

# Fishtail Projectile Points from South America: The Brazilian Record

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## Abstract

The projectile points known as Fishtail or Fell represent a specific design associated with the earliest hunter-gatherers of the Pleistocene-Holocene transition in South America. Brazil was traditionally considered as a marginal area of their distribution because in the past there were only a small number of findings known, often inadequately documented. In this paper we present a general and unified overview of the Brazilian record, including previously unpublished metric, technological and stylistic features. Also, we report on new findings of fishtail points in order to expand the amount of information currently available. Some issues related to these records are also evaluated by comparing them with data from the Uruguayan plains and the Argentinean pampas. The general picture that emerges after this analysis shows a growing record of fishtail projectile points in southern Brazil, demonstrating a significant presence of these early paleo-South American populations.

## Keywords

Fishtail Projectile Points, Paleoindian, South America, Brazil, Pleistocene-Holocene Transition

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## 1. Introduction

The projectile points known as Fishtail or Fell have been taken as an indicator of early hunter-gatherer populations during the Pleistocene-Holocene transition in South America, with known dated contexts ranging from 11,000 to 10,000 uncalibrated radiocarbon years BP. These points are usually of a medium size (between 50-

and 60-mm long) with a convex blade, rounded shoulders, and concave stem sides and bases. Some of these projectile points also show a very distinctive technological feature: a fluted channel on one or two faces (Bird, 1938, 1969; Bell, 1960, 1965; Mayer-Oakes, 1963; Dillehay, 2000; Meneghin, 2004; Flegenheimer et al., 2013; Nami, 2007, 2011a, 2001b, 2013, 2014a, 2014b).

Fishtail projectile points have a wide distribution in Central and South America, covering the entire western portion of the subcontinent and reaching as far as the southern extreme of Argentinean and Chilean Patagonia (Bird, 1938, 1969; Schobinger, 1969, 1971, 1974; Mayer-Oakes, 1963; Bell, 1960, 1965; Chauchat & Zeballos Quiñones, 1979; Nami, 1987, 1992, 2013; Ardila Calderón, 1991; Nuñez et al., 1994; Grosjean et al., 2005; Jackson et al., 2007; León Canales, 2007; Díaz Rodríguez, 2008; Briceño, 2010; Miotti et al., 2010; Maggard & Dillehay, 2011; Flegenheimer et al., 2013; Patané Araújo & Nami, 2014). In South America, they have a clear distribution along the Pacific coast. However, in the southernmost area, where the continent becomes narrower, its distribution also crosses over the interior to reach various regions of the Atlantic seashore, such as in Argentinean Patagonia, the Pampean area, central and northeastern Argentina, and the Uruguayan plains (Serrano, 1932; Schobinger, 1974; Eugenio, 1983; Politis, 1991; Mújica, 1995; Meneghin, 2004; Mazzanti, 1999, 2002, 2003; Martínez, 2001; Nami, 2007, 2010, 2013; Figueira, 1892; Bosch et al., 1980; Laguens et al., 2007; Femenías et al., 2011; Gascue et al., 2013). Recently a complete analysis of fishtail records in Patagonia, the Pampas, and Uruguay was performed by Flegenheimer et al. (2013).

Southern Brazil has been traditionally considered as a marginal area within the distribution range of these projectile points (Schobinger, 1974; Prous, 1992; Dias, 2004, 2007a; Bueno et al., 2013), although this perception is probably related to a lack of systematic local investigations regarding this record. Moreover, regional summary articles discussing fishtail points do not include all of the pieces documented in the Brazilian literature, generating a biased and impoverished view of their occurrence. In addition, some of the more recent findings have been recovered during CRM archaeology projects and later stored in local museums, remaining unpublished. Finally, another factor that has affected their consideration is the existence of other projectile points with a different morphology, which is well documented within the early Holocene and associated with the first early stage of settlement in the area. These are triangular stemmed points with well-formed auricles (or ears), included within the archaeological units known as Umbu and Bituruna (Meggers & Evans, 1977; Chmyz, 1981, 1983; Prous, 1992; Farías, 2005; Hoeltz, 2005; Dias, 2012; Caldarelli & Lavina, 2011; Hoeltz & Brüggemann, 2011; Bueno et al., 2013; Parellada, 2013). A very useful description of the morphometric properties of Umbu projectile points is found in Okumura and Araujo (2014).

In this paper we present the first unified review of Brazilian fishtail projectile points (FTPP). However, we first want to be clear about what this study is and what it is not. Firstly, the main aim of this paper is to bring together and update all of the dispersed and unpublished information about fishtail projectile points from southern Brazil, much of which has unfortunately remained unavailable to most researchers until now. The second main goal is to present new and unpublished pieces identified recently in order to compare and analyze this growing record in the region. As a part of these descriptions we have included key measurements for each artifact including a descriptive metric analysis and some allometric relationships. The metric information for each artifact is summarized in **Table 1**. These descriptions also include the raw materials used to produce the points and some other technological properties, but only in cases where the original information was available.

On the other hand, this work does not intend to present a geometric morphometric study or a statistical analysis of the metric properties, since our work on this type of specific analysis is still in progress and such results go beyond the goals of this paper. In fact, for that kind of study, a detailed discussion on the work of other archaeologists is required and their morphometric analyses need specific comments on methodology and results. Nor are radiocarbon dates presented for the artifacts discussed, since with only one exception there are no dates associated with FTTP points in southern Brazil. In this regard, the current state of knowledge is similar to the one observed some decades ago in other parts of South America. Consequently, this paper represents a first step towards the systematic study of fishtail projectile points in southern Brazil. Therefore, it is a starting point to expand the analysis on the early assemblages that have evidence of bifacial reduction technology, but have not been clearly identified as belonging to other archaeological entities such as Umbú Tradition. Hence, this paper brings together information on provenience, more complete metric data, images of each piece, raw materials used and some technical information. We also include analysis of some new specimens as well as information related to the local production of FTTP. Finally, we discuss some ideas about the importance of this record in relation to the peopling of southern Brazil.

**Table 1.** Fishtail projectile points from Brazil (finished or fragmented pieces). SC: Santa Catarina; RS: Rio Grande do Sul; MG: Minas Gerais; PA: Paraná; SP: São Paulo; BA: Bahia. \*Quartzite or silicified sandstone. All measurements are in mm. The number in parentheses in the “fluting” column indicates whether there is one (1) or two (2) sides of the stem with this technological feature.

State	Location	Site	Piece #	Raw material	Color	Total length	Width	Thickness	Blade length	Stem length	Stem width	Fluting
SC	Irani River	-	CAFS-1	chalcedony	brown-red	38.4	20.9	6.9	17.5	20.9	16.5	yes (1)
SC	Orleans	-	257	quartz	white	49.2	28.2	8.3	31.3	17.9	17.3	No
SC	Jaguaruna	11	-	quartzite	brown	78.9	30.1	-	56.8	22.1	18.4	?
SC	Itapiranga	SC-U-23	-	silex	-	55	27	8.6	35.7	19.3	18.6	?
RS	Monteneg.	-	-	silex	brown	60.6	23.2	7	43.6	17	18	No
RS	-	-	379	quartz	white	46	22	7	27.8	18.2	15.3	?
RS	Uruguaiiana	RS-I-69	-	quartz	white	-	-	-	-	-	-	?
RS	L. Collor	RS-C-43	-	-	-	-	-	-	-	-	-	No
MG	Serra Cipó	Santa Ana	-	-	-	-	-	-	-	-	-	?
PA	Iguazú	Jusante	48.98.L181	silex	brown-red	40.8	21	6.3	19.8	21	19.3	No (?)
PA	St. Helena	PR-FI-124	-	-	-	-	-	-	-	21.4	24.2	?
SP	Rio Claro	-	Ft-1	silex	brown	65	26.6	8	45	20	19	?
SP	Rio Claro	-	Ft-2	silex	grey	50	26	8	30	20	20	?
SP	Rio Claro	-	Ft-3	silex	grey	48	28.5	5	29.5	18.5	21	?
SP	Rio Claro	-	Ft-4	silex	brown	53.5	44	5	38	15.5	22	?
SP	Rio Claro	-	Ft-5	silex	grey	38	23	5	29	9	12	?
SP	Apiai	-	14	silex	black	131	58	6	109.7	21.3	20.2	Yes (2)
BA	-	-	-	silex	green	94.2	33.8	-	70.1	24.1	21.1	Yes (1)
	Average					60.6	29.5	6.7	41.7	19.1	18.8	
	Median					51.7	26.8	6.9	33.5	20.0	19.0	
	1 SD					24.7	10.5	1.3	24.1	3.5	2.9	
	25 <sup>th</sup> percentile					44.7	22.7	5.5	28.7	17.9	17.3	
	75 <sup>th</sup> percentile					68.5	31	8	47.9	21.3	21	
	CV (%)					40.7	35.8	19.4	57.8	18.5	15.4	

## 2. The Brazilian Record of Fishtail Projectile Points

One of the main problems encountered when analyzing FPHP from the published Brazilian literature is that much of the available information lacks sufficient descriptive and technological data. In some cases the artifacts are poorly described, the raw material usually is not mentioned, and/or there is a lack of good drawings or photos. Sometimes only one measurement is available (frequently the length). In such cases, as part of the present study we have been able to include new metric data by estimating other dimensions using tpsDig software (version 2.7). This is a free-access application that allows absent metric features to be estimated through landmarks anchored on a single known measurement. The program calculates the remaining measurements analyzed here using the relationship between the dimensions from an image and one known measurement as provided by the original author. Even when this initial measurement is absent, it has been possible to apply this analysis using the scale in the original photo or drawing. Moreover, in some cases it has been possible to obtain the metric information using both sources in order to check the precision of the data. This has provided a simple and reliable way, and in fact the only one available, to estimate the measurements that are absent in the literature, especially considering that it is impossible to gain access to every projectile point reported in the literature to

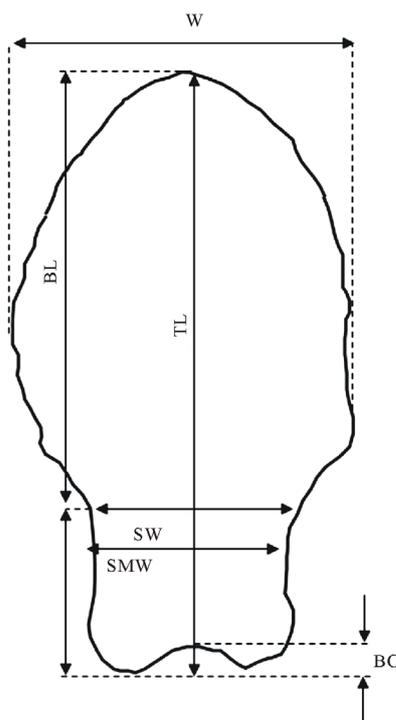
perform further analysis.

For pieces where photographs are available these new measurements can be considered as fairly accurate (Zelditch et al., 2004; Rohlf, 2006, 2010). However, in pieces with measurement estimations based on drawings, the accuracy depends heavily upon the precision of the original images and/or original scale used. This situation is therefore clarified below in relation to the metric estimation made on each piece. Another difficulty often confronted in relation to FTTP metrics is determining where the blade ends and where the stem begins. To clarify this and other measurements, a map of the dimensions can be seen in **Figure 1**. The description of the different parts of the projectile points follows the scheme proposed by **Cambron and Hulse (2012)**.

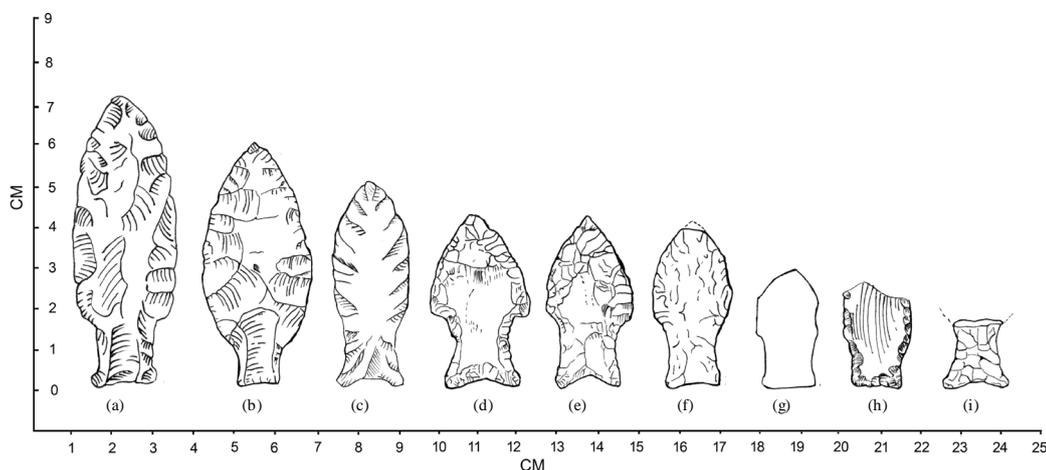
We have also incorporated new photos and drawings as well as additional descriptive data for some of the projectile points we were able to relocate. In cases where we lacked access to the original specimens and only drawings were available (from unpublished reports or other records), the new data was strictly reproduced according to the available image information.

### Reanalysis of Bibliographic Data

The first point analyzed here was surface-collected by **Rohr (1966)** at an eroded site known as SC-U-23, near the city of Itapiranga in western Santa Catarina state. This was recorded as a silex point but its color was not described. It has a lanceolate blade with convex sides and at least one rounded shoulder. This design, with a well-developed blade, is also found in other Brazilian fishtail points that we have analyzed in the present study, and it has also been found in other regions of South America (**Mayer-Oakes, 1986a, 1986b; Suárez, 2004; Nami, 2011a, 2011b, 2013; Da Silva Lopes & Nami, 2011**). The stem has the morphology typical of FTTP: a concave form on both sides and an expanded, concave base with two noticeable auricles. Rohr's report lacks any further metric or technological description of this specimen, but a scale was included with the original drawing. We have redrawn this artifact from the original version (**Rohr, 1966: p. 56, I-3**) (see **Figure 2(c)**) and we also applied the tpsDig software. This yielded the following estimated measurements: 55 mm length, 27 mm maximum blade width, and 8.57 mm thickness. The stem is estimated to be 19.28 mm long with an 18.57 mm width for its base. No other technological information is available for this specimen.



**Figure 1.** Mapping of the measurements considered on this analysis. TL: total length. W: maximum width. SW: stem width (maximum). SMW: stem width (minimum). SL: stem length. BL: blade length. BC: basal concavity. MT: maximum thickness.



**Figure 2.** Fishtail projectile points from Brazil, redrawn from their original illustrations. (a) Bahia (after Nami, 2010) redrawn at a 10% size reduction; (b) Apiaí (after Collet, 1980). This specimen is redrawn at a 40% size reduction from the original illustration; (c) Itapiranga (Rohr, 1966); (d) Rio Claro, specimen Ft-3 (after Beltrão, 1974); (e) Rio Claro, specimen Ft-2 (after Beltrão, 1974); (f) Rio Grande do Sul (after Schobinger, 1974); (g) RS-I-69 (after Miller, 1987); (h) RS-C-43 (after Dias, 2007a), the scale of this piece is approximate; (i) PR-FI-124 (after Chmyz, 1978).

A second FFTP reported by Schobinger (1974) was probably recovered in the state of Rio Grande do Sul, and is now curated at the Instituto Anchieta de Pesquisas (Universidade do Vale do Rio dos Sinos, Rio Grande do Sul). This specimen, with catalog number 379, is made of quartz. According to the original drawing (Schobinger, 1974: p. 35), which is redrawn here (see Figure 2(f)), it has the characteristic shape shared by all well-documented fishtail points, including a convex-sided blade, rounded shoulders, and an expanded base. Its blade length is similar to that of the stem, probably due to resharpener. The dimensions reported by Schobinger are: 46 mm maximum length, 22 mm width, and 7 mm thickness. Based upon this information, the stem measurements have been calculated as follow: 18.18 mm length and 15.33 mm width at the stem base. It is highly probable that this piece does not have a fluted channel, otherwise Schobinger would have noted its presence. There are no other technical features described for this point.

The third piece included here is a fragment. It was recovered by Pedro Ignácio Schmitz during excavation of the site known as RS-C-43, in the Cai River Valley (Lindolfo Collor County in northeastern Rio Grande do Sul state), and is also curated at the Instituto Anchieta de Pesquisas. There is no mention of raw material or any other information regarding measurements (Dias, 2007a, 2012). Based upon the available drawing (Dias, 2007a: p. 50, Figure 15, piece 7) the specimen shows a fragmented body and one stem side, with discontinuous marginal retouching. One shoulder is rounded and the other is sharp, the stem sides are concave, and the base is slightly expanded. The stratigraphic level from which this point was recovered remains undated. The ambiguous scale used in the original drawing allows us to redraw the artifact only with an approximate size (see Figure 2(h)), and because of this uncertainty, we have not estimated the measurements of this fragment. Moreover, Dias referred this piece with an ambiguous typological status as a “fishtail style stem” (Dias, 2007a: p. 54, 2012: p. 16). Although we have included the specimen within this group, further analysis is required to confirm its inclusion.

The fourth specimen is a stem fragment recovered within the stratigraphy of the PR-FI-124 site, located on the east bank of the Paraná River in Santa Helena County in western Paraná state (Figure 2(i)). The context was assigned to the Vinitú phase but was never dated, although Chmyz (1978) and Prous and Fogaça (1999) have estimated that it probably dates to between 6000 and 8000 years BP. However, if this assumption is correct, it is likely that this specimen was not recovered in a primary context since there are no FFTP known from this time period (Nami, 2013).

There is no reference to the raw material used nor to the artifact’s measurements, although a scale was added to the original drawing (Chmyz, 1978: p. 28, Figure 11 Q). This allowed us to estimate some measurements: the stem, with concave sides and expanded base, is 21.4 mm in length and 24.2 mm wide at the base.

The fifth FFTP was found by local residents in Apiaí County in São Paulo state, and was described by Collet

(1980, 1987). The raw material is a black silex. It has a long lanceolate blade, rounded shoulders, and concave sides along the stem, which has a fluted channel on both sides (see **Figure 2(b)**). The association of a large, elongated blade with a small stem is also found in other specimens such as the one published by Nami (2013: p. 6, **Figure 4.1**) from the Negro River region in Uruguay. Measurements of this specimen as provided by Collet are: 131 mm in length, 58 mm in width, and 6 mm in thickness. Based on its drawing we can estimate the stem length as 21.3 mm and the stem width as 20.1 mm at its base.

A sixth specimen was found at the RS-I-69 site (also known as Laranjito), on the left bank of the Uruguay River (Uruguaiiana County, Rio Grande do Sul state). It was recovered by Miller (1987: p. 57, **Figure 13a**) from a stratigraphic level with five dates ranging from 10.2 to 10.9 kyr, and recently it was correctly identified by Nami (2013) as a fishtail projectile point. According to Miller is manufactured using quartz. There is no other significant information on this point. The blade is small, caused by a substantial resharping process (Nami, 2013). Since the scale in the original photo is somewhat ambiguous we did not calculate its dimensions, but it is probably no longer than 4 cm. Moreover, the original image published in Miller's article (1987) is a low quality one, and for this reason, we have only redrawn its outline as seen in **Figure 2(g)**.

Another example comes from Bahía in the north-central region of Brazil, in a location far from the distribution area of FTTP. There is no provenience information about this isolated specimen published by Nami (2010). The raw material is a green silex (Nami, 2011b). It has a lanceolate blade, with one shoulder rounded and the other slightly sharp, and the stem has fluting only on one side (Nami, 2010: **Figure 1, K**). No other technological information is available. Based on the scale in the photograph the estimated measurements are 94.2 mm in total length and 33.8 mm in width, while the stem is 24.1 mm long and 21.1 mm wide at its expanded base. The drawing size is reduced by 40% in **Figure 2(a)** since its large dimensions distort the regular scale of the other projectile points.

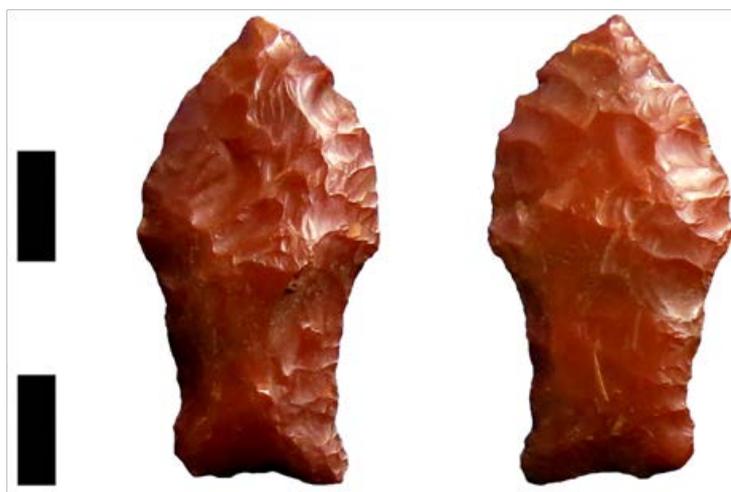
In the Rio Claro Valley area (northeastern region of São Paulo state), Beltrão (1974) identified five FTTP in a private collection compiled by 19th-century landowner Gualter Martins. Measurement data have been provided by Beltrão, and good drawings are available of two of the points, which we have redrawn in **Figure 2**. The first one, labeled as Ft-1, is made of brown silex. It has a lanceolate body, in line with the typical form of other FTTP coming from Brazil, with slightly rounded shoulders. One side of the stem is straight and the other is slightly concave. The total length of this specimen is 65 mm and its width is 24 mm, with a thickness of 8 mm. The stem length is 20 mm with a width of 17 mm and an expanded base width of 19 mm. The Ft-2 point is made of a grey silex. It has a smaller blade, with one rounded shoulder and concave sides on the stem. The main measurements are 50 mm length, 26 mm width, and 8 mm thickness. The stem is 20 mm long and 17 mm wide, with the width increasing towards the base until reaching a measurement of 20 mm. The stem and much of the blade show marginal retouching that only affects the edges (see **Figure 2(e)**).

The third point from Martín's collection (Ft-3) has a more triangular shape, with noticeable ears and the characteristic fishtail point stem. The raw material is grey silex. Total length is 48 mm, total width is 28.5 mm, and thickness is 5 mm. The stem is 18.5 mm long and 17 mm wide, with a concave base 21 mm wide (see **Figure 2(d)**). The fourth point (Ft-4) has no illustration, although the author states that the raw material is a brown silex. The measurements for this specimen are: length 53.5 mm, width 44 mm, and thickness 5 mm. The stem length is 15.5 mm with a width of 17.5 mm, and with the base expanding to 22 mm wide. Finally, the fifth point of this collection (Ft-5) is also made of grey silex, but like the fourth specimen there is no drawing or photo available. Its measurements are: length 38 mm, width 23 mm, and thickness 5 mm. The stem is 9 mm long and 12 mm wide, with the base expanding to a width of 15.5 mm.

The thirteenth point discussed in the present study was recovered in 1998 during an archaeological rescue project directed by Claudia Parellada on the lower Iguaçú River, Nova Prata do Iguaçú County in the southwestern area of Paraná state. It was surface-collected from the Jusante UHE Salto Caixas I site. This is a complex site generated by water transport and redeposition of Iguaçú River sediments. This point remains unpublished until now. It is curated at the Museu Paranaense (Paraná state, catalogue number 48.98. L181). The raw material used is a homogenous reddish-brown silex and its brightness might suggest that it was subjected to heat treatment (Nami et al., 2000). Its measurements are: total length 40.8 mm, width 21 mm, and thickness 6.3 mm (Parellada, pers. comm. 2014). The estimated stem length, based on the photograph, is 21 mm and the blade length is only 20.8 mm, which probably reflects a major resharping process. The width of the narrower portion of the stem is 17.5 mm, with the base expanding to 19.3 mm. Basal concavity is slight, only 1.5 mm, similar to other points described here (see below). One shoulder is rounded more than the other, and there is bilateral asymmetry.

No evidence of fluting can be seen on this point's stem (**Figure 3**).

Another specimen has been recently discovered in Montenegro County in the northeastern region of Rio Grande do Sul state (Da Silva Lopes & Nami, 2011). It was recovered from a small cavity caused by soil erosion while a county crew was working on one of the city's streets. The raw material is a high quality brown chert. Both sides of the stem are concave with rounded shoulders. Like the specimens from Itapiranga and Apiaí reviewed above, it has a particularly long, lanceolate blade. The edges of the stem also show smoothing by abrasion, a technological feature performed in order to prevent cutting of the hafting materials (such as leather cordage), and hence to prevent the point from becoming detached from the shaft (Nami, 2010; Nami & Castro, 2014). The maximum measurements of this projectile point are: 60.6 mm length, 23.2 mm width, and 7 mm thickness. The stem length is 17 mm and 15 mm in width, with the base expanding to 18 mm (Nami, 2010) (see **Figure 4**).



**Figure 3.** Fishtail projectile point from the Jusante UHE Salto Caixas I site. Museu Paranaense collection (Photo: Claudia Parellada). The scale is in cm. See accurate dimensions in the text.



**Figure 4.** Fishtail point found in Montenegro (after Da Silva Lopes & Nami, 2011. Photo by courtesy of H. Nami). The scale is in cm. See accurate dimensions in text.

The fifteenth point included here was recovered near the shell-mound (“sambaqui”) site known as Jaguaruna 11, located in an area of sand dunes on the coast of Santa Catarina state (Prous, 1992; Prous & Fogaça, 1999). It is unclear whether this point comes from the sambaqui itself or from an area immediately outside of the site (Prous, pers. comm., 2014). The raw material is a light brown quartzite or siliceous sandstone. It has a long lanceolate blade, similar to the points found in Itapiranga, Apiaí, Montenegro, and Bahia as described above. It shows what appears to be the remains of a fluted channel. The estimated measurements of this point are 78.9 mm in length and 30.1 mm in width. The stem length is 22.1 mm, with its narrower portion being 16.84 mm wide and its base expanding to 18.42 mm wide (estimated, since one of the corners is fractured)<sup>1</sup> (Figure 5).

The existing literature also contains some other less detailed references to FTTP. The first of these is a quartz stem recovered from the middle levels of the Abrigo de Santana do Riacho site in the Serra do Cipó region (Minas Gerais state), dated to ca. 7000 years BP. It would thus seem as though the antiquity of this piece, for which no other technical information is available, and it only can be the result of its recovery from an older site or level (Prous, 1992).

Another two pieces were mentioned by Schobinger (1974: p. 35). One is curated in the Instituto Anchieta de Pesquisas under catalog number 60 - 68 and it probably represents a FTTP, but uncertainty remains regarding its typological status as Schobinger stated. The other comes from the area of the Mirim lagoon (Rio Grande do Sul), but there is no other published information about this artifact. We therefore cannot take either of these two pieces into account. Prous (1992) also mentions that an unpublished thesis by J. Losada includes a reference of another find in Rio Grande do Sul state as well as two more pieces from Bahia state. However, again the problem with these three specimens is a lack of information on their technological characteristics as well as a lack of images and catalog numbers, making it impossible to consider them in this study. Finally, another finding that can be mentioned is a piece illustrated by Mentz Ribeiro et al. (1995). This artifact was recovered as part of a surface collection from the southwest of Rio Grande do Sul state. The photograph taken by the authors shows what appears to be a typical FTTP, but the image is a low quality one and we cannot be sure about its typological status. Moreover, the authors did not identify it as a FTTP. This specimen needs a new analysis in order to confirm its technological and stylistic information.

### 3. The New Findings

There are three new FTTP that have been identified in the region by the present authors. The first was found by local residents on the ground surface on the Irani River coast (a tributary of the upper Uruguay River) in western Santa Catarina state (27°08'47"S, 52°30'33.42"W). This specimen is now curated at the Centro da Memória do Oeste de Santa Catarina (Universidade Comunitária da Região de Chapecó, UNOCHAPECÓ), with catalog number CAFS-1. This is a small projectile point that weighs only 6.5 grams, made of a reddish chalcedony of excellent quality. The blade is lanceolate, with both shoulders rounded. It is 38.38 mm long, and its maximum width is 20.98 mm near the stem union. The thickness is 6.91 mm. The blade is only 17.43 mm long, which suggests that it was subjected to a heavy resharpening process. The stem is in fact longer than the blade: 20.95 mm by 14.58 mm wide at its central portion and 16.88 mm at its base, showing the classic expanded shape. Stem thickness in its central portion is 5.25 mm, which presents fluting that is slightly shifted from the axial center of the piece and which is 21 mm long and 9.33 mm wide. Another important feature is that the fluted channel is not only restricted to the stem, but continues up into the blade as well. In addition, the stem base shows the remnants of a abraded beveled platform produced by abrasion, a distinctive feature used to facilitate production of the fluted channel (Nami, 2001, 2013, 2014b). The stem's basal concavity is 0.8 mm deep. The blade's edges have been thinned by small retouches less than 0.5 mm wide, with no regular pressure flaking pattern. The blade's edge angle is 20°, while stem's edge angle is 30° (Figure 6).

The second new finding to be discussed here was recovered in the Tubarão River valley in Orleans County, southeastern Santa Catarina state (28°21'S, 49°17'W), 50 km from the Atlantic coast. It was recovered as part of a surface collection by a staff member of the Museu ao Ar Livre Princesa Isabel—Fundação Educacional Barriga Verde (Febave, Orleans, Santa Catarina), where it is now curated. This specimen, labeled with catalog number 257, is made of white quartz with reddish areas and weighs 12.55 grams (Figure 6). It is 49.20 mm long and 28.5 mm in maximum width, and its maximum thickness is 8.3 mm. The stem is 17.93 mm long, 16.17 mm wide, and 6.66 mm thick, with an expanding base of 17.3 mm. It shows the classic FTTP design, with one

<sup>1</sup>These measurements were calculated using the photographs with scales, kindly provided by André Prous.



**Figure 5.** Fishtail point from the Jaguaruna 11 site (Photo: André Prous). The scale is in cm. See accurate dimensions in text.



**Figure 6.** Specimen CAFS-1. Fishtail projectile point recovered from the shore of the Irani River. CEOM collection, Universidade Comunitária da Região de Chapecó, UNOCHAPECÓ, Santa Catarina state (original photo by the authors). The scale is in cm. See accurate dimensions in text.

rounded shoulder and the other one straight. The stem base is concave, showing two small divergent auricles and basal concavity 1.7 mm deep. Because of the characteristics of the raw material we cannot be sure about the presence of fluting and the shaping techniques cannot be properly appreciated, but several retouches no deeper than 9 mm can be seen on certain portions of the edges. The piece does not have perfect bilateral symmetry but is instead slightly unbalanced, probably due to resharpening of at least one of the blade's edges (Figure 7).

The third new finding reported here was, like the one above, recovered as part of a surface collection by personnel from the Museu ao Ar Livre Princesa Isabel, after digging activity related to building projects within the municipal limits of Orleans city. This artifact has been labeled with catalog number 342. The piece is undoubtedly a preform, and we think that it represents a fishtail preform in an advanced stage of manufacture, with its stem and blade shapes clearly outlined (Figure 8). It is a thin flake, obtained from a small tabular node of quartz that still has some cortex on both faces. Its maximum length is 56.6 mm and it is 32.04 mm in width. The thickness is 10.81 mm at the central portion of the blade and it weighs 19.46 grams. The stem also includes the rem-

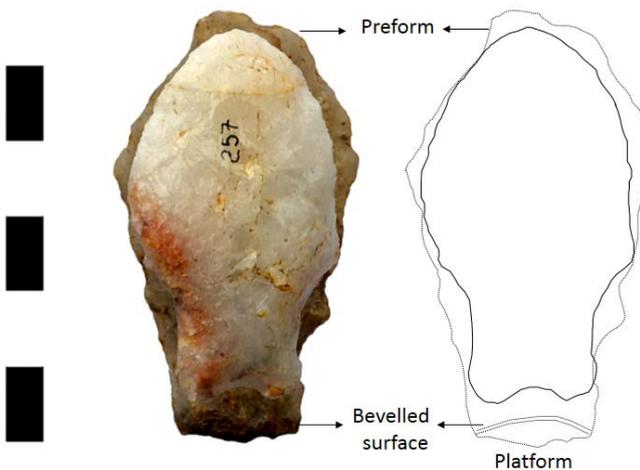
nants of a striking platform (*sensu* Andrefsky, 2005), which is flat with a 90° angle, and it seems likely that this area would eventually have been completely removed (see **Figure 9**, superposition of specimens 257 and 342).



**Figure 7.** Specimen 257. Fishtail projectile point from the collection of the Museu ao Ar Livre Princesa Isabel (Febave), Santa Catarina state (original photo by the authors). Scale is in cm.



**Figure 8.** Specimen 342. Fishtail projectile point preform from the Museu ao Ar Livre Princesa Isabel (Febave) collections (original photo and drawings by authors). Scale is approximate. See accurate dimensions in the text.



**Figure 9.** Superposition of specimens 257 and 342 (original photos and outline drawings). Scale is in cm.

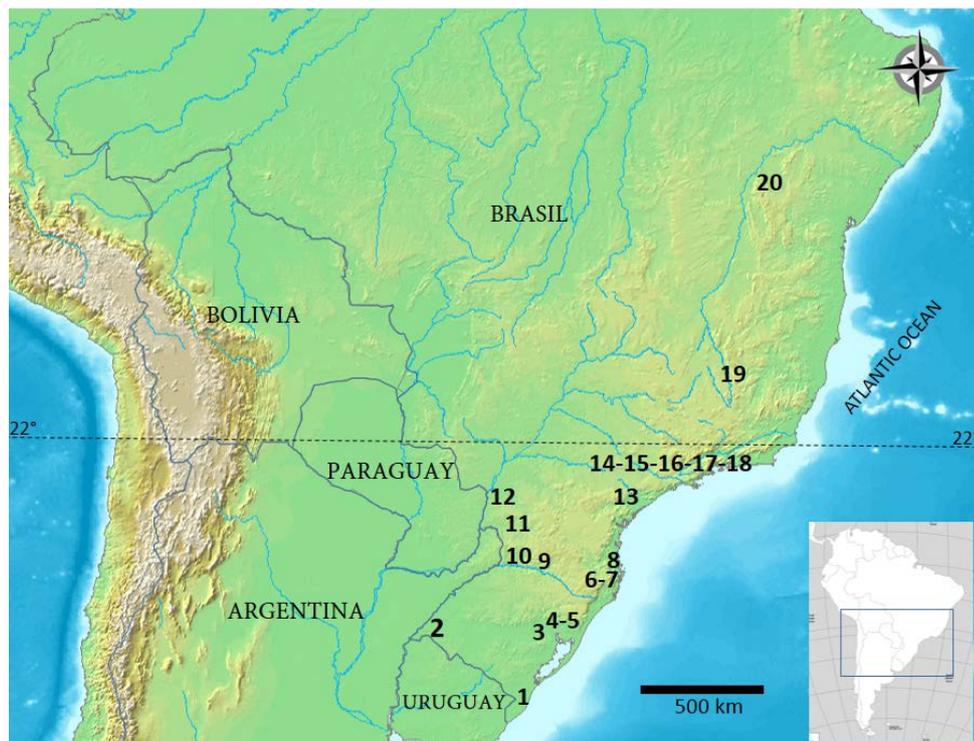
Above this feature, an abraded beveled platform can be seen, similar to the one observed in specimen CAFS-1.

There are many features in this piece that allow us to classify it as such. First, the general silhouette was obtained by percussion and retouching, pointing to an intermediate product close to the final shape of a FPHP, including a lanceolate blade, rounded shoulders, and a concave stem obtained by retouching, which makes it completely different from other point styles documented in the area. The beveled surface on the stem base is another quite distinctive technological feature of FPHP (Nami, 2014b: Figs 14-15; Nami, 2001, 2013). The experimental baseline and analysis of early stages of manufacture of fishtail projectile points are congruent with this piece as an intermediate stage of them (Nami, 2001, 2003, 2014b) and is quite similar to another preform illustrated by Nami (2015: Figure 7a) recovered in the adjacent Uruguayan plain. It is also difficult to define it as a preform for any other type of projectile point known from the area.

This summary review from southern Brazil has included 20 analyzed specimens. While it is possible that a few of these specimens in cases that are not well described or not well documented by photos or drawings, could be misclassified and hence incorrectly included in the FPHP group, the significant number of confirmed specimens suggests a full territorial coverage of southern Brazil by these early hunter-gatherers (see Figure 10 and Table 1).

#### 4. Discussion

Fishtail projectile points have played only a marginal role in previous academic discussions of the early peopling of southern Brazil (Prous, 1992; Dias, 2012; Bueno et al., 2013). The problem that archeology has yet to solve is that the amount of research on this subject remains low, and many of the recorded artifacts come from undated contexts, as noted by several authors (Prous, 1992; Bueno et al., 2013). However, the existing record should be considered as evidence of early colonization by these paleo-South American hunter-gatherers (in the sense of



**Figure 10.** Distribution of FPHP in Brazil. 1) Mirim Lagoon (Rio Grande do Sul state); 2) RS-I-69 site (Rio Grande do Sul State); 3) Montenegro (Rio Grande do Sul state); 4) RS-C-43 site (Rio Grande do Sul state); 5) Unspecified (Rio Grande do Sul state); 6 and 7) Orleans (Santa Catarina state); 8) Jaguaruna 11 site (Santa Catarina state); 9) Irani River (Santa Catarina state); 10) Itapiranga (Santa Catarina state); 11) Jusante site (Paraná state); 12) PR-FI-124 Santa Helena site (Paraná state); 13) Apiaí site (São Paulo state); 14)-18) Rio Claro (São Paulo state); 19) Abrigo do Santana do Riacho (Minas Gerais state); 20) Unspecified (Bahia state). The provenience of specimens 5 and 20 can only be assigned to the cited state.

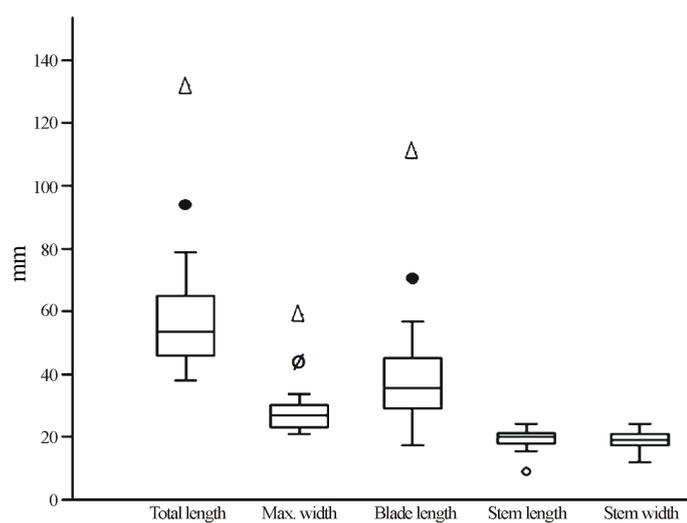
Nami, 2009, 2013), as some authors had begun to tentatively point out in the archaeological literature over forty years ago (Rohr, 1966; Schobinger, 1974). Fishtail points are highly abundant in the nearby Uruguayan plains, clearly extending to the border with Brazil (Nami, 2007, 2013; Flegenheimer et al., 2013), and it would be extremely unlikely that the current political frontier between the two countries represented a sharp limit to the distribution of these groups in the Late Pleistocene since it does not reflect any sort of real geographical or ecological barrier. Moreover, during this time the same biome covered this vast region, linking the southernmost Pampean plains with the territories of southern Brazil (De Vivo & Carmignotto, 2004; Morrone, 2006; Suárez & Santos, 2010; Gallo et al., 2013), with only small clinal variations being present until the 22°S parallel (Bombin, 1976; Oliveira, 1996; Cartelle & Lessa, 1988; Carlini et al., 2004; Kerber et al., 2014). Specifically, this vast territory that reaches the southern part of São Paulo state includes all of the localities with FTTP as presented in this paper, except for the projectile points recovered from Minas Gerais and Bahia states (see **Figure 10**).

The Brazilian assemblage shows high selectivity of raw materials. Ten pieces are made with silex (62.5%) and four with quartz (25%, including the preform). Both of these stone types have numerous outcrops in many areas of southern Brazil (Amaral, 1971; Stevaux et al., 1986; Wildner et al., 2006). Moreover, the quartz from Orleans County used in specimens 342 and 257 is macroscopically identical to the raw material used by local inhabitants to produce other types of projectile points during the Late Holocene (Carbonera & Loponte, 2015). It is also interesting to note that basalt has not been identified within the known assemblage of FTTP available, and with just one in chalcedony and one other in silicified sandstone. However, these last three raw materials were commonly used in assemblages from the early, middle and late Holocene in southern Brazil to produce other types of points (Dias, 2007b, 2012; Farias, 2005; Hilbert, 1994; Schmitz et al., 2009; Carbonera & Loponte, 2015). The preference for quartz in the manufacture of FTTP was suggested by Nami (2009) to reflect selection due some symbolic or aesthetic component, despite that generally this rock do not have optimal flaking qualities (Nami, 2009). On the other hand, the silex used in pieces CASF-1 (Irani River) and 48.98.L181 (Jusante, Iguazú) also has an excellent flaking quality. While we have not been able to check the quality of all of the silex used, it is clear that two main types of stone for flaking were generally selected, one with high and the other with medium quality. On the other hand, there is no evidence of stone coming from more southern regions, such as Uruguay or the Argentinean pampas. The raw material used in FTTP from Uruguay is usually silicified limestone from the Queguay or Mercedes Formation (Nami, 2013; Castiñeira et al., 2011), while specimens coming from Argentina's Pampean plains are mostly dominated by orthoquartzite (Flegenheimer et al., 2013). It is therefore notable that these rock types are not present in the Brazilian assemblage. Furthermore, in the Pampas region it has been suggested that the selection of reddish rocks to produce these types of projectile points was related to some type of symbolic meaning (Flegenheimer & Bayón, 2009). However, in the Brazilian assemblage reddish pieces are rare. However, it also remains the case that we are still far from knowing the natural availability of the different colors of silex in this extensive region.

There is a growing literature discussing the morphotypes of FTTP (Borrero, 1983; Nami, 1989-90, 1998, 2000, 2001, 2003, 2007, 2010, 2011a, 2013, 2014a, 2014b; Suárez, 2004; Baeza & Femenías, 2005; Flegenheimer et al., 2010, 2013; Castiñeira et al., 2011) and the Brazilian assemblage clearly can contribute to this topic. This is characterized by projectile points of medium size (75<sup>th</sup> percentile below 69 mm, see **Table 1**), with only two larger pieces representing outliers in the distribution (see **Figure 11**). However, it is difficult to know whether this restricted range in the distribution of sizes is related to the small sample size of artifacts available.

The highest degree of size variation is observed in blade lengths (CV = 57.8%), followed by the total width (CV = 35.8%). Both of these dimensions and the total length are highly correlated with each other (see **Table 2**), demonstrating an integrated system defined by design, function, and resharpening. However, whatever the sources of variation may have been, they did not affect the stems in the same way, a situation that has been described for projectile points in general (Flenniken & Raimond, 1986; Bettinger & Eerken, 1999). Indeed, the documented CV is lowest in stem length (18.5%) and in stem width (15.4%) (see **Table 1** and **Figure 11**), and the ratio between these last two dimensions shows a value close to 1 ( $1.09 \pm 0.16$ ). An identical result has been reported for Uruguayan pieces, where this relationship is  $0.9 \pm 0.11$  (calculated based upon Castiñeira et al., 2011: p. 344). These results are consistent with the standardization of the design of fishtail stems, as proposed by Baeza and Femenías (2005) for artifacts recovered in Uruguay.

The thickness of these projectiles also has been pointed out as the most standardized dimension directly related to issues of function (Borrero, 1983), and the one less affected by the reactivation process (Nami, 1989-90, 2000). Certainly, this is found to be one of the dimensions with the least variability in the Brazilian assemblage (CV =



**Figure 11.** Dispersion of the main dimensional variables considered. Symbol  $\Delta$  = projectile point from Apiai. Symbol  $\bullet$  = projectile point from Bahia. Symbol  $\emptyset$  = Ft-4, Río Claro.

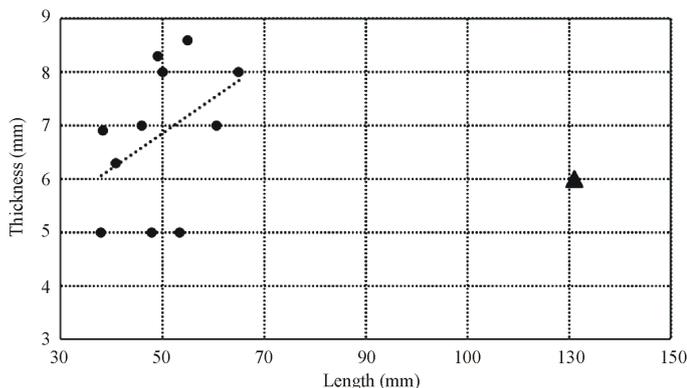
19.4%, see **Table 1**) as well as in the aforementioned Uruguayan collection (CV = 22.5%, based on [Castiñeira et al., 2011: p. 344](#)). Using a geometric morphometric study, these authors found that more elongated pieces are thicker, and smaller ones are thinner. In fact, total length and thickness has a strong and significant correlation in that collection ( $r_s = 0.69$ ;  $p = 0.001$ , estimates based on [Castiñeira et al., 2011: p. 344](#)). But in the Brazilian assemblage, thickness seems to have no significant correlation with the other dimensions (see **Table 2**), although smaller projectile points below 65 mm in total length presents an allometric vector suggesting an increase in thickness with increasing length of the piece. However, this trend is not only non-significant, but also begins to blur if larger specimens are incorporated (see **Figure 12**).

Finally, although the presence of fluting has been identified in a few pieces within the Brazilian assemblage, a lack of good descriptions in the original literature makes it difficult to identify this feature in many cases.

After definition of the typical FTTP in Central and South America ([Bird, 1969](#); [Mayer-Oakes, 1963, 1986a, 1986b](#)), progress in research has revealed significant morphometric variability, which increases along with the reactivation process for projectile points ([Nami, 1989-90, 1998, 2000](#); [Flegenheimer et al., 2010](#); [Castiñeira et al., 2011](#)). [Suárez \(2002, 2004\)](#) has suggested that the original FTTP were large by design, with shoulders at or near right angles ( $90^\circ - 100^\circ$ ), and with the stems having concave sides and bases. Following this scheme, the reactivation process results in multidirectional decreases in the measurements, with the blades becoming more lanceolate and the shoulders rounded with resulting angles of  $140^\circ - 160^\circ$ . The sides of the stem in turn become straight or slightly concave. However, this model does not fit with two of the three larger examples presented here (the pieces from Apiai and Jaguaruna 11) nor with some of the smaller ones (e.g., piece Ft-3) (see **Figure 2**). The first two projectile points mentioned are large pieces with lanceolate blades and rounded shoulders. The third piece is a small one, with shoulders at right angles and a triangular blade. Furthermore, the preform collected in Orleans County, which we consider to be a preform of a FTTP, was being developed in order to produce a medium-sized projectile point with rounded shoulders and a lanceolate blade, similar to piece 257 recovered from the same area. [Nami \(2001, 2003\)](#) considered the manufacturing process, whether from big bifaces or from flakes, to produce the same general design of projectile points, but with significant variability. [Flegenheimer et al. \(2010\)](#) believes that there were two different original sizes, one consisting of small pieces of ~6 grams and the other being large pieces over 25 grams. The preform labeled as 342 suggests the manufacture of a piece from 10-16 grams, similar to the weight measurement of point 257 (12.55 grams), which supports the idea of the existence of designs of various sizes, although not specifically within the weight ranges outlined above.

## 5. Concluding Remarks

This first step in the systematic study of FTTP from southern Brazil leaves us with the impression of an emerging



**Figure 12.** Total length vs. maximum thickness. ▲ = Projectile point from Apiaí.

**Table 2.** Correlation of values for the main metric variables considered in the present study.

	Total length		Total width		Blade length		Stem length		Stem width	
	rs	p	rs	p	rs	p	rs	p	rs	p
Total width	0.74	0.003								
Blade length	0.96	0.0001	0.96	0.0001						
Stem length	0.47	0.08	0.20	0.48	0.33	0.24				
Stem width	0.51	0.06	0.51	0.06	0.46	0.1	0.42	0.11		
Thickness	0.32	0.3	0.32	0.30	0.17	0.58	0.16	0.60	0.28	0.36

and increasing body of evidence regarding the records of these artifacts in the region. Although there are some cases where these projectile points have been recovered within a secure stratigraphic context, there is still a lack of reliable radiocarbon dates. Most of the findings were recovered from surface contexts, and in many cases they were completely isolated from their original associations. However, a similar scenario (scarce and poorly documented findings) was already noted some decades ago during an earlier stage of the archaeology of Uruguay and the Argentinean Pampas region (see, for example, the poor knowledge we had of these records as expressed in Politis, 1986, 1991), and by now this situation has shown a remarkable improvement (Flegenheimer et al., 2013). Correspondingly, there is little doubt that the assemblage analyzed here represents just a very small sample of the FTTP that are curated but not yet recognized in local museums and university-housed collections from southern Brazil. This conclusion is clearly supported by our own analysis of two unpublished collections (from the UNOCHAPECÓ museum and Fevabe collection), where three new specimens were identified. In fact, from the Museu Paranaense collection there are some other FTTP now under analysis, with the results due to be published shortly (Parellada, pers. comm. 2014). New field research projects as well as the study of several unpublished collections that still exist in southern Brazil will continue to increase the number of identified pieces, further improving our knowledge of the spatial and chronological distribution of these early paleo-South American artifacts. Also, we do not know yet how this early record is related to the early projectiles encompassed within the so-called “Umbú Tradition”. We hope this contribution become a starting point for analyzing these aspects as well as chronological and contextual analysis of fishtail projectile points in Brazil.

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## References

- Amaral, E. (1971). Geologia e Petrologia da Formação Irati (Permiano) no Estado de São Paulo. *Boletim do Instituto de Geociências e Astronomia da Universidade de São Paulo*, 2, 3-81. <http://dx.doi.org/10.11606/issn.2316-9001.v2i0p03-81>
- Andrefsky, W. (2005). *Lithics. Macroscopic Approaches to Analysis*. Cambridge: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511810244>
- Ardila Calderón, G. J. (1991). The Peopling of Northern South America. In: R. Bonnichsen, & K. L. Turnmire (Eds.), *Clovis. Origins and Adaptations* (pp. 261-282). Corvallis: Center for the Study of the First Americans.
- Baeza, J., & Femenías, J. (2005). *Nuevos registros de puntas líticas “cola de pescado” de Uruguay*. Santa Fe: Primer Encuentro de Discusión Arqueológica del Nordeste Argentino. Unpublished.
- Bell, R. (1960). Evidence of a Fluted Point Tradition in Ecuador. *American Antiquity*, 26, 102-106. <http://dx.doi.org/10.2307/277167>
- Bell, R. (1965). *Archaeological Investigations at the Site El Inga, Ecuador*. Quito: Casa de Cultura.
- Beltrão, M. C. (1974). Datações arqueológicas mais antigas do Brasil. *Anais da Academia Brasileira de Ciências*, 46, 211-251.
- Bettinger, R. L., & Eerkens, J. W. (1999). Point Typologies, Cultural Transmission, and the Spread of Bow-and-Arrow Technology in the Prehistoric Great Basin. *American Antiquity*, 64, 231-242. <http://dx.doi.org/10.2307/2694276>
- Bird, J. (1938). Antiquity and Migrations of the Early Inhabitants of Patagonia. *Geographical Review*, 28, 250-275. <http://dx.doi.org/10.2307/210474>
- Bird, J. (1969). A comparison of South Chilean and Equatorial “Fishtail” Projectile Points. *Kroeber Anthropological Society Papers*, 40, 52-71 (Berkeley, CA: University of California).
- Bombin, M. (1976). Modelo paleoecológico evolutivo para o Neoguaternário da região da Campanha-Oeste do Rio Grande do Sul (Brasil), A Formação Touro Passo, seu conteúdo fóssilífero e a pedogênese pós-deposicional. *Comunicações do Museu de Ciências da PUCRS*, 15, 1-90.
- Borrero, L. (1983). Distribuciones Discontinuas de Puntas de Proyectoil en Sudamérica. *11th International Congress of Anthropological and Ethnological Sciences Symposium “Early in South America”*, Vancouver, 1-18.
- Bosch, A., Femenías, J., & Olivera, A. (1980). Dispersión de las puntas líticas pisciformes en el Uruguay. *Anales del III Congreso Nacional de Arqueología*, Montevideo: CEA.
- Briceño, J. (2010). *Las tradiciones líticas del Pleistoceno tardío en la quebrada Santa María, costa norte del Perú. Una contribución al conocimiento de las puntas de proyectil paleoindias cola de pescado*. PhD Thesis, Berlin: Freien Universität.
- Bueno, L., Schmidt Dias, A., & Steele, J. (2013). The Late Pleistocene/Early Holocene Archaeological Record in Brazil: A Geo-Referenced Database. *Quaternary International*, 301, 74-93. <http://dx.doi.org/10.1016/j.quaint.2013.03.042>
- Caldarelli, S. B., & Lavina, R. (2011). Da arqueologia acadêmica à arqueologia consultiva no Oeste Catarinense. In M. Carbonera, & P. I. Schmitz (Eds.), *Antes do Oeste Catarinense: Arqueologia dos povos indígenas* (pp. 36-54). Chapecó: Editora Argos.
- Cambron, J. W., & Hulse, D. C. (2012). *Handbook of Alabama Archaeology: Part I Point Types*. The Archaeological Research Association of Alabama Inc., Project Gutenberg ebook.
- Carbonera, M., & Loponte, D. (2015). *Variabilidade de pontas de projétil no Estado de Santa Catarina*. Unpublished manuscript.
- Carlini, A. A., Zurita, A. E., Gasparini, G., & Noriega, J. I. (2004). Los mamíferos del Pleistoceno de la Mesopotamia argentina y su relación con los del Centro Norte de la Argentina, Paraguay y Sur de Brasil, y los del Sur de Brasil y Oeste de Uruguay: Paleobiogeografía y Paleoambientes. In R. G. Aceñolaza (Ed.), *Temas de la Biodiversidad del Litoral Fluvial Argentino* (pp. 83-90). Miscelánea: INSUGEO.
- Cartelle, C., & Lessa, G. (1988). Presença de *Myocastor coypus* (Molina, 1782), Rodentia, Myocastoridae, do Pleistoceno final-Holoceno, no centro-oeste da Bahia. *Actas do 11º Congresso Brasileiro de Paleontologia*, 1, 583-591.
- Castiñeira, C., Cardillo, M., Charlin, J., & Baeza, J. (2011). Análisis de morfometría geométrica en puntas cola de pescado del Uruguay. *Latin American Antiquity*, 22, 335-358. <http://dx.doi.org/10.7183/1045-6635.22.3.335>

- Chauchat, C., & Zevallos Quiñones, J. (1979). Una punta cola de pescado procedente de la costa norte de Perú. *Ñawpa Pacha: Journal of Andean Archaeology*, 17, 143-147. <http://dx.doi.org/10.1179/naw.1979.17.1.007>
- Chmyz, I. (1978). *Projeto Arqueológico Itaipu. Terceiro Relatório das Pesquisas Realizadas na Area de Itaipu (1977/78)*. Unpublished report, Curitiba.
- Chmyz, I. (1981). *Relatório das Pesquisas Arqueológicas Realizadas na Área da Usina Hidrelétrica de Salto Santiago (1979-80)*. Florianópolis-Curitiba: ELETROSUL/IPHAN. Unpublished report.
- Chmyz, I. (1983). *Sétimo Relatório das Pesquisas Realizadas na Área de Itaipu (1981-2)*. Florianópolis-Curitiba: Convênio IPHAN/ITAIPU, Unpublished report.
- Collet, G. C. (1980). *Considerações sobre Algumas Peças Líticas de “Pavão” (Itaoca, Apiaí, SP)*. São Paulo: Departamento de Arqueologia da SBE (Sociedade Brasileira de Espeologia). Unpublished report.
- Collet, G. C. (1987). *Descrição e algumas medidas referentes as pontas de projéteis de Itaoca. Temas 2, 101-115*. São Paulo: Museu Paulista de Antropologia.
- Da Silva Lopes, L., & Nami, H. G. (2011). A New Fishtail Point Find from South Brazil. *Current Research in the Pleistocene*, 28, 104-107.
- De Vivo, M., & Carmignotto, A. P. (2004). Holocene Vegetation Change and the Mammal Faunas of South America and Africa. *Journal of Biogeography*, 31, 943-957. <http://dx.doi.org/10.1111/j.1365-2699.2004.01068.x>
- Dias, A. S. (2004). Diversificar para povoar: O contexto arqueológico brasileiro na transição Pleistoceno-Holoceno. *Complutum*, 15, 249-263.
- Dias, A. S. (2007a). Da tipologia à tecnologia: Reflexões sobre a variabilidade das indústrias líticas da Tradição Umbu. In: L. Bueno, & A. Isnardis (Org.), *Das Pedras aos Homens: Tecnologia Lítica na Arqueologia Brasileira* (pp. 33-66). Belo Horizonte: Argvmentvan Editora.
- Dias, A. S. (2007b). Novas perguntas para um velho problema: Escolhas tecnológicas como índices para o estudo de fronteiras e identidades sociais no registro arqueológico. *Boletín del Museo Paranaense Emílio Goeldi, Ciências Humanas* 2, 59-76.
- Dias, A. S. (2012). Hunter-Gatherer Occupation of South Brazilian Atlantic Forest: Paleoenvironment and Archaeology. *Quaternary International*, 256, 12-18. <http://dx.doi.org/10.1016/j.quaint.2011.08.024>
- Díaz Rodríguez, L. H. (2008). Una punta tipo “cola de pescado” con acanaladura de Quillane, Arequipa. Tambo. *Boletín de Arqueología*, 1, 73-82.
- Dillehay, T. D. (2000). *The Settlement of the Americas: A New Prehistory*. Basic Books: New York.
- Eugenio, E. (1983). Una punta “Cola de Pescado” de Lobos, Provincia de Buenos Aires. *ADEHA*, 2, 20-31.
- Farias, D. S. E. (2005). *Distribuição e padrão de assentamento—Propostas para sítios da Tradição Umbu na Encosta de Santa Catarina*. PhD Dissertation, Porto Alegre: Curso de Doutorado em História-PUCRS, 364 p.
- Femenías, J., Nami, H. G., Florines, A., & Toscano, A. (2011). GIS Archaeological Site Record and Remarks on Paleoindian Finds in the Rio Negro River Basin, Central Uruguay. *Current Research in the Pleistocene*, 28, 98-101.
- Figueira, J. H. (1892). Los primitivos habitantes del Uruguay. In J. H. Figueira, & R. Dornaleche (Eds.), *El Uruguay en la exposición histórica americana de Madrid* (pp. 121-219). Montevideo: Imprenta Artística Americana.
- Flegenheimer, N., & Bayón, C. (2009). Abastecimiento de Rocas en Sitios Pampeanos Tempranos: Recolectando Colores. In C. Aschero, M. Kostanje, & P. Vuoto (Eds.), *Los Tres Reinos: Prácticas de Recolección en el Cono Sur de América Instituto de Arqueología y Museo FCN e IML-UNT* (pp. 95-107). Tucumán: Magna Publicaciones.
- Flegenheimer, N., Martínez, J. G., & Colombo, M. (2010). Un experimento de lanzamiento de puntas cola de pescado. In M. Berón, L. Luna, M. Bonomo, C. Monsalvo, C. Aranda, & M. Carrera Aizpitarte (Eds.), *Mamiñ Mapu. Pasado y presente desde la arqueología pampeana II* (pp. 215-232). Ayacucho: Libros del Espinillo.
- Flegenheimer, N., Miotti, L., & Mazzia, N. (2013). Rethinking Early Objects and landscape in the Southern Cone: Fishtail Point Concentrations in the Pampas and Northern Patagonia. In K. Graf, C. Ketron, & M. Waters (Eds.), *Paleoamerican Odyssey Conference Companion Book* (pp. 359-376). College Station, TX: Texas A&M University Press.
- Flenniken, J. J., & Raymond, A. W. (1986). Morphological Projectile Point Typology: Replication, Experimentation, and Technological Analysis. *American Antiquity*, 51, 603-614. <http://dx.doi.org/10.2307/281755>
- Gallo, V., Avila, L. S., Pereira, R. C. L., & Absolon, B. A. (2013). Distributional Patterns of Herbivore Megamammals during the Late Pleistocene of South America. *Anais da Academia Brasileira de Ciências*, 85. <http://dx.doi.org/10.1590/S0001-37652013000200005>
- Gascue, A., Baeza, J., & Bortolotto, N. (2013). Ocupaciones tempranas en el río Negro medio (Uruguay): Conjuntos artefactuales asociados a cola de pescado en el sitio navarro. *Cuadernos del Instituto Nacional de Antropología y Pensamiento Latinoamericano. Series Especiales*, 1, 236-248.

- Grosjean, M., Núñez, L., & Cartagena, I. (2005). Palaeoindian Occupation of the Atacama Desert, Northern Chile. *Journal of Quaternary Science*, 20, 643-653. <http://dx.doi.org/10.1002/jqs.969>
- Hilbert, K. (1994). Caçadores coletores pré-históricos no sul do Brasil: Um projeto para a redefinição das tradições líticas Umbu e Humaitá. In M. Flores (Org.), *Negros e índios: Literatura e história*. Porto Alegre.
- Hoeltz, S. E. (2005). *Tecnologia lítica: Uma proposta de leitura para a compreensão das indústrias do Rio Grande do Sul em tempos remotos*. Unpublished PhD Thesis, Porto Alegre: Pontifícia Universidade Católica do Rio Grande do Sul.
- Hoeltz, S. E., & Brüggemann, A. A. (2011). As indústrias líticas na área da UHE Foz do Chapecó, oeste catarinense: Antiguidade, estratégia tecnológica e variabilidade. In M. Carbonera, & P. I. Schmitz (Eds.), *Antes do Oeste Catarinense: Arqueologia dos povos indígenas* (pp.105-136). Chapecó: Editora Argos.
- Jackson, D., Méndez, C., Seguel, R., Maldonado, A., & Vargas, G. (2007). Initial Occupation of the Pacific Coast of Chile during Late Pleistocene Times. *Current Anthropology*, 48, 725-731. <http://dx.doi.org/10.1086/520965>
- Kerber, L., Gregis Pitana, V., Ribeiro, A. M., Schmaltz Hsiou, A., & Oliveira, E. V. (2014). Late Pleistocene Vertebrates from Touro Passo Creek (Touro Passo Formation), Southern Brazil: A Review. *Revista Mexicana de Ciencias Geológicas*, 31, 248-259.
- Laguens, A. G., Pautassi, E. A., Sario, G. M., & Cattaneo, G. R. (2007). ELS1, a Fishtail Projectile-Point Site from Central Argentina. *Current Research in the Pleistocene*, 24, 55-57.
- León Canales, E. (2007). *Orígenes Humanos en los Andes del Perú*. Lima: Universidad de San Martín de Porres.
- Maggard, G., & Dillehay, T. (2011). El Palto Phase (13800-9800 BP). In T. Dillehay (Ed.), *From Foraging to Farming in the Andes: New Perspectives on Food Production and Social Organization* (pp. 77-94). Cambridge: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9780511793790.005>
- Martínez, G. (2001). "Fish-Tail" Projectile Points and Megamammals: New Evidence from Paso Otero 5 (Argentina). *Antiquity*, 75, 523-528. <http://dx.doi.org/10.1017/S0003598X00088736>
- Mayer-Oakes, W. (1963). Early Man in the Andes. *Scientific American*, 208, 117-128. <http://dx.doi.org/10.1038/scientificamerican0563-116>
- Mayer-Oakes, W. (1986a). Early Man Projectile Points and Lithic Technology in the Ecuadorean Sierra. In A. Bryan (Ed.), *New Evidence for the Pleistocene Peopling of the Americas* (pp. 281-294). Orono: Center for the Study of the Early Man.
- Mayer-Oakes, W. (1986b). *El Inga. A Paleoindian Site in the Sierra of Northern Ecuador (Transactions of the American Philosophical Society)*. Philadelphia, PA: American Philosophical Society.
- Mazzanti, D. (1999). El sitio Abrigo Los Pinos: Arqueología de la ocupación Paleoindia, Tandilla Oriental, Pcia de Buenos Aires. *XII Congreso Nacional de Arqueología Argentina*, 3, 145-148.
- Mazzanti, D. (2002). Secuencia arqueológica del sitio 2 de la localidad arqueológica Amalia (Provincia de Buenos Aires). In D. Mazzanti, M. Berón, & F. Oliva (Ed.), *Del Mar a los Salitrales: Diez mil años de historia pampeana en el umbral del tercer milenio* (pp. 327-339). Mar del Plata: Universidad Nacional de mar del Plata.
- Mazzanti, D. (2003). Human Settlements in Caves and Rockshelters during the Pleistocene e Holocene Transition in the Eastern Tandilia Range, Pampean Region, Argentina. In L. Miotti, M. Salemme, & N. Flegenheimer (Eds.), *From Where the South Winds Blows: Ancient Evidence for Paleo South Americans* (pp. 57-61). College Station, TX: Texas A&M University Press.
- Meggers, B., & Evans, C. (1977). Lowlands of South America and Antilles. In J. Jennings (Ed.), *Ancient Native Americans* (pp. 543-591). CA: San Francisco: W. H. Freeman and Company.
- Meneghin, U. (2004). URUPEZ. Primer registro radiocarbónico (C-14) para un yacimiento con puntas líticas lisciformes del Uruguay. *Orígenes*, 2, 1-30.
- Mentz Ribeiro, P. A., Soloviy, J., & Herberts, A. L. (1995). Levantamentos Arqueológicos da região do Areal, Quaraí. RS. In M. Consens, J. M. López, & C. Curbelo (Eds.), *Arqueología en el Uruguay* (pp. 193-211). Montevideo: MEC.
- Miller, E. T. (1987). Pesquisas arqueológicas paleoindígenas no Brasil Ocidental. *Estudios Atacameños*, 8, 37-61.
- Miotti, L., Hermo, D., & Terranova, E. (2010). Fishtail Points, First Evidence of Late-Pleistocenic Hunter-Gatherers in Somuncurá Plateau (Rio Negro Province, Argentina). *Current Research in the Pleistocene*, 27, 22-24.
- Morrone, J. J. (2006). Biogeographic Areas and Transition Zones of Latin America and the Caribbean Islands Based on Pan-biogeographic and Cladistic Analyses of the Entomofauna. *Annual Review of Entomology*, 51, 467-494. <http://dx.doi.org/10.1146/annurev.ento.50.071803.130447>
- Mújica, J. (1995). Puntas cola de pescado de la costa occidental del río Uruguay medio, litoral argentino. *Comechingonia, Revista de Arqueología*, 8, 199-207.
- Nami, H. G. (1987). Cueva del Medio: Perspectivas arqueológicas para la Patagonia Austral. *Anales del Instituto de la Patagonia*, 17, 71-106.

- Nami, H. G. (1989/1990). Observaciones sobre algunos artefactos bifaciales de Bahía Laredo. Consideraciones tecnológicas para el Extremo Austral. *Anales del Instituto de la Patagonia*, 19, 141-151.
- Nami, H. G. (1992). Nuevos datos en relación a las puntas de proyectil paleoindias encontradas en el Cono Sur (Neuquén, Argentina). Palimpsesto. *Revista de Arqueología*, 1, 71-74.
- Nami, H. G. (1998). Technological Observations on the Paleoindian Artifacts from Fell's Cave, Magallanes, Chile. *Current Research in the Pleistocene*, 15, 81-83.
- Nami, H. G. (2000). Technological Comments of some Paleoindian Lithic Artifacts from Ilaló, Ecuador. *Current Research in the Pleistocene*, 17, 104-107
- Nami, H. G. (2001). Consideraciones tecnológicas preliminares sobre los artefactos líticos de Cerro de los Burros (Maldonado, Uruguay). *Comunicaciones Antropológicas*, 21, 1-23.
- Nami, H. G. (2003). Experimentos para explorar la secuencia de reducción Fell de la Patagonia Austral. *Magallania*, 31, 107-138.
- Nami, H. G. (2007). Research in the Middle Negro River Basin (Uruguay) and the Paleoindian Occupation of the Southern Cone. *Current Anthropology*, 48, 164-176. <http://dx.doi.org/10.1086/510465>
- Nami, H. G. (2009). Crystal Quartz and Fishtail Projectile Points: Considerations on Raw-Material Selection by Paleo South Americans. *Current Research in the Pleistocene*, 26, 9-12.
- Nami, H. G. (2010). Tecnología paleoindia de Sudamérica: Nuevos experimentos y observaciones para conocer la secuencia de reducción Fell. *Orígenes*, 9, 1-40.
- Nami, H. G. (2011). Observaciones experimentales sobre las puntas de proyectil Fell de Sudamerica. In A. Morgado, J. Baena Preysler, & D. García González (Eds.), *La Investigación Experimental Aplicada a la Arqueología* (pp. 105-111). Ronda: Universidad de Granada-Universidad Autónoma de Madrid.
- Nami, H. G. (2011b). Exceptional Fell Projectile Points from Uruguay: More Data on Paleoindian Technology in the Southern Cone. *Current Research in the Pleistocene*, 28, 112-116.
- Nami, H. G. (2013). Archaeology, Paleoindian Research and Lithic Technology in the Middle Negro River, Central Uruguay. *Archaeological Discovery*, 1, 1-22. <http://dx.doi.org/10.4236/ad.2013.11001>
- Nami, H. G. (2014a). Arqueología del último milenio del Pleistoceno en el Cono Sur de Sudamérica, puntas de proyectil y observaciones sobre tecnología Paleoindia en el Nuevo Mundo. In M. Farias, & A. Lourdeau (Eds.), *Peuplement et modalités d'occupation de l'Amérique du sud: L'apport de la technologie lithique* (pp. 279-336). @rchéo-éditions.com.
- Nami, H. G. (2014b). Secuencias de Reducción Bifaciales Paleoindias y Puntas Fell en el Valle del Ilaló (Ecuador): Observaciones para Comprender la Tecnología Lítica Pleistocénica en Sudamérica. In M. Farias, & A. Lourdeau (Eds.), *Peuplement et modalités d'occupation de l'Amérique du sud: L'apport de la technologie lithique* (pp. 179-220). @rchéo-éditions.com.
- Nami, H. G. (2015). *New Records and Observations on Paleo-Southamerican Artifacts from Cerro Largo, Northeastern Uruguay and a Peculiar Case of Reclaimed Fishtail Points*. Submitted to publication.
- Nami, H. G., & Castro, A. (2014). Fishtail Points, Technology and Microwear Analysis from the Negro River Basin, Uruguay. *Archaeological Discovery*, 2, 65-70. <http://dx.doi.org/10.4236/ad.2014.23008>
- Nami, H. G., Cattaneo, R., & Pupio, M. (2000). Investigaciones experimentales sobre el tratamiento térmico en algunas materias primas de Pampa y Patagonia. *Anales Instituto Patagonia, Serie Ciencias Humanas*, 28, 315-329.
- Núñez, L., Casamiquela, R., Schiappacasse, V., Niemeyer, H., & Villagrán, C. (1994). Cuenca de Taguatagua en Chile: El ambiente del Pleistoceno y ocupaciones humanas. *Revista Chilena de Historia Natural*, 67, 503-519.
- Okumura, M., & Araujo, A. G. M. (2014). Long-Term Cultural Stability in Hunter and Gatherers: A Case Study Using Traditional and Geometric Morphometric Analysis of Lithic Stemmed Bifacial Points from Southern Brazil. *Journal of Archaeological Science*, 45, 59-71. <http://dx.doi.org/10.1016/j.jas.2014.02.009>
- Oliveira, E. V. (1996). Mamíferos Xenarthra (Edentata) do Quaternario do Estado do Rio Grande do Sul, Brasil. *Ameghiana*, 33, 65-75.
- Parellada, C. I. (2013). Arqueología do vale do rio Piquiri, Paraná: Paisagens, memórias e transformações. *Revista Memore, 1*, 24-42.
- Patané Aróoz, C., & Nami, H. G. (2014). The First Paleoindian Fishtail Point Find in Salta Province, Northwestern Argentina. *Archaeological Discovery*, 2, 26-30. <http://dx.doi.org/10.4236/ad.2014.22004>
- Politis, G. (1986). Investigaciones arqueológicas en el área Interserrana bonaerense. *Etnía*, 32, 7-52.
- Politis, G. (1991). Fishtail Projectile Points in the Southern Cone of South America: An Overview. In R. Bonnichsen, & K. Turnmire (Eds.), *Clovis, Origins and Adaptations. Center for the study of the First Americans* (pp. 287-301). College Station, TX: ASM University.

- Prous, A. (1992). *Arqueologia Brasileira*. Brasília: Universidade de Brasília (UNB).
- Prous, A., & Fogaça, E. (1999). Archaeology of the Pleistocene-Holocene Boundary in Brazil. *Quaternary International*, 53-54, 21-41. [http://dx.doi.org/10.1016/S1040-6182\(98\)00005-6](http://dx.doi.org/10.1016/S1040-6182(98)00005-6)
- Rohlf, F. J. (2006). *tpsDig, Digitize Landmarks and Outlines, Version 2.05*. Stony Brook, NY: Department of Ecology and Evolution, State University of New York.
- Rohlf, F. J. (2010). *tpsDig*. Stony Brook, NY: Department of Ecology and Evolution, State University of New York.
- Rohr, J. A. (1966). Pesquisas arqueológicas em Santa Catarina, os sítios arqueológicos do município de Itapiranga. *Pesquisas: Antropologia*, 15, 21-60.
- Schmitz, P. I., Arnt, F., Beber, M., Osório Rosa, A., & Rogge, J. (2009). Taió, no Vale do Rio Itajaí, SC-O encontro de antigos caçadores com as casas subterrâneas. *Pesquisas: Antropologia*, 67, 185-320.
- Schobinger, J. (1969). *Prehistoria de Suramérica*. Barcelona: Editorial Labor.
- Schobinger, J. (1971). Una punta de tipo "cola de pescado" de La Crucecita (Mendoza). *Anales de Arqueología y Etnología*, XXVI, 89-97.
- Schobinger, J. (1974). Nuevos hallazgos de puntas "cola de pescado" y consideraciones en torno al origen y dispersión de la cultura de Cazadores Superiores Toldense en Sudamérica. *Atti del XL Congresso Internazionale degli Americanisti*, 1, 33-50.
- Serrano, A. (1932). *Exploraciones Arqueológicas en el río Uruguay Medio*. Paraná: Talleres gráficos Casa Predassi.
- Stevaux, J. C., Souza-Filho E. E., & Fúlfaro, V. J. (1986). Trato deposicional da Formação Tatuí (P) na área aflorante do NE da Bacia do Paraná, Estado de São Paulo. *XXXIV Congresso Brasileiro de Geologia, Goiânia. Sociedade Brasileira de Geologia Anais*, 1, 219-229.
- Suárez, R. (2002). Investigaciones Paleoindias en Uruguay: Estado actual del conocimiento y recientes investigaciones en la localidad arqueológica Pay Paso (Río Cuareim, dpto. Artigas). In M. Mazzanti, M. Berón, & F. Oliva (Eds.), *Del Mar a los Salitrales. Diez mil años de Historia Indígena en el Umbral del Tercer Milenio* (pp. 311-326). Mar del Plata: Universidad Nacional de Mar del Plata.
- Suárez, R. (2004). Arqueología de los Primeros Americanos en Uruguay: Componentes Paleoindios de los Ríos Uruguay-Cuareim y Asociación entre Cazadores Humanos y Fauna Pleistocénica en el sitio Pay Paso 1. In L. Beovide, I. Barreto, & C. Curbelo (Eds.), *X Congreso Uruguayo de Arqueología: La Arqueología Uruguaya ante los desafíos del nuevo siglo*. Montevideo: CD-ROM Multimedia.
- Suárez, R., & Santos, G. (2010). Cazadores recolectores tempranos, supervivencia de fauna del Pleistoceno (*Equus* sp. y *Glyptodon* sp.) y tecnología lítica durante el Holoceno temprano en la frontera Uruguay-Brasil. *Revista de Arqueología. Sociedade de Arqueologia Brasileira*, 23, 22-43.
- Wildner, W., de Brito, R. S. C., Licht, O. A. B. et al. (2006). *Geologia e Recursos Minerais do Estado do Paraná Escala 1:200.000*. Brasília.
- Zelditch, M. L., Swiderski, H. D. Sheets, & Fink, W. L. (2004). *Geometric Morphometrics for Biologists: A Primer*. New York: Elsevier Academic Press.