Journal of Paleolithic Archaeology

Cultural Taxonomies in Eastern South America: Historical Review and Perspectives

--Manuscript Draft--

Manuscript Number:	JPLA-D-20-00031R3	
Full Title:	Cultural Taxonomies in Eastern South America: Historical Review and Perspectives	
Article Type:	Article	
Funding Information:	FAPESP (2009/54.720-9)	Dr Astolfo Gomes de Mello Araujo
	FAPESP (2013/13.794-5)	Dr Astolfo Gomes de Mello Araujo
	FAPESP (2016/23.584-6)	Dr Astolfo Gomes de Mello Araujo
	FAPESP (2010/06453-9)	Dra Mercedes Okumura
	FAPESP (2018/23282-5)	Dra Mercedes Okumura
	Conselho Nacional de Desenvolvimento Científico e Tecnológico (302163/2017-4)	Dra Mercedes Okumura
	Conselho Nacional de Desenvolvimento Científico e Tecnológico (302024/2019-0)	Dr Astolfo Gomes de Mello Araujo
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Author Comments:	This manuscript is intended to be part of the special issue "Cultural Taxonomies in the Paleolithic"	
Response to Reviewers:	The answer is attached as "Reviewers 17 jun"	
Suggested Reviewers:		

Cultural Taxonomies in Eastern South America: Historical Review and Perspectives

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Abstract:
In this article, we will provide a brief history of the appropriation and development of the concepts of "culture", "tradition", "technocomplex", among others, in Eastern South America (Brazil), and present its state of the art. We will discuss some of the convergences and divergences in the nature of the archaeological record of South America, North America, and Europe, as well as their possible theoretical implications, since classification templates or classificatory schemes are strongly dependent on the phenomena they address, whether we acknowledge that or not. Finally, we aim to present some results and the main lines of future action in our current work on this topic.

Keywords: Brazilian Archaeology, tradition, cultural taxonomies, classification, systematics

1. Introduction

Eastern South America, or what is today mostly Brazilian territory, can be considered an interesting case study in terms of blending North American and European approaches to

the classification of archaeological phenomena. The professionalization of archaeology in Brazil is fairly recent, starting in the late 1960s and early 1970s, and therefore the available current knowledge in terms of cultural history for an area comprising roughly 8.5 million square km (larger than the whole of Western Europe) was built in merely 50 years. This can be considered either a blessing or a curse, but the fact is that there is still a lot to be done and in the process of further understanding the cultural history of this particular segment of the globe, we definitely need to learn from past mistakes and from discussions as to how to avoid them. At the same time, we do not intend to carry out a parochial discussion about Brazilian archaeology. The problems faced by archaeologists in trying to make sense of the archaeological record are not related to any specific chronological period or spatial boundary. There is a common necessity for theoretical clarity and methodological soundness when arranging data in a meaningful way, be it Lower Paleolithic choppers or Neolithic sherds.

Regarding the more empirical character of our research, we tend to agree with Williams and Madsen (2009) that the archaeological record of the Americas can be understood as being part of a larger picture, which involves several waves of human displacement using many routes, entering the New World from some point in the Old World at different times. The abovementioned authors make a strong argument for the inclusion of "Upper Paleolithic" when referring to the Last Glacial Maximum human occupations of the Americas, for two main reasons: 1) the observed patterns in the Americas have roots in the Old World and 2) the term "Upper Paleolithic" helps to improve the connection between the Americas and other archaeological patterns observed in the Old World. On the other hand, in the past we have used the term "Paleoindian" to refer to a chronological interval (e.g., Araujo et al., 2012), which is admittedly at odds with the meaning traditionally used by North American colleagues, and this perhaps imparts a touch of parochialism to our discussion. Undoubtedly, European colleagues might have the same impression, i.e., that the South American Late Pleistocene / Early Holocene record is all about big projectile points and megafauna hunters, which could not be more distant from what we observe. In this way, we are sympathetic to the idea that we are talking about a South American Upper Paleolithic, whose characteristics, as we will see, are totally different from North America and, surprisingly, much more akin to Old World archaeological phenomena.

In the first part of the article, we will provide a brief history of how Brazilian archaeologists have been dealing with key concepts of "culture", "tradition",

"technocomplex", among others, since the beginnings of the discipline in Brazil and how these defective classificatory schemes ultimately lead to a complete abandonment of the abovementioned terms by many local archaeologists from the late 20th century onwards. We will follow this section with a presentation of some Brazilian case studies and how old and new classificatory schemes have changed our interpretation of the archaeological record. Finally, we present a discussion of how classification templates and their respective theoretical approaches have called attention to cultural convergences and divergences in the nature of the archaeological record of South America, North America, and Europe. We also address the main lines of future action in our current work on the topic and reinforce the suggestion that European Paleolithic archaeologists can benefit from being exposed to knowledge and ideas generated in non-European archaeological contexts.

2. A Very Brief History of Brazilian Archaeology

Regardless of occupying nearly half of South America, the lowlands known as Brazil, east of the Andes, were not subject to archaeological interest until recently. Meggers (1985) suggested that this lack of interest and knowledge had to do with the characteristics of the archaeological record itself, and we tend to agree. There is no monumental architecture, no metal artifacts, no preserved textiles, no mummies, and the occurrence of aesthetically pleasing ceramics is restricted to a few areas.

The first forays into Brazilian archaeology were made incidentally by the Danish naturalist Peter Wilhem Lund in the 19th Century. Lund explored several caves in Lagoa Santa, central Brazil and, in the search for paleontological specimens, he ended up finding human remains associated with extinct fauna in 1840. After this, it took almost a century until a British amateur archaeologist, H.V. Walter, undertook new excavations in the same region in the 1930s, his results being published only in 1948 and 1958 (Walter, 1948, 1958; see Da-Gloria et al., 2017 for an overview). The first book on Brazilian prehistory was published in 1938 (Matos, 1938).

Due to the presence of exquisite ceramic vessels and the "allure of the jungle", Amazonian archaeology was also the object of some early interest, mostly involving the gathering of extraordinary objects to be exhibited in museums, with very little interest in systematic excavations. In 1948, North American archaeologists Betty Meggers and Clifford Evans, from the Smithsonian Institution, excavated shell middens in Marajó

Island, Amazonia (Meggers, 1948). In 1955, French archaeologists, Joseph Emperaire and Annette Laming-Emperaire begun to work in SE Brazil, mainly in the coastal shell middens (Emperaire & Laming-Emperaire, 1956). However, the training of Brazilian citizens as archaeologists only began after 1965, when the Smithsonian Institution and the Brazilian Council for National Research (CNPq) signed a five-year agreement to conduct a "National Program of Archaeological Research" (Programa Nacional de Pesquisas Arqueológicas - PRONAPA). At that time, Anette Laming-Emperaire was also training young Brazilian researchers in archaeological methods of excavation and analysis. To put it simply, Brazilian professional archaeology began in 1965 and the publications written by these newly trained local archaeologists first appeared in 1966 (see Meggers, 1985 for an overview). It is at this point that the North American and the French schools begin to influence the archaeological thought in Brazil in a more important way, including the theoretical approaches and the way archaeological phenomena could be organized and classified.

3. A Tale of Two Schools: North American and French Influences in Brazilian Archaeology

Given the previous historical overview, it is possible to acknowledge that two lines of reasoning were present at this stage. PRONAPA, under a North American perspective (and therefore labeled the "North American School"), was responsible for the archaeological mapping of huge portions of Brazilian territory. The French scholars and the Brazilian archaeologists who had their academic training in France were more akin to what was called the "French School". By 1968, while Laming-Emperaire was publishing an account of Brazilian archaeology separating "groups from hinterland" from "groups from the coast" and providing data and ten radiocarbon ages for five sites, the PRONAPA group had more than 1000 recorded sites, dozens of radiocarbon ages, having also created several lithic and ceramic "traditions", whose somewhat problematic definition will be presented later together their historical origins. The reason for this tremendous difference was that the French group applied a "paleoethnographic" approach, based on A. Leroi-Gourhan´s "ethnographic method" (e.g., Leroi-Gourhan & Laming, 1950; Pallestrini, 1983), and resulting in excavations of large open surfaces mimicking the excavations at Pincevent, in France (e.g., Leroi-Gourhan & Brézillon, 1972). The PRONAPA method, on the other hand, was based on a few one square meter

excavations, usually recording together all materials found in a ten cm layer. This allowed these researchers to reach the bottom of the deposits very quickly, sometimes in a single day. The excavation was followed by a quick analysis of lithics and ceramics by means of seriation, and by sending charcoal samples for dating. Such a strategy allowed the organization of a huge amount of data into "traditions" and "phases" in a few years, something unthinkable for the researchers that followed the French approach. Of course, criticisms were made to and from both sides. In the 1980s, after the development of the "New Archaeology", PRONAPA was heavily criticized in Brazil for having too much "culture history" and not enough "anthropological theory". The French approach, on the other hand, was accused of not providing a broad picture, only extremely detailed accounts of single sites, leaving a vast territory uncharted. Be as it may, what we know today about Brazilian archaeology is mostly based on PRONAPA´s "traditions" and "phases". As the years passed by, even the French started to mention the PRONAPA´s "traditions" in their publications (e.g., Laming-Emperaire, 1975).

PRONAPA and other North American researchers recognized at least 49 "phases" up to 1972 based on lithic materials. Later, some of these "phases" were grouped and gave origin to "traditions". The definitions of "phases" and "traditions" were somewhat problematic, and discussions about classification in archaeology began to try to approach such issues. In order to better understand the main problems involved in that discussion, we will have to delve into another brief historical review.

We will go back to 1934, when North American archaeologist Will McKern developed the so called "Midwestern Taxonomic Method" or "MTM" (McKern, 1939; see Lyman & O´Brien 2003 for a comprehensive analysis of the method), aimed at solving problems associated to the broadly used term "culture". The idea was to organize archaeological assemblages in categories. The smaller units were "components", or aggregates of artifacts found at the same spot, considered to be evidence of an episode of single occupation. In practice, a component was a list of traits. Similarities among these lists were used to assign components to five higher taxonomic levels: "focus", "aspect", "phase", "pattern", "base". Note that while components were based on empirical/material findings (a group of artifacts found together), the higher-level units were ideational units, or abstractions. A component was considered to be the manifestation of a "real" ethnographic entity, such as a band of hunter-gatherers. The MTM was considered problematic because it did not include either the time or the phylogenetic relations among its units, as stated by Lyman & O´Brien (2006).

Another system apparently resembling the MTM but with an interest in change through time was the "Southwestern Taxonomy" proposed by Gladwin & Gladwin in 1934 and further developed by Colton (1939). It held as a premise a unilinear, classic Morgan-Tylor-Spencer evolutionism character. Prehistoric groups would have passed through the same cultural stages, albeit at different times and places. The "phase" was the basic unit of interest. A "phase" was considered to be the equivalent of an "Indian tribe" according to Colton (1939). Changes in the archaeological record were considered as comprised of long periods of stasis followed by short, sudden periods of change. This would make the recognition of boundaries between periods just a matter of applying an adequate method, since they were "real", and not an arbitrary division made by the archaeologist.

In the 1950s, Gordon Willey and Phillip Phillips developed another classificatory scheme based on the previous ones (Phillips and Willey, 1953; Willey and Phillips, 1958). The difference is that they recognized "an archaeological culture" as an arbitrary division of the space-time-cultural continuum. They proposed three spatial units and two formal units. The spatial units were: locality (or site), akin to local human groups; region, akin to a tribe or society; and area, akin to the ethnographer´s "culture area". The formal units were "components" and "phases". A component was "the manifestation of a phase in a given site", or the equivalent of a band or a village. A phase was the equivalent of a society. Strangely enough, a phase could be described based on a single component. Significantly, as expressed by Dunnell (2008:62), the meaning of the term "phase" was very different in the MTM and in the Willey and Phillips system: for the former, "phases" were groups of artifacts put together by some similarity. for the latter, "phases" were classes defined by a list of traits. Traditions and horizons were integrative units denoting some form of historical contact rather than having implications in terms of phylogeny. A horizon was the manifestation of morphological similarities over a large area in a short period. A tradition was the manifestation of a morphology (usually in a limited space) over a long period of time, and such a tradition could be denoted on the scale of attribute of artifact, on the scale of artifact, or on the scale of aggregates of artifacts (called "whole-culture traditions").

In Brazil, the Willey and Phillips scheme was somewhat modified by Meggers and Evans and incorporated into the PRONAPA (1976) approach. Originally, the definitions of "tradition" and "phase" were, respectively: "group of elements or technologies with temporal persistence" and "any complex of ceramics, lithics, occupation patterns, etc, presenting some relationship in terms of time and space, in one or more sites". Such a

definition refers to a group (a cluster of elements that can be listed) rather than a class, which would require a definition (Dunnell, 2002: 45). Thus, such traditions were never defined, only described. These original definitions were, however, modified as they begun to be more broadly applied, and the perception that the "New Archaeology" demanded a more "anthropological" approach (Meggers & Evans, 1985). In practice, Brazilian archaeologists begun to use "phase" as akin to "indian tribe" and "tradition" as akin to "indian nation" or "society" (Schmitz & Becker 1991:72). Hence, several phases could be included in a single tradition. We can say that the PRONAPA "traditions" were akin to the "whole-culture traditions" of Willey and Phillips. On the other hand, the PRONAPA "phases" would be akin to the concept held by the MTM: a group (and not a class) of artifacts lumped together by some measure of similarity.

Given the somewhat inconsistent definition and use of terms like "phase", "tradition" by PRONAPA researchers and the influences of new theoretical schools (including New Archaeology and Post-processual Archaeology), most of the later generation of archaeologists actively demanded the abandonment of such terms (Dias, 2003:51; Dias, 2007; Dias & Hoeltz, 2010; Hilbert, 1994; Milder, 1999, among others), causing important problems in terms of describing the archaeological record, as well as hampering most attempts to compare data generated by different researchers. On the other hand, a few researchers (including ourselves), influenced mostly by Dunnell (1986), have tried to reconstruct the historical steps that led the Brazilian Archaeology to such a scenario and subsequently discuss potential pathways to give the abovementioned terms new heuristic definitions, in order to restore their use in Brazilian Archaeology in a systematic and theoretical oriented approach, since the terms continue to be used.

4. Case Studies

Given the brief historical review presented here, we will proceed to introduce four case studies that show how the abovementioned classification systems in Archaeology have been applied from the middle to the late 20th Century to try to unravel the material culture diversity observed in the Brazilian territory in the past. We will also discuss how these approaches were latterly criticized by scholars influenced by new archaeological approaches, and how we or other colleagues have been trying to approach such case studies by applying different concepts regarding the nature of cultural taxonomies. The introduction of such case studies will then allow us to address the following points:

1) Are "traditions", as described by Brazilian culture historians more than fifty years ago, still a useful heuristic concept? Currently, can we talk about traditions? If so, in which terms?
2) Is the establishment of traditions and phases an artifact of classification procedures, or a reflection of stable cultural periods?
3) How do we relate, both operationally and epistemologically, classes (ideational) to types (empirical), and then to higher order taxonomic units such as "traditions" or "cultures" (a mixed concept)?

Most case studies presented here will focus on lithic materials, although any other type of evidence (e.g. faunal remains, bone artifacts, etc) will also be considered when available. Early on, archaeologists, either linked to PRONAPA or to the French school, recognized at least three early lithic "traditions" in Brazil: Umbu, Lagoa Santa, and Itaparica (Figure 1). They represented three totally distinct and coeval lithic technologies, presenting earlier ages between 12,800 and 10,000 cal years BP, and distributed in different parts of the country (see Araujo, 2015): the southern Umbu Tradition presenting a formal industry, including small unifacial scrapers, and bifacial points (Figure 2); the central-northern Itaparica Tradition, presenting only unifacial flaking and a single type of formal artifact (plane-convex scrapers – Figure 3); and the "Lagoa Santa" industry, completely lacking any formal artifact, composed mostly of small quartz flakes (Figure 4). In terms of areas, the Umbu Tradition would encompass an area of 510,000 km², equivalent to the size of Spain. Itaparica comprises roughly 1,280,000 km², almost the combined areas of France, Germany, and the United Kingdom. The area for Lagoa Santa was not well established, but also seems quite large. The north-south strip shown in Figure 1 is equivalent to 1,000 km, the distance between Paris and Copenhagen. Regarding these three case studies, we have analyzed lithic materials from two of them (Umbu and Lagoa Santa) and relied on publications of other researchers to address the Itaparica Tradition. Besides these, we will briefly discuss a fourth potential case of "tradition" also presenting early ages in southern Brazil.

4.1. The "Umbu" Problem

Our first case study refers to the Umbu Tradition and its formal artifacts, the bifacial points, which caught the attention of researchers early on. In the 1970s, Brazilian

archaeologists tried to understand the morphological diversity observed in bifacial points found in Southern Brazil using shape-based typologies and the creation of archaeological phases. As a result, 27 "phases" were described for some 400 sites presenting bifacial points. Despite these early efforts to sort out the morphological diversity that was observed, the lack of good chronologies and the unclear definitions of the bifacial point classes led to difficulties in assigning new sites to these "phases", resulting in a later lumping of them into a single "tradition", called Umbu (Okumura & Araujo, 2016). Therefore, what we have in this case is an extreme classificatory splitting followed by an extreme classificatory lumping. After the 1980s, almost any site found in Southern or Southeastern Brazil and presenting a projectile point began to be classified as "Umbu" and as a result, this tradition began to be characterized simply by the presence of bifacial points. Moreover, Umbu Tradition was originally limited to the southern states (Paraná, Santa Catarina, and Rio Grande do Sul). Later on, however, sites from more northern latitudes, including the states of São Paulo, Minas Gerais, and even Mato Grosso do Sul were assigned to that tradition (Prous, 1991:154; Lima, 2005; Koole, 2007, 2014; Kashimoto & Martins, 2009; Martins & Kashimoto, 2012). To further complicate matters, the ages for the Umbu Tradition suggested it was too long-lived: sites were dated between 12,800 cal BP and the XVII century (Schmitz et al., 1980; Schmitz, 1999; see Noelli, 1999-2000 and Okumura & Araujo, 2016 for lists of dated sites presenting bifacial points). In 2011, following the criticisms made since the 1980s about the Umbu Tradition and especially that contentious idea that a single archaeological tradition could encompass such a vast territory and long-time span, we began to address the problem. We applied Geometric Morphometrics (GMM) to a large sample of bifacial points from five Brazilian states: Minas Gerais, São Paulo, Paraná, Santa Catarina, and Rio Grande do Sul (Figure 1). Our results indicated that points from São Paulo State were significantly different from the points from other states. The same was observed for the Minas Gerais points. Points from Paraná, Santa Catarina, and Rio Grande do Sul also showed differences among them, albeit smaller (Okumura & Araujo, 2013, 2015, 2016; Araujo & Okumura, 2018). The points from São Paulo, named "Rioclarense", could be considered different, or as part of a different "tradition" to use the same rationale. Moreno de Sousa (2019) analyzed the southern points from a technological perspective and was able to define a third group in Paraná State, named "Star Points", present at Tunas rock shelter.

We also tested the validity of the Umbu Tradition in terms of changes in the morphology of these points throughout time. Having the Garivaldino site as a case study, due to the abundance of points and good chronology, we ran the same GMM protocol, together with traditional morphometrics. Garivaldino is a small rock shelter located in Rio Grande do Sul State and could be considered a "classic" Umbu site. An excavation was made in the late 1980s (Mentz Ribeiro et al., 1989) and thanks to a fairly detailed record, it was possible to identify the stratigraphic position of most of the 236 points (from these, 91 were fit for GMM). The occupation span of the site ranged from 10,700 cal BP to at least 7600 cal BP, since there was, at that time, no dating for the upper 60 cm layers (Mentz Ribeiro & Ribeiro, 1999). Recently, we were able to obtain three ages for the upper levels, the youngest one of 5160 cal BP (4530 ± 30 BP, Beta 563665). This implies a 5500 year occupation span, or at least 270 human generations, and there was a reasonable expectation that we would observe some kind of cultural change through time, which did not happen. All statistical analysis (General Procrustes Analysis, Principal Component Analysis, Discriminant Function Analysis, D'AD) showed no significant differences among the morphology of these points through time (Okumura & Araujo, 2014).

Besides these analyses, such points were subject to a paradigmatic classification (Dunnell, 2002; O'Brien & Lyman, 2002b) where attributes ("dimensions") were intended to measure morphological variation through time, assuming that some of them, for example, stem shape, could be used to track stylistic changes, whereas others, like edge and shoulder shape could be related to functional differences (Dunnell, 1978). We also conducted a traditional "type" assignment using a sample of 177 points. In this case, a single point type can comprise several classes as defined here through paradigmatic classification, since some of the variation in the attributes were not considered sufficient to define a different type. In this view, types could be considered as synthetic units, comprised of one or more classes, on a scale where classes would be the analytic units (Dunnell, 2002:154). The aim of this analysis was to check if types, or groups of artifacts presenting an overall similar shape, were good chronological markers. We were also aiming to begin to identify these types, previously generically known as Umbu, in order to improve communication among researchers working with such points. Overall, there were four to ten different point shapes coexisting in the same stratigraphic interval, in accordance with the results of the GMM, which showed no significant correlation between stratigraphic position and point forms (form in morphometric analysis refers to size and shape information). In other words, there were no clear changes in the form of

points through time, although some types or forms showed differences in the frequencies according to the chronology. Moreover, there was a remarkable consistence in the frequencies of raw materials used to manufacture the points. Silicified sandstone was the preferential raw material in bifacial point making, regardless of the period and point shape, comprising around 70% of the points. The percentages of the second most important raw material, namely chert, were also extremely constant over time, around 15%. The only (minor) difference was perceived in the fluctuating importance of basalt versus the less frequently used raw materials. The ranking of the three most used raw materials, however, remained unchanged across time for the point making. We can rule out that this constancy is related to raw material availability, since the published data shows fluctuating frequencies of these three stone classes when all lithics are computed (scrapers, flakes, and flake chips). That this is not the case for the points is truly remarkable, because it shows a very strict, conservative raw material choice related to a single artifact class, and we did not find a similar case in the literature.

Moreno de Sousa & Okumura (2020) presented a technological analysis of the entire Garivaldino lithic assemblage, and these results matched our data: no significant technological changes were observed through time. The remarkable lack of important changes through time observed using different approaches (GMM, typology, and technology) challenged our confidence about being able to completely "deconstruct" the Umbu Tradition. If 270 generations of people were able to maintain the "recipes" of their points almost unchanged, there was definitely some cultural process operating there that deserved the label of "tradition", regardless of how we name it. On the other hand, the diversity observed in points from sites from São Paulo and Minas Gerais meant that not all sites originally classified as Umbu could indeed be considered as such, unless we return to the (useless) idea that any site presenting bifacial points can be included in the Umbu Tradition.

4.2. Lagoa Santa and (Yet More) Cultural Persistence

Going northwards, we have our second case study related to the Lagoa Santa early Holocene sites. They were never formally assigned to a "tradition", but they were referred to in the 1950s as "Cerca Grande Complex" (Hurt, 1960). The lithic industry is comprised entirely of non-formal (or generalized) artifacts, although extremely rare finds of bifacial points and plane-convex scrapers do occur in the area (see Angeles Flores et al., 2016;

Moreno de Sousa & Araujo, 2018). The main purpose of flaking rocks, mostly high-quality hyaline quartz, appears to be the production of small flakes (mean size of 20 mm) and rock splinters. The larger flakes (mean size 30 mm) sometimes present marginal retouch (about 1% of the lithics were retouched – see Araujo et al., 2012).

We analysed the lithic material from Lapa do Santo site, the largest rock shelter excavated in the region, and that presents a very well-established chronology (Araujo et al., 2018). We perceived a phenomenon of regional abandonment of the Lagoa Santa area during the mid-Holocene, which was called the "Archaic Gap" (Araujo et al., 2005), but at Lapa do Santo there was a period of reoccupation after the gap. This means that the site was heavily occupied during the early Holocene, abandoned for 3200 years, reoccupied for 880 years, and then abandoned again.

We ran statistical analysis on the following data: measurements and technology of the lithics, taxonomic analysis of the faunal remains, and types of bone artifacts in order to compare frequencies from the early Holocene with the ones from the short occupation of the Mid-Holocene. The results indicated an absence of statistically significant differences across time for all the classes (Araujo et al., 2018). Cultural changes through time were observed in the patterns of human burials (Strauss, 2010) and in the use of flint as raw material in the lower strata, albeit without any technological change (Araujo et al., 2018). Data from another rock shelter from Lagoa Santa region, Lapa Grande de Taquaraçu, showed the same general pattern (Venezia & Araujo, 2019). In sum, in the case of Lapa do Santo site we have a total time span of 8300 years of preserved material cultural stability, or roughly 415 human generations.

4.3. "Itaparica": A Persistent Unifacial Template

Unlike the "bifacial templates" from Southern Brazil, the Itaparica Tradition was created to classify sites presenting a single class of formal artifacts, namely plane-convex scrapers (similar to the European Upper Paleolithic side scrapers), after the comprehensive research program made in Central Brazil (Serranópolis, Goiás state) by P.I. Schmitz mainly in the 1970s and 1980s (Schmitz, 1980; Schmitz et al., 1989, 2004). Due to the similarity among scrapers from Serranópolis and Itaparica region (Pernambuco state, Calderón de la Vara, 1969), the tradition was named after the homonymous region. Several researchers adopted the name Itaparica to describe early Holocene sites where these scrapers were found in abundance (Calderón de la Vara, 1983; Martin et al., 1986;

Hurt, 1989; Schmitz et al., 1989, 2004; Martin & Rocha, 1990; Macêdo Neto, 1996). The groups responsible for the manufacture of these unifacial artifacts were not only contemporaneous to the ones in Lagoa Santa, but explored the same environment (Brazilian savannahs), which tends to rule out environmental factors as an explanation for their dissimilarities (Araujo, 2015).

In the last two decades, several researchers have been questioning the validity of Itaparica Tradition, including the longevity and the wide geographic area associated with it, similar to the criticisms made previously of the Umbu Tradition (Fogaça, 1995, 2001; Rodet, 2006; Rodet et al., 2011; Isnardis, 2009). However, a comprehensive study of key sites (site GO-JA-01, at Serranópolis, Goiás state and sites Boqueirão da Pedra Furada and Toca do Pica-Pau, at Serra da Capivara, Piauí State) was carried out by Lourdeau (2010, 2015) and his conclusions were:

> *"These data tend to strongly confirm the existence of the Itaparica technocomplex as a vast technocultural group distributed in central and northeast Brazil during the Pleistocene-Holocene transition and the early Holocene"*
> *"The cultural unity of this technocomplex suggests that this initial moment of significant occupation of space corresponds to a unique and coherent phenomenon*." (Lourdeau, 2015: 65).

Similar interpretations were made by Moreno de Sousa (2014, 2016a, 2016b), which analyzed both the scrapers and the flaking residues of the abovementioned Serranópolis sites plus the materials from site GO-JA-03 (also from the Serranópolis region). In any case, if we consider the conclusions made by these researchers, we can accept that the Itaparica Tradition, which is dated between 14,000 cal BP and 8000 cal BP, represents at least 6000 years of material culture persistence, corresponding to 300 human generations.

4.4. Fluvial Shellmiddens: The Same Pattern?

Finally, we will briefly present the fourth potential case of a tradition observed in the Ribeira de Iguape Valley (São Paulo state). Among the different types of sites observed in that region (rock shelters, open air sites, etc), there are mounds, which were named "fluvial shellmiddens" because they comprise terrestrial shell accumulations usually found in river terrace areas. This label stands in opposition to the abundant coastal

mounds found on the southeastern and southern coast of Brazil (see Wagner et al., 2011 for a review). There was never any attempt to assign these sites to any archaeological tradition since their systematic study is relatively recent. The fluvial shellmiddens from Ribeira de Iguape Valley present a regional chronology comprising three different clusters of ages, spanning from 10,400 cal BP to 1200 cal BP. In common, they share a very simple lithic industry (although few sites yielded bifacial points), numerous human burials, and bone artifacts (Figuti et al., 2013). The authors propose that their main shared features would be the moundbuilding activity (using *Megalobulimus sp*. shells) related to funerary rituals. They see these sites as representing a cultural continuum spanning 9000 years:

> *The strongest argument in favor of cultural continuity is the persistence of meaningful cultural patterns such as shellmound building associated with burial ground at repeatedly (re)visited permanent places, thus acting as persistent landscape locations and territorial marks* (Figuti et al., 2013:1220).

5. Discussion

Given the brief presentation of these four case studies, we can proceed to answer the first point raised, namely the heuristic usefulness of the concept of "tradition". Our examples strongly support the hypothesis that in the archaeological record of Eastern South America there is indeed a phenomenon we can call "cultural traditions", especially if we use the term as defined by O´Brien et al. (2010:3797): "*patterned ways of doing things that exist in identifiable form over extended periods of time*". Although it is difficult to find a proper definition of technocomplex (for example, Clarke [1978:363] included this term as the last of a sequence of elements, ranked in order of complexity: artifact, type, assemblage, culture, culture groups, and technocomplex), we understand this term as used by European researchers as being akin to "tradition", especially when terms such as "technocultural group" are used in tandem. The term "culture" as used both in North America and Europe, such as in "Clovis Culture" or "Bell Beaker Culture", is commonly applied "when (1) patterns of lithic typological variation are paralleled in other kinds of archaeological evidence, such as ceramics, architecture, bone tools, or personal

adornments; (2) variation in these other lines of evidence carry greater analytical weight than the lithic evidence" (Shea, 2013:38); or (3) certain traits are selected to be "determinants" of each culture (Cole and Deuel, 1937; Phillips, 1958). In Brazilian archaeology, the term "culture" was never widely used, although it is fair to accept that, in this case, "tradition" has been used to convey the same meaning, including the choice of giving different weights to different kinds of evidence, as will be discussed later.

The second point, as to whether traditions and phases are real or an artifact of the classification procedures, has to be addressed in terms of the role of classification in our perception of the empirical phenomena, as well as in how we perceive culture changes. Dunnell (2002) makes a difference between systematics, as a basis for a conceptual approach, and classification, as a basis for an operational model. It is important to remember that, at least in the Biological Sciences, the realm of systematics includes both classification and phylogeny. Classification aims to organize and name the empirical phenomena, while phylogeny aims to establish the evolutionary (ancestor-descendant relationship) history of the elements we want to study. For Dunnell, systematics is a starting point to establish the proper limits in order to create a system of units for the categorization of phenomena into meaningful classes. These classes can be the result of either a paradigmatic classification or a taxonomic classification. The main difference between these is that the latter involves different weights for distinct attributes. We will explore these differences later on.

As previously stated, our second point also addresses the role of classification on the perception of cultural change, which results in entailments about the very nature of cultural change. Any classification will involve two philosophically distinct, albeit closely-connected, issues. First, there is a question about what the world is like, which is a metaphysical issue. The second, which is an epistemological issue, refers to how one can choose among the numerous possible ways of grouping items (Reydon, 2020). Classification in Archaeology (as in other Sciences like Biology, for example, Reydon, 2020) suffers from a constant lack of clarity regarding which aspects these classifications are supposed to represent, as well as regarding the meaning of important terms such as "phase", "tradition", or "culture" (see Clark, 2009; Kleindienst, 2006; Reynolds & Riede, 2019). Moreover, in any classificatory scheme, we must address the fundamental question related to the nature of the worldly phenomena, or what is presented in the literature as the materialist versus essentialist ontologies (Dunnell, 1986; Sober, 1980; Mayr, 2002). This theoretical discussion presents strong implications for classification both in Biology

(regarding species), and in Archaeology (regarding types) since the main question posed is about the reality of the analytical units. Are biological species "real", or just an arbitrary cut in the time-space continuum? The same reasoning can be applied to artifact types, or to the basic question about the meaning of the units derived by means of any classificatory scheme: were these artifact types real entities in the past (Hill and Evans, 1972) or are they merely tools for conceiving a reasonable organization of the archaeological record? Since there is no way we can properly access the intentions and beliefs of the flintknapper or the pottery maker, the most parsimonious position is to acknowledge that these archaeological units are arbitrary (Phillips et al., 1951; Ford 1954a, 1954b; Hayden, 1984; Dunnell, 2002). Under this optic, types are never "discovered", but created by the archaeologist (Brew, 1946:46; Ford, 1954a, 1954b, 1961 *contra* Spaulding, 1953; Hill & Evans, 1972) "to serve human purposes, which strongly affects the way they are created and used" (Adams & Adams, 1991:xvi). Moreover, if we understand the cultural processes within a materialist ontology as something that never stops but is in continuous change, then types do not have "essences", but constitute aggregates of individual artifacts, each one representing the material result of a single activity, or snapshots of an ever-changing cultural process. These points were made extremely clear by several authors (e.g., Dunnell, 1986; Leonard & Jones, 1987; Lyman & O´Brien, 2006).

As an upshot of this rationale comes the question of *tempos* (or patterns) of cultural change, that is: does cultural change proceed by means of a gradual change, or a punctuated one? To use the old analogy of culture as a flowing river, does the river show a regular flow, or it is characterized by "pools and rapids"? For sure, the essentialist ontology sees culture as punctuated, a series of pools and rapids, since each "type" or "phase" develops into another almost instantly, each having its own "essence". However, even if a materialist ontology is embraced, we see no reason why a single or constant *tempo* necessarily needs to be espoused. O´Brien & Lyman (2002a; see also Lyman & O´Brien, 1997) rightly equate the materialist ontology with gradual change. However, *there is no reason to assume that a materialist ontology automatically entails the assumption of a continuous rate of change*. The concept of gradual change, in our view, means that change does not proceed in leaps but, on the other hand, does not mean that change occurs at the same pace all the time, either. Hence, it is perfectly sound to concede that in some cases culture can be extremely persistent or stable, presenting minor rates of change during extended periods. The flow can be understood simply as "pools and streams", without rapids, but surely with some pools. Another important factor to

acknowledge is that different aspects of culture will change at different *tempos*. For example, lithic industries and burial patterns are not expected to change at the same pace, as evidence supports (e.g., Ucko, 1969; Araujo et al., 2018).

The main conclusion we can draw from the four case studies is that they showed a remarkable cultural stability or persistence through space and time, which can be translated into "tradition", *as long as we understand the term as* "*patterned ways of doing things that exist in identifiable form over extended periods of time*" (O´Brien et al., 2010). In three cases, at least two different classificatory procedures were used: traditional culture historical "types", and technology. In one case, we added geometric morphometrics, and the results pointed in the same direction. For this reason, we tend to rule out that this perception of cultural stability was an artifact of the classificatory methods. Yet, we acknowledge that such a scenario is in stark opposition to the North American archaeological record, where Late Pleistocene and Early Holocene lithic traditions such as Clovis, Folsom, Agate Basin and so on, tend to be very short-lived (Surovell et al., 2016). Moreover, in North America there is also a strong tendency of decrease in spatial range and increase in point shape diversity (or types) through time (e.g., Hamilton et al., 2019; Huckell, 1996; Justice, 1995, 2002). Such phenomena were not observed in our case studies. These four South American traditions are all very different from their onset in the Early Holocene and tended to maintain their differences regarding the main artifacts and to not expand their geographic locations. This suggests that different cultural processes were operating in Northern and Eastern South America in comparison to North America, and we suspect such a pattern can be extrapolated for the Andean and coastal Pacific areas (Salcedo Camacho, 2012, 2014). In a way, given the time range and the spatial dimension, the Holocene South American record is more akin to some of the so-called techno-complexes of the Upper Paleolithic of Europe (for instance, the Gravettian or Magdaleniean industries).

In order to address the third point, about the operationalization of classes, types, and traditions (or cultures, or technocomplexes etc) we need first to present a proper nomenclature. Therefore, we define a "class" as a statement of the necessary and sufficient conditions for membership (Dunnell, 2002:45). In using this definition, *a class is a theoretical construct*. We define a "group" *as an aggregate of things* that are put together for some reason. A group is composed of material phenomena. We can sort things by means of *classification* (i.e., using the class statement to put them together) or by means of *grouping* (i.e., putting things alike together based on shape, on elemental

composition, on raw material, etc). Classification provides classes; grouping provides types (Dunnell, 2002; O´Brien & Lyman, 2002b).

When dealing with bifacial points from Southern Brazil, we had to use both approaches. First, we used a paradigmatic classification, which involves the use of mutually exclusive attributes (Dunnell, 2002; Banning, 2020). We used nine attributes, each of them being constituted by a number of attribute states (Figure 5). This means that theoretically we could have 4,233,600 classes. Of course, not all classes would have material phenomena (real points) assigned to it, and this is both the weakness and strength of a paradigmatic classification: it has a huge number of classes, but you can map which classes are observed and which are not. That provides a means of tracking down *variation*, either in time or in space (Cochrane, 2001; Lipo et al., 2010; O´Brien et al., 2010). Moreover, new points can be satisfactorily assigned to the previously proposed classification, without the need of changing attributes.

However, it is also true that, in giving equal weight to all attributes, and in having very cumbersome labels, a paradigmatic classification is not very well suited to communication between humans. For example, point number 34 would be considered to be a member of class 424111104. The first number, 4, means that the state of the "edge" attribute is "convex"; the second number tells us that the second attribute, "stem", is "present" (attribute state 2); the third number, 4, tells us that the "stem base" presents "convex shape", and so on. The class is *defined* by this sequence of numbers.

Morphological types, in turn, may include several classes as defined here through paradigmatic classification, as some variations in attributes may not be considered important enough to define a new morphological type. In this view, *types can be considered as synthetic units*, consisting of one or more classes, on a scale where classes would be analytic units (Dunnell, 2002:154). For example, Type I (Figure 6), consisting of 14 specimens, comprises six different paradigmatic classes: 25113522372123, 25223111672122, 25443133332113, 25223411112114, 25223122111113, and 25223122353122. Types are *described*, not defined.

Finally, the third question refers to how we relate classes (ideational) and types (empirical), to higher order taxonomic units such as "traditions" or "cultures", which are a mixed concept? A taxonomy implies a hierarchical arrangement, for two reasons: 1) because we are dealing with different fields (a field here means the subject of classification; the field of flaked stone, the field of polished stone, the field of bone artifacts, etc) in order to propose the existence of a given "culture" or "tradition"; and 2)

because not all attributes observed in an artifact are considered to be of equal importance. For instance, when we record the shape of the base of the stem of a bifacial point in a paradigmatic classification, it may be perhaps important to track minor changes through time or among regions, but the mere existence of bifacial points in a given industry might be more important than the shape of the base of the stem, or even more important than the presence of the stem itself. Here we begin to enter dangerous ground, because imparting a different importance or weight to some attributes at the expense of others needs some theoretical reasoning. In the case of PRONAPA, this reasoning was never explicit and we suspect that it was never considered necessary or important. The "definition" of the Tupiguarani Tradition, for instance, was "*characterized mainly by polychrome ceramics (red or black over white or red), corrugated or brushed, by* [the presence of] *secondary burials in urns, polished stone axes, and the use of small stone t-shaped ornaments*" (Brochado et al., 1969:10, our translation). It is readily apparent that this is not a proper definition, but a description of several material phenomena, coming from different fields (ceramics, lithics, bones), all of them lumped together. At a first glance, it *seems* that we are dealing with a class because a list of traits was provided, but then we acknowledge that in most of the sites assigned to the Tupiguarani Tradition, polished stone axes, t-shaped ornaments, and human burials are absent (this is akin to what was observed by Clark (2009:25) regarding the list of 92 tool types comprising the European Upper Paleolithic: most sites actually present few of them). In practice, ceramics ha**v**e a much stronger role in the assignment of a given site to the Tupiguarani Tradition than an occasional groundstone axe or a t-shaped ornament found elsewhere. If a t-shaped ornament is found at a site presenting ceramics that do not match the "polychrome, red or black over white or red, corrugated or brushed" description, this single artifact would be considered "intrusive", or the result of goods exchange, and not a characteristic of the Tupiguarani Tradition. In short, the description of any group, be it called a "tradition", a "technocomplex", or a "culture", must impart more weight to a given class of artifacts at the expense of others. Ideally, such a decision should be theory-based but, if not, at least this decision needs to be clearly presented and tentatively justified. In a way, the greater importance given to the "fossil guides" of Umbu and Itaparica Traditions (namely, bifacial points and plane-convex scrapers, respectively), were the main problem pointed out by Brazilian archaeologists when criticizing the "Pronapian" approach (Hilbert, 1994; Milder, 1999; Dias, 2003:51; Dias, 2007; Dias and Hoeltz, 2010).

The *definition* of a "tradition" or "culture" is impossible in formal terms. They can only be *described* because, as we saw, they comprise different fields, or kinds of artifacts. In the abovementioned example, the definition of a paradigmatic class for our points is composed of nine digits. This is not possible for a "tradition". Therefore, a "culture", or "tradition" or any higher taxonomic level represents a synthetic unit and therefore cannot be manipulated as an analytical unit. It serves only for data organization on a higher level and for the purposes of peer communication, but it should be based on the humble paradigmatic classifications. If we try to handle data from the types, or to handle the material/empirical phenomena from types, it will result in confusion, because types are synthetic units. In our view, that was one of the major problems faced by culture historians. The limits between "phases", for instance, or any taxonomic unit below "tradition", must be made on the basis of statistical differentiations that will be revealed thanks to the attributes recorded using paradigmatic classifications.

Finally, we are fully aware that classification is inherently theory-dependent and therefore there might be some variation as to the attributes and/or attribute states that a researcher might be interested in recording. However, the endeavor of recording at least some common attributes in order to be able to compare both attribute distribution and paradigmatic classification results among research projects (including different sites, chronologies, and regions) surely benefits from a policy of data sharing, which allows researchers to easily access data recorded by others and to run new analyses (Marwick & Birch, 2018).

6. Conclusions

Our own work in Eastern South America is starting to deal with a large amount of data which was produced in a few years (when compared to Europe) and by fewer researchers (when compared to North America). As recently put by Riede et al. (2020) any effort to organize large amounts of archaeological data must hinge on clearly defined criteria for artifact classification and for the construction of high-level cultural taxonomic units. The following paragraphs comprise, at the same time, concluding remarks and a few actions we want to implement in a near future. Hopefully, such actions might be useful for other researchers interested in investing in the topic of cultural taxonomies.

We understand that archaeological collections should be analyzed by means of a minimum number of standardized attributes. Different fields (lithics, ceramics, etc) will

have their attributes properly defined. Researchers should and could record other attributes, but for the sake of comparison, a minimum standard should be set, and the reasons for the choices must be explicit. The use of paradigmatic classifications is essential, and it comprises an analytical step. The resulting paradigmatic classification can be used as a basis for other analyses, including GMM, multivariate statistical analysis, etc. The visual assignment to morphological types is also valid, if also made with explicit, clear, and replicable parameters. Clusters of artifacts can be obtained on this basis, including the use of computer-based shape classifications to minimize bias. Here we are talking about types, or groups of phenomena. A type is a synthetic unit and it combines more refined data into boxes for the sake of communication among peers, allowing people to talk and discuss the same empirical phenomena.

It is never too much to emphasize that "cultures", "traditions", or "technocomplexes" are our constructs. They are attempts to reflect a past reality and should not be confused with the reality. As everything else in science, they are always provisional. They can be split, lumped together, or even abandoned, if necessary. These decisions have to be taken as more data is made available, new methods are developed, and new interpretations are made.

As a closing remark, we hope our case studies can be useful to think about human adaptations in the Holocene as the product of emergent properties, and not as something that is "built in" in modern humans, such as "enhanced symbolic capacities" or simply "large brains". The rationale is simple: we have four cases of modern human groups that were (most probably) not genetically or culturally related, yet they all showed very low rates of cultural change. Their behavior seems much more akin to what is perceived in the archaeological records of Australia or in the Upper Paleolithic of the Old World than what is present in North America. This entails two questions for further thought: 1) are modern humans inherently innovative? and 2) what explains the fact that the South American record is so different from the North American? We already addressed these two questions elsewhere (Araujo, 2015; Okumura & Araujo, 2014; Araujo et al., 2018), and we believe they are of interest for European researchers when discussing the longevity and geographic spread of cultural taxonomic units such as the "Aurignacian", "Gravettian", or "Solutrean". It is also interesting to note that "over-imitation", a concept readily applied to Neanderthals (e.g., Nielsen et al., 2020; Rossano, 2017), can be easily recognized in our case studies. We suspect that beneath these perceived patterns of cultural stability there are both genuine cultural processes and artifacts of classification

(or "accidents of history" as put forward by Clark, 2009) playing their roles, and the only manner to disentangle this knot is controlling what we can control: classification procedures and taxonomy construction.

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Figure captions

Figure 1: Selected archaeological sites related to the eastern South American Lithic Traditions.

Lagoa Santa: 1= Lapa do Santo, Boleiras and Taquaraçu; 2= Santana do Riacho; 3= Lapa Pequena; 4= BA-RC-28; 5= Abrigo do Pilão.

Itaparica: 6= Gruta do Gentio II; 7= Lapa do Varal; 8= GO-JA-01; 9= MT-GU-01; 10= Lapa do Dragão; 11= Lapa do Boquete; 12= Furna do Estrago; 13= Pedra Furada (São Raimundo Nonato area); 14= Lajeado.

Umbu: 15= PR-FI-124; 16= PR-FI-138; 17= Tunas; 18 = RS-C-43 and RS-S-327; 19= RS-I-69.

Figure 2: Bifacial points found in sites commonly associated to the Umbu Tradition, S and SE Brazil. A) Queimador I site; B) Areia Branca 2 site; C) BA-6 site; DD Céu Azul site. Photographs by Letícia Correa, drawing by F. Parenti.

Figure 3: Plane-convex scrapers from the Itaparica Tradition. Pedra Furada site, NE Brazil. Drawings by F. Parenti

Figure 4: Small quartz core (A) and flake (B) as examples of the most common artifact classes found at Lagoa Santa, Central Brazil. Both pieces are from Taquaraçu rockshelter, modified from Venezia (2020). Photographs by A. Gotardo, drawings by N. Batalla.

Figure 5: Attributes and attribute states used in the paradigmatic classification of the bifacial points found at Garivaldino rockshelter, Southern Brazil.

Figure 6: Morphological types, or synthetic units comprising several paradigmatic classes in order to convey a general shape, addressing the bifacial point variability at Garivaldino rock shelter, Southern Brazil.

Acknowledgements

We would like to thank Felix Riede for the invitation to contribute to this volume, and to all colleagues that participated in the "All These Fantastic Cultures" workshop, held in November 2019 by the CLIOARCH project in Denmark, for their valuable input. We also would like to thank the financial support given to the authors by CNPq and FAPESP (see Funding session). We also thank two anonymous reviewers for their thoughtful comments and Susan Pyne for her English proof-reading services.

Funding

This work was supported by CNPq Productivity Scholarships (302163/2017-4 [MO] and 302024/2019-0 [AGMA]) and FAPESP grants (2009/54.720-9, 2013/13.794-5, 2016/23.584-6, 2019/18.664-9 [AGMA] and 2010/06453-9, 2018/23282-5 [MO]).

Conflicts of interest/Competing interests: The authors declare that they have no conflict of interest.

Figure 1

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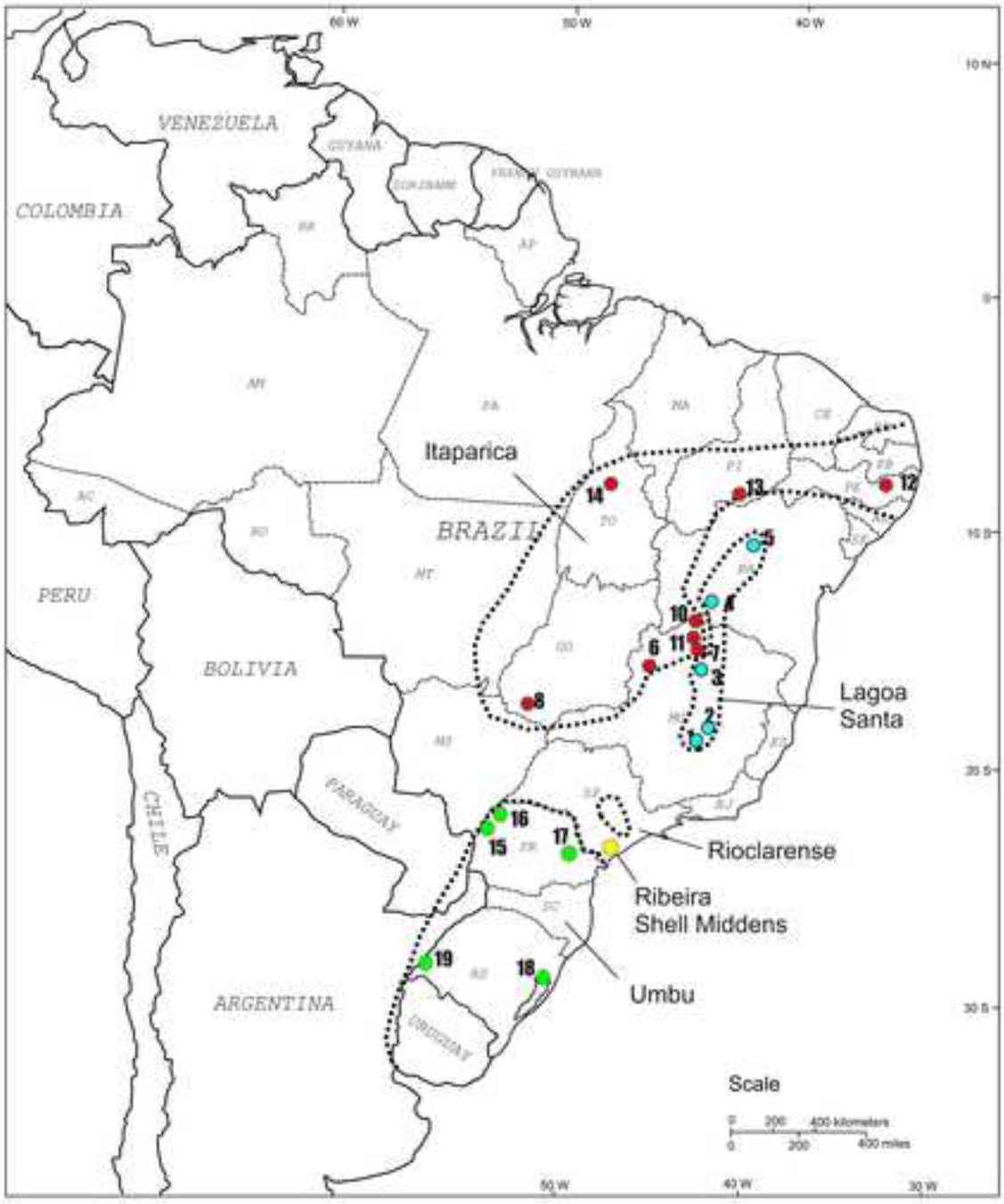
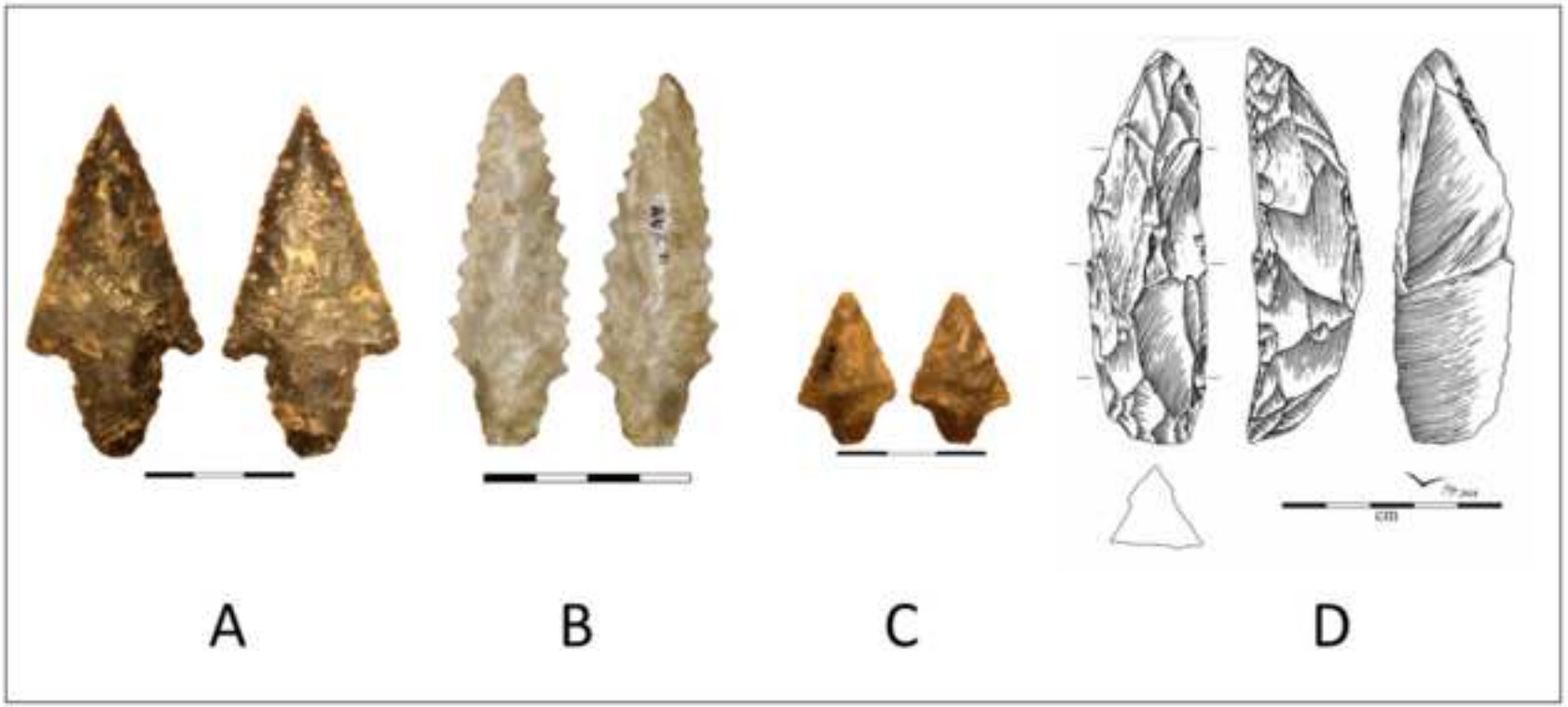


Figure 2



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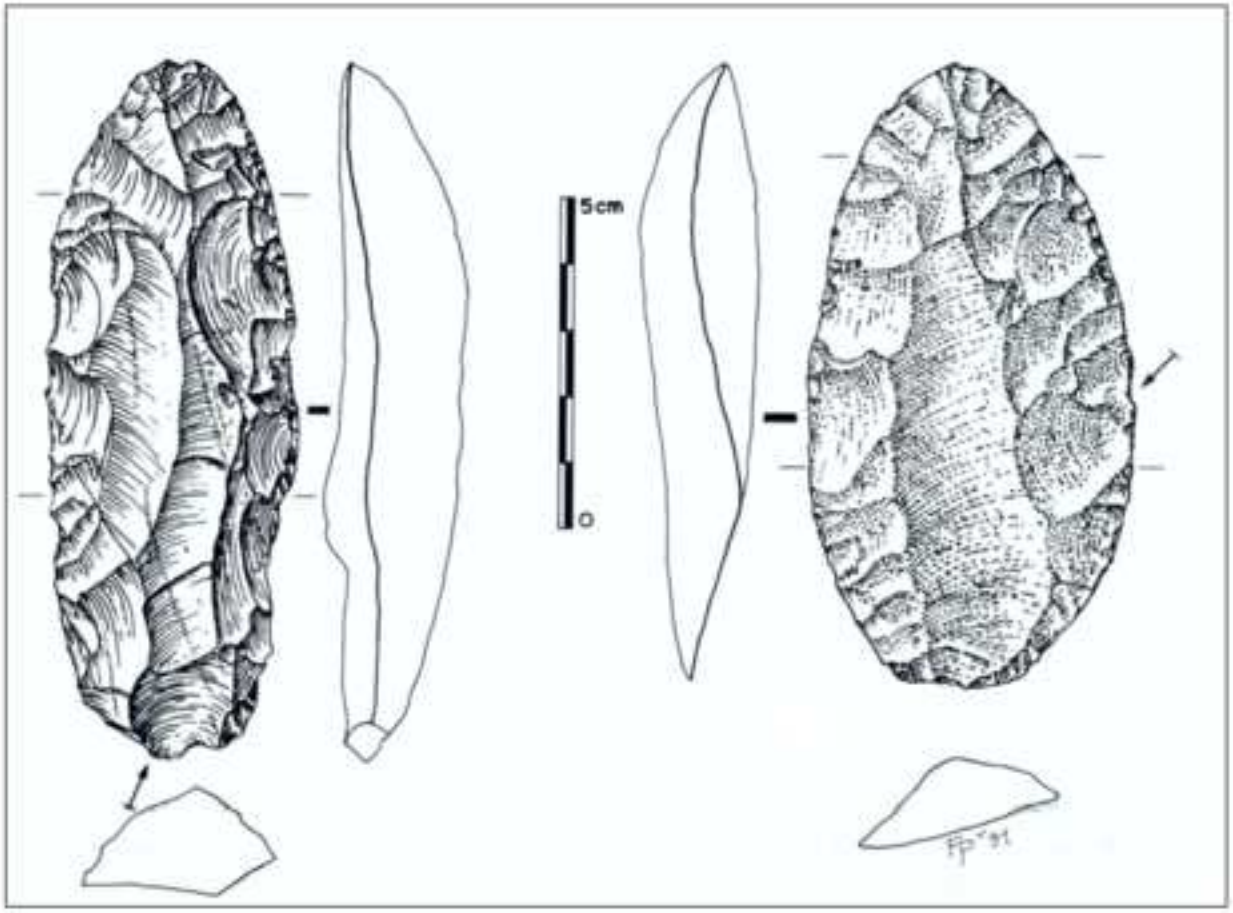

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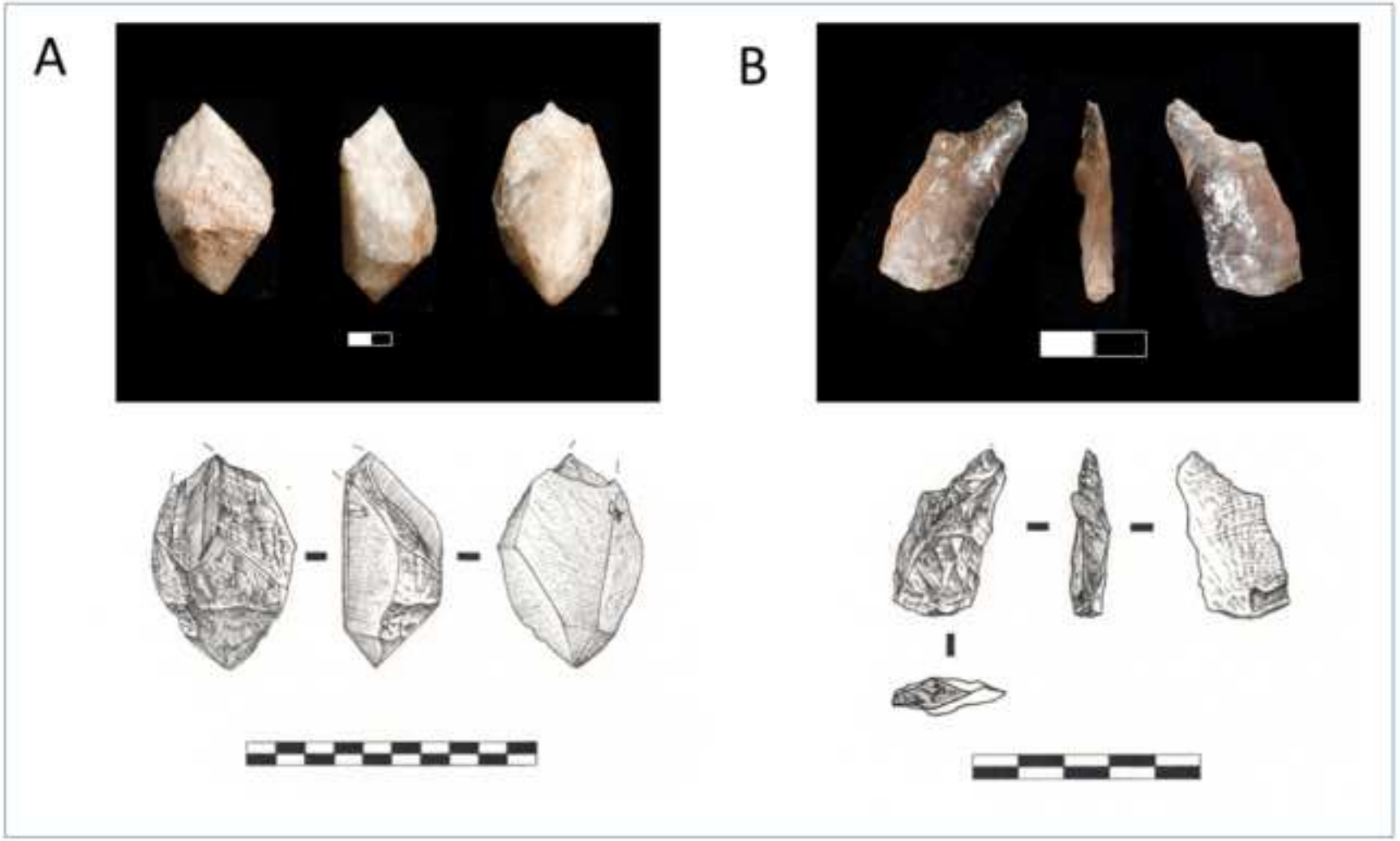

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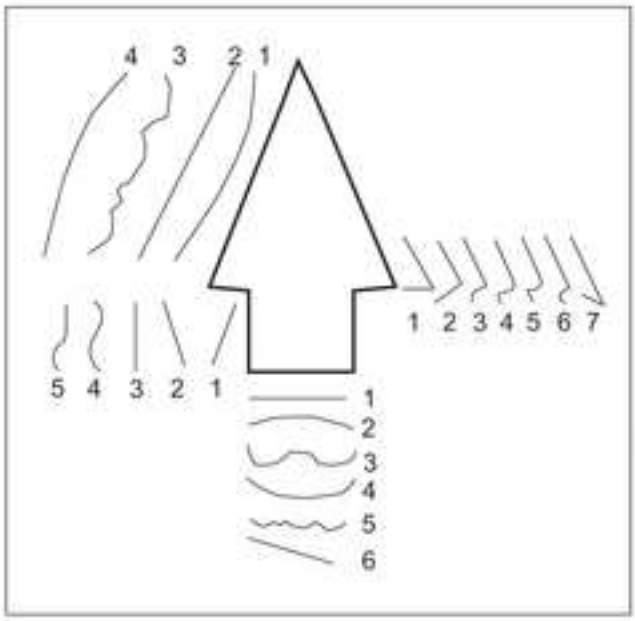


Bifacial Point Attributes

A. Edge shape
1. concave
2. straight
3. irregular
4. convex

B. Base
1. straight
2. concave
3. bifurcated
4. convex
5. irregular
6. oblique

C. Stem side
1. convergent
2. divergent
3. paralel
4. sinuous a
5. sinuous b

D.Shoulder
1. perpendicular
2. obtuse
3. concave a
4. convex a
5. convex b
6. concave b
7. acute

E. Transverse section
1. planoconvex
2. parallel
3. biconvex
4. asymmetrical
5. irregular
6. asymmetrical biconvex

F. Longitudinal section
1. planoconvex
2. parallel
3. biconvex
4. concave-convex
5. ovate
6. triangular
7. irregular

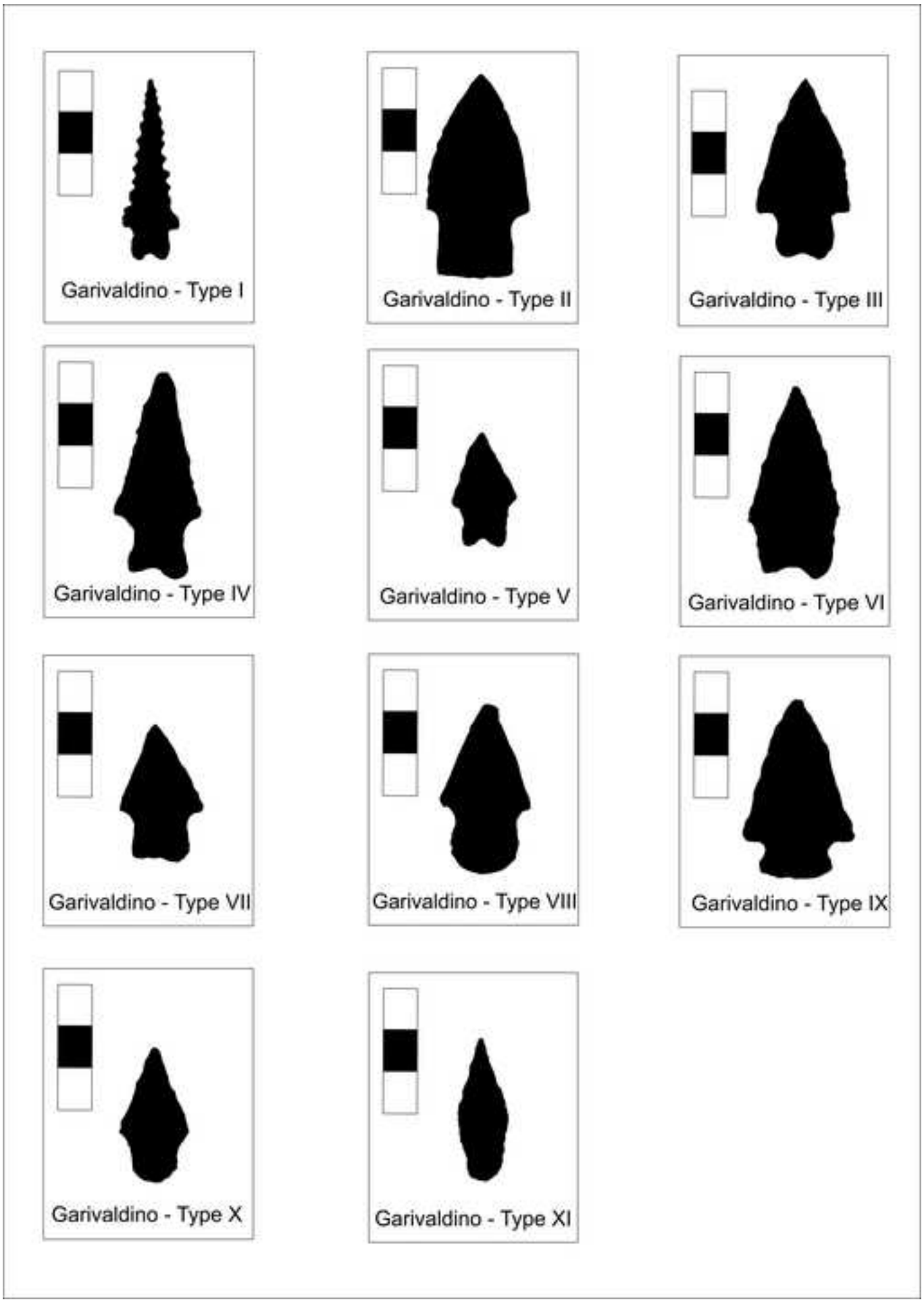
G. Maximum thickness
1. mesial body
2. proximal body
3. neck
4. mesial stem
5. proximal stem
6. distal body

H. Length / width ratio
1. > 2.5
2. 2.1 to 2.5
3. 1.5 to 2.0
4. > 1.5

I. Size
1. up to 10 mm
2. up to 20 mm
3. up to 30 mm
4. up to 40 mm
5. up to 50 mm

Figure 6

Click here to access/download;Figure;Figure 6.jpg



We thank the editor for the final remarks, and for the suggestions regarding concepts that we can incorporate in our future work, such as Resilience and Panarchy Theory.

We accepted and incorporated all the suggestions and corrections. These changes are shown in blue.

There was only a minor misunderstanding about the word "dimension", which means a given attribute inside a paradigmatic classification, but since it can be easily mistaken by "size", we put the word among parentheses (page 10).

It is a great honor to be able to contribute to the JPA from a theoretical standpoint.

Best regards,

Astolfo