millennium B.C.

Another commonly used species was *Chicoreus ramosus*, a large shell characterised by an inflated body whorl, covered with sets of 3 long curving varices or spines and numerous smaller tubercules (fig. 3, c). Adult specimens range in size from 70 mm to 250 mm in length and 60 mm to 200 mm in width, including the varices. Although generally larger than the *T. pyrum*, it has much thinner body walls and a hollow, spiralling columella. The sutures, however, are quite solidly joined making it possible to produce several circlets from each shell, providing all the exterior spines are first removed.

The most common habitat for this species is on rocky areas or coral reefs and though it has a wide distribution throughout the Indo-Pacific region, its actual distribution along the coasts of the subcontinent is somewhat limited. It is quite common along the southern shore of the Gulf of Kutch, where there are suitably luxuriant reefs, but it becomes quite uncommon further west along the Sindh and Makran coasts. However, one major modern source is noted in the Gulf of Oman around Fahal Island near Muscat (11), though it is either extinct or extremely rare in the Gulf itself. Smythe suggests that its absence in the Gulf is only a recent development, because she has seen well preserved specimens purported to have come from inside the Gulf (12).

Lambis truncata sebae is the most massive shell used at Mohenjo Daro, ranging in size from 200 mm to 300 mm in length and 130 mm to 200 mm in width, including the digitations (13) (fig. 3 b). One of the characteristic features of this genus are 6 or 7 digitations extending form the outer lip. In *sebae* these are not very distinct due to the massive build up of porcellaneous, enamel layers on the outer lip and over part of the spire. The spire itself is well balanced and has a series of small tubercules along the shoulder ridge near the sutures. This form of spire differentiates it from the subspecies *Lambis truncata truncata*, Humphery, which has a flattened truncated spire. As in most gastropods, the columella is solid and spiraling, but it is not as massive as would be expected for a shell of this size. In fact, except for the heavy accumulations on the outer lip, the remainder of the shell is quite thin, and the sutures are relatively weak.

This species is also gregarious, and large numbers are found on sandy or coral rubble bottoms, especially on the seaward side of the reefs (14). Occasionally, specimens can be found washed up on the reefs, and in South Indian waters they are common in shallow weedy bottoms.

There has been some confusion regarding the distribution of this subspecies, due to the occurrence of the flat-spired subspecies *truncata* in an intervening geographical region. *Sebae* is basically found throughout the Pacific region and then again along the western coasts of the Indian subcontinent from Kutch to the Makran. It is also reported from the Gulf of Oman, the Red Sea and Smythe feels that there is a possibility that it does occasionally occur inside the Gulf (15). *Truncata* on the other hand is found from South Indian waters across the Indian Ocean to Zanzibar and the east coast of Africa (16).

Fasciolaria trapezium is similar in form to the *T. pyrum*, but slightly more elongate, reaching 200 mm in length and 150 mm in width (fig. 3 a). A series of short nodes or tubercules is located on the shoulder of the spiraling whorls and the spire is well balanced. Although the columella is solid, spiraling and massive, it can be distinguished from that of the *T. pyrum* by the presence of two or three low columellar ridges or folds. Traces of the thick periostracum are often fused in the center of the columella and in the spiraling sutures, resulting in a less homogeneous columella and weak sutures.

Occurring in habitats similar to the *T. pyrum*, these two species are often found together on sandy bottoms (17). In some regions however, *F. trapezium* occurs around rocky areas or reefs, where it is exposed to the predations of burrowing organisms. Most specimens found at Indus sites are badly damaged by their interlacing burrows.

Unlike the *T. pyrum*, this species has a widespread distribution, and is common throughout the Indo-Pacific region. Along the coasts of the Indian subcontinent, it is found from South India to Kutch, with occasional specimens reported from the Sindh and Makran coasts. Like the *C. ramosus* it is found in the Gulf of Oman around Fahal Island and off the coast from Muscat (18), but it is quite rare or possibly extinct in the Gulf itself (19).

(11) Bosch and Bosch, 1982 : 89.
(12) Smythe, 1982 : 59.
(13) Abbott, 1961 : 156.

(14) *Ibid.* : 155.
(15) Smythe, 1984, pers. comm.
(16) Abbott, 1961 : 156.
(17) Hornell, 1951 : 27.
(18) Bosch and Bosch, 1982 : 107.
(19) Smythe, 1982.

Pugilina buchephala is smaller and less elongate than *F. trapezium*, and has a similar series of nodes or tubercules on the exterior. It ranges from 75 mm to 100 mm in length and 50 mm to 70 mm in width. The columella is solid and spiraling, but there are no traces of any columellar ridges, distinguishing it from both *F. trapezium* and *T. pyrum*. A thick periostracum covers the exterior of the shell, and like the *F. trapezium*, this periostracum becomes pinched between the sutures and in the columella as the shell grows. Due to this weakening of the sutures, circlets made by cutting diagonally across the whorl tend to break at the suture point.

This species is found on rocky areas or reefs, from the intertidal zone to depths of about 10 meters. Distributed throughout the Indo-Pacific region, it is common along the Sindh and Makran coasts, in the Gulf of Kutch and along the remainder of the subcontinent. Its occurrence in the Gulf is not confirmed (20).

Marine bivalves did not play an important role in the shell industry at inland sites, but they were very important at Harappan coastal sites, particularly at Balakot (21).

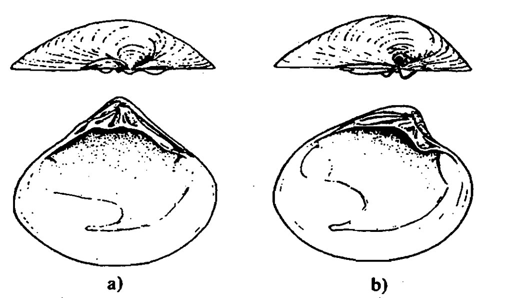

FIG. 4. — **Bivalves.**
a) ***Tivela damaoides*** **(Gray).**
b) ***Callista impar*** **(Lam.).**

Tivela damaoides, (Gray) is a large heavy shell, having two equal sized, sub-triangular valves (fig. 4 a). These shells prefer to live in sandy areas with little mud, and require fresh clean salt water. They are usually found on the open beaches at the mouths of estuaries, where they are exposed to strong tidal currents. Average adult specimens range from 80 to 90 mm by 30 to 50 mm. There is considerable confusion over the distribution of this species because of its similarity to other Venerid clams. The author has examined specimens from the Sindh and Makran coasts west of Karachi, as far as Pasni. It is also reported from the Arabian coasts from the Gulf of Oman to the east coast of Africa (22).

Two additional species were occasionally used along with the *T. damaoides* in the production of bangles, but due to their lighter structure and asymmetry, they can generally be distinguished from the former species.

(20) *Ibid.*
(21) DALES and KENOYER, 1977.
(22) SMYTHE, 1982 : 105.

Meretrix meretrix is usually slightly smaller than *T. damaoides* and has a distinctive hinge structure that is slightly skewed towards the anterior margin. This species is found in similar habitats as the *T. damaoides* but has a widespread distribution from the Arabian/Persian Gulf to the Gulf of Kutch and along coasts of the entire Indian subcontinent.

Callista impar is similar in shape and size to the *M. meretrix*, but again, it is distinguished by its peculiar hinge structure (fig. 4 b). This species is also asymmetrical, being skewed towards the anterior margin. Unlike the previous two species, these shells are found further back in estuaries and lagoons, living in muddy sand and covered by brackish water. Their distribution is not well documented, but the author has examined specimens from the Sind and Makran coasts west of Karachi, as far as the mouth of the Gulf. Their occurrence in the Gulf itself is not confirmed, but since similar habitats do occur in the Gulf, it is probable that reported specimens may have been confused with *Meretrix meretrix*.

Keeping in mind the variable distributions and habitats of these species, we can see that a wide range of marine eco-systems were being exploited by the Indus peoples in their collection of food and suitable raw materials. Clams were being gathered from protected lagoons and estuaries by digging in the sand at low tide; some gastropods such as *Lambis truncata sebae* and *Chicoreus ramosus* were probably collected from reefs and rocky areas by wading and submerging at low tide; while others such as *Turbinella pyrum* and *Fasciolaria trapezium* were being obtained by divers who may have been using reed or wooden boats. The fishing seasons for the intertidal species could have extended throughout most of the year, but the use of boats and diving was probably limited by seasonal weather conditions, such as the monsoons. Present day weather conditions do not appear to have changed drastically since the 4th and 3rd millennia B.C. (23), so the ancient shell fishing season probably followed the same pattern as the modern shell fisheries in Kutch and South India. These fisheries begin around April and continue through June, until the onset of the monsoon storms, after which they continue from October to the beginning of January.

The collection of shells is relatively simple once they have been located, but the sea is not a gentle playground and it contains numerous other creatures that must be respected and avoided. Sharks do not pose a grave problem to divers, since collection areas are in relatively shallow water and large sharks do not normally haunt these regions. However, several species of poisonous fish and snakes inhabit the coral reefs, along with moray eels, and when the wind blows them inshore, there are the extremely poisonous *Pysallia* (Portugese Man-o-War) and the *Chrysaora* "jelly-fish" (24).

(23) RAIKES and DYSON, 1961.
(24) HORNELL, 1914 : 20.

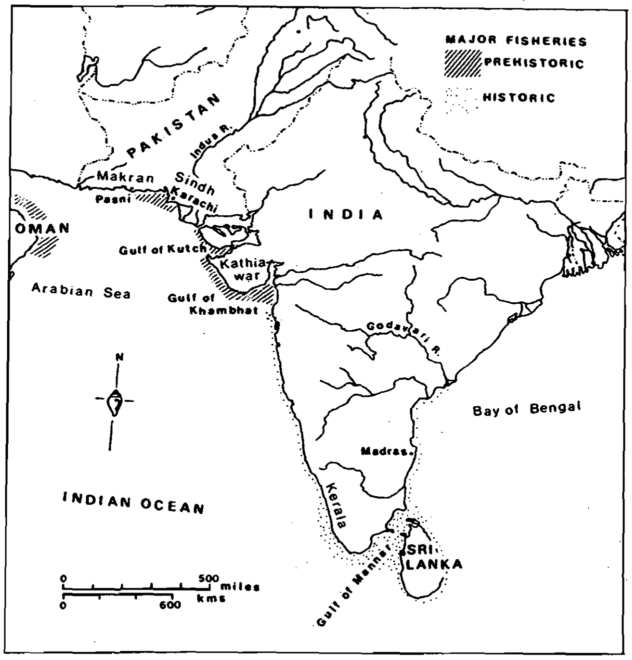

FIG. 5. — Distribution of major shell fisheries.

Very little research has been done at the coastal sites of the Indus Civilization, regarding subsistence patterns and social organization (25), but it is probable that the collection of shells was a part of the subsistence strategy of those coastal populations specializing in the exploitation of marine resources, and was not done by the specialists who actually manufactured the shell objects. It is not improbable that at the coastal sites of Balakot, Allahdino, Nageshwar, or Lothal, for example, there may have been a close relationship between shell collectors and shell workers, but at larger inland centers they were undoubtedly quite removed from one another, both physically and socially.

THE SHELL INDUSTRY

Having briefly discussed the raw materials and their probable source areas, we can now turn to the discussion of the shell industry as it is seen in different types of sites. The largest variety of shell objects and shell species is seen at the large urban center of Mohenjo Daro, therefore I have used this sample as the reference point from which to compare the industries at other sites. During my research over the past three years it has been possible to examine and record over 2800 shell artifacts collected during the early excavations and the more recent surface surveys at the site (26). These artifacts have been classified on the basis of morphological and possible functional variables (27) and for general reference can be grouped into eight basic categories :

1) Finished Ornaments
2) Unfinished Ornaments and Manufacturing Waste
3) Finished Utensils
4) Unfinished Utensils and Manufacturing Waste
5) Finished Inlay
6) Unfinished Inlay and Manufacturing Waste
7) Other Special Objects
8) Unfinished Objects and Manufacturing Waste.

Ornaments

The most common shell ornament at Mohenjo Daro, as well as at most Indus sites, is represented by shell bangle fragments. These bangles were produced almost exclusively from *T. pyrum*, using a variety of specialized and unspecialized tools. First, the shell was prepared for sawing by hollowing out the interior and breaking the thick columella (fig. 6 a-f). A stone or metal hammer was used to perforate the apex and then a metal pick (or hammer and punch) was used to break the internal septa. Once the shell had been hollowed out in this manner, it was sawn at a diagonal to avoid the aperture and remove the irregular anterior portion (fig. 6 g-i). The remaining hollow spire was then sawn into rough circlets of the desired width (fig. 6 j-k). These circlets were ground on the interior using a cylindrical piece of sandstone or some other type of abrasive tool, while the exterior was probably ground on a flat sandstone slab (fig. 6 m-n).

Most of the finished bangles have an incised design carved into the shell at the point where the suture joins the whorls together (fig. 6 o). The motif is generally in the form of a chevron, "V", which very neatly transforms the natural irregularity of the shell circlet into an attractive design. This design may simply be a special geometric sign or possibly represents a serpent's head, but whatever it was meant to signify, it is found on almost all shell bangles. Usually the bangles are thin and have a basically triangular or peaked section (fig. 10 : 1), but others are quite wide, each bangle being made from a single shell (fig. 10 : 3).

The incised design could have been made using a chert blade or a more specialized copper/bronze file, and a study of the striae suggests that both types of tools were used. Sawing, on the other hand, was not done with stone tools, as has been suggested in the past, but by a highly specialized form of bronze saw. A detailed study of sawing wasters from various Indus sites indicates that the saw had a long convex cutting edge that was extremely thin, between .4 and .6 mm. Usually, this saw was only needed to cut through the thickness of the shell body wall, about

(25) Meadow, 1979.
(26) Kenoyer, 1985 (in press).
(27) Kenoyer, 1983, appendix 2.

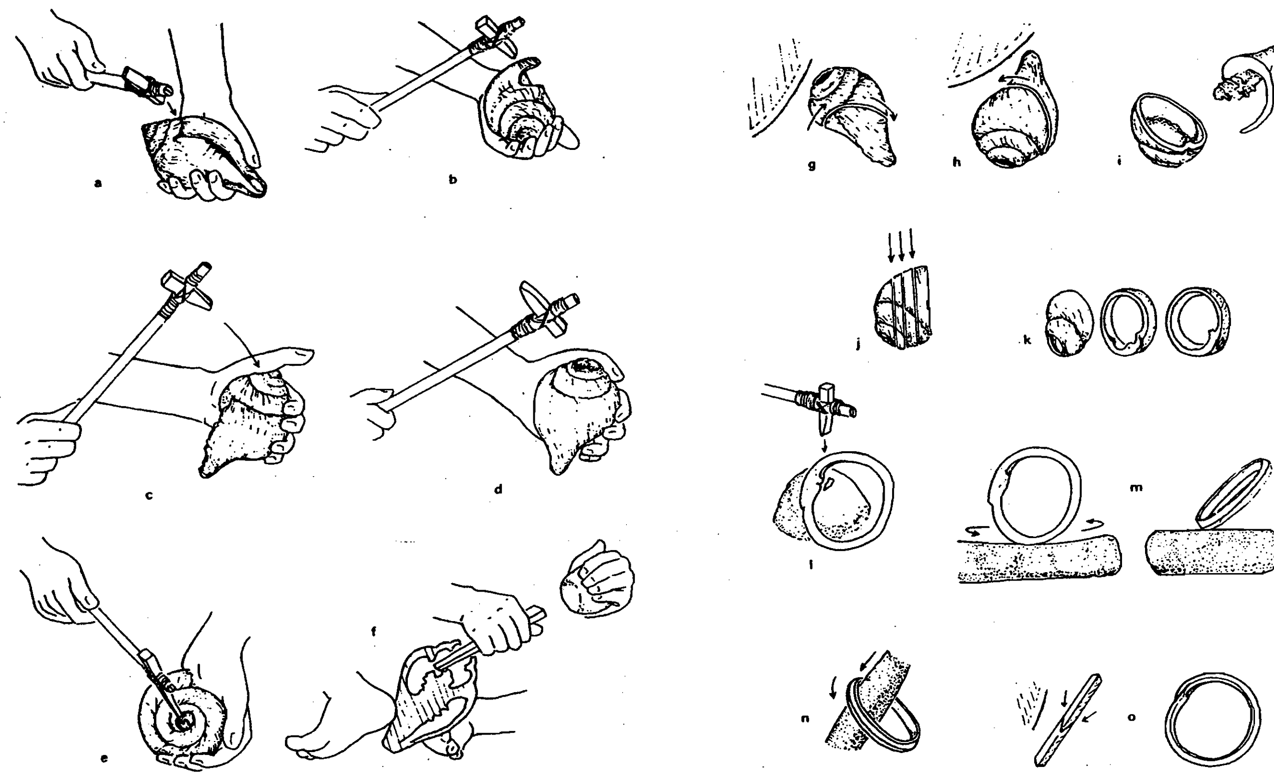

FIG. 6. — Bangle manufacture with *Turbinella pyrum.*

5 to 7 mm, but the maximum recorded depth of the cut is between 20 and 30 mm. The section of the saw edge is generally slightly rounded, and the cutting striae indicate that the saw was bi-directionally denticulate, cutting equally well with each thrust as it was moved back and forth (fig. 6). There is no evidence to suggest that any form of abrasive was used in the cutting process. Several convex saws have been recovered from the earlier excavations, but none of them fit the requirements indicated by the shell wasters. The only ethnographic example of a similar saw is the large crescent saw used by modern shell cutters in West Bengal and Bangla Desh (28).

In addition to *T. pyrum,* two other species, *Pugilina buchephala* and *Chicoreus ramosus* were also occasionally used for manufacturing bangles. It is usually difficult to determine the species of a shell from a small bangle fragment, but if the shell suture is present one can distinguish bangles made from *T. pyrum* — thick, heavy; from those made from *C. ramosus* — thin, twisted (fig. 10 : 2).

Other ornaments made from shell include various sizes of rings, beads, pendants and large perforated discs. With small fragments, it is often impossible to determine the original shell species, but many of the larger shell objects portray characteristic structural features of the original shell. When these structural features are present it is possible to determine which parts of the shell and/or which species were being used for particular purposes. Rings were generally made from the spire portion of the *T. pyrum,* perforated cylinders and tubular beads from the columella, and large convex/concave perforated discs from the body whorl. These large discs were probably worn as ornaments on clothing belts or necklaces and are particularly important because of the presence of identical discs from some sites in Mesopotamia (29). Most of the smaller beads, discs, pendants, etc. were being produced from various of the larger gastropods, with no evidence for the dominant use of any one species.

A wide variety of manufacturing techniques were used to produce the various types of ornaments. Simple beads and pendants were often made by chipping, grinding and drilling, but occasionally saws were used in the preliminary shaping. Many of the smaller circular pieces were made using a tubular drill, which was probably made of copper/bronze. Smaller perforations were made by tiny chert drills using a simple bow drill. Experiments using replicas of these chert drills have shown that a piece of shell 3 mm thick can be perforated in about one minute.

Utensils

Natural shells, particularly bivalves, were commonly used as containers. The presence of black or red stains on the interior of some of these suggests that they were used for holding pigments, but the

(28) KENOYER, 1983, chapter 4.

(29) KENOYER, 1983; GENSHEIMER, this volume, *infra* : 65-73.

occurrence of tiny perforations at the umbo of some examples also suggests that they may have been used for dispensing oils or liquids in controlled portions. The most commonly used bivalves are the attractive ribbed shells that are common in estuaries and sandy/muddy beaches (Families ARCIDAE, CARDITIDAE, CARDIIDAE, etc.). These bivalves are basically unmodified and due to their wide distributions, provide relatively little information about technology or trade and exchange.

The most important utensils produced from shell are the ladles or spoons made exclusively from *Chicoreus ramosus* (fig. 7; fig. 13 : 1). Each of these ladles represents a considerable amount of labor and they were undoubtedly highly prized objects. Prior to sawing the shell, the exterior spires and varices were chipped or ground off (fig. 7 a-b). A diagonal cut was made from the top of the main whorl extending around the shell towards the narrow anterior end (fig. 7 c-d), and a handle was formed by making two parallel, longitudinal cuts extending from the anterior tip towards the main body whorl (fig. 7 e). In this manner, a rough ladle was detached from the body of the shell, and by repeating the process, a second smaller ladle could be produced from the remaining half of the shell (fig. 7 d-e). The exterior surface and sawn edges were then ground and polished, but due to the irregular nature of the natural surface, even finished ladles often have a rough appearence (fig. 7 f). Another apparent defect in the ladles are the numerous holes left by burrowing organisms. Some of these holes actually perforate the body of the shell and were presumably stopped up with some sort of plaster to make the ladle functional. In view of the disproportionate amount of work required to produce these ladles it is not likely that they were used for everyday domestic purposes. Their occurrence in most Indus sites indicates that they were in considerable demand and possibly served some specific socio-ritual function. The first documented use of these distinctive ladles occurs during the Mature Indus period and since they are not found after the decline of the major urban centers, they are important chronological and cultural indicators.

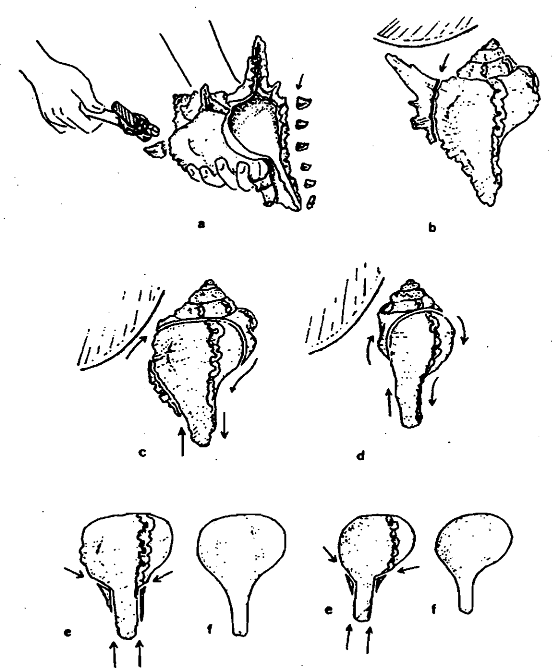

FIG. 7. — Ladle manufacture with *Chicoreus ramosus*.

Inlay

Shell inlay is quite common at Mohenjo Daro and other large urban sites, and the presence of numerous burned fragments suggests that most of the inlay was set in wooden furniture or paraphernalia. It was also occasionally used for decorating statuary and accentuating features, such as eyes (30). On most inlay pieces, the edges have been intentionally bevelled to facilitate setting, which was possibly done with a form of gypsum plaster (31) or bitumen. Some of the incised pieces have traces of red or black pigment in the incised grooves, but we do not know what the overall patterns might have been. If ceramic motifs are any clue we can imagine panels made up of exquisite geometric and floral patterns with the white shell outlined in red and black.

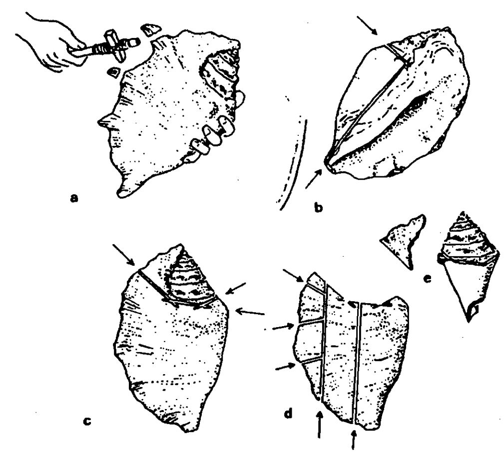

FIG. 8. — Inlay manufacture with *Lambis truncata sebae*.

Due to the small size of most inlay pieces, it is often impossible to determine the species of shell used to make a particular piece, but a study of the shell wasters indicates that all of the large gastropods were used in the production of inlay. Bangle manufacturing waste of *T. pyrum* was recycled to make various flat geometric designs (fig. 11 : 12). *Chicoreus ramosus* fragments were also reused, but it is interesting that on the evidence of the types of manufacturing waste recovered from Mohenjo Daro and Harappa, the species *F. trapezium* was used almost exclusively for the manufacture of inlay

(30) MARSHALL, 1931 : Pl. XCVIII.
(31) MARSHALL, 1931, vol. I : 566.

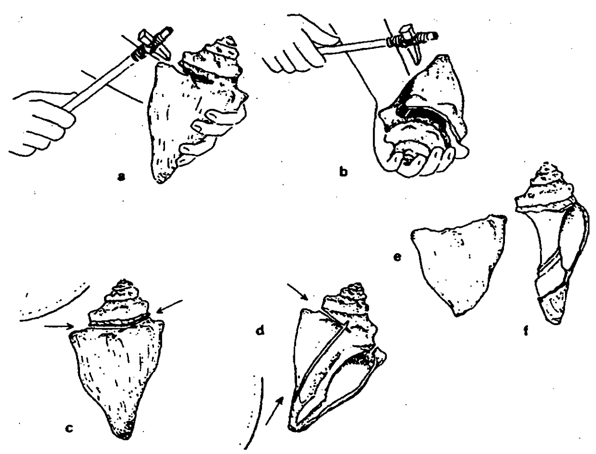

FIG. 9. — Inlay manufacture with *Fasciolaria trapezium*.

(fig. 9). Numerous examples of this shell have been found where only the thick body whorl was removed by chipping or sawing, leaving the columella and spire as waste. The large pieces of body whorl were sawn, chiseled, drilled and ground to produce various geometric shapes. Another species, *Lambis truncata sebae*, was used primarily for making exceptionally large, solid plaques (fig. 8; fig. 11 : 10, 11). The outer lip was sawn into thin sheets or planks that could then be cut into the desired designs. Saw marks on many of the inlay wasters, especially those cut from the *Lambis*, appear to have been sawn by a saw having a flat, rather than convex cutting edge. This saw was also bi-directionally denticulated, but the saw cuts are slightly thicker, indicating that the saw edge was about 7 mm thick (32).

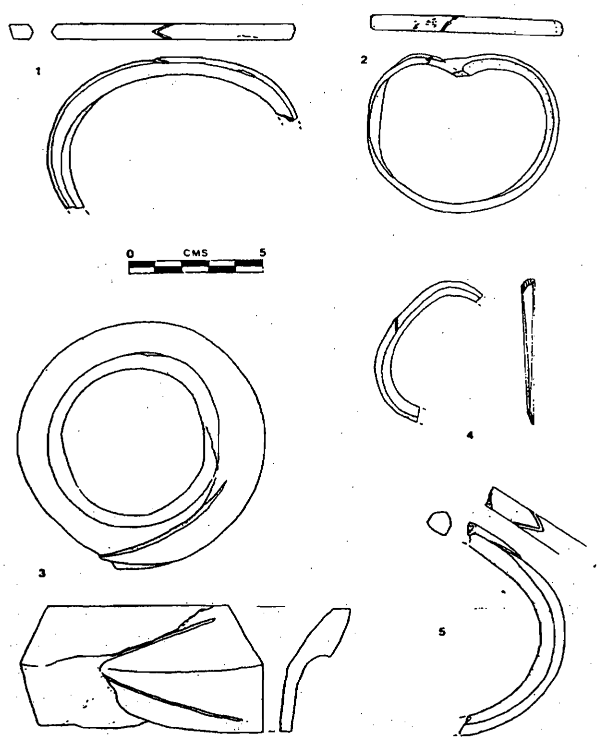

FIG. 10. — Shell bangles

1. Incised bangle. *Turbinella pyrum*.
   Balakot, 3 BLK/Lot 345 (Exploration Branch, Karachi).
2. Incised bangle. *Chicoreus ramosus*.
   Harappa, PWM 1900 (Prince of Wales Museum, Bombay).
3. Incised bangle, *Turbinella pyrum*.
   Harappa B 1578, HM 13828 (Harappa Museum).
4. Incised Bangle, *Tivela damaoides*.
   Balakot 2 BLK/Lot 36 (Exploration Branch, Karachi).
5. Incised bangle, *Tivela damaoides*.
   Balakot 2 BLK/Lot 405 (Exploration Branch, Karachi).

Special objects

This group includes all of those shell objects not covered by the above categories, but only a few of the major types are discussed below because it is not in the scope of this paper to present a detailed discussion of all the different varieties. The craftsmen at Mohenjo Daro were extremely skilled at working shell and they chose different species to produce a wide range of objects that were often made in terra cotta or other materials. Below is a list of the most common objects, and the species from which they were manufactured.

Object	Species and Portion
Cone	*T. pyrum*, columella
Cylinder	*T. pyrum*, columella
Gaming Piece	*T. pyrum*, columella
Sphere	*T. pyrum*, columella
"Wavey Ring"	*T. pyrum*, columella
"Cap"	*T. pyrum*, *F. trapezium* and *C. ramosus*, body whorl and spire
Toy Cart Frame	*L. truncata sebae*, outer lip
Animal Figurines, Bull. Frog. Tortoise, Bird, Gharial	*L. truncata sebae*, outer lip
"Libation" Vessel	*T. pyrum*, entire shell

Most objects in this group are solid, heavy pieces made from the thickest portions of various shells. The massive columella of *T. pyrum* (fig. 11 : 2, 6) was used to produce a wide range of these objects. Numerous pointed cones have been found that are similar to the more common terra cotta cones (33), but unfortunately the examples in shell do not shed any more light on possible uses for this simple object. The columella was also used to make various sizes of solid and perforated cylinders. Many of the solid cylinders appear to be rough-outs for making smaller objects, such as spheres, "gaming pieces" or "wavey rings" (fig. 11 : 3, 4, 5). Other of the large perforated cylinders are smoothed on the exterior, as well as the interior of the hole, presumably from use as ornaments. A few examples from Mohenjo Daro as well as other sites have been decorated with lines or wide ridges (fig. 11 : 7, 8 from Lothal). The absence of any glyptic art on the exterior of shell cylinders suggests that they were not intended as cylinder seals, though shell was commonly used for

(32) Kenoyer, 1983, appendix 3 : 9.
(33) Marshall, 1931 : 476.

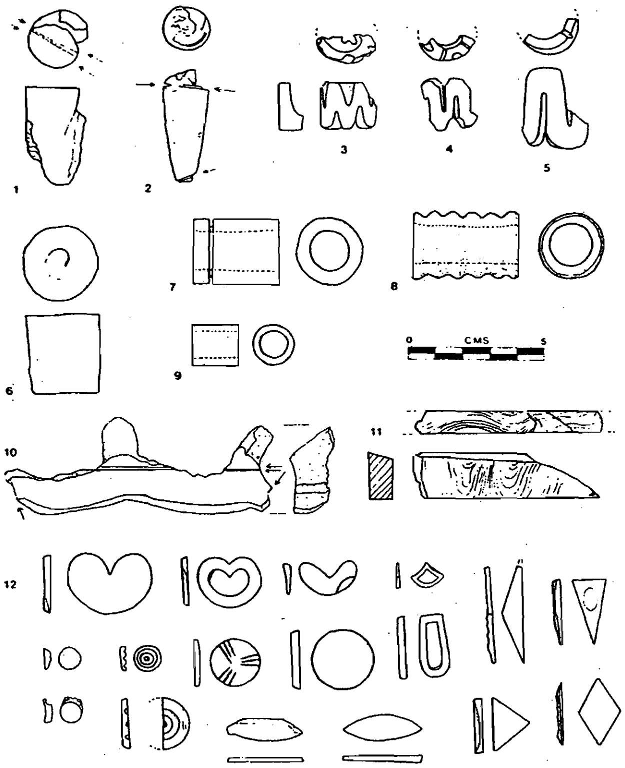

FIG. 11. — Shell rings, cylinders, inlay

1. Sawn columella, *Turbinella pyrum*.
   Mohenjo Daro, Surface Survey 1983 MD/83/196.
   (Exploration Branch, Karachi).
2. Sawn and ground columella, *Turbinella pyrum*.
   Mohenjo Daro, HRE/83/412.
3. Unfinished "wavey ring", *Turbinella pyrum*.
   Mohenjo Daro, DK/83/415.
4. Unfinished "wavey ring", *Turbinella pyrum*.
   Mohenjo Daro, DK/83/546.
5. Finished "wavey ring", *Turbinella pyrum*.
   Mohenjo Daro, HRS/83/110.
6. Unfinished cylinder, *Turbinella pyrum*.
   Lothal, SRG3/2958 (Lothal Museum).
7. Perforated and incised cylinder, *Turbinella pyrum*.
   Lothal, SRG/144 D.
8. Ribbed cylinder, *Turbinella pyrum*.
   Lothal, SRG/333 D.
9. Perforated cylinder, *Turbinella pyrum*.
   Lothal, SRG2/10254.
10. Sawn outer lip, *Lambis truncata sebae*.
    Harappa, HM 13058.
11. Sawn Plank, *Lambis truncata sebae*.
    Mohenjo Daro, MD/83/198.
12. Assorted Inlay, finished and unfinished, species ?
    Mohenjo Daro, Surface Survey 1983.

this purpose in Mesopotamia at this same time (34). Another group of shell cylinders, usually short ones, are smoothed on the exterior, but not inside the hole. These may have been used as components in segmented or composite rods as has also been suggested for the "wavey rings" by Mackay (35). After considerable detailed examination of these artifacts, I would agree with Mackay's interpretation, primarily on the basis of the lack of wear on the interior and the ends of the "wavey rings" and the presence of a high polish on the exterior. The only major problem is that we have found no evidence of a paste or mastic used to join the rings on a central rod, but this discussion must await further research and exploration.

Another intriguing object is the shell "cap". These objects were comprised of two or three convex pieces that theoretically joined together to form a low, flat-topped dome. The exteriors are incised with single or parallel grooves that were often filled with red coloring. So far, however, no matched sets have been recovered and their function is still a mystery. They were made from three different species, *T. pyrum* (fig. 12 : 6), *F. trapezium* and *C. ramosus* (fig. 12 : 7).

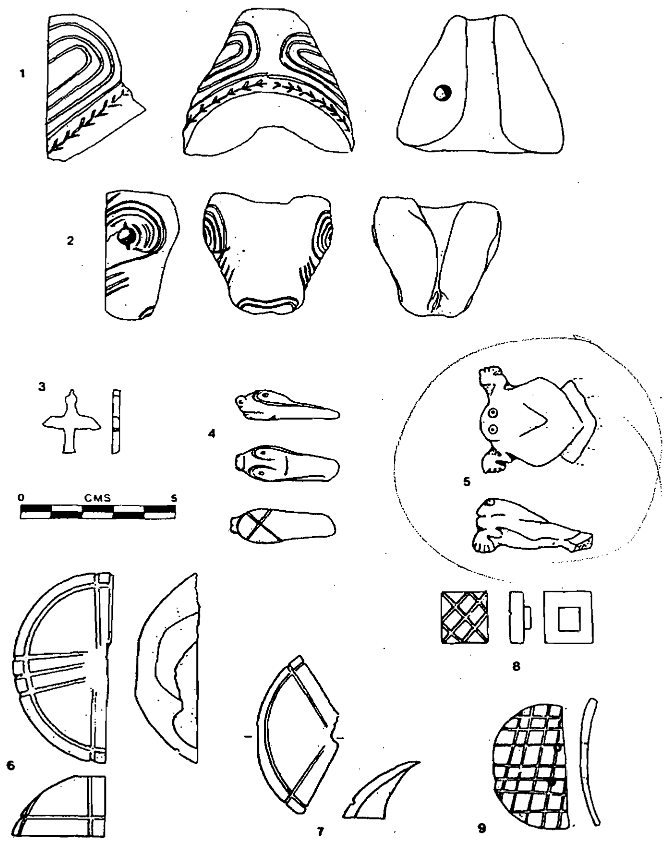

FIG. 12. — Shell figurines, caps, seals

1. Composite bull figurine, Hump, *Lambis truncata sebae*.
   Mohenjo Daro, L Area # 78 1, (Mohenjo Daro Museum).
2. Composite bull figurine, Head, *Lambis truncata sebae*.
   Mohenjo Daro, DK Area #5923, MM 913 (Mohenjo Daro Museum)
3. Bird Figurine, flat inlay, species ?
   Mohenjo Daro, MM 937.
4. Snake and tortoise head, *Turbinella pyrum*.
   Mohenjo Daro, SD area #3307.
5. Frog figurine, *Lambis truncata sebae*
   Mohenjo Daro, DK area # 95.
6. "Cap", 1/2 type, *Turbinella pyrum*.
   Mohenjo Daro, MN/83/72.
7. "Cap", 1/3 type, *Chicoreus ramosus*.
   Lothal, SRG/977.
8. Square seal, unperforated boss, *Turbinella pyrum*.
   Lothal, SRG/8976.
9. Button seal, circular, *Turbinella pyrum*.
   Lothal, SRG2/7105.

(34) see GENSHEIMER for discussion; this volume *infra* : 65-73.
(35) MARSHALL, 1931 : 475.

Although the columella of the *T. pyrum* is massive, it is not quite as large as the outer lip of *Lambis truncata sebae,* and most figurines and toys were made from this shell. Generally, the thick digitations on the edge of the outer lip were sawn off to make the head of bull figurines (fig. 12 : 1, 2). These figurines were often made in two parts, the head and the hump. No other body parts have been discovered yet, and it is possible that these objects were attached to a rod as a carved standard or possibly set into the pommel of a tool/weapon. Other types of figurines include birds, snakes, frogs (fig. 12 : 3, 4, 5), gharials, tortoises, etc. The carving on all of these objects is so exceptional that one can only assume that Mackay was speaking in a different context when he suggests that the shell workers of Mohenjo Daro were not so "adept" as the Sumerians (36).

One other group of special objects deserves special mention, particularly because its significance has been overlooked in the earlier reports. These are called "shell receptacles" by Mackay and he mentions that "In Sumer similarly smoothed shells were used as drinking cups or for libations or ablutions" (37). It should be emphasised that the examples from Mohenjo Daro are all made from *Turbinella pyrum,* while in Mesopotamia they are almost exclusively made from *Lambis truncata sebae.* Furthermore, the incised motifs on the Indus vessels are significantly different from those on the Mesopotamian ones. The Indus vessels were carefully made by chiseling out the interior septa and massive columella by way of the aperture, thereby leaving the apex intact. The hollow shell was then ground on the exterior to remove the natural shell surface and finally incised with simple grooves. Generally the apex was decorated with a spiral groove or a set of three rings, while the aperture was outlined with a single or double groove (fig. 13 : 2, 3, 4). On many of the examples red coloring is still visible in the grooves and it is possible that other designs may have been painted on the white shell. With regard to the function of these vessels, it could be suggested that they were used as lamps, but there is no evidence of burning at the edges. Similar, unincised shells are used in South India today to milk-feed infants or administer medicine to the ailing. More elaborate and carefully incised vessels are made in Bengal and used throughout South Asia for special ritual libations. Because of their special manufacture and shape, which is particularly suited to pouring some form of liquid, it is highly probable that the Indus vessels were used in some specific ritual function and therefore I have called them "libation vessels" in order to distinguish them from domestic utensils. Further discussion regarding the possible socio-ritual function of these and other shell objects, such as bangles and inlay, will be continued below.

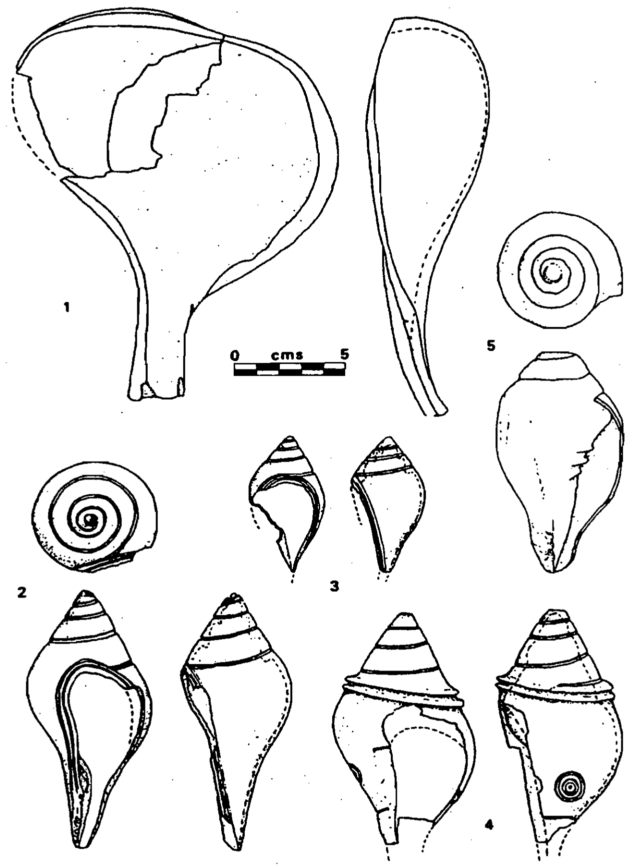

FIG. 13. — Shell ladle, libation vessels, trumpet

1. Ladle, heavily worn, *Chicoreus ramosus.* Mohenjo Daro, E/83/99.
2. "Libation vessel", *Turbinella pyrum.* Mohenjo Daro, DK area #8538 (Mohenjo Daro Museum).
3. "Libation vessel", *Turbinella pyrum.* Mohenjo Daro, HR area #5726 (Mohenjo Daro Museum).
4. "Libation vessel", *Turbinella pyrum.* Mohenjo Daro, HR area #3517 (Mohenjo Daro Museum).
5. Trumpet, *Turbinella pyrum.* Harappa, R. 2332 (Lahore Museum).

Returning now to the discussion of the shell industry, the evidence of numerous manufacturing wasters and a wide variety of finished artifacts indicate that Mohenjo Daro had specialized workshops for the production of ornaments, inlay, utensils and various special objects. A detailed study of the percentages of manufacturing waste to finished objects, along with the size of specific manufacturing areas suggest that the industry was gauged for local markets within the city itself or at the most, for local markets that had close economic ties with the urban center (38). One interesting feature is seen in the low percentage of ladle manufacturing waste compared to a high percentage of finished pieces. This pattern suggests that many of the finished ladles at Mohenjo Daro were being brought to the site from other manufacturing centers.

On the basis of the reconstruction of ancient shell resource areas presented above, the raw shells used

(36) *Ibid.* : 568.
(37) *Ibid.* : 1931 : 569.

(38) Kenoyer, 1983 : 199.

at the workshops were being collected from three major source areas; the Karachi coast, which supplied *Turbinella pyrum* and *Pugilina buchephala;* the Gulf of Kutch, which supplied the previous two species as well as *Chicoreus ramosus*, and the Gulf of Oman, which is the probable source for *Fasciolaria trapezium* and *Lambis truncata sebae*. The recent discovery of a Harappan potsherd with graffiti in the Harappan script from the site of Ra's Al-Junayz in Oman (39) may indicate that this area had close contacts with Harappan sites across the Gulf, and raw shells may have been one of the important commodities in this trade/exchange.

The raw shells were probably brought to Mohenjo Daro along riverine trade routes or possibly overland. Some of these raw shells were undoubtedly traded further inland, but the production of finished shell artifacts was gauged for regional rather than extra-regional trade. Consequently, the shell industry at Mohenjo Daro does not appear to have been of critical importance to the overall economy at the site.

Other large urban centers of the Indus Civilization had very similar shell workshops with only minor variations depending on the availability of raw materials. The site of Harappa is some 825 km to 875 km from the Karachi or Kutch resource areas and about 460 km northeast of Mohenjo Daro. This great distance from the sea is reflected by less variety in the range of shell species (smaller gastropods and bivalves) and a lower frequency of shell objects in general (40). Nevertheless, the types of shell objects manufactured at the site were basically identical to those made at Mohenjo Daro and all of the major shell species were used, including *Lambis* and *Fasciolaria*. Ladles were also being manufactured at the site, but again, the percentages of manufacturing waste to finished pieces suggests that many of the finished ladles were being brought to the site from other manufacturing areas. The only difference in the types of artifacts is seen in the absence of "libation vessels" and the presence of what appears to be a trumpet, made from *Turbinella pyrum* (fig. 13 : 5).

At Harappa the nature of shell production is quite similar to that seen at Mohenjo Daro, with specialized workshops catering to the needs of the local population and not for external trade.

Another major collection that I have been able to study is from the site of Lothal. This important urban center is located right on the Gulf of Khambhat and though it is only one half the size of Mohenjo Daro, its shell workshops produced a similar variety of objects; ornaments, inlay, ladles, and special objects such as button and stamp seals (fig. 12 : 8, 9). No examples of the "libation vessel" have been reported from this site. The important difference between this site and Mohenjo Daro is the fact that only *Turbinella pyrum* and *Chicoreus ramosus* were used as raw materials. One explanation for the absence of *Lambis* and *Fasciolaria* could be that these species were not very common in the Gulf of Kutch during the 3rd millennium B.C., and that the major urban sites in the central Indus valley had exclusive contacts with the major sources off the coast of Oman. Another interpretation could be that there was a regional preference for local raw materials and no demand for objects made from the large *Lambis* shell. In terms of ladle manufacture, Lothal has a slightly higher percentage of manufacturing waste to finished objects, which may be due to the accessibility of *Chicoreus ramosus* in the nearby Gulf of Kutch. A detailed analysis of the overall percentages of waste to finished objects, and the nature of the manufacturing areas within the site suggests that Lothal, like Mohenjo Daro and Harappa was not a major shell manufacturing center, but had specialized workshops that manufactured goods only for the local market.

In contrast to these large urban centers, the small site of Nageshwar (250 × 300 m) on the southern shore of the Gulf of Kutch (fig. 1) provides a good example of a major shell working site. This site had been partly exposed by contractors who needed earth for building a dam (41).

In the process of their excavations they exposed many stone foundations, Mature Indus period pottery and a vast quantity of shell manufacturing waste. On the basis of preliminary analysis of these artifacts it appears that the site was a coastal manufacturing center that specialized in the production of shell bangles and ladles. The bangles were made primarily from *Turbinella pyrum* and occasionally from *Chicoreus ramosus,* but the ladles were made only from the latter species. A few of the bangle fragments are of finished bangles, but the majority are unfinished pieces in various stages of manufacture. No finished ladles have been recovered yet, though large quantities of unfinished fragments are present. These factors combined with the fact that no inlay, beads or other special objects have been found, suggest that the production at this site was oriented primarily towards supplying regional sites with finished or semi-finished bangles and ladles. Some of these objects may have also been produced for the larger urban centers in the central and northern Indus plain. Recent excavations by the Maharaja Sayajirao University, Baroda, have confirmed the findings of the preliminary surface survey (42).

One other site that is extremely important for understanding the regional variations in production and distribution of shell objects, is the coastal site of Balakot. Located on Sonmiani Bay, west of Karachi, this site had access to a wide range of molluscan resources that were used for subsistence as well as

(39) Tosi, 1982.
(40) Kenoyer, 1983 : 202.
(41) Bhan and Kenoyer, 1983.
(42) Bhan, 1984, pers. comm.

raw materials in specialized industry. *Turbinella pyrum* was locally available and used primarily for manufacturing shell bangles, but beads and smaller objects were also being produced. The important feature of the Balakot industry is the use of bivalves, *Tivela damaoides*, etc. for producing shell bangles that are almost identical to those made from *T. pyrum* (fig. 10 : 4-5) (43). In contrast to the highly efficient technique of sawing the large gastropods, only one bangle could be made from each valve, through a tedious process of chipping and grinding. The presence of these two technologies during the same period raises many questions about the nature and structure of Indus economy and production. Metal tools were undoubtedly an expensive commodity, particularly the specialized saws needed to cut hard shells. At most Indus sites, these tools were probably available only to those craftsmen who were supported or controlled by more affluent individuals. In the context of Balakot, however, the presence of an alternative mode of production using locally available tools and raw materials, allowed the production of comparable finished products, i. e. *Tivela* bangles. The stimulus for this alternative production is extremely difficult to define, but one possibility is a regional market demand that was not being met by the "high tech" workshops. Basically, the only investment required to produce *Tivela* bangles was time and lots of patience.

The presence of a market demand for *Tivela* bangles raises the important question of identifying the market. Were these ornaments being made for local consumption or for trade to the adjacent regions ? No *Tivela* bangles have been reported from sites in the central or northern Indus valley, but there are examples at sites along the western Coast at Sutkagen Dor, Sotka Koh, Shahi Tump and to the east at Allahdino (44). The distribution of these bangles appears to reflect a system of coastal exchange networks that were not dependant on networks in the lower Indus plain, and were similarly unrelated to the seaboard trade between the urban centers of the Indus valley, the Gulf region and Mesopotamia. Further evidence for this intra-regional level of trade and exchange can be seen in the absence or rare occurrence of shell species from the Gulf of Oman, or the Gulf of Kutch.

Summary

Following this brief discussion of the context and nature of shell industries at specific sites, several important features can be pointed out regarding the role of shell working and shell objects in the Indus Civilization. Raw materials used in the production of shell objects were being procured from three geographically distinct resource areas. The use of specific shell species at different sites reflects their proximity to these source areas, as well as their control over the access and distribution of these materials. On the basis of these factors, we can postulate a complex hierarchy of interaction spheres and trade systems within the Indus Valley. The major urban center of Mohenjo Daro had direct contact with all three distinct source areas and the primary raw materials were distributed further inland to the site of Harappa. A decrease in the quantity of primary raw materials and the variety of secondary species at the site of Harappa can be attributed to its greater distance from the source and the intervening transshipment at Mohenjo Daro. Smaller urban sites in the lower Indus plain and along the western coast had access only to those species available from the eastern and western seabord. This access was limited to semi-finished or finished artifacts, as in the case of *C. ramosus* ladles at Balakot. In the eastern region most sites had access to both *T. pyrum* and *C. ramosus*, but there was evidently some contact with the western coast since one *Tivela* bangle fragment has been found at Lothal (45).

Stratification in the trade of raw materials and the movement of finished goods is also reflected in the shell industry. Different types of shell working techniques were necessary to produce various objects, and at each site, the role of this industry is slightly different. Nonetheless, an overall pattern can be seen in the industry at the major urban centers such as Mohenjo Daro, Chanhu Daro, Harappa, and Lothal. At these sites we see a wide variety of objects being produced primarily for markets within the city or at the most for nearby rural sites, e. g. Cholistan sites. Smaller rural or coastal sites like Allahdino, Balakot and Nageshwar produced only a limited range of artifacts. At Balakot the intensive production of *Tivela* bangles appears to have been gauged towards a limited regional market along the Western coast. Nageshwar, however, seems to have been specialized in the production of bangles and ladles primarily for trade to regional and extra-regional markets.

In contrast to this specializations between sites, the basic manufacturing technology was quite standardized. A specific technique for chipping and cutting the shells was used in all of the distant workshops and even the thickness of the copper/bronze saw blade was identical. Although there was some regional variation in the widths of bangles, they were all incised with the same chevron motif, and this tradition continued throughout the Mature Indus period. The only change in this style is seen during the Late Indus period at the sites in Kutch and Kathiawar. Other artifacts such as ladles, shell caps, gaming pieces and even inlay designs show a remarkable uniformity between the distant regions.

These similarities in artifact types and style of decoration undoubtedly reflect specific uses related

(43) Dales and Kenoyer, 1977.
(44) Dales and Kenoyer, 1977; Kenoyer, 1983 : 225.
(45) Kenoyer, 1983 : 231.

to the common cultural and socio-ritual role of shell objects. The question remains, how can we better understand these cultural traditions ? Shell artifacts have been found in basically every imaginable context; from dumps to habitation areas, on sculptures and in burials. No pattern has been discernable in their occurrence in burials, so we can assume that their association with other funerary offerings is more or less coincidental. Bangles, beads, pendants and perforated discs, etc. were undoubtedly used for personal adornment, but was their use related to a culturally defined socio-ritual quality of the shell, or was it just for ornamentation ? Ladles made from the spine covered *C. ramosus* required an unproportionate amount of labour for use as domestic utensils, and yet their occurrence at almost every Indus site indicates that someone or some group of people required them. Were they used by affluent individuals as symbols of status and wealth, or did they function in some specific ritual ? Imitations made in clay suggest that they were of considerable value and in high demand. Similar questions can be raised regarding the finely incised shell containers or "libation" vessels from Mohenjo Daro (and Chanhu Daro), and the trumpet from Harappa.

All of the objects except for *C. ramosus* ladles are presently used in South Asia for various domestic and institutionalized rituals where the shell functions as a protective or purifying agent. Evidence for the antiquity of these rituals can be traced back to the Early Historic period (c. 600 B.C.) and to earlier textual references in the Hindu Epics. In view of the continuity of shell working traditions from the Mature Indus period to the Early Historic period in Kathiawar, it is suggested that some of the socio-ritual uses of shell in the later period may have had their roots in the Indus Civilization. By this I do not mean that there is any direct relationship with specific Hindu or Buddhist ritual traditions, but rather that there was a continuity in the abstract concept relating to the ritual purity of the white shell.

Other important socio-economic questions can be raised from our observations of varied levels in production and overlapping but distinct trade/exchange networks. What groups were involved in the collection of raw materials and were they related to the artisans who manufactured the shell objects ? In view of the necessary specialization involved in marine exploitation, i. e. knowledge of proper source areas, diving, boating, etc., the shell collectors and fishermen probably formed a distinct social group. Shells and other marine commodities were probably exchanged for agricultural products and objects that required specialized production, such as pottery, metal and cloth.

The internal trade/exchange systems that were used to distribute raw shells to distant inland sites were undoubtedly quite complex, and by looking only at shell artifacts it is not possible to make conclusive statements regarding their economic or political structure. My study of modern shell collectors and shell workshops in modern India (46) suggests that the acquisition/distribution of raw materials is closely related to the production and distribution of finished objects. Coastal sites, such as Balakot and Nageshwar, obviously had direct access to the raw materials, and it is not unlikely that the shell collectors and the shell workers were closely related socially. However, specialization in production would eventually result in a sharp distinction between the two groups. At Balakot, this distinction could be represented by the presence of two radically different methods of production.

Distribution of raw materials and finished goods from the coastal sites to the inland manufacturing centers was probably defined by social ties between the major shell working communities. The existence of such social connections would explain the uniform technology used in shell productions and the standard types of designs. In the larger urban centers, the distinction between shell collectors and shell workers would have been even more pronounced, and possibly certain individuals or families were more involved in trade than production.

The main emphasis of this study has been on the role of shell working within the Indus Civilization and not on the trade of Indus shell objects to other regions. It should be pointed out though, that *Turbinella pyrum* and certain shell objects of Indus origin were being transported to Mesopotamia, probably through the intervening Gulf region. Whether or not this trade was through direct contact, i. e. traders from one region travelling to the other, or through the activities of middlemen, is still undecided. One of the main problems in comparing the shell artifacts from the Indus Civilization with those used in Mesopotamian sites is that shells in Mesopotamia have been poorly studied and inadequately published. In an attempt to clarify some of the problems in such comparative studies, Gensheimer (47) has contributed some important new observations relating to the species of shells used in Mesopotamia and their possible source areas.

In the past, the potential information available from shell objects was not fully recognized, and in this study I have tried to demonstrate the vast amount of information that can be retrieved through problem oriented studies of material culture. There are still many unanswered questions regarding the complex socio-economic structures of proto-historic urban civilizations, but there are also many more categories of objects that have yet to be properly studied.

(46) Kenoyer, 1983, chapter 4.

(47) Gensheimer; this volume, *infra* : 00-00.

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Jonathan Mark KENOYER
Department of South
and Southeast Asian Studies
University of California
Berkeley, California 94720, U.S.A.

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