Did Palaeoindian technology persist during the Middle or Late Holocene in central Brazil? A review from the Córrego do Ouro 19 site (GO-CP-17), Goiás state

João Carlos Moreno de Sousa

PPGArq, Museu Nacional, Universidade Federal do Rio de Janeiro. Quinta da Boa Vista s/n, São Cristóvão, Rio de Janeiro, RJ, Brazil. Email: jcmorenodesousa@gmail.com

Abstract:

The Itaparica tradition is a Palaeoindian cultural group identified in northeastern Brazil throughout the Brazilian Central Plateau. Palaeoindian sites are associated to Itaparica tradition because of a large presence of limaces - specific unifacial plan-convex scrapers with multiple active edges. Although some of these artifacts still can be found during the Middle Holocene in the central region of Brazil, the association of the lithic industries to the Itaparica tradition seems problematic because of the low frequency of limaces and the general technological changes on the lithic industry from the Early to Middle Holocene. This article presents a review of the Córrego do Ouro site (also known as GO-CP-17) research and the technological features that make the Itaparica tradition association problematic, such as the rarity of limaces in the region (only one), the lack of Early Holocene dates, and the lack of similarities with the Serranópolis region lithic industry.

Keywords: Itaparica tradition; Middle Holocene; Late Holocene; South America; lithic technology

1. Introduction

The Córrego do Ouro 19 site, also known as "GO-CP-17", is located near Palestina de Goiás, Goiás state, midwestern Brazil (Figure 1). Palaeoindian sites in this region are usually associated with the Itaparica tradition because of the large presence of limaces in the lithic industries. Limaces are specific unifacial scraping tools with multiple active edges, produced from large flakes with a plan-convex profile and an elongated shape (Fogaça & Lourdeau 2008; Moreno de Sousa 2016). Archaeological sites associated with the Itaparica tradition are spread throughout northeastern Brazil and the Central Plateau (for examples, see Araujo 2015; Angeles Flores *et al.* 2016; Calderón 1973; Fogaça 2003; Fogaça & Lourdeau 2008; Lourdeau 2010, 2012, 2015, 2016; Moreno de Sousa 2014, 2016; Rodet *et al.* 2011; Schmitz *et al.* 1989, 2004). This article presents analytical data concerning the lithic technology at the Córrego do Ouro 19 site and its problematic association with the Itaparica tradition.

Moreno de Sousa, J. C. 2016. Did Palaeoindian technology persist during the Middle or Late Holocene in central Brazil? A review from the Córrego do Ouro 19 site (GO-CP-17), Goiás state. *Palaeoindian Archaeology*, 1 (1): 32-49.

Published by Kvasir Publishing
ISSN: 2500-980X. URL: http://kvasirpublishing.com/journals/pa/

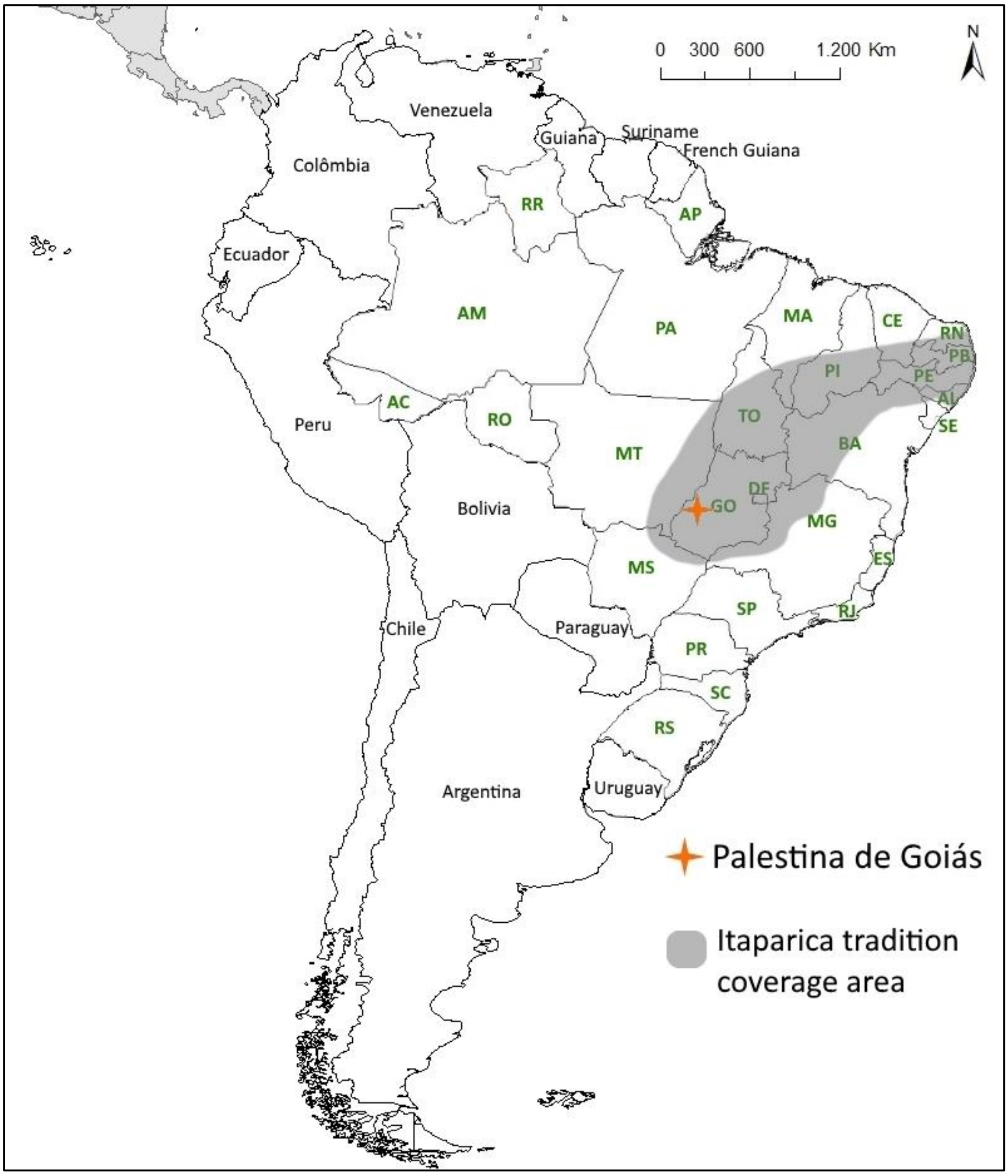

Figure 1. Location of the Palestina de Goiás region and the extent of the Itaparica tradition within South America.

1.1. History of research at Córrego do Ouro 19

The first research at this location was carried out by Pedro Ignácio Schmitz, between 1979 and 1981, during the Caiapônia Project, as part of the Goiás Archaeological Program. At that time, all of the archaeological sites found by Schmitz and colleagues were located in Caiapônia city. Since then, modern political borders have changed and all those sites are now located at within the territory of the city Palestina de Goiás. According to Schmitz *et al.* (1986), the aim of the Caiapônia Project was to study rock shelters with paintings and engravings near the Caiapó River. Schmitz *et al.* (1986) divided the archaeological sites that were found into two main groups: the Córrego do Ouro area and the Torres do Rio Bonito area. This division is not related to any cultural traits but rather by the geographical locations where they are concentrated. All sites identified received the same name of the area they belong to plus a sequential record number. However, all researchers who studied the sites from this region referred to them using the official code from the *Carta Arqueológica - Divisão Regional para Cadastramento de Sítios Arqueológicos de Goiás* (in Portuguese: *Archaelogical Letter of the Regional Division for Archaeological Sites Recording of Goiás State*) (Melo & Breda 1972). In this sense, Córrego do Ouro 19 was mainly referred to as GO-CP-17 in past publications. However, in this publication we refer to the site by the official name registered in the *Cadastro Nacional de Sítios Arqueológicos* (in Portuguese: *Brazilian National Records Database of Archaeological Sites*) (SGPA/CNA/IPHAN 1997).

Schmitz *et al.* (1986) also provided general descriptions of technological features for the lithic assemblage from the Córrego do Ouro 19 site. According to Schmitz and colleagues, lithic analysis took the production processes and the use marks more into account than the morphology of the artifacts. They connected the lithic industry to the Palaeoindian cultural group known as the Itaparica tradition because of the presence of a limace and other unifacial plan-convex scrapers as well as because of general technological similarities to the lithic assemblages identified in the Serranópolis region by Schmitz *et al.* (1989), only 200 km away. It is important to note that no excavations were carried out at that time. Instead, there was only collecting of surface finds. An area of 486 m² was delimited for collection control within each 3 x 3 m square (Figure 2). Schmitz and colleagues also delimited an area for excavation in another site nearby, known as GO-CP 17a.

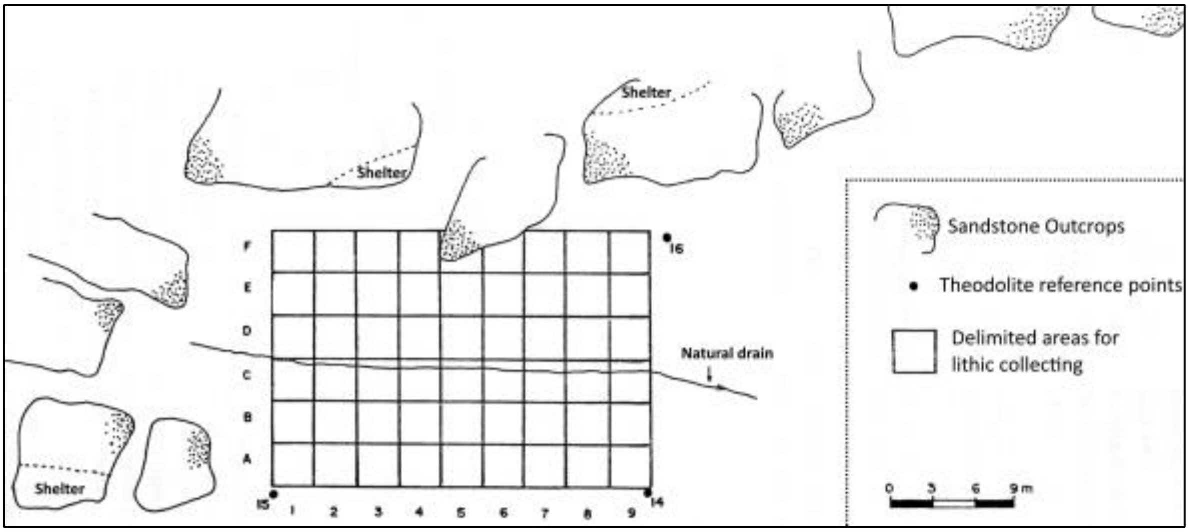

Figure 2. Córrego do Ouro 19 site delimited area for archaeological vestiges collection during 1979 to 1981. Modified from the original by Schmitz *et al.* (1986: 116).

Excavations at the Córrego do Ouro 19 site were carried out by Sibeli Viana from 2007 to 2009, with the objectives of increasing the lithic material sample for analysis, understanding stratigraphy and site formation, and collecting dating samples (Viana 2010). Unfortunately, Viana's research only succeeded in increasing the lithics sample. Viana (2010) described the new collecting system as "total collecting" as opposed to "tendentious collecting" where just the surface materials were collected. After all of the stages of tool productions were identified among the collected lithic materials, (Viana 2010) considered the site to be a lithics workshop. For the excavation, a new delimitation of 64 m² was made, with 2 x 2 squares (Figure 3). The new delimitation did not follow the same delimitation made by Schmitz *et al.* (1986). Viana (2010) justifies that the previous reference points could not be located, since the previous research possibly did not use precision tools for this, and also because there were new goals for the new project. Only 7 out of the 16 squares were excavated. The excavation only reached a 20 cm depth. According to Viana (2010), the proximity of the site to another site nearby, known as Córrego do Ouro 20 (also known as site GO-CP-17a), and the similarity of the artifacts allow them both to be considered as the same site. Viana does not associate the site to the Itaparica tradition.

NBW1 C	NBW1 D	NBW2 C	NBW2 D
NBW1 A	NBW1B	NBW2 A	NBW2 B
NAW1 C	NAW1 D	NAW2 C	NAW2 D
NAW1 A	NAW1 B	NAW2 A	NAW2 B

Figure 3. The delimited area of the Córrego do Ouro 19 site for archaeological excavation from 2007 to 2009. Only grey squares were excavated. Modified from the original by Viana (2010: 25).

During Viana's project, Borges (2009) and Moreno de Sousa (2010) carried out technological analyses of the lithic remains found during excavations. Borges, however, avoids associating the lithics assemblage with the Itaparica tradition. Borges and Moreno de Sousa both applied a method based in the operatory chain notion proposed by Mauss (1936) and Leroi-Gourhan (1965), as well as the notions of lithic technological features of Inizan *et al.* (1995), the notion of techno-functional units (UTFs) of Boëda (1997), and the basic procedures of technical drawing of Dauvois (1976). In this sense, the technological features were useful for the identification of production stages (debitage, reduction and retouch), and for understanding the diachronic organization of the negatives likewise. The transformative UTFs (or "active edges") were also identified based on technological features patterns.

In a more recent study, Borges & Viana (2014) describe the technological features and production stages of only two unifacial plan-convex scrapers from Córrego do Ouro 19, including the single limace found. Finally, Viana *et al.* (2016) provide a general technological description for the lithic remains previously collected by Schmitz and his colleagues from 1979 to 1981 at the Córrego do Ouro 18 and Córrego do Ouro 19 sites. In those both publications the authors reaffirm that the site is not associated with the Itaparica tradition.

1.2. Context

Córrego do Ouro 19 is located close to small rock shelters (no higher than 1 m) with rock paintings and engravings. It is an open-air site, and the archaeological material appears in a sediment layer abundant in quartzite pebbles and small cobbles. This layer is just above the local granite formation, in addition to the sandstone formation of the region, the same one in which the regional rock shelters occur, and was formed over the granite. In this case, it is clear that some event eroded the sandstone at the area of the site and deposited the sediment with quartzite pebbles. It is also important to note that some of the same type of pebbles were identified inside the nearby sandstone outcrops (in small rock shelters). Viana (2010) also points out that the site suffers from pluvial erosion.

The main vegetation at this location is that of the typical *cerrado* (Brazilian savannah), and the area is now used for cattle grazing. Viana (2010) did not provide stratigraphic information. According to the author, the sediment in the archaeological levels is confusing, and the refitting of lithic remains from different levels could indicate an intense occupation or anthropic disturbance of the sediment.

Although dates have never been provided for the site, dates for other sites in the region have. During Viana's research, only one date sample was collected, coming from the Córrego do Ouro 18 (a.k.a. GO-CP-16) site. All the other samples were taken during Schmitz' research. All dates correspond to the period between the Middle and Late Holocene (Table 1). No ceramics were found on the levels older than 1,200 BP in the region. As well, some sites that are younger than 1,200 BP do not present ceramics either. In this sense, Córrego do Ouro 19 is probably no older than 5,436 cal. BP nor younger than 551 cal. BP.

Table 1. Radiocarbon dates from Palestina de Goiás region archaeological sites according to Schmitz (1977), Schmitz *et al.* (1986), SGPA/CAN/IPHAN (1997), and Viana (2010). All dates are before present (BP). (Calibrated dates from CalPal2007_HULU)

Sample code	**Archaeological Site**	**Level**	**Radiocarbon Date**	**Calibrated date**
SI-47239	Córrego do Ouro 03 (GO-CP-05)	20-30 cm	580 ± 50	594 ± 43
-	Córrego do Ouro 18 (GO-CP-16)	28 cm	940 ± 60	853 ± 61
SI-6744	Torres do Rio Bonito 10 (GO-CP-34)	10-20 cm	1,020 ± 65	925 ± 82
SI-6742	Córrego do Ouro 04 (GO-CP-06)	05-15 cm	1,020 ± 40	938 ± 31
SI-6745	Torres do Rio Bonito 08 (GO-CP-32)	20-30 cm	1,200 ± 65	1,134 ± 86
SI-6740	Córrego do Ouro 03 (GO-CP-05)	40-50 cm	2,920 ± 75	3,086 ± 112
SI-6741	Córrego do Ouro 03 (GO-CP-05)	60-70 cm	4,100 ± 65	4,653 ± 121
SI-6743	Córrego do Ouro 18 (GO-CP-16)	40-50 cm	4,455 ± 115	4,623 ± 157

2. The lithics data

Table 2 shows the quantification of lithic remains categories that were identified by Schmitz *et al.* (1986) after surface collecting, and the ones identified in this study after excavations carried out by Viana (2010).

Table 2. Lithic categories and quantification from the Córrego do Ouro 19 site from each research project.

Category	Schmitz's project	Viana's project
Debitage flakes	230	51
Reduction flakes		101
Retouch flakes		79
Anvil support flakes		103
Undefined flakes		160
Detritus	1169	304
Cores	398	25
Tools	22	156
Tools fragments	-	14
Hammer stone	13	17
Anvil stone	1	-
Hammer or anvil stone	1	-
Total	**1529**	**1012**

The category *detritus* is related to lithic remains without platform, bulb, or any feature that could be technologically analyzed.

The main raw material in the assemblage is quartzite (83%), other types being less frequent, such as quartz (11%), sandstone (4%) and flint (2%).

Schmitz *et al.* (1986) also quantified the artifacts and the data presented about their features was aggregated to other assemblages from sites. These sites were identified as "fields of pebbles" by these authors.

3.1. Cores

Schmitz *et al.* (1986) only provided some measurements for the identified cores from the fields of pebbles. The variance of those measurements is shown at Table 3.

Table 3. Technological feature tendencies for lithic cores found at the Córrego do Ouro 19 site, according to data provided by Schmitz *et al.* (1986).

Technological features	Cores (*n*=12)
Length	40-150 mm
Width	30-110 mm
Thickness	20-70 mm

Borges (2009) has identified 24 cores but only analyzed 20, since the others were broken. The author divided the cores into four categories, according to their technological features. No formal cores (*e.g.*, blade, discoid, pyramidal) were identified in the assemblage. Besides the presence of signs of the slicing debitage method which has been identified on flakes, no core related to this method was identified. Core technological features provided by Borges (2009) are shown at Table 4.

Table 4. Technological feature tendencies for lithic cores found at the Córrego do Ouro 19 site, according to data provided by Borges (2009).

Technological features	**Category 1 (*n*=4)**	**Category 2 (*n*=9)**	**Category 3 (*n*=6)**	**Anvil support method category (*n*=1)**
Raw material	Quartzite	Quartzite	Quartzite	Quartz
Length	51-86 mm	32-74 mm	43-76 mm	61 mm
Width	55-102 mm	49-101 mm	50-98 mm	47 mm
Thickness	36-56 mm	34-100 mm	31-73 mm	36 mm
Number of blank negatives	1	1	1-3	-
Negatives length	24-34 mm	30-70 mm	-	-
Negatives width	30-45 mm	25-50 mm	-	-
Negative angle	90-100°	90-115°	95-115°	-

Viana *et al.* (2016) interpret that these cores were tested by technical methods that do not predict initial configuration. In these cases, debitage was made by taking advantage of the core's natural features.

One other core was identified by Moreno de Sousa (2010) from the NBW1 excavation unit (Figure 4). This core is 130 mm long, 90 mm wide and 62 mm thick. There are at least 8 blank negatives in this core, that vary 25-75 mm long and 25-55 mm wide, and the identified angles being 90-110°.

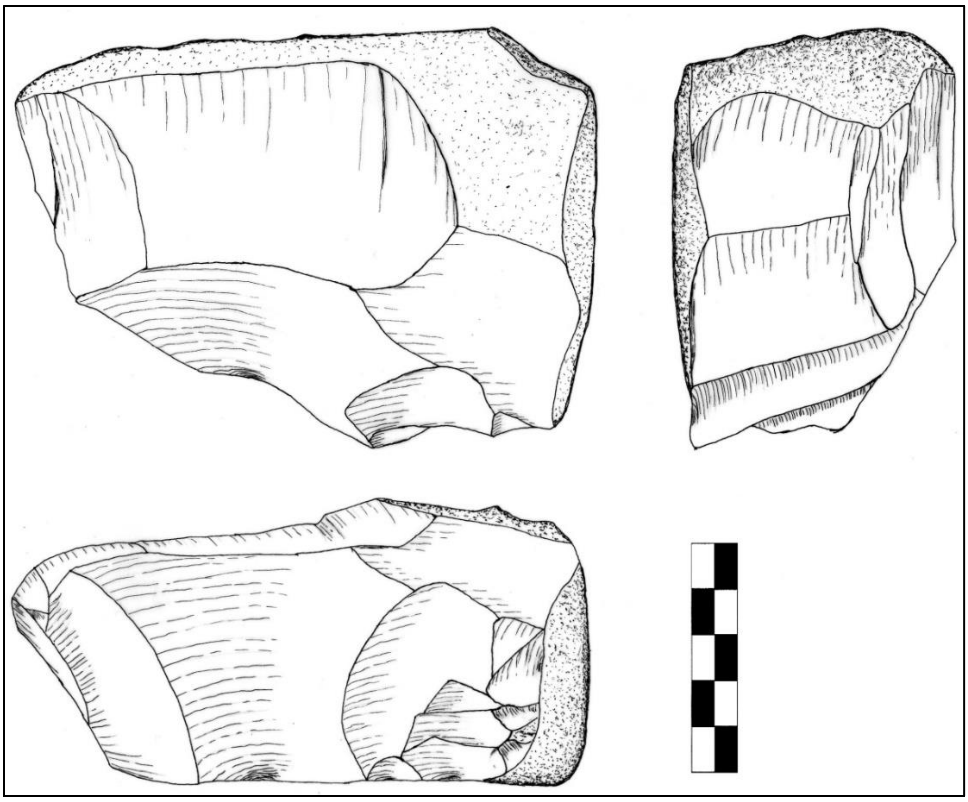

Figure 4. Example of a core from the Córrego do Ouro 19 site, made from a quartzite cobble. Drawing by João Carlos Moreno de Sousa.

3.2. Flakes

Schmitz *et al.* (1986) did not identify flakes based on production stage categories. Instead, flakes were divided into categories related to the presence of cortex. Their technological features are provided in Table 5.

Table 5. Technological feature tendencies for lithic flakes found in the "fields of pebbles" in Palestina de Goiás region, according to data provided by Schmitz *et al.* (1986).

Technological features	**Cortical flakes (*n*=20)**	**Non cortical flakes (*n*=25)**
Raw material	25-99 mm	15-78 mm
Mean length	15-71 mm	09-65 mm
Mean width	05-30 mm	01-23 mm
Platform type	Flat	Flat
Platform thickness	-	-
Platform angle	100-120°	100-120°
Flake form	Undefined	Undefined
Flake side view	Plano-convex	Plano-convex
Number of upper face negatives	1-4	-

Borges (2009) and Moreno de Sousa (2010) identified and provided technological feature information about them (Table 6). Flakes that were identified as products of anvil support flaking (*n* = 103) were not analyzed by the authors, since their technological features are not predetermined by that method. However, both authors provide technological feature data on a specific category of debitage flakes, identified as products of the "slicing" method ("*fatiagem"*, in Portuguese) (Table 6).

Although the slicing method is frequently mentioned in Brazilian archaeological publications (for examples, see: Alves 2010; Rodet *et al.* 2007; Viana 2005), there is no consensus on the definition of the term. This is mainly because similar methods have been identified by the same name in different regions, without taking into account its technological variability. In a general way, the slicing method would be a debitage method for removing flakes from elongated pieces of raw material (for example, pebbles, cobbles, crystals, *etc.*) from one extremity to the other.

Borges (2009) and Moreno de Sousa (2010) also identified some of the debitage flakes as unused blanks - flakes with similar technological features to the tools, but that have not been modified by reduction and retouch nor been used. The technological features of debitage flakes, as well as those of reduction and retouch flakes, provided by the authors were aggregated since both authors applied the same analysis method (Table 6).

Table 6. Technological feature tendencies for lithic flakes found at the Córrego do Ouro 19 site, according to data provided by Borges (2009) and Moreno de Sousa (2010).

Technological features	**Slicing flakes (*n*=28)**	**Blank flakes (*n*=23)**	**Reduction (*n*=101)**	**Retouch (*n*=79)**	**Undefined flakes (*n*=160)**
Mean length	37 mm	59 mm	27 mm	15 mm	30 mm
Mean width	33 mm	50 mm	28 mm	17 mm	30 mm
Mean thickness	11 mm	18 mm	8 mm	4 mm	10 mm
Platform type	Cortical	-	Flat	Flat Linear	flat
Mean platform angle	110°	-	91°	73°	-
Flake side view	-	-	Concave Flat	Flat Concave Helical	Flat Concave Helical
Flake form	Horizontal blade	Horizontal blade	Diverse	Diverse	Square Triangle Blade
Number of upper face negatives	-	-	> 4	2-3	Diverse
Organization of upper face negatives	-	Diverse Cortical	Diverse	Diverse	Diverse

According to Viana *et al.* (2016), flake features indicate that soft hammer would have been used for production of some of the tools, especially the unifacial ones. However, no evidence has been presented.

3.3. Tools

Schmitz *et al.* (1986) identified five scraper categories, or "groups", withing the assemblage of the fields of pebbles. Table 7 shows technological features which they provided. Schmitz and colleagues also identified two bifacial tools which were reduced, retouched, or both, approximately 80 mm long, 53 mm wide and 23 mm thick.

Table 7. Technological feature tendencies for lithic tools found in the fields of pebbles in Palestina de Goiás region, according to data provided by Schmitz *et al.* (1986).

Technological features	**Group I (*n*=15)**	**Group II (*n*=3)**	**Group III (*n*=1)**	**Group IV (*n*=11)**	**Group V (*n*=2)**
Blank type	Flake Flake fragment	Flake Flake fragment	Anvil support core	Flake Flake fragment	Fragment
Length variance	64-104 mm	63-69 mm	43 mm	50-93 mm	76-82 mm
Width variance	26-56 mm	52-65 mm	28 mm	47-61 mm	48-60 mm
Thickness variance	14-27 mm	18-29 mm	11 mm	17-41 mm	21-24 mm
Section	Plan-convex	Plan-convex	-	Diverse	-
Shape	Elliptic	Rectangular	-	Diverse	-
Active edge type	Continuous	Limited	-	Diverse	Beak form

Schmitz *et al.* (1986) associate the technological features of the Group I scrapers category to the Itaparica tradition.

Borges (2009) identified 87, out of the 102 tools, within seven different categories, or "technotypes". Technological features of those tools are presented in Table 8.

Table 8. Technological feature tendencies for lithic tools found at the Córrego do Ouro 19 site, according to data provided by Borges (2009).

Technology features	**Tt. 1A (*n*=23)**	**Tt. 2 (*n*=13)**	**Tt. 3 (*n*=4)**	**Tt. 4 (*n*=7)**	**Tt. 5 (*n*=10)**	**Tt. 6 (*n*=5)**	**Tt. 7 (*n*=9)**	**Tt. 8 (*n*=6)**
Blank types	Pebble Flake	Flake	Flake	Flake	Flake	Flake	Flake	Flake
Mean length	63 mm	55 mm	68 mm	73 mm	73 mm	52 mm	53 mm	69 mm
Mean width	51 mm	48 mm	57 mm	30 mm	72 mm	50 mm	39 mm	37 mm
Mean thickness	47 mm	26 mm	41 mm	23 mm	23 mm	22 mm	13 mm	20 mm
Section shape	Square	Trapezium	Triangle	Triangle	Diverse	Diverse	Diverse	Plan-convex
Reduction	Yes (12) No (11)	Yes	Yes	No	No	Yes (1) No (4)	No	Yes
Retouch	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Active edges	1-4	1-3	2-3	1-2	1-3	1-2	1	2-7
Active edge shapes	Concave Straight Convex	Concave Straight Serrated Denticulate Sinuous Convex	Concave Sinuous Convex Point	Concave Straight Notch	Concave Straight Denticulate Convex	Concave Denticulate	Concave Denticulate Straight Convex	Straight Convex
Active edge angles	65-90°	60-90°	65-85°	65-90°	45-90°	65-85°	55-75°	55-90°
Function	Scraper	Scraper	Scraper	Scraper	Scraper Cutter	Scraper	Scraper Cutter	Scraper Cutter

The other 13 tools analyzed by Borges (2009) were not identified as technotypes since, according to the author, they could not have their blank types identified.

Moreno de Sousa (2010) identified 54 other tools (Figure 5) in the assemblage. However, the author did not create categories for them. Instead, the author describes all the 54 tools one by one. The main technological features of those artifacts are shown in Table 9.

Table 9. Technological feature tendencies for lithic tools found at the Córrego do Ouro 19 site, according to data provided by Moreno de Sousa (2010). Tendency values for length, width and thickness are calculated by mean and standard variation.

Technological features	**Tendency values**
Blank types	Flake (64%)
Length	25-76 mm
Width	27-59 mm
Thickness	08-34 mm
Section shape	Plan-Convex (29%); Convex-Convex (25%); Square (20%); Trapezoid (16%); Triangle (10%)
Reduction	No (70%)
Retouch	Yes (81%)
Number of active edges	One (64%)
Active edge shapes	Denticulate (26%); Straight (20%); Notch (17%); Convex (17%); Concave (11%); Others (9%)
Active edge angles	One (64%)
Function	Scrap 70%

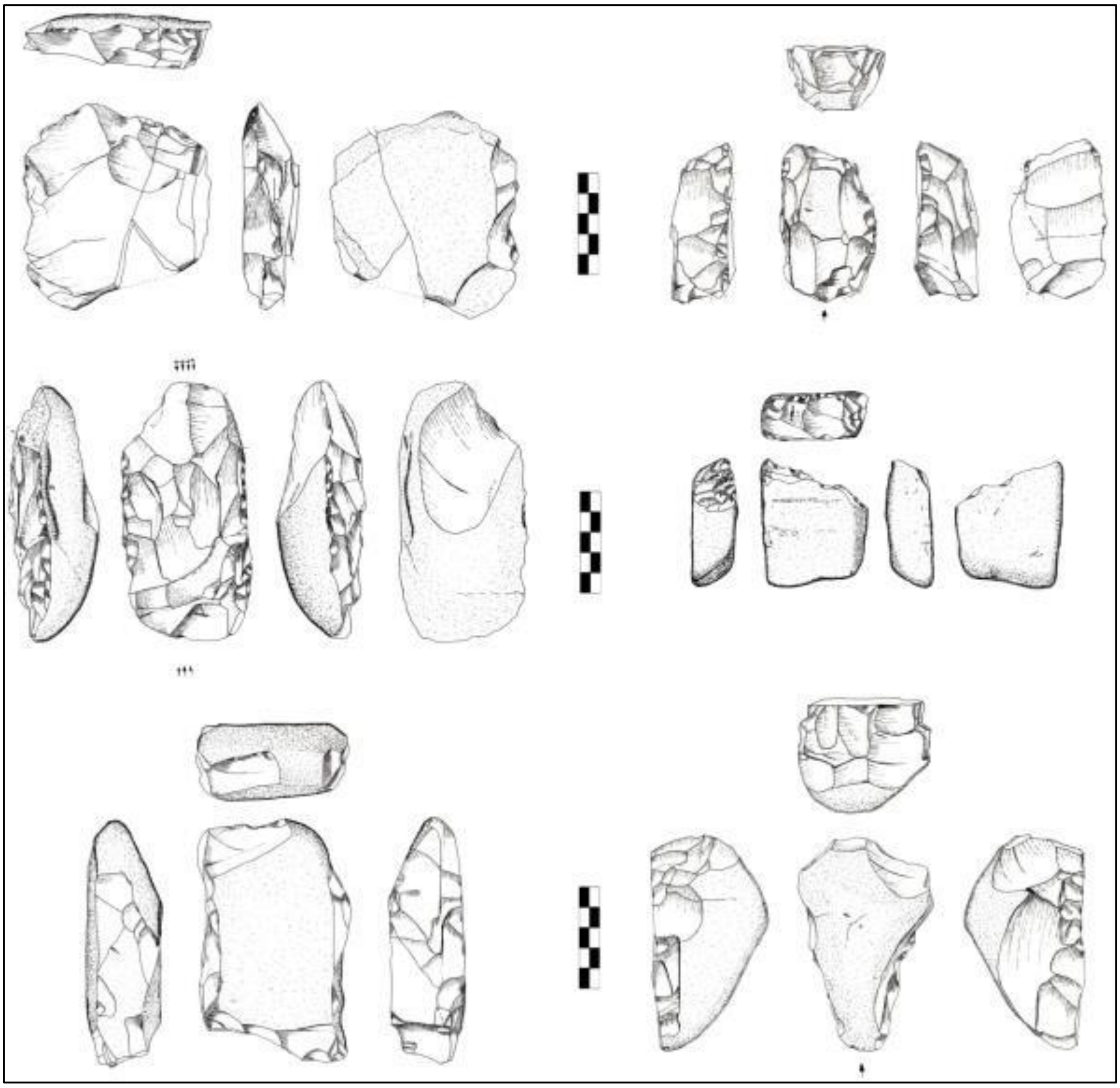

Figure 5. Examples of lithic scrapers from the Córrego do Ouro 19 site, made from quartzite cobbles. Drawing by João Carlos Moreno de Sousa.

Both tools described by Viana & Borges (2014), including the limace (Figure 6), were previously identified by Schmitz *et al.* (1986) as the Group I scraper category, and by Borges (2009) as Technotype 8. The limace is made from a quartzite flake, and measures 92 mm long, 32 mm wide, and 18 mm thick. Information on active edges provided by Borges (2009) and Viana & Borges (2014) are incongruent, since the former describes in detail seven active edges, and the latter describe in detail only two active edges on the extremities of the artifact.

Viana *et al.* (2016) affirm that there are a variety of operatory chains of lithic tool production identified in the assemblage. However, only three of them are described. The first is the "asymmetrical technical structure tool production" composed of eight tools; the second operatory chain is the production of tools by unifacial reduction using a very flat surface for knapping, and was identified in 9 artifacts including the limace (Figure 6); finally, the third operatory chain, identified in 29 tools, is the square (in the original: *modular*) pebble reduction.

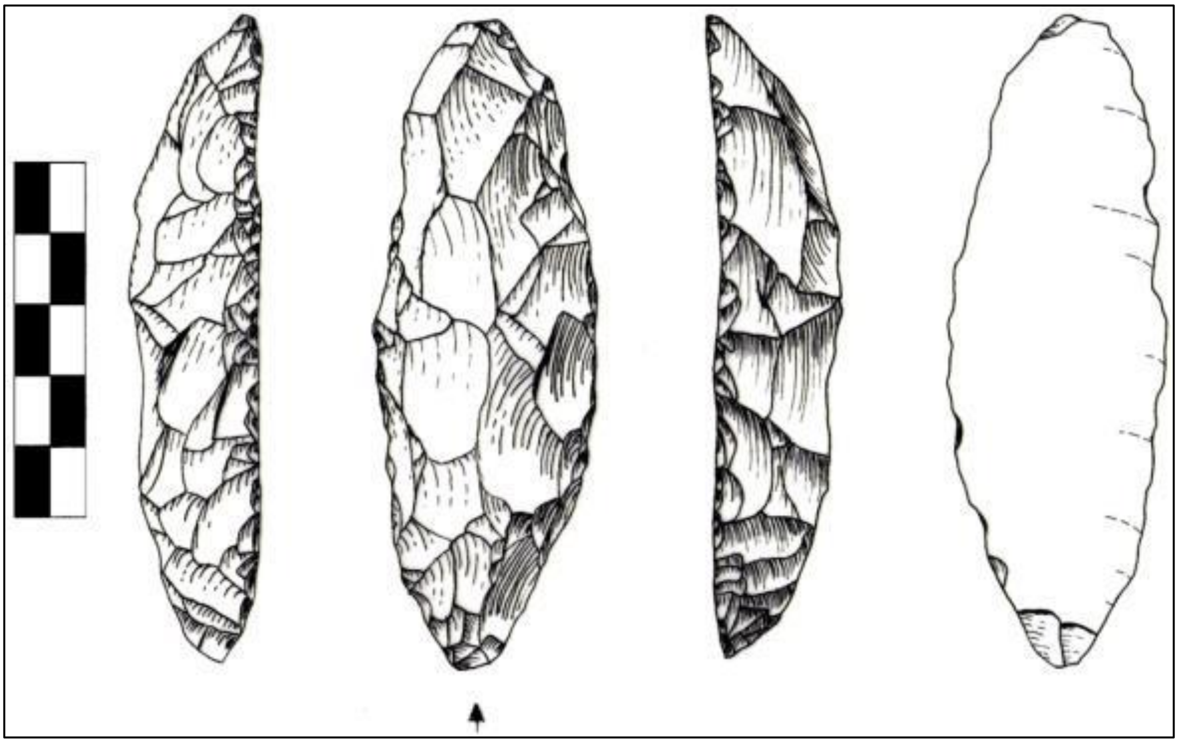

Figure 6. Limace found at the Córrego do Ouro 19 site during the 1979-1981 collections. Drawing by João Carlos Moreno de Sousa.

3.4. Hammer and anvil stones

According to Schmitz *et al.* (1986), hammer stones were identified as local pebbles and cobbles with percussion marks. Some of those hammers also presented marks of anvil percussion. Hammer and hammer-anvil stone features provided by the authors are shown in Table 10.

Table 10. Technological feature tendencies for hammer and hammer-anvil stones found in the fields of pebbles in Palestina de Goiás region, according to data provided by Schmitz *et al.* (1986).

Artifacts features	Hammer stones	Hammer-anvil stones
Length	40-180 mm	60-100 mm
Width	30-100 mm	50-100 mm
Thickness	Non provided	35-80 mm
Shapes	Round Elliptical	Round and flat

Using the same methods, Borges (2009) identified 10 hammer stones and provided their size and weight measurements. In the same way, Moreno de Sousa (2010) identified 7 other hammer or anvil stones (Figure 7), and also provided the same measurements. The tendencies of those measurements are shown at Table 11.

Table 11. Measurement tendencies for hammer or anvil stones found at the Córrego do Ouro 19 site, according to data provided by Borges (2009) and Moreno de Sousa (2010). Tendency values are calculated by mean and standard variation.

Artifacts features	Tendency values
Length	40-87 mm
Width	33-64 mm
Thickness	21-44 mm
Mass	12-428 g

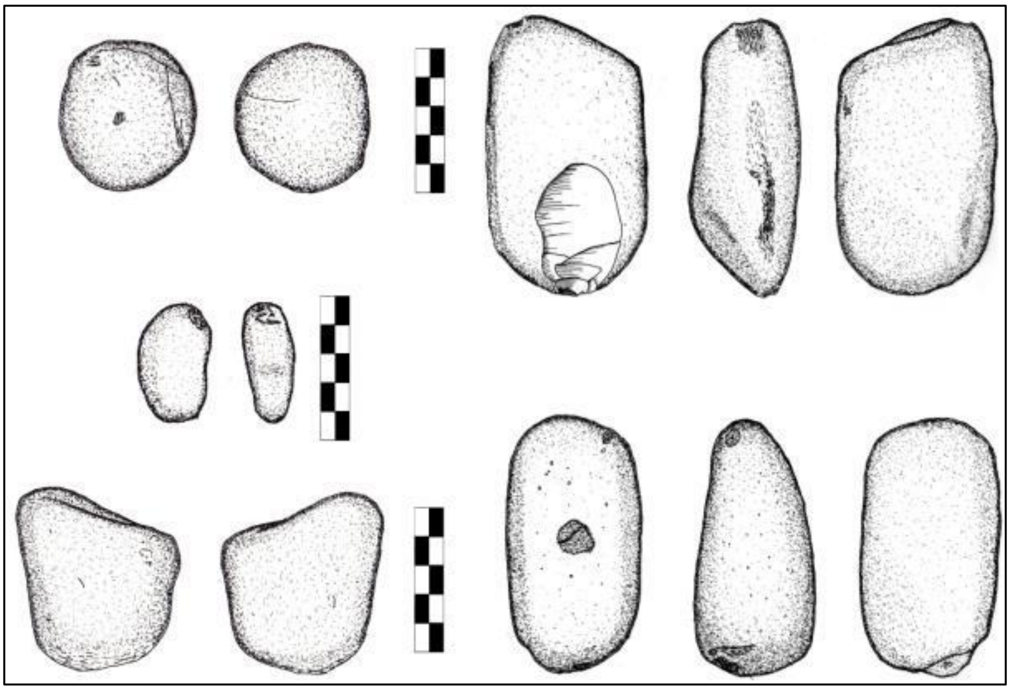

Figure 7. Examples of hammer or anvil stones from the Córrego do Ouro site, made from quartzite cobbles and pebbles. Drawing by João Carlos Moreno de Sousa.

Both Borges (2009) and Moreno de Sousa (2010) point out that some of those artifacts exhibit red and yellow pigment in the same areas which show percussion marks.

4. Discussion

The cores present all similar features. Although Borges (2009) divided them into categories of complexity levels, the main difference could be just the amount of blanks that have been removed from them according to what the natural structure and volume for the pebbles and cobbles provided. In this sense, all cores could be aggregated at the same category, since the debitage method is similar on all of them. The only exceptions would be the single core made by anvil support method. As it was said before, although the slicing method was identified on the flakes, the cores related to it were not. The single new core identified by Moreno de Sousa (2010), besides being bigger than the other ones, still presents technological features that are similar to the ones identified by Borges (2009).

No differences could be identified among the flakes, according to Schmitz *et al.* (1986) results. The flake analyses carried out by Borges (2009) and Moreno de Sousa (2010), despite providing more specific data, still lacks further information on technological features for comparison with other Itaparica tradition assemblages. The data provided does not seem to be similar to the one provided by Moreno de Sousa's (2016) analysis of flakes from the Serranóplis region.

The tools categories provided by Schmitz *et al.* (1986) are unclear regarding the features that define each "group". It seems that only form, shape and size are relevant to determining the categories. The same problem affects Borges' (2009) categories, which seem to be mainly determined by tool cross-section shape. The descriptions of Viana & Borges (2014) and Viana *et al.* (2016) for some tools are also problematic in that they are inconsistent with categories created by previous authors and because only three of the supposedly identified categories are described. In contrast to these authors, Moreno de Sousa (2010) did not identify tool categories by specific features, since the tools do not seem to present different technological tendencies to different types of tools. In fact, the main differences are those related to the original size and shape of the pebbles and cobbles modified into tools. In this sense, it is possible to affirm that the tools identified at Córrego do Ouro 19 do not correspond to the same ones identified in the Serranópolis region by Lourdeau (2010; 2012; 2015; 2016) and Moreno de Sousa (2014; 2016), except for the single limace found in the region (Figure 6). According to Viana *et al.* (2016), the unifacial tool production would confirm the correspondence of the Serranópolis region lithic industry with the Palestina de Goiás region lithic industry, but no evidence is provided.

Hammer stones and anvil stones do not seem to present any standard characteristics, except that they seem to be local and some of them might have also been used to prepare rock painting pigments, since some of them present red and yellow pigmentation in modified areas.

Schmitz *et al.* (1986) identify Córrego do Ouro 19 as a source of raw material and a lithics workshop. Borges (2009), Viana (2010) and Viana & Borges (2014) reached the same conclusions. However, those descriptions of the site may contain within them a more complex system of activities at the site. Viana *et al.* (2016) consider evidence that suggests other activities than only lithic tool production in the area. It is also clear that the location is indeed a good source of raw material, since there is an abundance of pebbles and cobbles in the area. It is also clear that all the stages of lithic tool production can be identified at the site. The frequency of tools in comparison to the total assemblage (17%) is very high, contrasted with other lithics workshops associated with the Itaparica tradition where this frequency is very low. At the Gruta das Araras site, Serranópolis region, for example, this frequency is 0.15% (Moreno de Sousa 2016).

Although Schmitz *et al.* (1986) associate Córrego do Ouro 19 with the Itaparica tradition, mainly because of the unifacial plano-convex scrapers, they note that sites related to this cultural unit usually present dates older than those from the Palestina de Goiás region. The studies of Borges (2009), Viana (2010), Viana & Borges (2014) and Viana *et al.* (2016) do not associate the site or its artifacts to any cultural unit. Those studies were focused on describing technological and functional aspects of the artifacts. However, those authors also identify technological similarities between the Córrego do Ouro 19 limace and the Itaparica tradition artifacts found in the Serranópolis region, 200 km away (for examples, see: Lourdeau 2010, 2012, 2015, 2016; Moreno de Sousa 2014, 2016; Schmitz *et al.* 1989, 2004).

5. Final considerations

The Córrego do Ouro 19 site cannot be considered a lithics workshop, since the frequency of tools in comparison to the total amount of lithic remains is too high. Instead, one might consider that Córrego do Ouro 19 was a location used for specific activities (involving mainly scraping activities). The fact that all production stages of lithic tools were identified at the site does not necessarily mean that the area was only used for that. Instead, the tool production could have been a secondary activity in the area.

The association of Córrego do Ouro 19 with the Itaparica tradition is problematic, since the dates for sites in the region are not related to the Early Holocene, and there is only one limace with typical Itaparica tradition technological features. In this sense, two hypotheses can be considered to explain the presence of the limace in the assemblage. The first would be that Córrego do Ouro 19 dates from Middle Holocene, perhaps older than the radiocarbon dated sites in the region, and the human groups occupying the region obtained the artifact from an Itaparica tradition group that still remained in midwestern Brazil until the Middle Holocene, such as from the sites identified in the Serranópolis region that still had few limaces up until the Middle Holocene (Schmitz *et al.* 1989; 2004). The second hypothesis is related to technological changes over time, in which the limace is a rare remaining cultural trait from the regional Palaeoindian period. In any of these cases, it is suggested that some technological traces from the Early Holocene persisted throughout time although the general technological features of the lithic industry cannot be identified as belonging to the Itaparica tradition.

However, more technological studies are necessary in order to understand the lithic industries of the Palestina de Goiás region. For a better understanding of the Córrego do Ouro 19 site, more excavations are suggested, particularly with application of methods that could aid in establishing stratigraphy, reaching the lowest levels, and collecting dating samples from different levels. In this sense, further publications by Viana and colleagues will likely result from the on-going project (Viana 2015).

Acknowledgements

This article is a late result of a study carried out by the author during 2009 and 2010 as bachelor’s thesis research. Hence, thank go to all professors and colleagues at the *Instituto Goiano de Pré-História e Antropologia, Pontifícia Universidade Católica de Goiás*, Brazil who helped in different ways during those years of scientific initiation. Special thanks go to Dr. Sibeli Viana for her invitation to participate in the *Alto Araguaia II* research project during its last year (2009-2010), for allowing me to participate at Córrego do Ouro 19 site excavations and to study part of its lithics assemblage, as well as for providing space at the laboratory for analysis. Thanks also to Carolina Borges for the discussions on technological analysis during the time we were studying the lithics assemblage together. Thanks to Rosiane Holanda and Otis Crandell for English language review. Finally, thanks go to the *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPq) for funding these studies.

References

Alves, T. M. 2010. Cultura e Tecnologia: *Estudo Tecnomorfológico Das Indústrias Líticas Lascadas Do Sítio Arqueológico Buritizeiro/MG*. Dissertação de mestrado. FAFICH UFMG, Belo Horizonte, 260 p.

Angeles Flores, R.; Moreno de Sousa, J. C.; Araujo, A. G. M. & Ceccantini, G. 2016. Before Lagoa Santa: Micro-remain and technological analysis in a lithics artifact from the Itaparica industry. *Journal of Lithic Studies*, 3 (1): 27 p. doi:10.2218/jls.v3i1.1423

Araujo, A. G. 2015. On Vastness and Variability: Cultural Transmission, Historicity, and the Paleoindian Record in Eastern South America. *Anais da Academia Brasileira de Ciências,* 87 (2): 1239-1258. doi:10.1590/0001-3765201520140219

Boëda, E. 1997. *Technogenèse de Systèmes de Production Lithique au Paléolithique Inférieur et Moyen e Europe Occidentale et au Proche-Orient*. PhD Dissertation. Université de Paris X Nanterre, Paris, 173 p.

Borges, C. T. 2009. *Oficina lítica de superfície GO-CP-17 (Palestina de Goiás - GO). Atual análise, novas propostas, possíveis interpretações*. Bachelor thesis. Goiânia: Instituto Goiano de Pré-História e Antropologia, Pontifícia Universidade Católica de Goiás, Goiânia, 120 p.

Calderón, V. 1973. A pesquisa arqueológica nos Estados da Bahia e Rio Grande do Norte. *Dédalo*, 9 (17-18): 25-32.

Dauvois, M. 1976. *Precis de Dessin Dynamique et Structural des Industries Lithiques Préhistoriques*. Fanlac, Périgueux, 263 p.

Fogaça, E. 2003. Instrumentos líticos unifaciais da transição Pleistoceno-Holoceno no Planalto Central do Brasil: Individualidade e especificidade dos objetos técnicos. *Canindé*, 3: 9-35.

Fogaça, E. & Lourdeau, A. 2008. Uma abordagem tecno-funcional e evolutiva dos instrumentos plano-convexos. *FUMDHAMentos*, 7: 260-347.

Inizan, M.-L.; Reduron-Ballinger, M.; Roche, H. & Tixier, J. 1995. *Technologie de la Pierre Taillé.* CREP, Paris, 122 p.

Leroi-Gourhan, A. 1965. *Le Geste et le Parole, tome 2. La Mémoire et les Rhythmes*. Albin Michel, Paris, 288 p.

Lourdeau, A. 2010. *Le Technocomplexe Itaparica. Définition Techno-Fonctionelle des Industries à Pièces Façonnées Unifacialement à une Face Plane dans le Centre et le Nord-Est du Brésil Pendant la Transition Pléistocène-Holocène et l'Holocène Ancien.* PhD Dissertation. Paris: Université Paris Ouest Nanterre La Defense, Paris, 477 p. URL: http://www.theses.fr/en/2010PA100190

Lourdeau, A. 2012. The Itaparica Technocomplex: The First Conspicuous Settlement of Central and Northeastern Brazil from a Technological Perspective. In: Miotti L.L.; Salemme M.; Flegenheimer N. & Goebel T. (Eds.) Southbound: Late Pleistocene peopling of Latin America. *Current Research in the Pleistocene*, Special Edition, Center for Study of the First American, College Station, Texas: p. 53-56.

Lourdeau, A. 2015. Lithic Technology and Prehistoric Settlement in Central and Northeast Brazil: Definition and Spatial Distribution of the Itaparica Technocomplex. *PaleoAmerica*, 1 (1): 52-67. doi:10.1179/2055556314Z.0000000005

Lourdeau, A. 2016. Industries lithiques du centre et du nord-est du Brésil pendant la transition Pléistocène-Holocène et l'Holocène ancien: La question du Technocomplexe Itaparica. *L'Anthropologie*, 120 (1): 1-34. doi:10.1016/j.anthro.2016.01.002

Mauss, M. 1936. Les techniques du corps. *Journal de Psychologie*, 32(3-4): 271-293.

Melo, E. L. & Breda, J. I. 1972. *Carta Arqueológica - Divisão Regional para Cadastramento de Sítios Arqueológicos de Goiás*. Goiânia: Museu Antropológico, Universidade Federal de Goiás, Goiânia, 101 p.

Moreno de Sousa, J. C. 2010. *Mente, Corpo e Cultura em Pedras: A Cognição Humana na Tecnologia Pré-Histórica*. Bachelor thesis. Goiânia: Instituto Goiano de Pré-História e Antropologia, Pontifícia Universidade Católica de Goiás, Goiânia, 237 p.

Moreno de Sousa, J. C. 2014, *Cognição e cultura no mundo material: Os Itaparicas, os Umbus e os "Lagoassantenses". Volume 1*. Master Thesis. São Paulo: Museu de Arqueologia e Etnologia, Universidade de São Paulo, São Paulo, 200 p. doi:10.11606/D.71.2014.tde-26092014-160812

Moreno de Sousa, J. C. 2016, Lithic Technology of an Itaparica Industry Archaeological Site: The Gruta Das Araras Rockshelter , Midwest Brazil. *Journal of Lithic Studies*, 3 (1): 20 p. DOI:10.2218/jls.v3i1.1298

Rodet, M. J., Duarte, D.; Cunha, A. N. C.; Diniz, L. R. & Baggio, H. 2007. Os métodos de "fatiagem" sobre seixo de arenito/quartzito do Brasil Central: Exemplo do sítio arqueológico de Buritizeiro, Minas Gerais. Presentation at the XIV Congresso Da Sociedade de Arqueologia Brasileira, Florianópolis. *Anais do XIV Congresso da Sociedade de Arqueologia Brasileira*. No pagination.

Rodet, M. J.; Duarte-Talim, D. & Bassi, F. 2011. Reflexões sobre as primeiras populações do Brasil Central: "Tradição Itaparica". *Habitus*, 9 (1): 81-100.

SGPA/CAN/IPHAN. 1997. *Cadastro Nacional de Sítios Arqueológicos (CNSA GOOOO96)*. URL: http://portal.iphan.gov.br/sgpa/cnsa_detalhes.php?1979 (Retrieved 26 October 2016).

Schmitz, P. I. 1977. Arqueologia de Goiás: Seqüência cultural e datações de C14. *Anuário de Divulgação Científica (UCG)*, 3-4: 1-19

Schmitz, P. I.; Ribeiro, M. B.; Barbosa, A. S.; Barbosa, M. O. & Miranda, A. F. 1986. *Caiapônia - Arqueologia nos Cerrados do Brasil Central*. Unisinos, São Leopoldo: 334 p.

Schmitz, P. I.; Barbosa, A. S., Jacobus, A. L., & Ribeiro, M. B. 1989. Arqueologia nos Cerrados do Brasil Central: Serranópolis I. *Pesquisas - Antropologia*, 44: 1-208.

Schmitz, P. I.; Rosa, A. O. & Bitencourt, A. L. 2004. Arqueologia nos Cerrados do Brasil Central. SERRANÓPOLIS III. *Pesquisas - Antropologia*, 60: 1-286.

Viana, S. A. 2005. *A variabilidade tecnológica do sistema de debitage e de confecção dos instrumentos líticos lascados de sítios lito-cerâmicos da região do Rio Manso/MT*. PhD Dissertation. Porto Alegre: Pontifícia Universidade Católica do Rio Grande do Sul, Pelotas, 355 p.

Viana, S. A. 2010. *Análise do sistema tecnológico das indústrias líticas pré-históricas recuperadas pelo Projeto Alto-Araguaia: Projeto Alto-Araguaia II*. Research report. Goiânia: Instituto Goiano de Pré-História e Antropologia, Pontifícia Universidade Católica de Goiás, Goiânia, 51 p.

Viana, S. 2015. *Pré-História de Palestina de Goiás*. Research Project. Goiânia: Instituto Goiano de Pré-História e Antropologia, Pontifícia Universidade Católica de Goiás, Goiânia. No pagination.

Viana, S. A. & Borges, C. T. 2014. Compreendendo ferramentas líticas a partir das persistências e das variabilidades técnicas. Estudo de caso dos sítios GO-CP-17 e MT-SL-31, Região Centro Oeste do Brasil / Compréhension des outils lithiques à partir des persistances et des variabilités techniques. Etude de cas des sites GO-CP-17 et MT-SL-31, région Centre-Ouest du Brésil. In: Farias, M. & Lourdeau, A. (Eds.) *Peuplement de l´Amérique du sud: L'apport de la technologie lithique / Povoamento na América do Sul: a contribuição da tecnológica lítica / Población de América del Sur: La contribuición de la tecnología lítica*. @rchéo-éditions, Paris: p. 65-95

Viana, S. A.; Ramos, M. P.; Rubin, J. C. R.; Barberi, M.; Boëda, E. 2016. O Complexo Arqueológico de Palestina de Goiás/Brasil – uma avaliação dos conjuntos líticos mais antigos em contextualização macrorregional. *Cadernos do CEOM*, 29 (45): 188-211