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## The large rongorongo tablet from the collections of the Smithsonian Institution, Washington, D.C.

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*This paper is dedicated to the improvement of the documentation of the Large Washington rongorongo tablet (inventory number A129774) in the collections of the Smithsonian Institution, presenting for the first time detailed high-resolution photographs of the artifact at almost original size. Digital image processing was employed to enhance the contrast of the signs damaged by reshaping of the tablet for its later use in marine carpentry. The possible reuse of other rongorongo artifacts is discussed. A new improved tracing of the Large Washington inscription based on digitally enhanced images and direct study of the original artifact allowed the recoding of more glyph traces in damaged areas of the tablet. The analysis of the inscription prompted a tentative explanation of structured sequences that appear frequently in rongorongo script.*

*Este artículo esta dedicado a mejorar la documentación de la Grande tablilla rongorongo de Washington (número de inventario A129774) que pertenece a las colecciones de la Smithsonian Institution. Por la primera vez, presentamos imágenes detalladas y en alta resolución, mostrando el artefacto casi a su tamaño real. El procesamiento digital de las imágenes fue utilizado para mejorar el contraste de los signos dañados cuando la forma de la tablilla fue modificada para su nuevo uso en la carpintería marina. El posible reciclaje de otros artefactos con escritura rongorongo esta analizado. Los nuevos mejorados trazos de la inscripción de la Grande tablilla de Washington basados sobre las imágenes digitales y estudio directo del artefacto original muestran más grifos en las áreas dañadas de la tablilla. El análisis de la inscripción propone una explicación tentativa de las secuencias estructuradas que aparecen frecuentemente en la escritura rongorongo.*

### Introduction

The *rongorongo* script of Easter Island (Rapa Nui) has attracted much scientific attention since the first inscribed artifacts were collected in the 1870s following the request of the Bishop Tepano Jaussen (Fischer 1997:21-31). Many of the collection activities were done by the missionaries, who managed to acquire the tablets now known as Tahua, Aruku Kurenga, Mamari, Echancrée, Keiti, the Chauvet fragment, and the Large St. Petersburg tablet. Several expeditions visiting Rapa Nui during the late 19th century tried their best to procure the famous inscribed tablets. On December 18, 1886, the USS *Mohican*, under the command of Benjamin F. Day, dropped anchor by the shores of the island. The expedition team led by Paymaster William J. Thomson managed to accomplish a colossal amount of work prior to their departure on December 31, surveying 113 platforms around the coast (Thomson 1891:500-513), documenting the quarry of Rano Raraku, and excavating painted slabs from the stone houses of 'Orongo village. The expedition recorded important legends and details of Rapanui culture, produced a short glossary (Thomson 1891:547-

552) and acquired – with the help of Alexander Paea Salmon, the resident manager of Brander's sheep company – a remarkable collection of Easter Island artifacts, including two inscribed tablets, "apparently the last, intact, classical *rongorongo* inscriptions ever to be acquired on Rapanui" (Fischer 1997:87). Thomson attempted to push the point further, proceeding with inquiries among the indigenous population concerning the reading of the tablets. He was keen to interview "a man called Ure Vaeiko [sic], one of the patriarchs of the island [who] professes to have been under instructions in the art of hieroglyphic reading at the time of the Peruvian visit, and claims to understand most of the characters" (Thomson 1891:514). Ure Va'e Iko's readings were recorded and translated by Salmon; the corresponding texts in Rapanui and English were published by Thomson (1891:517-526).

The artifacts collected by the *Mohican* Expedition – including two *rongorongo* tablets – were deposited in the collections of the Smithsonian Institution. Several plaster casts of each tablet were made, and these casts (with sign outlines enhanced with a darker substance) appeared in the Expedition Reports (Thomson 1891:Plates 38-41). This was an early step

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aimed at producing the best printed image quality using the equipment available at the end of the 19th century; the original tablets – especially the larger one – were too deteriorated in places to see the signs clearly, and the photograph only reduced the quality of the images further. As the Small Washington tablet had better preservation (despite a piece that had been broken off prior to the artifact's collection), one can easily find good-quality images thereof in the literature (e.g., Campbell 1999:280; Heyerdahl 1975:Plates 58b and 59b; Kjellgren 2000:49). Preservation of the Large Washington tablet is different. It measures 63 by 12cm (Fischer 1997:472), and the *largest* published photograph (Heyerdahl 1975:Plates 58c and 59c) is 18cm wide and is insufficient in scale (about 29% of the original artifact) to provide extensive detail. Imbelloni (1951:Plate 8c) published an image at a scale of 50% of the original artifact, which covers only slightly more than a third of the better-preserved side. In the face of the quality issues imposed by both size and erosion of the artifact, many authors have decided to reproduce Thomson's images of a plaster cast with enhanced sign outlines – which are sharper but not always accurate – rather than photographs of the original tablet (Campbell 1999:281; Fischer 1997: Figures 57, 58; Klein 1988:Plate 71).

This paper is dedicated to remedy the situation by presenting, for the first time, the photographic documentation of the Large Washington tablet at a scale approaching the size of the original artifact. Many insights were obtained by considering the tablet's reuse as canoe-planking. The computer enhancement of the digital images, complemented by direct study of the artifact, allowed production of the new enhanced tracings of the surviving parts of the inscription, which sets the basis for a discussion on calligraphic and structural peculiarities of its text. Barthel's nomenclature is used throughout the paper to address the inscribed artifacts, lines, and individual glyphs. All tracings of *rongorongo* texts shown in the figures were made by the author.

## Documentation of the Tablet

The Large Washington tablet (artifact S in Barthel's notation) has a complicated story. The tablet was inscribed in a classic script by a highly-skilled *tangata rongorongo* (Barthel 1958:31) on both sides of an elongated board. The writing was done over the smoothed wood surface without creating the sign-protective fluting seen on other artifacts (e.g., Aruku Kurenga, Large Santiago, Small Santiago, and Small St. Petersburg tablets). As the *tapu* connected with inscribed tablets faded, the artifact was used as a plank of wood in canoe construction, for which it was reshaped with the loss of a considerable portion of its

text: "The large one [of the collected tablets] is a piece of drift-wood that from its peculiar shape is supposed to have been used as a portion of a canoe" (Thomson 1891:514). Routledge (1919:207) provides an extended narrative about this tablet:

"The natives said that they burnt the tablets in compliance with the orders of the missionaries, though such suggestion would hardly be needed in a country where wood is scarce; the Fathers, to the contrary, state that it was due to them that any were preserved. Some certainly were saved by their means ... but some or all of these existing tablets are merely fragments of the original. The natives told us that an expert living on the south coast, whose house had been full of such glyphs, abandoned them at the call of the missionaries, on which a man named Niari, being of a practical mind, got hold of the discarded tablets and made a boat of them wherein he caught much fish. When the 'sewing came out,' he stowed the wood into a cave at an ahu near Hanga Roa, to be made later into a new vessel there. Pakarati, an islander now living, found a piece, and it was acquired by the U.S.A. ship Mohican."

This narrative seems plausible, as Thomson (1891:474) reports seeing the rest of the canoes in a cave on the island:

"There are no canoes in use at the present time, but we found two very old ones in a cave on the west coast, having long ago passed their days of usefulness on the water and now serving as burial cases. They were a patchwork of several kinds of wood sewed together, and though in an advanced stage of dry-rot the material was sufficiently well-preserved to prove that it never grew on Easter Island, but had been obtained from the drift-wood on the beach."

Indeed, the wood of the Large Washington tablet was identified as *Podocarpus* species (Imbelloni 1951:103). Barthel states that the wood is *Podocarpus latifolia* (1958:31) without citing any sources. More details are presented by Orliac (2007:9): "Henri Lavachery [1934:70] also published the identification of the wood of the Large Washington tablet, carried out by M. Watkins, Assistant Curator of Wood Technology, at the National Museum of Natural History ... [which turned out to be] a *Podocarpus latifolia* wood." It is important to note that Tablet S is not unique in this choice of wood, which was also used to carve Echancrée, the Small Vienna tablet, and the Large St. Petersburg tablet:

"Palynological and anthracological studies ... make it possible to state that no *Podocarpus* species ever grew on Rapa Nui. So this material arrived by sea:

is it a piece of driftwood from the shores of a far-off continent? A fragment of wreck brought by the waves? The remains of an emergency repair during a ship's stopover? Or, perhaps, it represents the remains of the three crosses raised at Poike by the Spanish in 1770 when they took possession of the island. In any case, the fact that these four objects are carved in the same wood poses the question of their contemporaneity; it is hard to imagine that exceptional circumstances made it possible, on four occasions, to bring the same material to the islands; the hypothesis that these tablets were carved from the same piece of wood, in approximately the same period, thus seems plausible" (Orliac 2007: 9).

It is worth emphasizing that the Large St. Petersburg tablet measures 63 by 15cm (Fischer 1997:483), which is extremely close to the Large Washington tablet's size of 63 by 12cm, making it tempting to speculate that both artifacts might have been produced from a single, larger plank.

Photography of Tablet S is complicated due to damage to the artifact and its large size. In this paper, the photographs present illustrations of both sides and the edge of the artifact with a scale close to the original size (Figures 1-4). These high-resolution images were taken in January 2012 by Donald Hurlbert, who did truly impressive work with lighting to emphasize the glyphs – especially on eroded Side B. The artifact is relatively dark (Figure 5), so multi-stage digital image enhancement is *required* to obtain an image with sufficient detail and contrast for printing in grayscale. First, the image was split into red, green, and blue channels; it was determined that the red channel provides more contrast, so all further processing was performed with this data channel alone. To emphasize the contours of the signs, a local histogram equalization was applied (Gonzalez & Woods 2008:139). The images obtained with different sizes of filter windows were compared, and the best image contrast to preserve detail came from additive superposition of the high-pass image with filter size 50 by 50 pixels onto the image obtained by a local histogram equalization using a 200 by 200 pixel window. The resulting image allows us to distinguish even faint sign traces in the damaged area of the tablet (Figure 2).

The present shape of the artifact was achieved by severe reduction of its original form, probably to fit the tablet for canoe-planking. One edge of the tablet was planed away, and grooves were carved to receive the neighboring planks. The extent of these grooves is marked with arrows in Figure 5a. A deep groove continues from the bottom edge of the tablet to its vertical edge (Figure 5a, right side, and Figure 5b). Study of the glyphs near this edge makes it clear that a part of

the tablet was trimmed; Side B preserves an incised line marking the trimming size (Figure 5c, black arrows). The deep groove (see Figure 5j for a sketch of the tablet seen from its vertical edge) weakened the wood, leading to the formation of a crack (Figure 5c, white arrow) and breakage at the hole drilled for lashings (Figure 5c, bottom part). The wood around the opposite side of the hole is worn but not broken (Figure 4, end of line Sa3). Much of Side B includes evidence of pronounced erosion which complicates photographic representation of the artifact. For other tablets (and for Side A of the Large Washington tablet as well) the use of angled lighting is beneficial in making glyph outlines clearer. However, this lighting strategy is almost useless for Side B of the artifact, as the glyphs become practically lost in a light-and-shadow pattern on the weathered wood. This issue can be resolved by studying the artifact under varying positions of light source, allowing for example, to properly trace the inscription of line Sb6 containing the series of glyphs suffixed with a rare *rongorongo* sign 711v depicting four fish on a fishing line (Figure 5d). Taking into account a possible reuse of the Large Washington tablet in canoe planking, it is tempting to speculate that Side B formed the exterior surface of the boat and deteriorated from contact with water.

The pointed end of the tablet, with a knife-blade appearance (Imbelloni 1951:103), features traces of rough reshaping by adze and scraper, which are most evident under angled illumination (Figure 5e). There are several holes drilled along the perimeter of the tablet; the majority of these likely post-date the inscription by cutting through glyphs (e.g., Figure 5f-h). For one particular hole, such a conclusion is impossible to make because its surrounding wood was removed completely, and no glyph traces survived in its vicinity (Figure 5i, top center). If one hazards to suggest that it could have been a central hole used for hanging the tablet before reshaping (Figure 5a, marked with an arrow at the top), we might conclude that Barthel's (1958:31) estimation of sign-loss was underestimated.

Side A, featuring better wood preservation, underwent damage for thickness reduction (Figure 5i). The modification of the surface may have been done using two implements: an adze leaving rounded marks that are clearly seen at the upper left part of Figure 5i and a scraper with a chipped edge responsible for characteristic marks in the form of longitudinal grooves covering the entire damaged section (Figure 5i). The same (but fainter) scraper marks can be seen at the pointed end of the tablet (Figure 5e), suggesting that reshaping of the tablet may have been done in a single session using the same set of tools. Some additional selective scraping in a vertical direction erased signs at the bottom right part of Figure 5i. Fortunately, the scraping depth was shallow. Thus, only finishing glyph



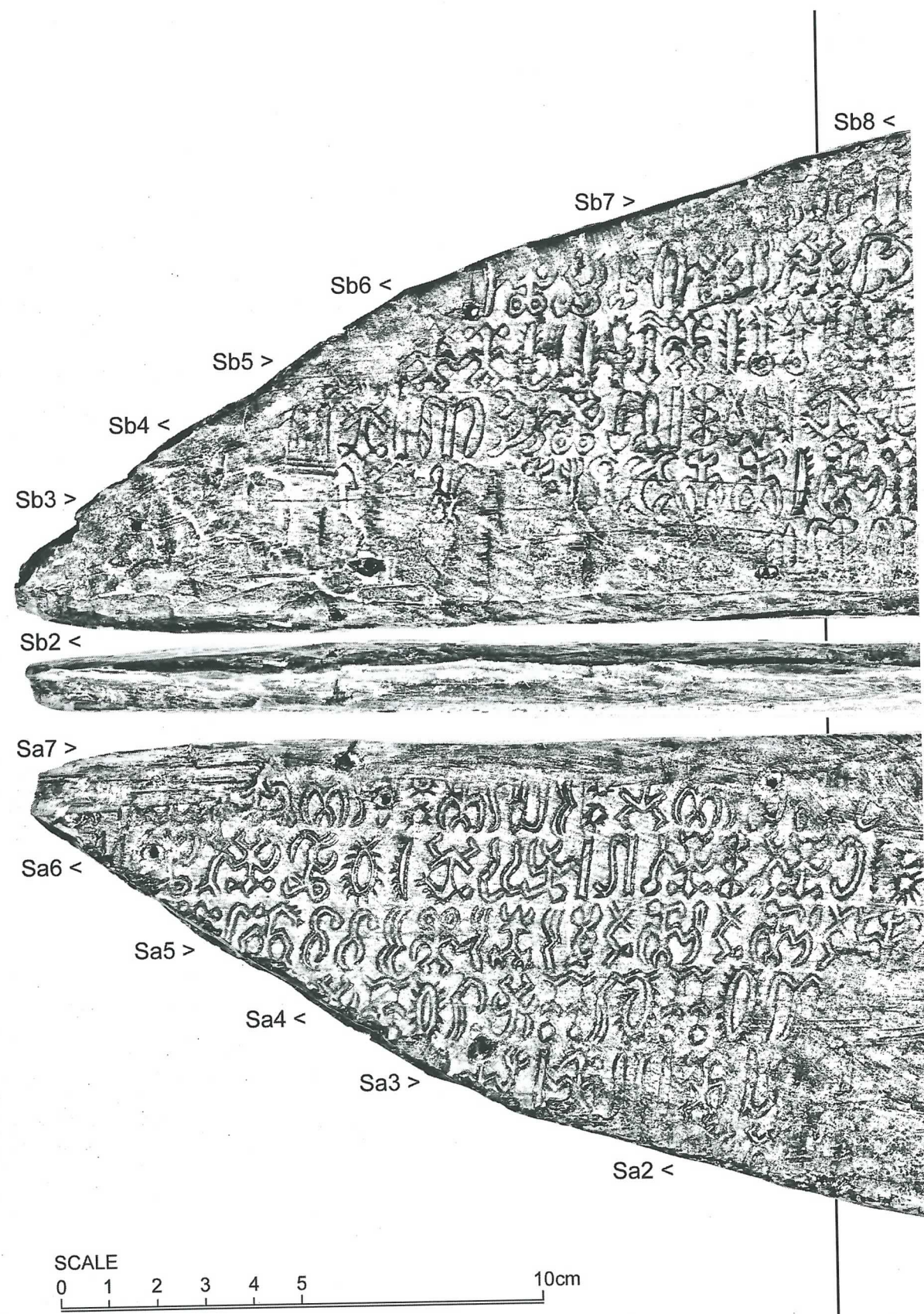


Figure 1. Partial view of the Large Washington tablet A129774. Photographs by Donald E. Hurlbert (National Museum of Natural History) are reproduced with permission of the Smithsonian Institution.

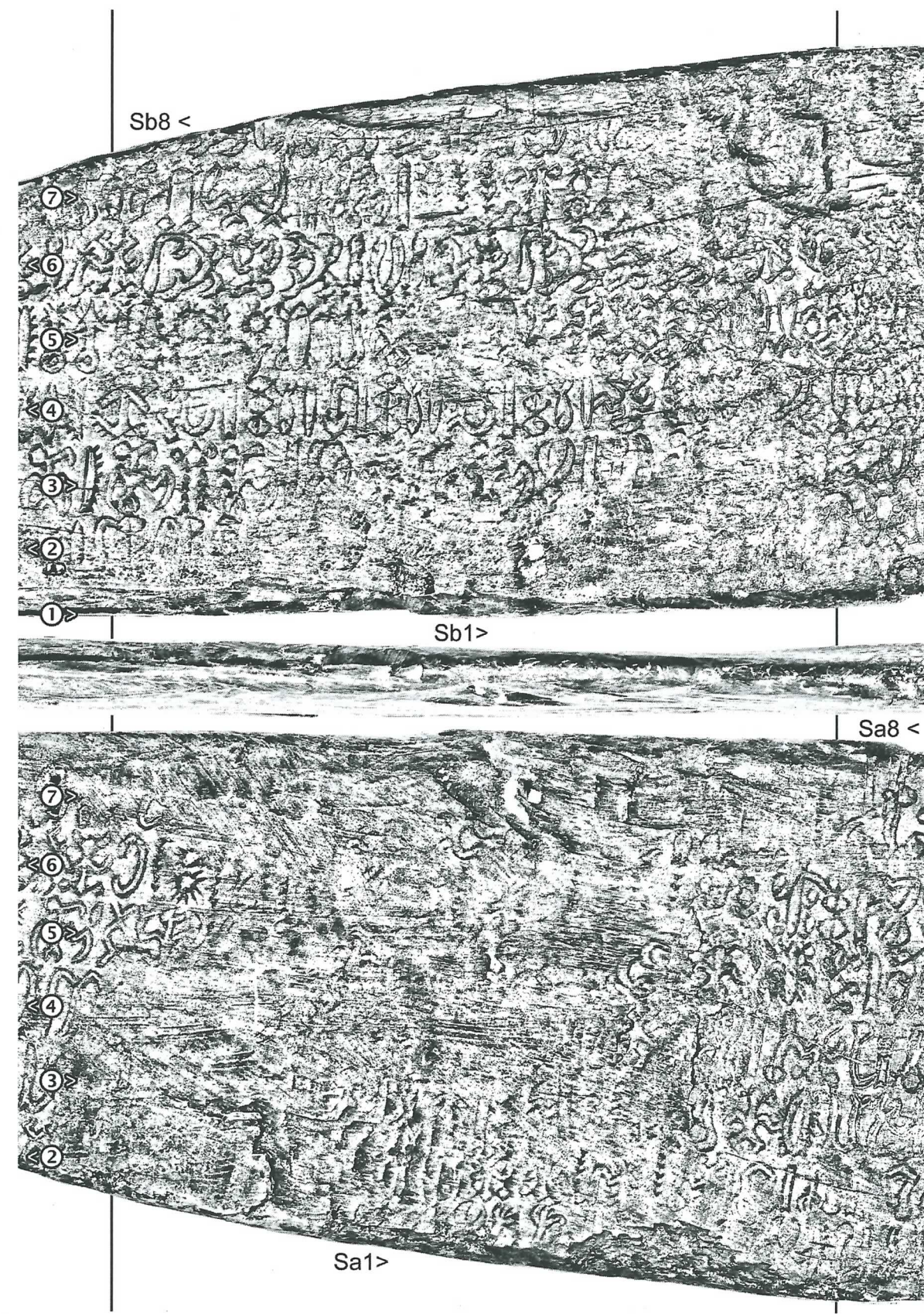


Figure 2. Partial view of the Large Washington tablet A129774. Photographs by Donald E. Hurlbert (National Museum of Natural History) are reproduced with permission of the Smithsonian Institution.



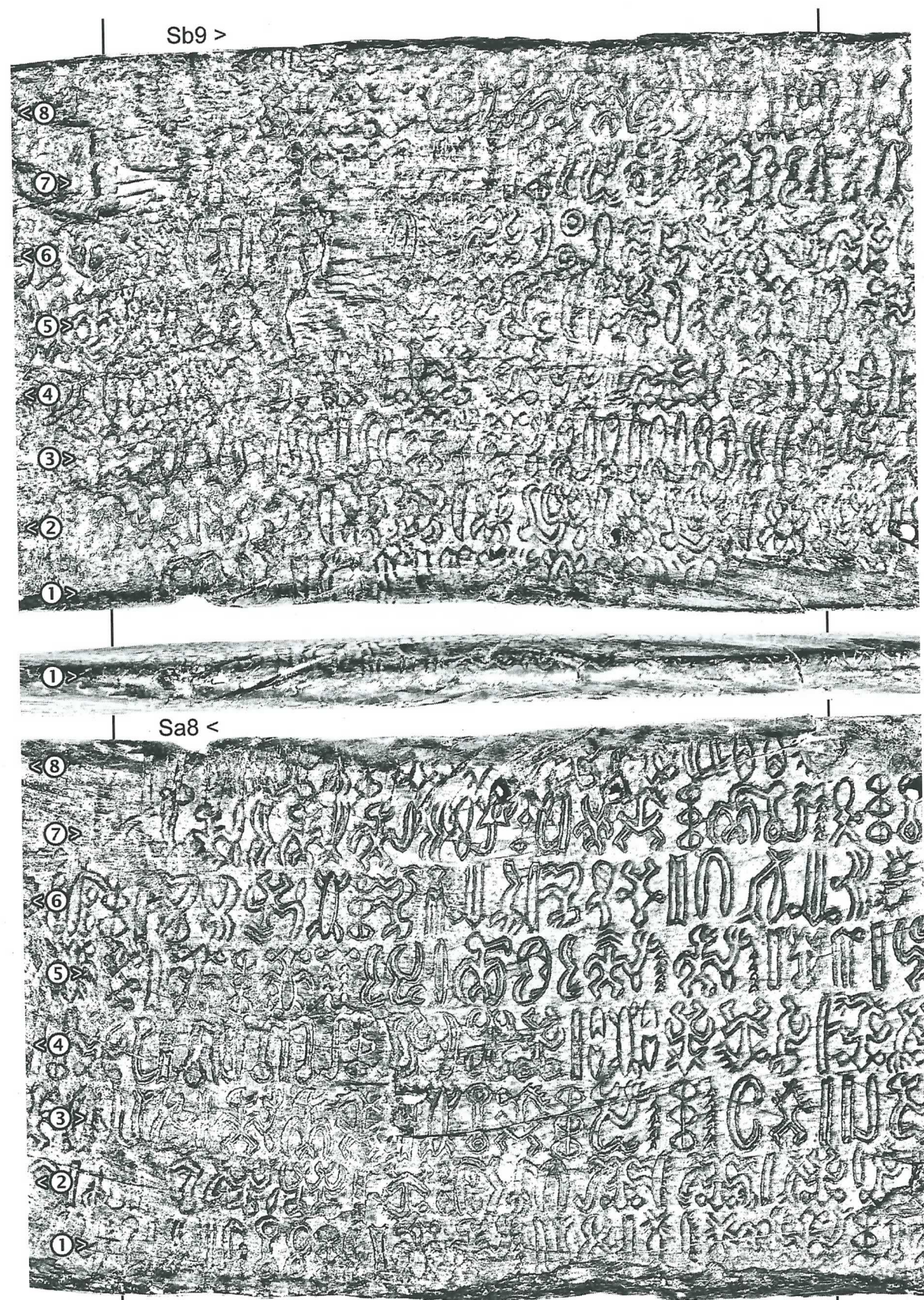


Figure 3. Partial view of the Large Washington tablet A129774. Photographs by Donald E. Hurlbert (National Museum of Natural History) are reproduced with permission of the Smithsonian Institution.

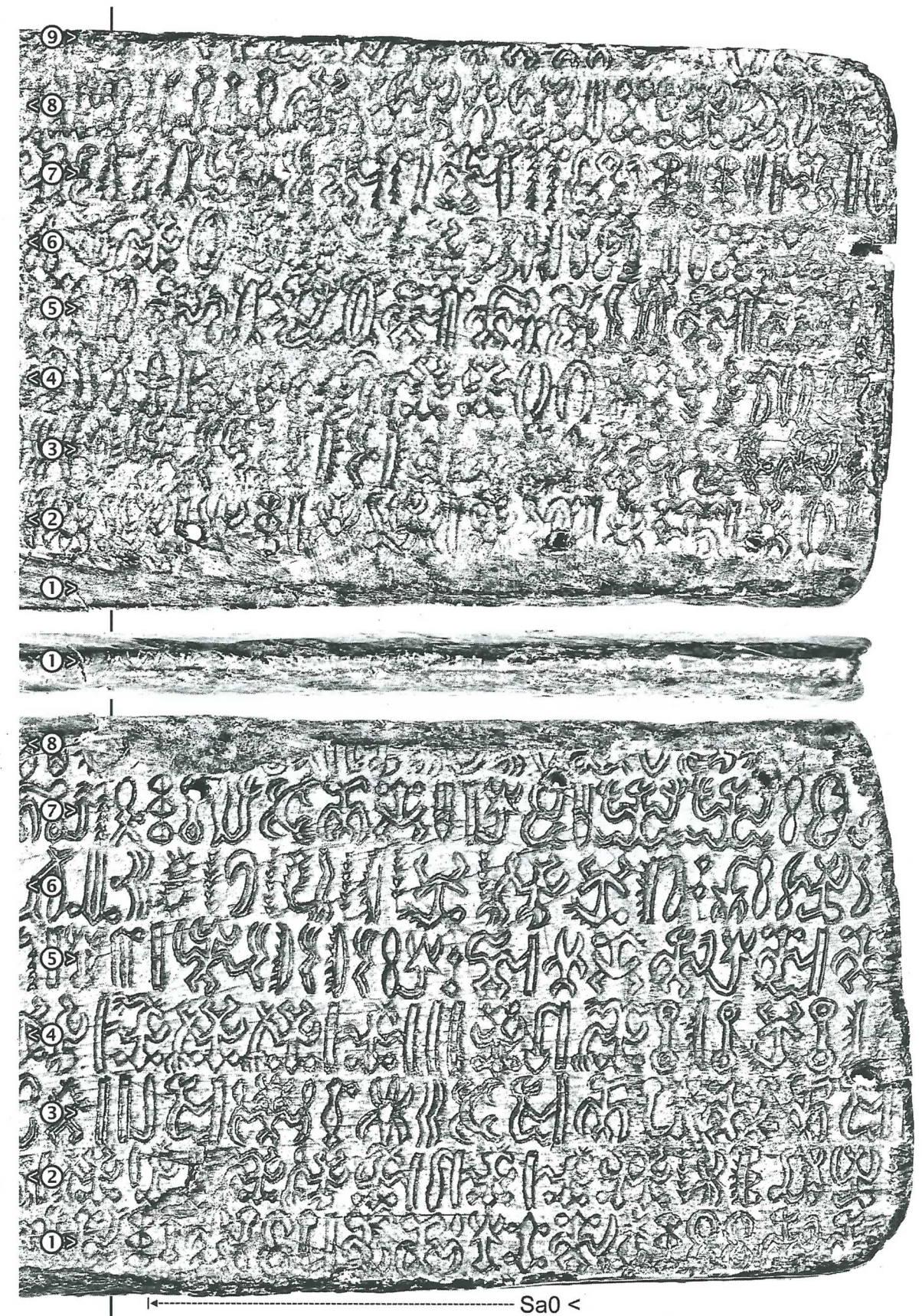
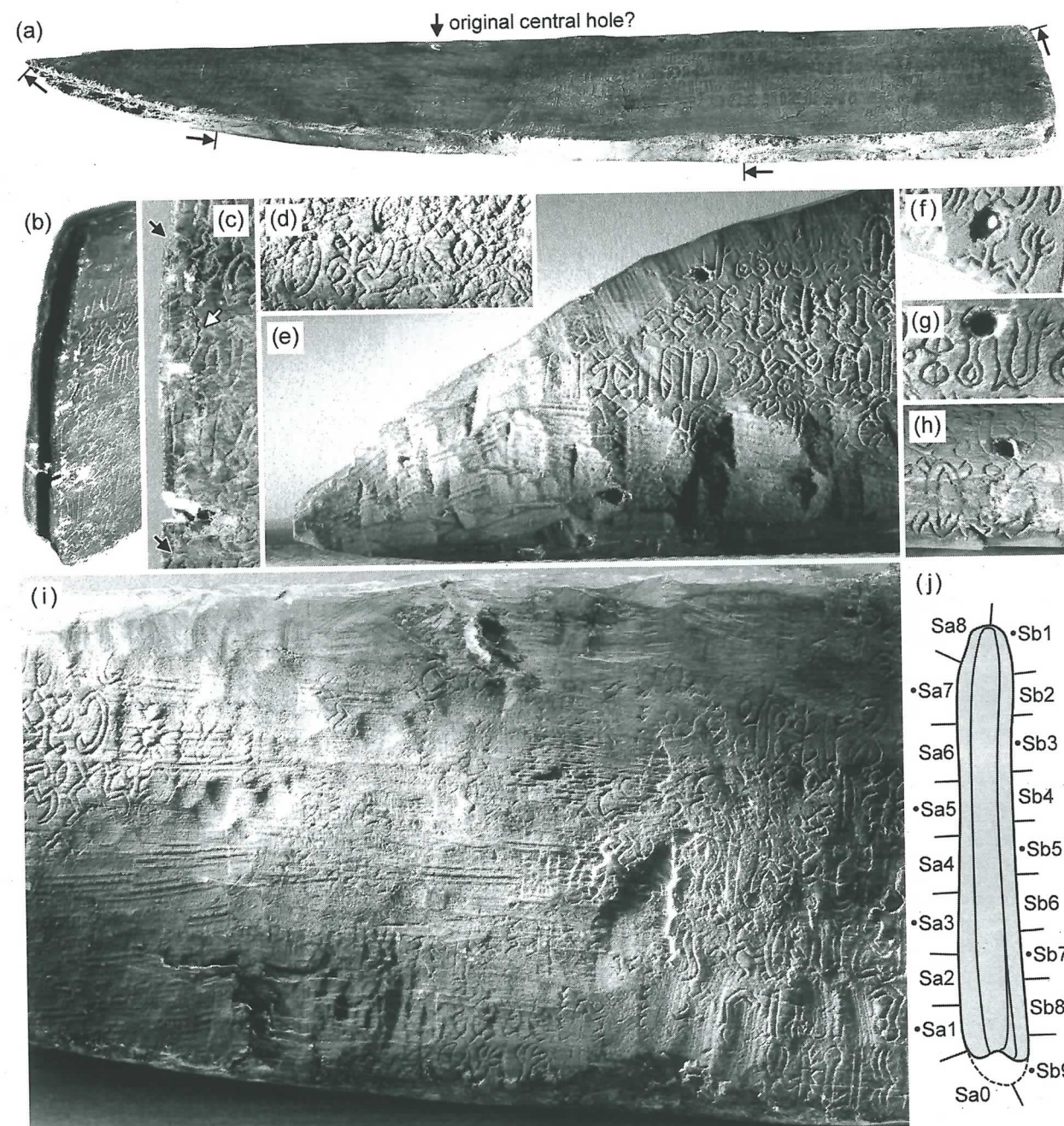


Figure 4. Partial view of the Large Washington tablet A129774. Photographs by Donald E. Hurlbert (National Museum of Natural History) are reproduced with permission of the Smithsonian Institution.





Figures 5. Reuse of the Large Washington tablet A129774 (photographs by the author reproduced with permission of the Smithsonian Institution): a) planed bottom edge of the tablet with grooves cut to receive the neighboring planks (marked with arrows). The possible original central hole is marked at the top. The tablet is seen from the Side A; b) a deep groove carved in the vertical edge of the tablet, seen from the Side B; c) close-up to the Side B in the vicinity of the edge, showing the incised line denoting the required trimming size (black arrows) and a wood crack (white arrow); d) side-raking light image of Side B revealing traces of considerable surface erosion; e) pointed end of the tablet with traces of reshaping and several holes; f) hole cutting through the head of the glyph in the line Sa3; g) hole cutting through the upper part of the signs in the line Sa7; h) reshaping of beveled edge and hole cutting through the sign in the line Sb2; i) damaged part of the Side A with traces of two implements used for reshaping; j) side view of the tablet with line margins, hypothesizing the amount of wood loss and existence of line Sa0. The lines ending at this edge are marked with circles, proving that line Sa0 will ensure the inverse boustrophedon line order for the entire inscription.

outlines were destroyed, but deeper hairline incisions are still distinguishable in places.

The study of the original artifact in August 2011, with permission kindly provided by Felicia Pickering, suggests that fire damage mentioned by several scholars may have never occurred to the artifact. Review of the available literature suggests that Barthel was the first to write about the purported carbonization:

“Exemplar S has the contour of an elongate board, which tapers towards one side. Presumably the piece of wood was used for canoe building. When necessary processing was done, a part of the original rectangular shape was lost. Both writing surfaces are damaged to a considerable extent by fire. The loss of text is woefully high” (Barthel 1958:31).

The origin of these observations may have roots in black-and-white photographs available to Barthel. To increase the contrast for low-sensitive photography in those days, it was common to fill the glyphs with a white substance (e.g., Orliac & Orliac 2008:Figures 187, 190, 192, & 198). Some white in-fill still survives in the sign grooves in lines Sa3-Sa5 (Figure 3), which may also be plaster stuck to the wood when the mold of the tablet was made. The damaged areas are indeed dark in the photographs with white-filled glyphs (Heyerdahl 1975:Plates 58c & 59c), hence the conclusion about fire damage (Heyerdahl 1975:275).

The question about the original height of the tablet is far from being clear. The reshaping marks on the beveled top edge (Figure 5i) are cutting through the signs (Figure 5h), leaving less than half of line Sb1. The bottom edge of the artifact was completely lost in reshaping (Figure 5a). At first glance, it seems that only a part of the first line Sa1 was planed away as its signs are seen at full height past the point where reduction of the tablet ends (Figure 5i, bottom right corner). The study of Side B proves this optimistic conclusion to be wrong; the remnant of line Sb9, first recorded by Fischer (1997:472), continues along the planed edge. The remaining bottom halves of signs suggest that at least 0.5cm of wood was removed. The profile view of the tablet (Figure 5j) shows that surfaces bearing lines Sa1 and Sa9 are almost parallel to each other, just like those at the level of the lines Sa7 and Sb2. Therefore, it would be unlikely to expect that the planed-away part was occupied only by line Sb9. There should be at least one additional line, Sa0, lost in reshaping, which would have produced a bottom edge with smooth beveling reminiscent of the top edge of the artifact. Detailed study of the original tablet under angled lighting revealed fragments of several signs below line Sa1, at the very border of the non-damaged surface (Figure 4, dashed section; see also tracings in Figure 9). The

surviving fragments do not provide enough data for reconstruction of any individual sign. However, they present proof that line Sa0 once existed on the artifact.

This extra line Sa0 may have been wrapped around the bottom of the tablet (similarly to line Sb1 trailing over its top), having the *upper* half of its signs inscribed on the edge and the *lower* half extending to Side A. In this way, each side of the tablet would have had at least nine lines (Figure 5j). It is worth noting that the lines ending at the vertical edge, marked with circles, will ensure inverse boustrophedon sequence of the lines for the entire artifact. However, the existence of the line Sa0 jeopardizes the line order proposed by Barthel, because it had to start with head-down glyphs at the bottom-right corner of the tablet, below the two anthropomorphic signs at the end of line Sa1 (Figure 4). As we know,

“The reading should commence at the lower left-hand corner, on the particular side that will bring the figures erect ... arriving at the top of the first face, the reading is continued over the edge to the nearest line, at the top of the other side, and the descent continues in the same manner until the end is reached” (Thomson 1891:516).

This essentially offers two possibilities:

- (1) The text starts with line Sb1 and follows to Sb9, then continues to Sa0 (now lost) and Sa1 through Sa8. The line order corresponds to that proposed by Barthel, but the side order should be reversed.
- (2) The text starts with Sa8 and continues to Sa1, followed by line Sa0. The other side starts with Sb9 and ends with line Sb1. Thus, the side order proposed by Barthel is kept, but the line order should be reversed.

For other tablets, it is possible to find some extra clues about the line order by studying parallel passages that continue from one line to another – which, alas, is not the case with the Large Washington tablet for which all known parallel passages are contained within their corresponding lines. Thus, taking into account the trimming of the artifact from the both ends, we should accept that *every* line of Tablet S actually represents a separate *rongorongo* fragment, the order of which in the original inscription is not known.

### Possible Reuse of Rongorongo Tablets in Canoe-Planking

Wood was prized on Rapa Nui after heavy depletion of its flora. Some ceremonial wooden objects were carefully preserved and repaired in the event of damage (Orliac & Orliac 2008:128, 130, 160, 239)



and survive by the hundreds in museums around the world (e.g., Orliac 2010 identifies at least 200 carved wooden objects). Inscribed artifacts were not as lucky, with only about two dozen objects surviving today. However, *rongorongo* glyphs were thought to be endowed with magical power (*mana*), that could be reused upon the incorporation of tablet fragments into new construction, similar to the way in which several *ahu* contain earlier *moai* embedded into their masonry as building blocks (e.g., Ahu Te Pito Kura, Ahu Nau Nau, and Ahu Maitaki te Moa – see Smith 1961:200, 209, & 214, respectively). The easiest way to fix a tablet in place involves lashing:

“The fact that the Rapanui sewed together driftwood boards in order to fashion a canoe was already documented by Cook in 1774. Compare the similar holes on ‘Large St. Petersburg’ (RR 18), which was probably also used to make a canoe, possibly Niari’s” (Fischer 1997:654, Note 35).

Yet, the presence of the holes is insufficient for conclusive proof of the sea-related reuse. To answer this question in more detail, we should first focus on canoe construction techniques.

It is true that the scarcity of wood forced the islanders to build their canoes from every available material (Tregear 1892:98):

“The canoes were few, and were very poor structures; to be accounted for by the lack of large timber on the island. Narrow strips of wood were carefully sewn together with small cord to form vessels about 18ft. or 20ft. long. They were very narrow, with carved bows and sterns somewhat elevated, were fitted with outriggers, and capable of carrying about four persons in each canoe.”

A drawing of such a canoe appears in the Atlas of La Pérouse’s voyage (Figure 6a), showing a man and a woman (in a characteristic boat-shaped hat) paddling an outrigger canoe formed by a carefully-fitted mosaic of small planks. Skinner sees the elaborate masonry of several Rapa Nui ceremonial platforms (such as Ahu Vinapu or Ahu Ohau) as a development of the skills used in canoe building (Skinner 1955:293):

“The Polynesian veneer of stone slabs carefully fitted edge to edge ... gives a final smooth surface to the rough stone-work of Vinapu ... Its resemblance to the stone-work of Cuzco is superficial. It is built, not with the technique of Cuzco stone-work, but with the technique of plank work used in Polynesian canoes.”

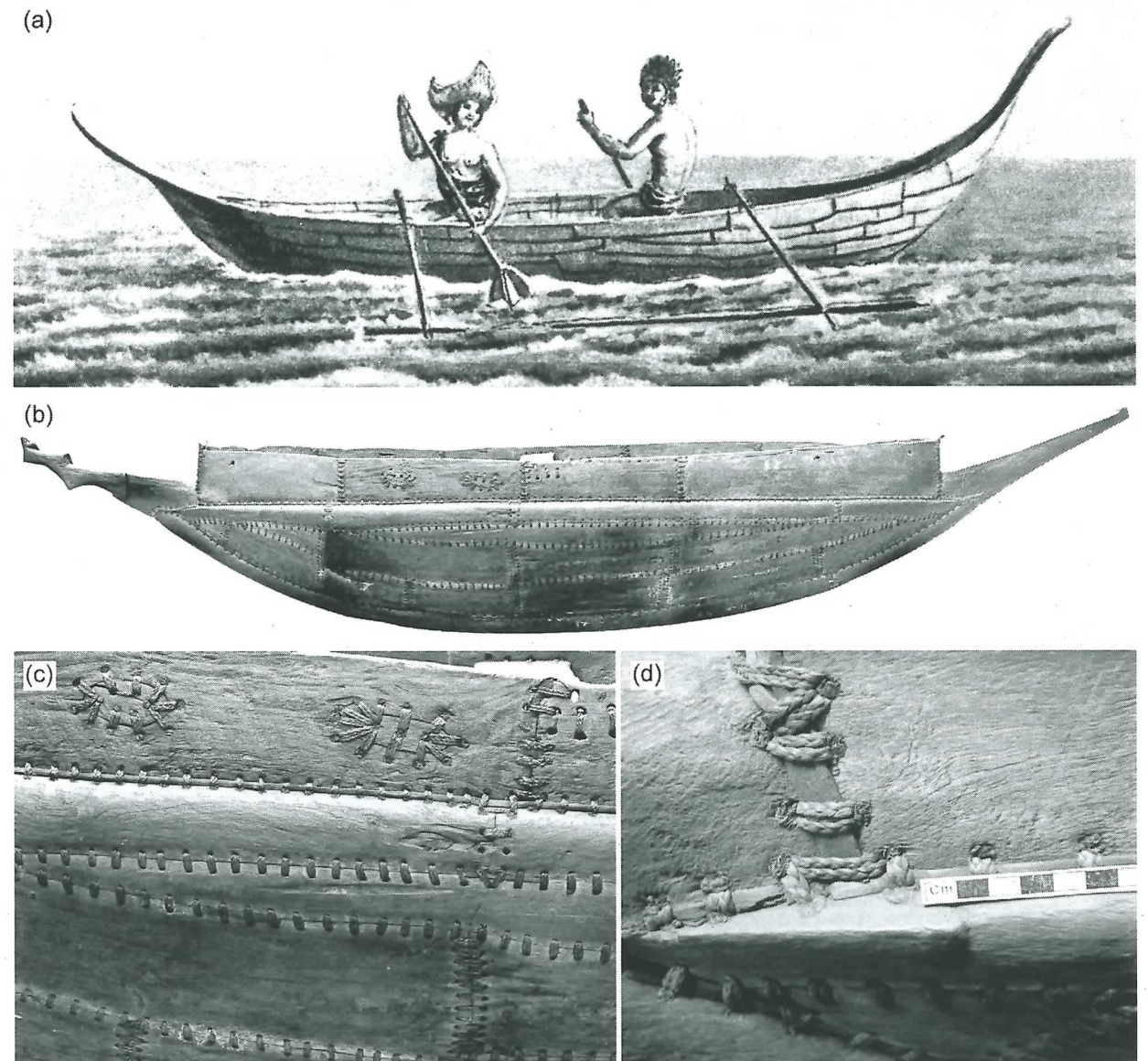
To illustrate this argument further, he cites Kennedy (1931:75) for the technique of precise fitting used in carpentry, which could be extended to stone objects:

“The method of trimming (canoe timbers) to make an exact fit merits notice. The fitting surfaces are trimmed with the adze to the approximate shape. One surface is then smeared with a black mixture of powdered charcoal and water. This surface is then applied to the other, and, on their being separated, the projecting irregularities of the unsmeared surface are indicated by black marks. These black marks are cut away with the adze, and the two surfaces are again placed together. This operation is repeated until one surface makes contact with the other at every point of its length.”

One of the magnificent examples produced by this technique, according to Skinner (1955:293), is the Nukutavake canoe (Figure 6b) collected by Captain Samuel Wallis in 1767 at the island of Nukutavake (Tuamotu Archipelago) and brought to London aboard the HMS *Dolphin* where it entered the Collections of the British Museum in 1771. This canoe is 387cm long and 68cm wide, with the hull composed of 45 planks tightly sewn together with a cord (Hooper 2006:168). The lashings are very dense, especially at the vertical joints (Figure 6c, bottom right). The holes in the gunwales are closed with carefully-fitted elliptically-shaped pieces of wood, fixed in place with radial lashings (Figure 6c, upper part). The close-up of the canoe interior shows that lashing holes were drilled at a distance of 2-3 centimeters apart, and the diameter of each hole was large enough to accommodate doubled lashing cord to ensure tight joints between the canoe planks. Of course, the Nukutavake canoe was of exceptional craftsmanship that impressed Wallis so much that he decided to bring it to London (Hooper 2006:18). Rapa Nui canoes observed by Roggeveen were considerably simpler:

“Their canoes are put together with manifold small planks and light inner timbers, which they cleverly stitch together with very fine twisted threads ... But as they lack the knowledge and particularly the materials for caulking and making tight the great number of seams of the canoes, these are accordingly very leaky, for which reason they are compelled to spend half time in bailing” (Sharp 1970:101).

Figure 7 presents a schematic depiction of all multi-hole *rongorongo* tablets that may have been used in marine carpentry. Making a comparison to the craftsmanship of the Nukutavake canoe makes it clear that the number of holes in every tablet shown in



Figures 6. Sewn-plank canoes in Polynesia: a) Easter Island canoe drawn by Blondela and included to the Atlas of La Pérouse’s voyage (Chauvet 1935:Plate 11, Figure 19); b) Nukutavake canoe, British Museum Catalogue Number Oc1771,0531.1, a general view (Image Copyright Trustees of the British Museum); c) close-up of the exterior lashings (Image Copyright Trustees of the British Museum); d) close-up of the interior lashings (Image Copyright Trustees of the British Museum).

Figure 7 is *far below* that necessary to ensure a tight joint with neighboring planks. The Aruku Kurenga tablet (Figure 7, Bv) has two holes that post-date the inscription; drilling of another hole started in the middle of its wide side, but it was never finished. Therefore, we could speculate that these holes were intended for hanging the artifact: one for horizontal stability and the other for vertical position. There were five holes in the Keiti tablet (Figure 7, Ev), two of which definitely pre-date the inscription and one that certainly post-dates it. Two remaining holes could be either post-dating or pre-dating. The central position of two holes suggests that they were used for passing the hanging cord.

Perhaps the first hole was drilled away from the line passing through the center of mass of the tablet, which caused the tablet to hang at an angle. The situation was remedied by drilling another hole. The secondary holes carved on the right hand side of the tablet may have been used to improve the hanging stability.

The Large St. Petersburg tablet features four holes along its upper edge (Figure 7, Pr). Only the central hole pre-dates the inscription; all other holes are secondary. The wood around the holes is worn. The second hole from the left is elongated as if it were composed of two holes drilled side-by-side. One more perforation was started to the right, but was never finished. There



are three suspicious notches along the upper edge that may have been formed by holes drilled too close to the edge. One hole appears at the bottom-right part of the tablet, with a portion of eroded wood around it. A small piercing was started at the bottom edge, but was never finished. It is also worth noting that, apart from the wood damage in the direct vicinity of the holes, the surface of the tablet is of perfect preservation – which we might not expect for a canoe plank that was in contact with water at least on one side. Therefore, the low number of holes, their proximity to the edges, and the absence of reshaping traces cast considerable doubt on the possible reuse of the Large St. Petersburg tablet in canoe-planking. However, one can hypothesize that the tablet was lashed to another object and was carefully curated under favorable conditions to ensure good preservation of the wood.

The Large Washington tablet (Figure 7, Sb) is a different story altogether. It was reshaped from all sides and bears many holes, nine of which were drilled along the upper edge. The distance between the holes varies from one to fourteen centimeters, which is a far cry from the Nukutavake canoe masterpiece. Nevertheless, the holes are drilled at more or less a constant distance from the edge that may have allowed an efficient lashing with the neighboring plank. The side edges of the tablet feature one and two holes respectively. Surprisingly, not a single hole is seen at the bottom edge (Figure 7, Sb).

With these observations, it is possible to propose a tentative reconstruction of the way in which the tablet might have been lashed to other planks. Considerable reshaping of the upper edge and a groove cut into its bottom edge suggest that the tablet was inserted into a similar groove in the plank above it, and sat on top of yet another plank below it (Figure 8a). The concave-convex junction might have allowed insertion of some caulking material such as moss between the planks for reducing leaks. The front view of the lashed tablet is shown in Figure 8b with the holes numbered 1-12, and the hypothetical neighboring planks marked with Roman numerals. The proximity of holes 2, 3 and 5, 6 was considered indicative of joints between the planks II-III and III-IV. Hole 10 is drilled too close to the border, and it might have ended up inside the joint with the plank IV, lashed by a cord passing through the neighboring hole 9. Holes 11 and 12 were used for lashings joining the tablet with the plank V. The type of junction used for the bottom part is unclear. There is a groove over 15cm long cut into the edge, maybe to receive plank VII, but there are no holes above this groove. Thus, two options are possible:

- (1) What is shown as the bottom planed side of the tablet in Figure 8a was never intended to have joints because it corresponded to an upward-facing edge, such as that of a gunwale. The groove for plank VII

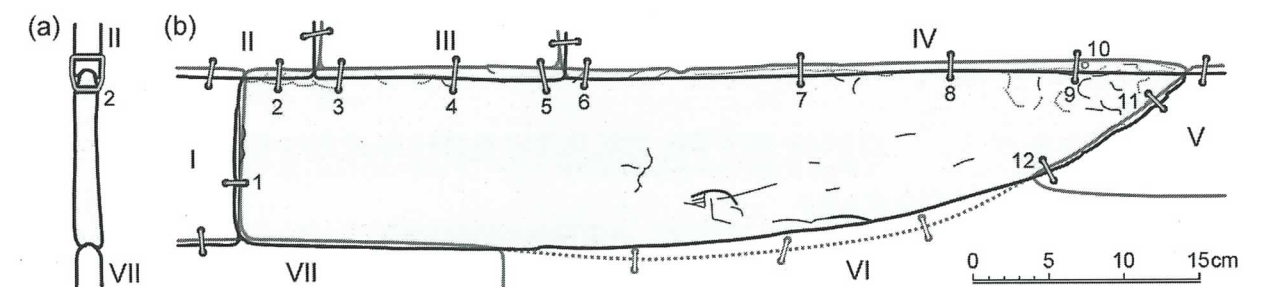


Figure 8. Tentative reconstruction of possible lashing of the Large Washington tablet among canoe planks: a) profile view; b) front view. Lashing holes numbered 1-12 are discussed in the text.

was the consequence of an error (or change of plans) of the carpenter, which would explain why there are no holes in this part of the tablet. If this were the case, Figure 8 should be rotated upside-down. The drawback of this hypothesis is that the resulting ridge formed by the tablet and surrounding planks would not be even because the groove carved for plank V suggests that the latter will end several centimeters off the planed edge of the tablet.

- (2) The tablet was removed from the canoe and reshaped one more time before it was collected by the *Mohican* Expedition. It may have been damaged/rotten at the bottom edge so that the latter was removed for “cosmetic effect”. In this case, the bottom plank (VI and VII) might have accommodated the full length of the tablet, with a joint achieved by lashing holes drilled in a now-absent part of the tablet (tentatively shown with a dot contour in Figure 8b). However, it is still unclear why not even one hole appears above the groove carved to receive the plank VII.

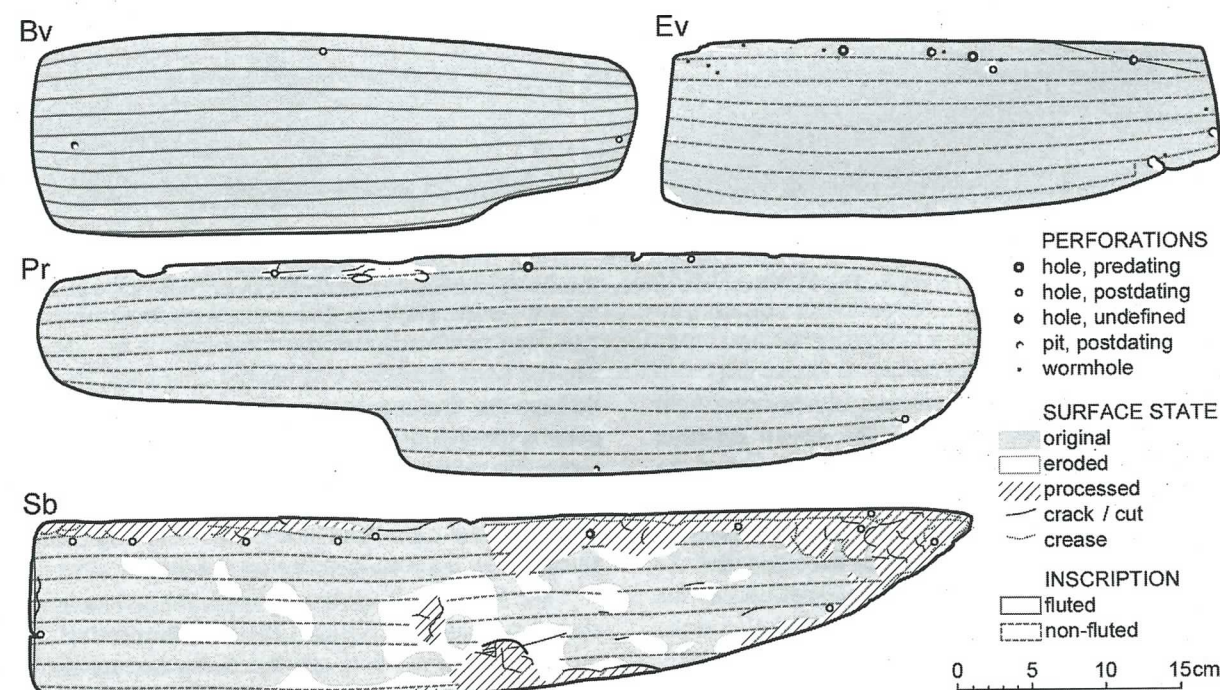
The present analysis demonstrates that *only* the Large Washington tablet shows extensive evidence of being reused in a sewn-plank canoe. No other surviving *rongorongo* artifact, despite having multiple holes, shows traces of reshaping and pronounced one-sided erosion that would be characteristic for the use in marine carpentry. Yet, even for the Large Washington tablet, the question is not completely clear due to the absence of lashing holes around the entire perimeter of the artifact and the general scarcity of holes (Figure 8b) in comparison with the lashing pattern observed in the Nukutavake canoe (Figure 6c).

### Inscription of the Large Washington Tablet

The digitally-enhanced images of the Large Washington tablet allowed improved tracings of its text (Figures 9 & 10), including glyph remains on the damaged parts of the artifact that were not documented by Barthel

(1958) or Fischer (1997:470-472). The inscription of the Large Washington tablet is rich in complex ligatures and calligraphic variants absent in other *rongorongo* texts, inviting a lengthy discussion that goes beyond the scope of this paper. Nevertheless, there are several glyphs that require particular attention (Figure 11). Near the beginning of the seventh line of Side A, there is a clear upside-down anthropomorphic sign with raised finger-and-thumb hands (Figure 11, Sa7<sub>1</sub>). The upper part of the glyph incurred double damage as a piece of wood was broken off after planing by an adze. Judging by the direction of the contour and estimating the line height from neighboring bird sign 660, the glyph in question might have been a complete upside-down sign 316 (depicting a standing man) or 356 (a sitting variant thereof). The latter case may be more probable due to preceding traces of a sitting glyph, so that two signs might have formed a symmetric composition, similar to a pair of sitting anthropomorphs 356-356 appearing subsequently in the same line (Figure 11, Sa7<sub>2</sub>). The upside-down mirroring of the neighboring glyphs is a rare feature; the known occurrences consist of two inverted long-beaked birds 22.660x:660 (Figure 11, Sb5) and the glyph 196 (Figure 11, Bv7) including a reduplicated form – perhaps 6.17-6.17.76. A fragment of the line Sb4 contains in-line repetition with a puzzling rearrangement of signs: a text 91.206.52-280-522 is rewritten as 300.91.52-280-522 (Figure 11, Sb4). Interchangeability of anthropomorphic glyphs 200 with lozenge-shaped head and 300 with a gaping-mouth head (including corresponding versions with different types of hands) are known in the *rongorongo* corpus. It is also possible that some types of hands may be an integral part of the glyph and not the ligature, yet it is difficult to explain how the ABC sign sequence (91.206.52) transforms into BAC (300.91.52) in a seemingly similar context.

Direct study of the artifact allowed positive identification of the signs at eroded sections of the Side B: a lengthy fragment with numerous suffix glyphs 711v depicting four fish on a line (partially



Figures 7. Sketch of inscribed tablets with multiple secondary holes: Aruku Kurenga (B, verso side), Keiti (E, verso side), Large St. Petersburg tablet (P, recto side) and Large Washington tablet (S, Side B).



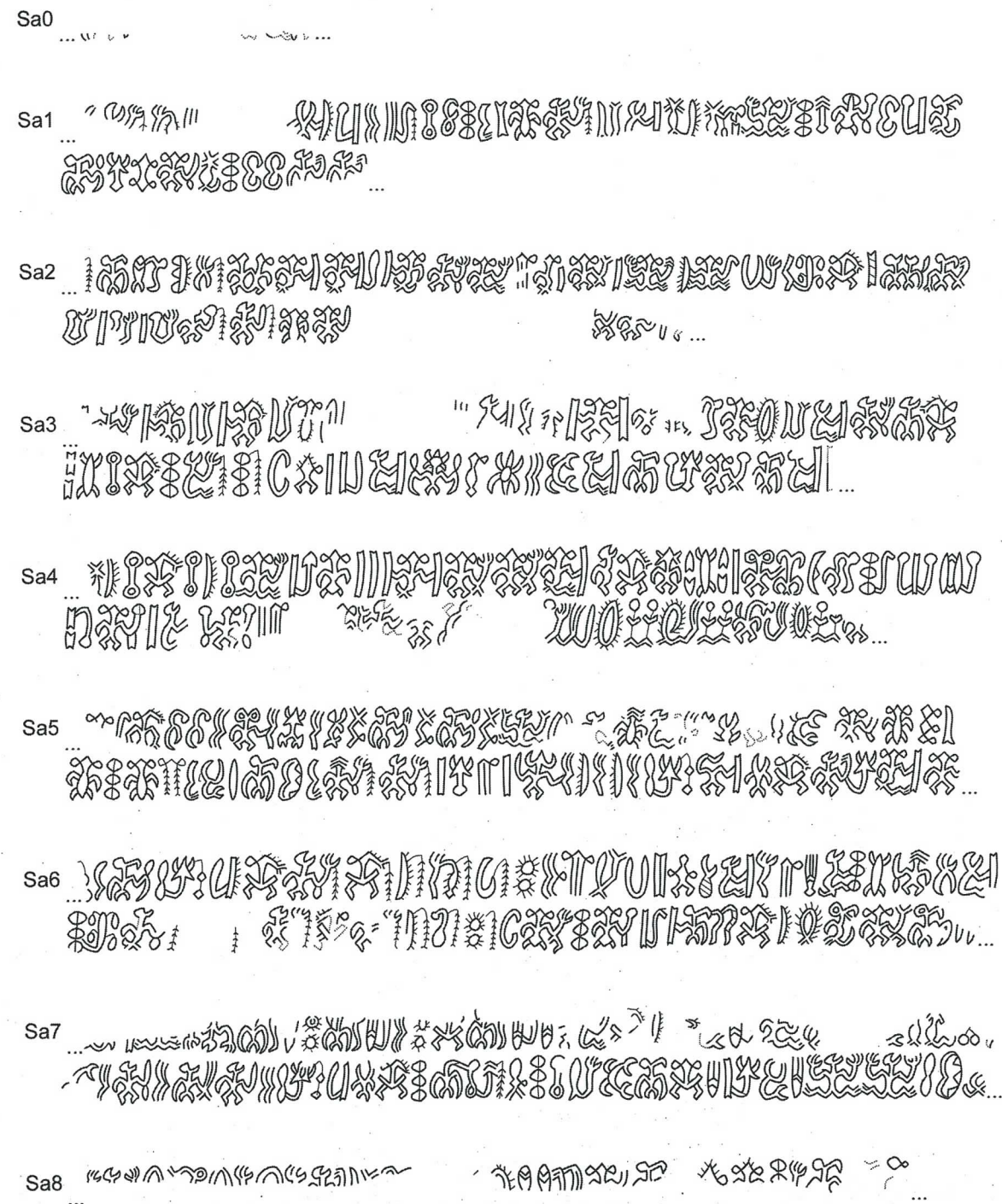


Figure 9. Tracing of the Large Washington tablet inscription, Side A.

shown in Figure 11, Sb6). Formerly, these glyphs were known only from the Great Tradition texts H/P/Q with two examples shown in Figure 11 (Hv5, Pv7). In the calligraphy of the Great Santiago tablet (as well as in the Small St. Petersburg tablet, line Qv8, not shown) the sign contains four fish. On the Large St. Petersburg tablet, only three fish are shown: a central one

(reminiscent of a common sign 711) and two fish joined head-to-head (forming an outline somewhat similar to an inverted *reimiro*) – sufficient to convey the notion of “many fish”. The relation between “single fish” sign 711 and its “many fish” version 711v is not clear. They may be calligraphic variants depicting a catch, with the more elaborated “many fish” sign illustrating an

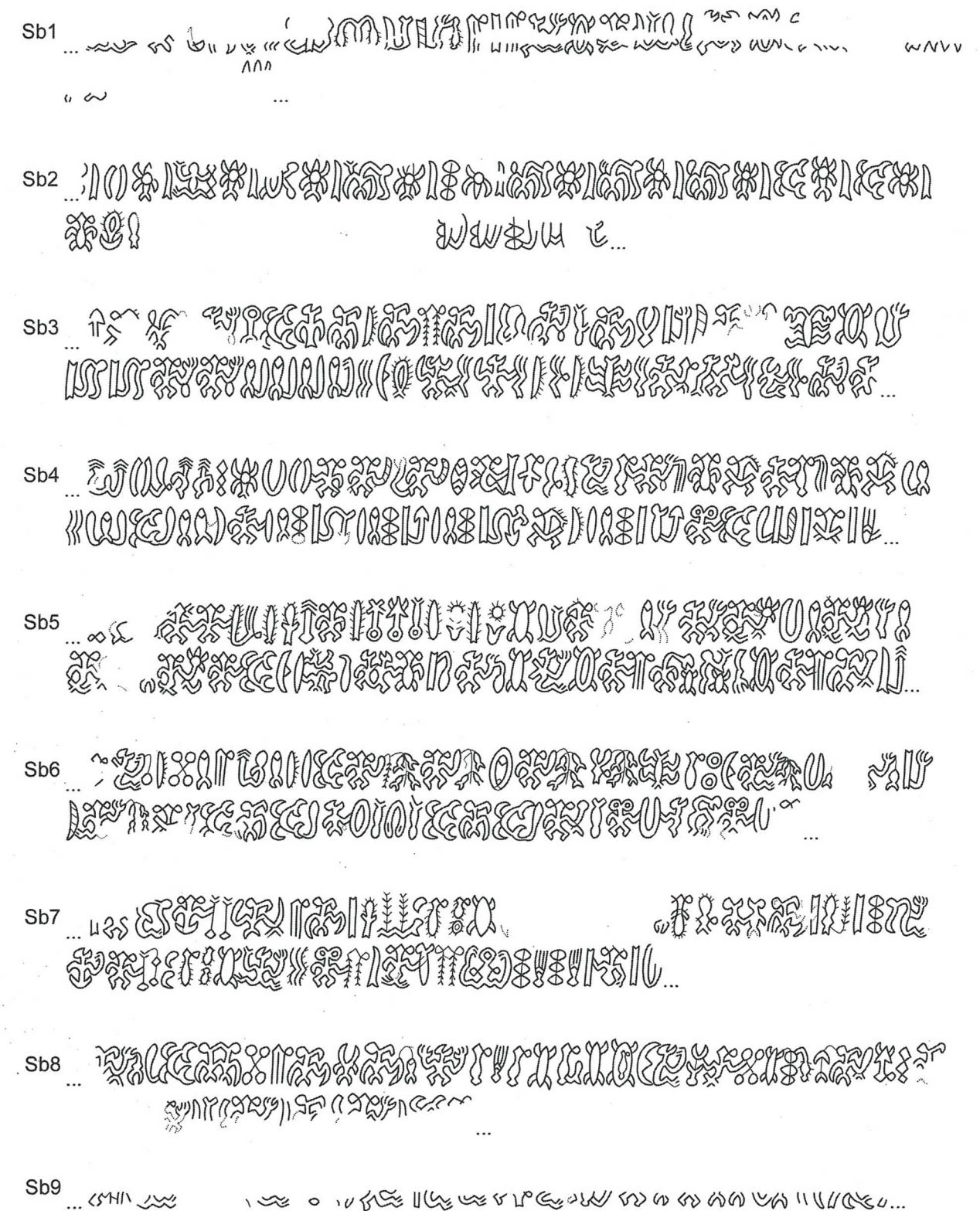


Figure 10. Tracing of the Large Washington tablet inscription, Side B.



abundant catch. It seems safer to classify these signs as different ones, yet there is a ligature 206?711 with a “single fish” glyph inside the sequence that otherwise uses “many fish” glyph 711v (Figure 11, Sb6; note that the fish in the damaged ligature 27.711v? is small and that it may be another “many fish” sign 711v). Except for these occurrences, there is only one more instance of a “two fish” glyph on the Large Santiago tablet (Figure 11, Hv9); the corresponding text on the Large St. Petersburg tablet is damaged (Figure 11, Pv11), but the surviving part may show heads of two fish glyphs side-by-side. If these indeed were ligature 711.711, the situation becomes complicated by requiring decomposition of every “many fish” glyph into the corresponding number of “single fish” glyphs. However, calligraphy studies point out that the head of a “single fish” glyph 711 starts at the elbow level of the neighboring anthropomorphic signs or even below it (Figure 11, Sb6, Cb14), while in the “many fish” version of the sign 711v the fish are smaller and their heads are carved at the height of the raised hand of the anthropomorphs (Figure 11, Sb6, Hv5, Pv7). In the damaged text fragment of Pv11, the possible fish heads are carved at the hand level as if forming part of a “many fish” sign 711v that parallels the Large Santiago text. The question about several adjacent “single fish” signs (Figure 11, Cb14; also end of line Er6, not shown) remains open.

The Large Washington tablet contains several structured sequences, which is a common feature of *rongorongo* inscriptions (e.g., Barthel 1958:153; Butinov & Knorozov 1957:14-15; Davletshin 2012:251;

Fedorova 1982:54; Guy 1982:445, 2006:59-60; Horley 2007:25-27; Pozdniakov 2011:46-50). Let us consider an example from line Sa6 (Figure 12). The light-colored glyph sequences with brackets below are well-known mini-texts occurring (in fuller form) in lines Bv8 and Ev6, among others. Immediately following, there are two structural sequences formed by glyphs (and ligatures thereof) suffixed with a delimiter sign 3, possibly depicting a feather garland. The upper-case letters above the line denote glyph elements appearing in structured sequence; the lower-case “x” marks the delimiter sign. As one can see from the figure, the majority of entries in a structured sequence consist of a single glyph, 522 (marked with letter C), 22f (D), 145 (G), 74 (F?) and 102 (H). The latter sign is not appended with a garland 3 in the first list, but in the second one it is suffixed with this delimiter. The inverse happens with a “proboscis” glyph 522f – it is suffixed in the first but not in the second sequence. The fishhook-shaped sign 145 from the first sequence might be a scribal variant of the sign 141 following directly after the second sequence. Other glyph “shuffling” is also evident – the “feathered” oval 22f occurs after the sign 522f in the first sequence, while in the second one it appears after an anthropomorphic glyph with a finger-and-a-thumb hand, possibly glyph 306.

Feather garland sign heralds many structured sequences, but it is not the only glyph with such a function. Several sequences are formed with the sign 68 (Figure 12, Hv11; see also Figure 9, the first part of line Sa5). Further in the line Hv11, there is a structured sequence delimited with crescent signs 40



Figure 11. Fragments with peculiar glyphs and arrangements thereof.

Figure 12. Structured sequences in the *rongorongo* texts.



and 42 (a rotated variant used to form vertical ligatures with down-up reading). The Great Tradition includes a structural sequence delimited with ten signs 65 (Figure 12, Aa1) serving as prefixes (Butinov & Knorozov 1957:14; Guy 1985:378). The inscribed *reimiro* from the British Museum has a line that ends with a structured sequence delimited with ten *komari*-shaped signs 115 and 51 (Figure 12, La1), which serve as suffixes because sign 51 ends the inscription. Note that the up-down ligature 79:51 probably reads from top to bottom; otherwise it would create an improbable sequence of two *komari* glyphs breaking the general pattern. The fragment of Keiti text (Figure 12, Er6) is delimited with the sign 450. Curiously, several structured sequences feature glyph repetition in adjacent “slots”: there are two garland signs 3 attached to the delimiter 65 in the beginning of Aa1 sequence; two hatched sticks 11 almost at the end of sequence La1, and two marine creatures 730 followed by two “diving stance” birds 407 and 608 in Er6 sequence (Figure 12).

Structured sequences can appear inside lists, forming intricate patterns. For example, the recto side of tablet Keiti featured a list with a lengthy delimiter 40.300-41-300-300.24-4.430-22.380 written in several variations; the glyphic groups within this list in the first three lines are “interlaced” with adze-shaped sign 63 (Figure 12, Er1). The second list entry illustrated in the figure is especially puzzling by forming a sequence ABxBxBxBxB where anthropomorphic glyph 200 stands for “A”, inward hand 61 for “B” and the delimiter glyph 63 is denoted as “x”. From the first ligature 201.63 (ABx) it seems that adze sign 63 acts as a suffix. However, it eventually turns into a prefix as the sequence ends with sign 61 and not sign 63.

The delimiters of structured sequences are not always composed of a single glyph; sign group 73.6 is attested as a delimiter on the Small Santiago tablet (Figure 12, Gr2), the ligature 1.450 delimits a sequence on the Tahua tablet (Figure 12, Ab6); glyphic group 8-4 forms long structured sequence in line Sb2 (Figure 10). An even more elaborate structure with delimiter signs set as a kind of “brackets” appears in the lines Aa1 / Hr5-6 / Pr5 and Qr5 (Butinov & Knorozov 1957:14; Fischer 1995:103-104; Guy 1985:367-388). To reveal the underlying structure, the delimiter signs are shown in a lighter tone and corresponding letters are presented above the signs (Figure 12, Pr5). Sign group 66.9-66.6, appearing before the discussed sequence, belongs to another structured list (see the ending of fragment Aa1, Figure 12). Glyphs 67-15.34 standing after the sequence belong to another passage (Guy 1985:377). Therefore, the highlighted sequence is completely isolated and consists of ten entries of a fixed structure: the beginning of *every* entry is marked with a sun-like sign 8 (which in Barthel’s nomenclature sometimes

is “absorbed” into composite signs 554 and 553 or appear as an allograph 81) and ends with glyphs 15-22f (Butinov & Knorozov 1957:14, Table VI). The entries of this sequence (given in dark outlines in Figure 12, Pr5) are mostly composed of one or two signs. There are, however, two cases with possible tri-element text obtained if the glyphs 110 and 13 are considered composite. In the parallel text written on the Tahua tablet, line Aa1, sign 15 is absent from the delimiter “bracket” (Fischer 1995:104; Guy 1985:378).

It goes without saying that such highly-ordered structures in *rongorongo* require a detailed analysis. Hypothesizing that Rapanui script represents a true writing system (Guy 1985:386; Pozdniakov 1996:297) automatically imposes a phonetic constraint:

“All scripts that are full writing – that is, a ‘system of graphic symbol that can be used to convey any and all thought’ ... – operate on one basic principle ... Both alphabets and the Chinese and Japanese scripts use symbols to represent sounds (i.e., phonetic signs); and all writing systems use a mixture of phonetic and semantic signs. What differs – apart from the outward forms of the symbols, of course – is the *proportion* of phonetic and semantic signs. The higher the proportion, the easier it is to guess the pronunciation of a word.” (Robinson 2007:14).

“A purely pictographic system fails at the outset to express some elementary spoken concepts.” (Robinson 2007:42).

In other words, frequent highly-ordered sequences in *rongorongo* texts *should* have a corresponding counterpart in Rapanui language. We would be lucky to find them in everyday speech patterns. However, if writing was not readily available to the entire population in historic times, such structured sequences might have appeared only in a certain type of narratives, chants, charms, or word games. Proper identification of a possible nature of the structured sequences can significantly help in their study. On the contrary, direct sign-by-sign interpretation thereof may have certain difficulties due to unusually high usage of the delimiter glyphs.

To illustrate the scope of the problem, let us consider published readings/interpretations of the structured sequences obtained by treating *rongorongo* as predominantly logographic or mostly syllabic writing. The first transcription of four *rongorongo* tablets was made by Bishop Tepano Jaussen according to the chants of Metoro Tau’a Ure in 1873 (Fischer 1997:50); the famous “Jaussen List” was distilled from these readings. The original Metoro chants were published by Barthel (1958:183-199). Metoro’s reading

of the structured sequence from the line Er6 (Figure 12) was the following (Barthel 1958:186):

“*tangata mau* [200] – *moa* [450] – *te honu paka* [280] – *moa* [450] – *kua kau* [770] – *moa* [450] – *moe te goe* [730] – *moa* [450] – *moe te goe* [730] – *moa* [450] – *manu rere* [407] – *moa* [450] – *kua oro* [608] – *moa* [450] – *manu kake* [680].”

The words corresponding to delimiters are underlined; individual sign numbers are added in brackets to simplify the discussion. One can tentatively translate the aforementioned passage as:

“a man carrying [200] a chicken [450] the dry turtle [280] a chicken [450] with a wide one [770] a chicken [450] recumbent Milky Way [730] a chicken [450] recumbent Milky Way [730] a chicken [450] a flying bird [407] a chicken [450] with a fluttering one [608] a chicken [450] a climbing bird [680].”

Despite the fact that the structure of the text fits the inscription, it is obvious that the “readings” only describe the signs without producing any coherent narrative. Another passage (Barthel 1958:192) includes a structured sequence delimited with sign 3 (Figure 12, Cb12):

“*tangata mau maro* [3.215] – *te hokohuki* [4] – *manu rere* [400] – *te marama* [40] – *te kihikihi* [3] – *te kihikihi ki te henua* [3.50] – *tangata kua here te maro i te puoko* [670.3].”

which can be translated as:

“a man holding a garland [3.215] the drill [4] a flying bird [400] the light [40] the lichen [3] the lichen to the land [3.50] a man with the garland tied to his head [670.3].”

It is important to note that the provided “readings” are also ambiguous. For instance, the delimiter 3 is identified either as *kihikihi* (lichen) or as *maro* (feather garland/pennon).

Despite these discouraging results, the Jaussen List and Metoro’s readings were considered a possible “dictionary” of *rongorongo*. Lanyon-Orgill’s (1953:61) attempts to read the structured sequence delimited with the same glyph 3 in lines Cb10-11 (Figure 12) produced the text:

“*Feathers* [3] – *man at work* [305]; *he cultivates* [4.600]; *feathers* [3] – *moon* [40]; *feathers* [3]; *Earth* [50]; *spade, spear* [95]; *feathers* [3] – *bird with a long beak* [670]; *the king* [99].”

After some extra editing the passage becomes (Lanyon-Orgill 1953:72):

“Some men are at work in the moonlight digging the feathers from the bird into the ground (to make it especially fertile?). But the bird with the long beak had been a heavenly king.”

As one can see, the repetition of “feather” sign 3 was simply reduced to a single word (highlighted). However, Lanyon-Orgill (1953:78) himself was quite uncomfortable with the result:

“It has been accepted that the signs are ideographs and that therefore we cannot expect the text of a tablet when interpreted to be more than a statement of the basic idea rather than a series of complete and coherent sentences such as an European would be accustomed to understand.”

Barthel approached *rongorongo* as a “telegram-style” writing (Barthel 1958:316); his attempt to read the structured sequence in line Hv11 (Figure 12) produced the following text (Barthel 1990:131):

“*ea* [93, not shown] *vaka* [22, not shown] *ea* [93, not shown] *raa* [81] *ara* [68] *kumara* [30] *ara* [68] *kuru* [34] *ara* [68] *kau* [59] *ara* [68] ... [24] *tea raro* [5].”

to which Barthel supplies a poetic translation:

“a boat appeared on the horizon [93 - 22], where the sun raises [93 - 81], on the road of the sweet potato [68 - 30], the road of the breadfruit (which is West) [68 - 34], the road of cold winds (is the South) [68 - 59], the road ... downwind (is the North) [68 - 24:5].”

However, direct translation of the proposed Rapanui text gives quite a prosaic narrative:

“boat raises [93 - 22], sun raises [81 - 93], a road, a sweet potato [68 - 30] a road, a breadfruit [68 - 34] a road wide [68 - 59] a road, ... white below [5].”

This narrative, similar to the previous readings, reduces structured sequences into a set of words that are practically devoid from grammatical inter-relations.

Fischer studied one of the most complicated structured sequences with “bracketing” delimiter 8-[...]-15-22f (Figure 12, Pr5), suggesting that the glyphic groups 8.6;15t-22f-8 and 200-15-22f-8 (denoted with xJyzx and Gyzx in Figure 12) can represent procreation structures (Fischer 1995:104). The first passage is assigned with a provisional reading:



"the [qualified] suns copulated with Y [unidentified]: there issued forth the sun."

The second passage has the sign 8:

"replaced by the very frequent Rongorongo anthropomorphic main glyph 200. In this instance one should perhaps assume a textual redaction – that is, the earlier procreation statement ... has for some reason here been altered to "[qualified] A [a deity?] copulated with Y [unidentified]: There issued forth the sun." (Fischer 1995:104).

It will be interesting to find a general interpretation of the entire structural sequence Pr5 in the framework of this hypothesis, because it should contain ten consecutive cosmogonies involving the sun (if this is what the sign 8 actually depicts). Fischer also analyzed structured lists with delimiter 380.1, frequently said to depict "sitting man with a stick" (see Figure 9, lines Sa3 and Sa6 for examples; one list item 380.1-2.34 is shown as light-tone glyphs in Figure 12, line Sa6):

"It is suggested here that compound 380.1 (together with alloglyphic compounds 380.1.3 [common on the Small Santiago and London tablets G and K, respectively] and 380.1.52 [particular to the Small Vienna tablet N] whose suffixes – perhaps reproducing pua 'turmeric' (*Curcuma longa*) and/or hauhau (*Triumfetta semitriloba*) – are probably suppletive, and thus expendable, mnemonics indicating "ritual hauhau" "flourish", "sprout", etc. possibly reproduces a similar [to "E aha tora'ua 'ariki" text collected by Thomson] poem of the type "What does their chief make flourish up here?" That is, the *Rongorongo* compound would prompt an entire similar phrase. Daniel Ure Va'e Iko's wordage would, of course, not be found in any of the identified 380.1 series in the surviving *Rongorongo* corpus. However, the structural similarity between Daniel's chant and these series seems sufficiently close to posit the suggestion that such *Rongorongo* passages – interspersed between other genres of a tablet collation – might convey first-fruit pœans" (Fischer 2004:71-72).

The interesting point for the present discussion concerns the suggestion that sign 3 may also read as pua, providing a notion of flourishing and sprouting. This assumption sounds completely feasible when the sign 3 is appended to the glyph of floral origin, such as a gourd (74.3, Figure 12, line Sa6) and a sugar cane (65.3, Figure 12, line Aa1). However, there are many instances when the glyph supplied with "flowering" garland 3 is definitely non-floral – a fishhook (145.3,

Figure 12, line Sa6), a marine creature (739.3, Figure 12, line Bv4), the sun and the moon (8.3 and 40.3, Figure 12, Ab5<sub>2</sub>), a spear (86.3, Figure 12, Hr3) and a bird (600.3, Figure 12, Ab3<sub>2</sub>). It is important to note that the aforementioned collocations have no solution using either Metoro's reading of sign 3 as lichen (*kikihiki*) or feather garland (*maro*).

On the other hand, *rongorongo* can be considered as predominantly syllabic script (Pozdniakov 1996:303). However, direct application of this approach will also fail to obtain a meaningful phrase out of the sign sequence ABxBxBxB (Figure 12, Er1) for any syllabic values assigned to "A", "B" and "x", respectively. To see why it is so, let us consider the repetitive patterns that are common to Rapanui language. In the narrative mode, it is possible to form a sequence of actions introduced with the aspect marker *he* in prefix-like manner:

"*He* tui, *he* amo, *he* oho ... *He* iri Teke, *he* éa kirunga ki te miro, *he* koa, *he* kakata *he* ki ki te Ariki. "Matu, ki oho ki te kainga rivariva!"

"He took [the baskets], put them on his shoulders and left ... Teke got into the boat, he was happy and he said [to the king], laughing, "Now let's go to some good lands!" (Englert 2006:48-49).

The limitative particle *no* also can form suffix-like arrays:

"*E* toto te eki *no*, kino *no*, nga roki *no*, nga renga *no*, nga tokatoka ruapapa *no*."

"There spread only wailing, abomination, the sad, the mutilated, the *ruapapa* survivors" (Atua Mata Riri verse 36, Fischer 1997:99).

However, it should be noted that:

- 1) Structured sequences attested in Rapanui texts are quite short and contain about five entries at most; structured sequences in *rongorongo* script have a much higher number of entries (Figure 12, ten elements – Aa1, Ab3<sub>2</sub>; at least nine elements – La1, Ab5<sub>2</sub>; at least seven – Er6, Gr2).
- 2) The length of the individual entries – which in many cases is limited to a single sign – has little explanation if *rongorongo* is predominantly syllabic, for which there should be a considerable number of two-syllabic, tri-syllabic (and longer) words. This issue is clearly illustrated with Englert's example: even if one envisions an abbreviated discourse reduced to a verb sequence "*he* iri, *he* éa, *he* koa, *he* kakata *he* ki", the delimited words are mostly two-syllabic.

- 3) Particles known to form repetitive patters are few (*he*, *ka*, *ma*, *mo* and *no* among the most popular) and are bound by grammatical rules determining their prefix-like or suffix-like use; the number of glyphs acting as delimiters in structured sequences is considerably higher (signs 3, 6, 8, 32, 40, 51, 55, 63, 65, 68, 450 only for the sequences illustrated in Figure 12), some of which may stand either before or after the signs belonging to the structured sequence.

The complications arising from a straightforward application of any syllabary to a structured sequence can be illustrated with de Laat's reading of a passage from Aa1 (Figure 12):

"*u-ra* [65.3] *u-ra* [65.3] *hu-ha* [65.95a]; *huu-huu* [65] *ra-ua* [65.74f]; *u-a* [65-1] *u-e* [65-22]; *u-ta* [65.45y] *u-nga* [65.9] *u-i* [65.6] *o o-ho* [4-4-4, not illustrated],"

which he translates as:

"(Yes, your) limbs (become) red-hot! They start to burn! (And your) nerves start to tremble! (His) look gives orders so that (you) will not leave!" (de Laat 2009:152).

The suggested text in Rapanui has a clear "telegraph" style, because frequent repetition of the delimiter syllable (*h*)*u* leaves no place for any grammatical particles. De Laat suggests a solution to the problem by assuming the presence of "supplementary layers of meaning" in *rongorongo* inscriptions (de Laat 2009:216-217):

"There are exactly ten 'tu'-glyphs [sign 8, Figure 12, line Pr5], ten combinations 'ra-e' or 'e-ra' [sign 21f, the same structured sequence] and ten '(h)u'-glyphs [sign 65, line Aa1]. Surely, these tenfold appearances could be explained away by pointing out that they originated in an oral tradition which must have relished in repeating a number of words with the same syllables a fixed number of times ... In the same manner, it is possible that the ten '(h)u'-glyphs [sign 65, Figure 12, line Aa1] ... were especially selected to portray the yam fields the women are fleeing from [escaping from an evil wizard in accordance to the translations proposed by de Laat] ... In any case, if these yams are really there, there can be no doubt that they were put there for a reader and not for the listener."

As structured sequences "interlaced" with the same sign are *bound* to produce readings devoid of

any grammar (and hence ambiguous), it becomes tempting to hypothesize that not every sign should represent a syllable:

"Two lists of signs depicting plants attested on the Great Santiago tablet, verso, line 11 [Hv11, see Figure 12]: one list is introduced with the "Twig" sign [Barthel's number 68] and another with the "Crescent" sign [40, 42]. In my opinion, these lists represent the best evidence for the existence of word-signs in the *kohau Rongorongo* script, as it is impossible to imagine such a structured sequence of signs depicting homogeneous objects occurring purely by chance" (Davletshin 2012:251).

This approach offers a promising solution for single-glyph entries of the structured sequences. Indeed, even if *rongorongo* is *predominantly* syllabic, there might be a number of word glyphs. However, classification of the glyphs into word/syllabic ones is not an easy task, especially because many single signs attested in structured sequences (which seemingly points to their word status) also form ABAB combinations with other glyphs (which is indicative of their syllabic nature). Also, it is not completely clear how delimiters should be treated. They may be word signs, syllable signs, or perhaps even numerals, as Davletshin (2012) argues. An alternative option is to assume that not every sign should be read phonetically, especially when they form highly repetitive patterns:

"Glyphs often occur in sequences, each member of the sequence repeatedly associated with the same glyph ... I shall speak here of "harmonic sequences" and of "clefs" [corresponding to structured sequences and delimiter glyphs discussed in this paper]. ... The fact that many glyphs are found functioning as clefs and the repetitive nature of clefs make it very unlikely these glyphs should have a phonetic value when functioning as clefs. It is more likely that they functioned as taxograms (semantic classifiers). However, they may have had phonetic values when not functioning as clefs of harmonic sequences." Guy (2006:59-60).

Indeed, it is quite feasible to assume that *tangata rongorongo* might have had a need to emphasize certain parts of the text (such as direct speech, names, toponyms, etc.) To cope with this task, Egyptian scribes enclosed proper names in cartouches; the ancient Maya accompanied the names of their rulers with title glyphs of a highly conventionalized structure. Thus, it may be possible that a *rongorongo* passage can be highlighted by prefixing/suffixing every glyph with the same sign (which works in a logographic approach as well because



a delimiter is not required to match pictographically the signs in the highlighted sequence).

To better understand the properties of the delimiters, let us consider structured sequences appearing in parallel passages Sa5 and Bv4 (Figure 12). The text can be tentatively structured as marked with upper and lower brackets. It is important to emphasize that isolated fragments may not represent individual sentences, but rather fixed word combinations, so that a sentence might have been formed by several such fragments. The parallel texts start with the foot sign 60. The evident rephrasing of the fragment can be treated in two ways: there is either a word formed by an oval sign and a bird 22.600 (as they appear joined in Bv4) or the word is composed by a bird sign and a shell sign 600-159(29y). The next stable fragment includes the signs suffixed with a garland glyph 3 in both parallel passages. The third fragment is especially interesting, as in text Bv4, three signs are suffixed with the hand glyph 6, but in Sa5, no such suffix is present. This omission seemingly suggests that sign 6, in this case, should be devoid of phonetic value. From this point, both inscriptions continue differently; line Sa5 features two mini-texts known from other tablets. It is interesting that the first fragment starting with the "horned" glyph 190a forms a lengthy structured sequence in line Sb3 (Figure 10) with the delimiter glyph 55b. In the line Bv4, the next fragment is also a structured sequence, this time with a rare delimiter glyph 32. Hence, the inscription of Bv4 features three consecutive structured sequences with delimiters 3, 6 and 32. In the text Sa5 there are also three sequences, though the second one is written without delimiter glyphs.

Many interesting insights can be learned from the lengthy structured sequences delimited with a feather garland glyph 3 that appear in the texts of the Tahua, Mamari, Large Santiago and Large St. Petersburg tablets (Figure 12, Ab3<sub>1</sub>, Ab5<sub>1</sub>, Pr3, Hr3 continued with Cb10-11, Ab5<sub>2</sub>, Cb12, and Ab3<sub>2</sub>). The first half of this sequence also appears on the Small St. Petersburg tablet, line Qr3, but it essentially follows the text of Hr3 and thus is not shown in the figure. The sequence starts with an anthropomorphic glyph 202 with a fist-formed hand; the body of this glyph is absent in Ab3<sub>1</sub> because the tablet was trimmed (Fischer 1997:409). The sequence continues with signs 600 and 4 grouped differently in each case (in the text Qr3 the corresponding signs are not connected at all: 4-600-4). Interestingly, one version from the Tahua tablet (Figure 12, Ab3<sub>1</sub>) has a feather garland suffixed to sign 4, which does not occur in other texts. The moon glyph 40 in the second version from Tahua (Figure 12, Ab5<sub>1</sub>) has a feather garland to the left, while in every other case it is attached to the right, sometimes being held by a hand protruding from the crescent. The following glyph 50 also has its garland

attached to its left side only in the case of Ab5<sub>1</sub>. The next entry is composed by a duplication 95d.6-95d.6 in the line Pr3, seemingly proving that both signs are syllabic; the rest of the passages display a very similar sign 93 which should represent a single syllable, too. The composite sign with two long-beaked bird heads in Ab3<sub>1</sub> lacks the garland suffix; in Ab5<sub>1</sub>, the suffix is in place (Figure 12). The next entry is the ligature 27.9 suffixed with the sign 3 in Ab5<sub>1</sub>, but written as two separate glyphs, each supplied with its own garland in the lines Pr3, Hr3 and Qr3. This point is quite difficult to interpret if delimiter glyph is expected to be read phonetically in this structured sequence. The next two entries essentially repeat the situation: a ligature 95:60, clearly read with its bottom sign first (Figure 12, Ab5<sub>1</sub>), becomes split into two glyphs, each suffixed with a delimiter (Figure 12, Pr3, Hr3). In some cases the foot sign 60 is replaced for a sitting man sign 254, which could be cautiously explained as the use of different spellings or similar words. The sitting man is ligatured with the sign 95 in the line Pr3, while both signs form separate entries in the lines Ab3, Hr3 (and Qr3).

The continuation of these structured sequences involves two passages written on the Mamari tablet (Figure 12, Cb10-11 and Cb12); they start with a similar anthropomorphic glyph with a raised hand 215(305) and a bird sign 600(400) accompanied with a fang-shaped sign 4. The structured sequence continues with glyphs 40 and 50, each attached with a delimiter garland 3. But, in Cb10 the delimiters are prefixed, in Cb12 one is suffixed and another one is prefixed, and on the Tahua tablet both are suffixed (Figure 12, Ab5<sub>2</sub>, Ab3<sub>2</sub>). Marking the sign 40 with an "A", sign 50 with "B" and delimiter glyph 3 with "x" one would ascertain that  $xAbx = AxBx = AxxB$ , which may preclude any phonetic reading of the "x" sign. The long-beaked bird sign 670 has a curious appendage to its left in the lines Cb10 and Cb12; the parallel sequence (Figure 12, Ab3<sub>2</sub>) suggests a possible solution – the sign 411 with the same hand form is written separately and supplied with its own garland glyph 3. The passages continue with a ligature 605.3 (reduplicated as 605.3-605.3 in Ab3<sub>2</sub>); the same occurs with the sign group 4-2: it may be duplicated or triplicated (Figure 12, Cb11 and Ab5<sub>2</sub>, respectively).

To summarize, delimiter glyph 3 behaves quite erratically in the structured sequences considered: it may be suffixed, prefixed or omitted; list entries composed of several glyphs may appear as a ligature in one text but written separately in the other, with a delimiter added to every element. An even more surprising fact is that the lines Ab3 and Ab5, as well as the lines Cb10 and Cb12 are the nearest neighboring lines with glyphs standing the same side up. This may indicate that when the scribes were carving lines Ab5

and Cb12, they had the lines Ab3 and Cb10 right in front of them, being able at any moment to verify (or copy) the corresponding passages, and yet these parallel sequences show seemingly free positional variation of their delimiter glyphs. Such behavior would be quite surprising for a strict phonetic script. However, if the function of the delimiters was to mark/tag/highlight the text in some way, their presence was of more importance than their exact position.

There can be yet another explanation: delimiter glyphs in the structured sequences may have been used for obfuscation purpose. It is known that ancient Rapanui had a secret language called *ponoko*. Very little information about it survived, as systematic studies of Rapanui language started long after decimation of the island's population. Du Feu (1996:190) says that "ponoko 'secret language' metathesis was obviously important but in the modern language it is rare. The only common example is the alternation of va'ai and 'ava'i, [both meaning 'to] give'." The English part of Fuentes' (1960:825) dictionary says that the message was encoded by changing "the logical order of the syllables in a word"; in the Spanish part of the same book (Fuentes 1960:297) gives more information:

"ponóko (noun), to call a name formed in the manner that the others would not understand it. Generally is formed by inverting the order of the syllables, e.g. José: Séjo // (verb transitive) to form such entangled names."

This essentially follows the lines of du Feu's example: in a bisyllabic word the syllable order becomes inverted JO-SE → SE-JO; in a tri-syllabic word the changes occur only with the first pair of syllables: 'A-VA-I → VA-'A-I. Englert (1978:152) says that "hakaponoko [means] to invert for a joke the syllables of a word, so that the others would not understand what is said; for example: to say *kepo* in place of *kope*." This example is radically different, because only the vocals are switched, so that two initial syllables transform into two unrelated syllables: KO-PE → KE-PO. Changes of the sign order in the parallel sequences – that will correspond to syllable "flipping" illustrated by du Feu and Fuentes – is also known in *rongorongo*. Englert's example requires substitution of one sign group by another group, which also occurs in parallel passages. However, such substitutions are difficult to distinguish from word substitution cases.

Campbell (1999:200) mentions two methods of obfuscation:

"It is very common that if a foreigner learned sufficient language and they [the Islanders] don't want him to understand, they speak a Rapanui jargon

at a very fast rhythm. They call it *haka-ponoko*. In the extreme cases they speak backwards, which is called *atu'a-maitu'a*, for which they have an extraordinary ability. In this way Rapanui defends his/hers expressions of intimate, particular, arcane, in contrast with tendencies of the most modern, who use an international language and many neologisms."

All above-mentioned means of message jumbling by "juggling" the syllable order do not fit the structured sequences AxBxCx. Yet, very similar structures are known in other Polynesian cultures (J. Korovina pers. comm. 2012), including word games documented in New Zealand (Best 1976:119):

"Young folk often spoke in some pre-arranged manner most confusing to those listening. A common method was to introduce foreign syllable after every syllable of the ordinary words uttered; thus the words "*maku tena*" might be given as *ma-te-ku-te te-te-na-te*."

The example AxBxXxCx given by Best fits structured sequences perfectly (with a delimiter coincidentally matching one "encoded" syllable). Moreover, the initiated person can easily understand the message even if some of "foreign syllables" will be displaced or omitted, so that *te-ma-te-kute-te-na-te* (xBxXxCx) will function as well as *ma-te-te-ku-te-te-na-te* (AxxBxXCx, mimicking baffling behavior of the delimiter sign 3 in Figure 12, Cb10, Ab5<sub>2</sub> and Cb12). This suggestion is based on the fact that a far more sophisticated word jumbling technique called *kōrero hunuru* was documented in use by the Māori:

"A kind of rhyming slang [was] obtained among certain sections of the young. This slang was formed by the intrusion of a consonant, and the increase and repetition of the vowels. Its practice may be illustrated by taking an ordinary sentence such as: – *Me hāere tatou ki te kaukau, ne?* (We shall go to bathe, shall we?), a phrase which – with the aid of the consonant r – by the process indicated becomes: *Me-re-ere hā ra-ara-ere tā-ra-ara-toro-oro-uru ki-ri-iri te-re-ere ka-ra-uru ka-ra-uru, nere-ere?* Again, with the aid of the consonant w, the phrase: *E pā mai koia*, becomes: *E-we pā-wa-ma-wa-i-wi ko-i-wi-a-wa*. In which examples, as will be noticed, the letters and syllables in black type are mere verbiage. By this simple if cumbersome method the speakers concealed their subjects of discussion from the uninitiated. But such forms are speedily acquired. More technical systems were therefore formulated, amongst which it is found that a whole sentence is reduced to one or two words and then treated in the foregoing or some similar manner: *E hāere ana koutou ki hea?*,



is reduced to “*ki hea?*”, and this is secreted away in the following verbiage: *Ki-ri-era tiri-era hi-ri-era?* It is quite impossible for the uninitiated to understand this form of slang. The following pattern is practiced: *Hīniri, hānara, hōnoro, hēnere, hūnuru*, thence the term: *Kōrero humuru*” (Stowell 1911:228).

The possibility of using such foreign syllables/glyphs can settle many issues. It explains why so many signs appear as delimiters in the structured sequences – it is because any syllable/glyph can potentially function as an obfuscator. If the “encoded” message is composed of several parts, these can be jumbled with different obfuscators that will yield the sequence of syllables quite reminiscent to that seen in the line Bv4 (Figure 12), where three structured sequences with different delimiters follow one another. As carving extra signs requires more time and resources, it is important to mention that the majority of delimiter glyphs illustrated in Figure 12 (signs 3, 6, 32, 40, 63, 65, 450) are narrow and of simple outlines, requiring less carving space and scribal effort invested. Structured sequences delimited with several glyphs such as 73.6 (Gr2), 1.450 (Ab6) and 8-4 (Sb2) are more costly to produce, but perhaps specific requirements justified the means, for example, to avoid straightforward writing of a phrase containing *tapu* words.

## Conclusions

The study of the original Large Washington tablet at the Smithsonian Institution allowed confirmation of its possible reuse in canoe-planking as indicated by reshaping of the artifact, long grooves cut along its edges to receive the neighboring planks, multiple holes drilled along the tablet's perimeter, and more pronounced erosion at one side that possibly contacted water. No other *rongorongo* artifact displays all these traits, suggesting that *only* the Large Washington tablet was possibly used in marine carpentry. Analysis of enhanced digital photographs allowed the production of new tracings, documenting more signs from the damaged areas and the edge line Sb1. Before reshaping, the artifact contained an extra line (provisionally entitled Sa0), a few traces of which have survived.

The text of the Large Washington tablet contains several structured sequences that are common in *rongorongo* corpus but have no obvious direct parallels in Rapanui language, assuming either a predominant syllabic or a logographic nature of the script. It was shown that delimiter glyphs do not follow strict rules, and their positions may vary even in the structured sequences appearing several times on the same artifact. This property suggests that in many cases delimiters were possibly devoid of any phonetic value, acting

for example, as text markers of a kind. Alternative explanation can be proposed by paralleling frequent use of delimiter glyphs with insertion of foreign syllables used to jumble a message in secret languages recorded in New Zealand.

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