

Quarries in Harappa

Paolo Biagi*

Department of Asian and North African Studies, Ca' Foscari University – Venice, Venezia, Italy

Flint was the most important raw material exploited by the third millennium BCE Bronze Age inhabitants of the Indus Valley and its related territories. Although the importance of this siliceous stone, apart from very few exceptions (Cleland, 1987; Hoffman & Cleland, 1977; Inizan & Lechevallier, 1997; Kenoyer, 1984), has rarely been pointed out even in the most recent publications on the subject (see, for instance, Lahiri, 1992, 2005; Possehl, 2002; Ratnagar, 2004; Wright, 2010), nevertheless, the research carried out mainly during the last 30 years in the Rohri Hills in Upper Sindh (Biagi, 1997), Ongar and the neighboring hills (Biagi, 2005; Biagi & Nisbet, 2011), and Jhampir (Biagi & Nisbet, 2010; Biagi 2011; Ozcelik, Közem, & Kartal, 2011) in Lower Sindh and also in the artisan workshops of the metropolis of Mohenjo-daro (Bondioli, Tosi, & Vidale, 1984; Vidale, 2000; Vidale, Siviero, Sidoti, Guida, & Priori, 2013) has shown the fundamental role played by flint in the wider context of this highly developed urban civilization of the Indian subcontinent.

Although the Rohri Hills have been known since the end of the 1970s as a raw material source (Allchin, 1976), systematic surveys and excavations in the region were undertaken only in the 1990s, after the discovery of impressive clusters of Indus age flint mines in the limestone terraces east of the Shrine of Shadee Shaheed made in 1986 (Biagi & Cremaschi, 1991), by the Ca' Foscari University of Venice (Italy) and the Shah Abdul Latif University, Khairpur (Sindh, Pakistan: Biagi & Starnini, 2011; Biagi & Shaikh 1994; Starnini & Biagi, 2011). The first to report the presence of flint artifacts from this region was Blandford (1880, p. 103), who, in his *Geology of Western Sind*, describing the flat tops of the Rohri Hills south of Rohri, wrote, “The surface of the limestone consists in general of a series of low slopes, corresponding in direction to the dip of the rock. The flints weather out and cover the surface throughout a large area; cores and flakes split from them being scattered about in abundance in some places” (Fig. 1). The same author mentions the recovery of “some flint cores, from which flakes have been chipped, obtained from Lieutenant Twemlow, R. E., in the bed of the Indus. The cores were remarkable for their regularity” (Blandford, 1880, p. 20), although the same author suggested that the cores found in the Indus were manufactured from people different from those who had chipped their tools on the hills around it. These latter cores were first illustrated by Evans (1866 p. 434) who was “superintending excavations connected with a canal, near Shikarpoor, in Upper Scinde.” Furthermore, Blandford (1880, p. 20) reports that “large quantities of flint cores have been found near Sukkur and Rohri, and there is a good collection in the Geological Museum Calcutta” (Figs. 2 and 3).

Apart from the rediscoveries made by Cousens (1929) and De Terra and Paterson (1939), Allchin (1976, p. 477) of the University of Cambridge visited the northernmost edge of the hills, near Rohri, in December 1975. Here she noticed “extensive Harappan working floors on the top of several of them,” which were illustrated by the same author in some of her papers (Allchin, 1979, 1999, pp. 291–292), where she describes each of them as “an area large enough for a man to sit cross-legged,” which “had been completely cleared of stones” (Allchin, Goudie, & Hedge, 1978, p. 276).

*Email: pavelius@unive.it

*Email: paolo.biagi@unive.it

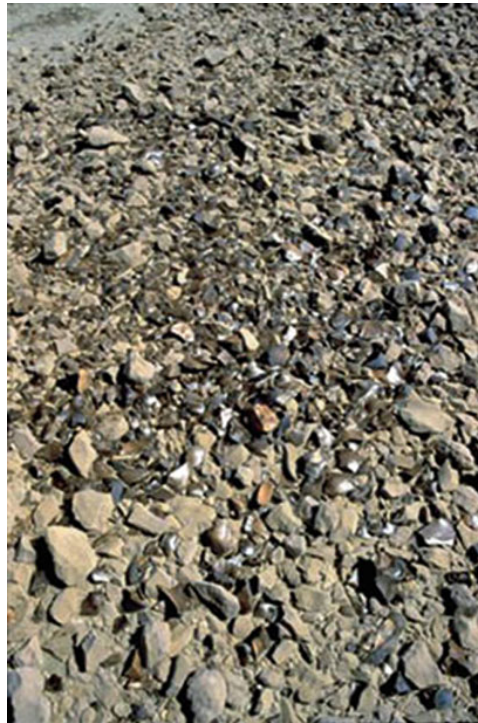


Fig. 1 A Harappan flint workshop mainly composed of debitage flakes



Fig. 2 The Indus at Rohri

Before the complete destruction of this important archaeological area, due to industrial quarrying (Biagi, 2007), I visited the limestone mesas south of Sukkur in April 1985 and again in January 1986, when groups of large flint mines were discovered by me and Professor M. Cremaschi of Milan University in the Shadee Shaheed terraces (Figs. 4, 5, and 6).



Fig. 3 Fishermen flat-bottomed boats in the Indus at Sukkur



Fig. 4 The hill to the east of the Shrine of Shadee Shaheed where the first Harappan flint quarries were discovered in 1986

The Rohri Hills

The Rohri Hills, which are some 40 km long and 16 wide, extend in a north–south direction between the course of the Indus and the cities of Sukkur and Rohri, in the north, and the westernmost fringes of the Thar Desert, in the south (Fig. 7), which, in this part of the country, is very rich in salt-lake basins (Figs. 8 and 9). The hills consist of fossiliferous limestone rocks of the Brahui formation attributed to the Middle Eocene/Early Oligocene period, very rich in seams of good quality flint (Blandford, 1880, p. 103), which attracted the prehistoric populations at least from the Early Paleolithic Acheulian period onwards (Biagi & Cremaschi, 1988; Biagi, Kazi, & Negrino, 1996; Biagi, 2008; Fig. 10). They separate two very different environmental regions, the Indus Valley to the west and the Thar Desert to the east. Their eastern fringes are lapped by the Nara Canal, which



Fig. 5 A concentration of debitage flakes along the edge of a Harappan flint quarry-pit on the Shadee Shaheed Hills



Fig. 6 The circular appearance of a flint quarry-pit at Shadee Shaheed

flows inside the old bed of the Hakra–Ghaggar River. The hills are limestone mesas (Fig. 11), dissected by erosion and deeply incised by old river courses (Fig. 12).

As mentioned above, the surveys carried out in 1986 led to the discovery of groups of Indus flint mines and workshops in the Shadee Shaheed area of the hills (Biagi & Cremaschi, 1991). Here, the most impressive structures were located along the edges of the limestone plateau (Fig. 13). From the surface the mines consisted of almost circular empty areas, representing the mine pits, filled with



Fig. 7 The southwestern fringes of the Rohri Hills partly covered by the Thar Desert sand dunes



Fig. 8 A salt-lake basin near the caravan city of Thari, south of the Rohri Hills

aeolian sand, blown from the Thar Desert dunes, and heaps of limestone block, deriving from prehistoric mining activity (Fig. 14). All around these structures, flint workshops were noticed (Fig. 15), represented by scatters of flint flakes and blades among which were typical Indus-elongated blade cores and characteristic bullet cores with very narrow bladelet detachments (Fig. 16). During the same survey, it was possible to observe that large areas of this part of the hills had already been highly damaged by illegal activities carried out by limestone quarriers (Figs. 17 and 18) and that even wider devastations were in progress by modern industrial limestone quarrying (Fig. 19). Nevertheless, it was possible to notice that the area covered by the presence of groups of prehistoric mines was very wide and extended all over the central–western region of the hills. Indus Civilization mines were discovered also in the valleys of the internal mesas (Fig. 20).



Fig. 9 The high sand dunes surrounding the salt-lake basin of Sāin Sim



Fig. 10 Acheulian bifaces on the surface of a workshop near the tomb of Ziarāt Pir Shabān on the Rohri Hills



Fig. 11 The western fringes of the central part of the Rohri Hills

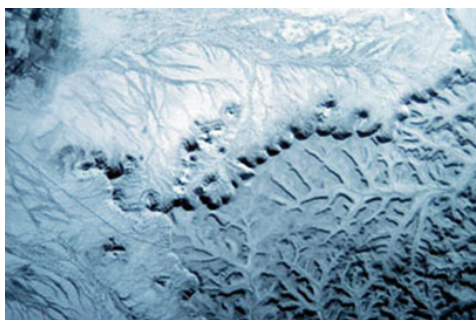


Fig. 12 An aerial view of the Rohri Hills at Shadee Shaheed and their very corrugated system



Fig. 13 Professor Cremaschi positioning the first Harappan flint quarries at Shadee Shaheed in January 1986

The Excavation of Mine RH862

The excavation of mine RH862 was carried out between 1995 and 1998 (Starnini & Biagi, 2011). This mine lies along the western edge of the Shadee Shaheed Hills, some 3.5-km south of the shrine that bears the same name (Fig. 21). “The site is part of an impressive, wide ring-shaped group of features, some 120 m in diameter, related to a Harappan flint mining activity area” (Starnini & Biagi, 2005, p. 1). The mine was surrounded by several flint scatters and workshops (Negrino, Ottomano, Starnini, & Veesar, 1996), one of which was connected with the production of narrow bladelets from typical bullet cores (see Fig. 16). As mentioned above, the excavation was carried out during four fieldwork seasons. It was aimed at understanding the mining techniques employed by the Indus Civilization workers and the understanding of its chronological attribution. Thanks to the discovery of two small pieces of *Zyzyphus* cf. *nummularia* charcoal it was possible to obtain an AMS radiocarbon date of the excavated pit. It gave the result of $3,870 \pm 70$ uncal BP (GrA-3235), which attributes the structure to the mature Indus Civilization (Biagi, 1995). The excavation covered an area of some 60 m² down to a depth of 1.5 m, where the floor reached by the Indus workers was found (Fig. 22), inside which dozens of extractive holes containing flint nodules still in situ (Figs. 23



Fig. 14 Aerial view of part of the main system of Harappan, flint quarry-pits on the hills near Shadee Shaheed



Fig. 15 Very wide, circular concentration of Harappan debitage flakes near Shadee Shaheed

and 24) were discovered (Starnini & Biagi, 2005, Fig. 4). The excavation did not yield any metal or other extractive tool which might have been employed for breaking the fissured limestone and reaching the flint seam. In contrast, it produced a huge amount of flint debitage (Fig. 25) and several hammerstones and cores from the same material. On the basis of the field observations, “the preparation of the precore rough-outs was most probably performed inside the quarry trench, or along its edge, as many decorticating flakes, pre-forms and typical crested blade-like-flakes found inside the ditch fill should indicate” (Starnini & Biagi, 2005, p. 5).



Fig. 16 Harappan bullet cores with very narrow bladelet detachments

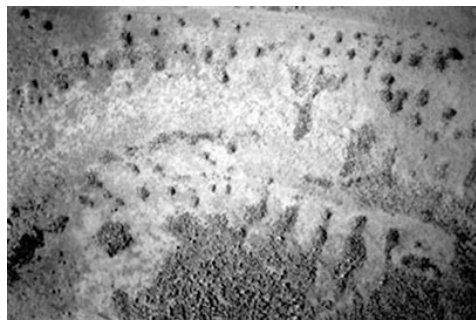


Fig. 17 Large area cleaned by the quarries. The modern heaps of flints are clearly visible



Fig. 18 Modern handmade quarrying along the fringes of the Rohri Hills mesas



Fig. 19 Machine quarrying in the central part of the Rohri Hills as it was in 1999



Fig. 20 An internal region of the central part of the Rohri Hills rich in groups of Harappan flint quarries and workshops

The Ongar, Daphro, and Bekhain Hills

The surveys carried out on the Ongar, Daphro, and Bekhain Hills, south of Hyderabad, some 8 kms north of Jhikar, in Lower Sindh, led to the discovery of other flint-extractive mines also in this region (Biagi, 2005; Biagi & Franco, 2008; Biagi & Starnini, 2008). Indus flint extraction trenches were discovered mainly along the edges of a narrow hill still intact that elongates between Ongar and Daphro. Also a few points of Daphro Hill revealed the presence of flint-extractive systems similar to those observed along the western mesas of the Rohri Hills in Upper Sindh (Figs. 26 and 27). Apart from ditches excavated along the edges of the limestone mesas, the surveys revealed the systematic



Fig. 21 The beginning of the excavation of the Harappan flint quarry-pit 862 in the Rohri Hills



Fig. 22 The flint seam reached by the Harappan miners during the mid-third millennium BCE with many nodules still in situ, ready for extraction at quarry-pit 862



Fig. 23 A large flint nodule discovered in the bottom layer of the excavation carried out at quarry-pit 862



Fig. 24 A small flint nodule prepared for its extraction in the bottom layer of the excavation carries out at quarry-pit 862



Fig. 25 Concentration of flint debitage flakes discovered during the excavation of quarry-pit 862



Fig. 26 A large, Harappan flint workshop discovered in the Daphro Hill in 2006



Fig. 27 Three parallel, Harappan flint extraction trenches opened along the edge of the Daphro Hill



Fig. 28 A long Harappan flint extraction trench excavated along the edge of the Daphro Hill

recurrence of flint workshops (Fig. 28), undoubtedly attributable to the Indus Civilization, as indicated by the presence of characteristic elongate, subconical, flint cores with long blade detachments (Fig. 29). A similar situation has been noticed also along the sides of Bekhain, a low hill, located just to the south of the abovementioned two, where most of the Indus flint mines had already been destroyed at the time of their discovery. At Bekhain Hill, the occurrence of large-sized pre-cores (Fig. 30), already prepared for being transported, is of major interest. Single pre-core specimens have been found also at Mohenjo-daro, the Rohri Hills, and Kahiro Bhandari near Badin (Khan, 1981), close to the Rann of Kutch. This discovery is particularly important because it indicated that not only the final products, such as well-defined types of blades and bladelets, were transported to the major centers of the Indus Civilization for being transformed into instruments for



Fig. 29 Harappan elongated core for the production of long, narrow flint blades with parallel edges



Fig. 30 Harappan flint pre-core already oval-shaped for its exportation to one of the Harappan urban centers of the Indus Valley

craft production around the middle of the third millennium BCE, but also complete, large blocks of flint already prepared for their transport. It is highly regrettable that most of the above important third millennium BCE extractive areas were devastated during the last 50 years by illegal limestone quarrying and that they are also “exploited to produce flint cores and blades, seemingly to decorate private residence walls” by a Karachi enterprise (Biagi & Nisbet, 2011) without any interest by both local- and national-appointed authorities.

Jhimpir

The presence of a flint source in the Ranikot bed northwest of Jhimpir railway station had already been reported by Blandford (1880, p. 153). Although a survey conducted in the area in 2010 did not reveal any important flint seams in situ in the limestone deposits, further investigation conducted south of the above small town led to the discovery of two distinct flint outcrops in two limestone terraces oriented in an east–west direction (Biagi 2011; Biagi & Nisbet, 2010). Further investigations in the area undertaken the following year showed that the same flint seam, although interrupted, continues further to the west, following the same direction. The most evident traces of prehistoric exploitation were recorded on a flat terrace that elongates close to the Larinadi riverbed.

Here, the westernmost part of the mesa is marked with extraction trenches surrounded by workshops marked by the presence of blade cores, debitage flakes, crested blades, and bifacial picks made from the same flint. Good-quality flint seams were observed also at the top of an inclined terrace located about one mile south of the abovementioned one. At present, this seam is exploited on a small scale for industrial purposes.

Considerations

The discoveries made in the Rohri, Ongar, Daphro, and Bekhain Hills and Jhimpir have demonstrated that flint was still extremely important during the flourishing of the third millennium BCE Indus Civilization. Flint was extracted not only from the Rohri Hills quarries but also from other mining areas which were unknown to archaeologists until a few years ago and most probably also from other outcrops still to be discovered (Biagi, 2010, p. 13). During this period, they were traded over long distances at least as far as Harappa, to the north (Law, Baqri, Mahmood, & Khan, 2002–2003), and the Indus cities located along the north Arabian Sea coast, to the south (Gadekar, Ajithprasad, & Madella, 2013). The complicated extractive system, which undoubtedly involved a great number of workers and knappers (flint shapers), and the extraordinary great number of mines discovered on the Rohri Hills indicate that this was undoubtedly a main extractive center and that flint was of primary importance at least during the mid-third millennium BCE mature Indus Civilization. Although the extraction systems have not been fully understood and the trade routes are still poorly known, there is no doubt that the role played by this raw material has so far been underestimated by archaeologists.

Furthermore, as already remarked on many occasions, the damage to a more comprehensive knowledge of the Indus Civilization caused by the systematic devastation, for illegal industrial activities, of most of the aforementioned archaeological areas of Upper and Lower Sindh is remarkable (Dar, 1991; Allchin, 1999, p. 298; Biagi, 2007).

References

- Allchin, B. (1976). Palaeolithic sites in the plain of Sind and their geographical implications. *The Geographical Journal*, 142(3), 471–489.
- Allchin, B. (1979). Stone blade industries of early settlements in Sind as indicators of geographical and socioeconomic change. *South Asian Archaeology 1977*. In M. Taddei (Ed.), *Papers from the 4th international conference of the association of South Asian archaeologists in Western Europe* (pp. 173–211). Naples: Istituto universitario orientale.
- Allchin, B. (1999). Some questions of environment and prehistory in the Indus valley from palaeolithic to urban Indus times. In A. Meadows & P. Meadows (Eds.), *The Indus river biodiversity resources humankind* (pp. 285–299). Karachi: Oxford University Press. Linnean Society of London.
- Allchin, B., Goudie, W., & Hedge, K. (1978). *The prehistory and palaeogeography of the great Indian desert*. London: Academic Press.
- Biagi, P. (1995). An AMS radiocarbon date from the Harappan flint quarry-Pit 862 in the Rohri hills (Sindh-Pakistan). *Ancient Sindh*, 2, 81–84. Khairpur: Shah Abdul Latif University.
- Biagi, P. (1997). www.harappa.com/rohri (Pakistan). O. Khan (Ed.), (San Francisco).

- Biagi, P. (2005). Ongar revisited. *Sindhological Studies*, 25, 5–25. Jamshoro: Institute of Sindhology.
- Biagi, P. (2007). The archaeological sites of the Rohri hills (Sindh, Pakistan): The way they are being destroyed. *Sindhological Studies*, 23, 5–26. Jamshoro: Institute of Sindhology.
- Biagi, P. (2008). The palaeolithic settlement of Sindh: A review. *Archäologische Mitteilungen aus Iran und Turan*, 40, 1–26.
- Biagi, P. (2010). Archaeological surveys in lower Sindh: Preliminary results of the 2009 season. *Journal of Asian Civilizations*, 33(1), 1–42. Islamabad: Taxila Institute of Asian Civilizations.
- Biagi, P. (2011). Late (upper) palaeolithic sites at Jhimpir in lower Sindh (Thatta, Pakistan). In M. Kartal H. Tashkiran, M. Kartal, K. Özçelik, M.B. Közem & G. Karta (Eds.), *Studies in honour of Işin Yalçinkaya* (pp. 67–84). Ankara: Bilgin Kültür Sanat Yaynları.
- Biagi, P., & Cremaschi, M. (1988). The early palaeolithic sites of the Rohri hills (Sindh, Pakistan) and their environmental significance. *World Archaeology*, 19(3), 421–433.
- Biagi, P., & Cremaschi, M. (1991). The Harappan flint quarriers of the Rohri hills (Sindh-Pakistan). *Antiquity*, 65(246), 97–102.
- Biagi, P., & Franco, C. (2008). Ricerche Archeologiche in Balochistan e nel Sindh Meridionale. In S. Gelichi (Ed.), *Missioni Archeologiche e Progetti di Ricerca e Scavo dell'Università Ca' Foscari di Venezia* (pp. 9–18). Rome: Bretschneider.
- Biagi, P. M., Kazi, M., & Negrino, F. (1996). An Acheulian Workshop at Ziarat pir Shaban on the Rohri Hills, Sindh, Pakistan. *South Asian Studies*, 12, 49–62.
- Biagi, P., & Nisbet, R. (2010). The prehistoric flint mines at Jhimpir in lower Sindh (Pakistan). *Antiquity Project Gallery. Antiquity*, 84, 325.
- Biagi, P., & Nisbet, R. (2011). The Palaeolithic sites at Ongar in Sindh, Pakistan: A precious archaeological resource in danger. *Antiquity Project Gallery. Antiquity*, 85, 329.
- Biagi, P., & Shaikh, N. (1994). An Italo-Pakistani joint project in the Rohri hills (Sindh-Pakistan): Aims and perspectives. *Ancient Sindh*, 1, 1–12. Khairpur: Shah Abdul Latif University.
- Biagi, P., & Starnini, E. (2008). The Bronze Age Indus quarries of the Rohri hills and Ongar in Sindh (Pakistan). In R. I. Kostov, B. Gaydarska, & M. Gurova (Eds.), *Geoarchaeology and archaeomineralogy. Proceedings of the international conference* (pp. 77–82). Sofia: St. Ivan Rilsk.
- Biagi, P., & Starnini, E. (2011). Technological choices and lithic production in the Indus period: Case studies from Sindh (Pakistan). *Iranian Archaeology*, 2, 21–32. Waheshi Mina International Institute, Tehran.
- Blandford, W. T. (1880). The geology of western Sind. *Calcutta: Memoirs of the Geological Survey of India*, 17(1), 1–210.
- Bondioli, L., Tosi, M., & Vidale, M. (1984). Craft activity areas and surfac survey at Mohenjo-daro. Complementary procedures for the evaluation of a restriced site. In M. Jansen & G. Urban (Eds.), *Interim reports* (Vol. 1, pp. 9–38). RWTH Aachen: German Research-Project Mohenjo-Daro & Rome: Istituto per il Medio ed Estremo Oriente.
- Cleland, J. H. (1987). Lithic analysis and culture process in the Indus region. In J. Jacobson (Ed.), *Studies in the archaeology of India and Pakistan* (pp. 91–116). New Delhi: Oxford and IBH Publishing.
- Cousens, H. (1929). *The antiquities of Sind*. Calcutta: Archaeological Survey of India.
- Dar, S. R. (1991). From the editor's desk. *Lahore Museum Bulletin*, 4(2), 1–2. Lahore.
- De Terra, H., & Paterson, T. T. (1939). *Studies on the ice age of India and associated human culture*. Washington, DC: Carnegie Institute.
- Evans, J. (1866). On some flint-cores from the Indus, Upper Scinde. *The Geological Journal*, XXVIII, 433–435.

- Gadekar, C., Ajithprasad, P., & Madella, M. (2013). Crested ridge technique and lithic assemblage from Datrana, Gujarat. *Journal of Multidisciplinary Studies in Archaeology*, 1, 16–28.
- Hoffman, A., & Cleland, H. (1977). Excavations at the Harappan site of Allahdino. The lithic industry at Allahdino. A metric and quantitative analysis of an Harappan activity system. *Papers of the Allahdino expedition* (Vol. 2). New York.
- Inizan, M.-L., & Lechevallier, M. (1997). A transcultural phenomenon in the chalcolithic and Bronze Age lithics of the old world: Raw material circulation and production of standardized long blades. The example of the Indus civilization. In R. Allchin & B. Allchin (Eds.), *South Asian archaeology* (pp. 77–85). New Delhi/Calcutta: Oxford and IBH Publishing.
- Kenoyer, J. M. (1984). Chipped stone tools from Mohenjo-daro. In B. B. Lal & S. P. Gupta (Eds.), *Frontiers of the Indus civilization* (pp. 117–132). Delhi: Books and Books.
- Khan, A. R. (1981). “Kot Kori” – A site of Indus civilization in lower Sind. In A. H. Dani (Ed.), *Indus civilization new perspectives* (pp. 43–45). Islamabad: Quaid-i-Azam University.
- Lahiri, N. (1992). *The archaeology of Indian trade routes (up to c. 200 BCE)*. Oxford: Oxford University Press.
- Lahiri, N. (2005). *Finding forgotten cities. How the Indus civilization was discovered*. New Delhi: Permanent Black.
- Law, R., Baqri, R. H., Mahmood, K., & Khan, M. (2002–2003). First result of a neutro activation study comparing Rohri Hills chert to other chert sources in Pakistan and archaeological samples from Harappa. In *Ancient Sindh* (Vol. 7, 7–25). Khairpur: Shah Abdul Latif University.
- Negrino, F., Ottomano, C., Starnini, E., & Veasar, G. M. (1996). Excavations at site 862 (Rohri Hills, Sindh, Pakistan): A preliminary report of the 1995 and 1997 campaigns. In *Ancient Sindh* (Vol. 3, 67–104). Khairpur: Shah Abdul Latif University.
- Possehl, G. L. (2002). *The Indus civilization a contemporary perspective*. Oxford: Altamira Press.
- Ratnagar, S. (2004). *Trading encounters from the Euphrates to the Indus in the Bronze Age*. New Delhi: Oxford University Press.
- Starnini, E., & Biagi, P. (2005). Excavations at the Harappan Flint Quarry 862 on the Rohri Hills (Sindh, Pakistan). *Der Anschnitt*, 19, 1–8.
- Starnini, E., & Biagi, P. (2011). The archaeological record of the Indus (Harappan) lithic production: The excavation of RH862 Flint mine and Flint knapping workshops on the Rohri hills (upper Sindh, Pakistan). *Journal of Asian Civilizations*, 34(2), 1–62. Islamabad: Taxila Institute of Asian Civilizations.
- Vidale, M. (2000). *The archaeology of the Indus crafts. Indus craftspeople and why we study them* (Reports and memoirs. Series minor, Vol. IV). Rome: Istituto Italiano per l’Africa e l’Oriente.
- Vidale, M., Siviero, A., Sidoti, G., Guida, G., & Priori, G. (2013). Three end-scrapers from Mohenjo-daro (Pakistan). In E. Starnini (Ed.), *Unconformist archaeology. Papers in honour of Paolo Biagi* (BAR international series, Oxford: Archaeopress. Vol. 2528, pp. 119–129).
- Wright, R. (2010). *The ancient Indus: Urbanism, economy and society*. New York: Cambridge University Press.