



HAL
open science

PRE-COLUMBIAN LITHIC OBJECTS IN THE GRAND CUL-DE-SAC MARIN (GUADELOUPE): LOSSES AND SHIPWRECKS? OR SUBMERGED REMAINS OF ANCIENT TERRESTRIAL SETTLEMENTS?

Christian Stouvenot, Benoît Bérard

► **To cite this version:**

Christian Stouvenot, Benoît Bérard. PRE-COLUMBIAN LITHIC OBJECTS IN THE GRAND CUL-DE-SAC MARIN (GUADELOUPE): LOSSES AND SHIPWRECKS? OR SUBMERGED REMAINS OF ANCIENT TERRESTRIAL SETTLEMENTS?. Joshua M. Torres and A. Brooke Person. Proceedings of the 27th Congress of the International Association for Caribbean Archaeology, Association Internationale d'Archéologie de la Caraïbe, 2019. hal-02196521

HAL Id: hal-02196521

<https://hal.univ-antilles.fr/hal-02196521v1>

Submitted on 30 Aug 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.





PRE-COLUMBIAN LITHIC OBJECTS IN THE GRAND CUL-DE-SAC MARIN
(GUADELOUPE): LOSSES AND SHIPWRECKS? OR SUBMERGED
REMAINS OF ANCIENT TERRESTRIAL SETTLEMENTS?

ARTEFACTOS LÍTICOS PRECOLOMBINOS EN EL GRAND CUL-DE-SAC
MARIN (GUADALUPE): PÉRDIDAS Y NAUFRAGIOS? O RESTOS
SUMERGIDOS DE ANTIGUAS ASENTAMIENTOS TERRESTRES?

OBJETS LITHIQUES PRECOLOMBIENS DANS LE GRAND CUL-DE-SAC
MARIN (GUADELOUPE) : PERTES ET NAUFRAGES ? OU VESTIGES
SUBMERGES D'ANCIENNES IMPLANTATIONS TERRESTRES ?

Christian Stouvenot and Benoît Bérard

Christian Stouvenot  Ministère de la Culture, Service régional de l'archéologie de Guadeloupe
and UMR 8096 - CNRS - ArchAm (Archéologie des Amériques) / Université Paris 1 - Panthéon-
Sorbonne,
christian.stouvenot@culture.gouv.fr

Benoît Bérard  Université des Antilles, Laboratoire AIHP/GEODE (EA 929), Campus de
Schœlcher, BP 7209, 97275 Schœlcher cedex, Martinique F.W.I,
benoit.berard@univ-antilles.fr

In the Caribbean archipelago, the rare pre-Columbian underwater remains identified to date are generally located at shallow depths on coastal margins such as the Los Buchillones site in Cuba, the Îlet Colas or the Îlet Chasse site in Guadeloupe. The new discoveries in the Grand Cul-de-Sac Marin are of a completely different nature. Following reports in 2012, surveys were organized: a sample of 160 lithic pieces scattered on the seabed between 2.50 m and 4 m deep was taken more than 1 km offshore. It is macrolithic tools in andesite. The most spectacular are axes blades and abrasive tools such as grinding stones, grinders, mortars and circular polishers. There are also elongated pebbles bearing percussion marks attesting to their use as hammers. The status of this vast deposit is still undetermined. It could result from the repetition over the centuries of marine accidents leading to cargo losses. Another hypothesis supposes that these artefacts come from camps or pre-Columbian villages installed on a paleo-littoral and whose vestiges were submerged by the sea following the post-glacial rise of the sea level, or because of great storms causing the erosion of the substrate. The hypothesis of submergence of pre-ceramic sites by rising sea level is reinforced by the discovery of a layer of peat around 5 m deep dated around 4000-5000 BC and containing remains of freshwater trees reflecting a terrestrial environment.

Key Words: Precolumbian, Antilles, Submerged Landscape, Underwater Archaeology, Holocene

En el archipiélago antillano, los escasos vestigios precolombinos subacuáticos identificados hasta la fecha se localizan generalmente a poca profundidad, en márgenes litorales como los de los sitios de Los Buchillones en Cuba, o de los Islotes Colas y Chasse en Guadalupe (Antillas francesas). Los nuevos hallazgos en el Grand Cul-de-Sac Marin son de otra índole. A raíz de reportes hechos en el 2012, fueron realizadas prospecciones: a más de 1 km de la costa, se extrajo una muestra de 160 piezas líticas esparcidas en el fondo marino, entre 2.50 m y 4 m de profundidad. Se tratan de herramientas macrolíticas de andesita. Las más espectaculares son hojas de hachas y herramientas abrasivas como metates, manos, morteros y circular pulidores. También se encontraron guijarros alargados que llevan huellas de percusión, las cuales dan fe de su uso como martillos. La situación de este amplio yacimiento sigue indeterminada. Podría resultar de una multitud de accidentes marítimos a lo largo de los siglos que llevaron a pérdidas de cargas. Otra hipótesis es que dichos artefactos provengan de campamentos o de poblados precolombinos ubicados en un paleolitoral y cuyos restos fueron sumergidos a raíz de la elevación postglacial del nivel del mar, o a causa de fuertes tormentas que provocaron la erosión del substrato. La hipótesis de la sumersión de sitios precerámicos por elevación del nivel del mar está reforzada por el hallazgo de una capa de turba alrededor de 5 m de profundidad que data de 4000-5000 A.C. y que contiene restos de árboles de agua dulce indicando un medio terrestre.

Palabras Claves: Precolombino, Antillas, Paisaje Sumergido, Arqueología Subacuática, Holoceno

Dans l'archipel antillais, les rares vestiges précolombiens sous-marins identifiés à ce jour sont généralement localisés à faible profondeur sur des marges littorales comme le site de Los Buchillones à Cuba, de l'Îlet Colas ou de l'Îlet Chasse en Guadeloupe. Les nouvelles découvertes dans le Grand Cul-de-Sac Marin sont d'une toute autre nature. À la suite de signalements en 2012, des prospections ont été organisées : elles ont permis de prélever à plus de 1 km au large un échantillon de 160 pièces lithiques dispersées sur le fond marin entre 2,50 m et 4 m de profondeur. Il s'agit d'outillage macrolithique en andésite. Les plus spectaculaires sont des lames de haches et des outils abrasifs de type meule, molette, mortier et polissoir circulaire. On trouve aussi des galets de forme allongée portant des traces de percussion attestant de leur utilisation comme marteaux. Le statut de ce vaste gisement est encore indéterminé. Il pourrait résulter de la répétition au cours des siècles d'accidents de mer conduisant à des pertes de cargaisons. Une autre hypothèse suppose que ces artefacts proviennent de campements ou de villages précolombiens installés sur un paléo-littoral et dont les vestiges ont été submergés par la mer suite à la remontée post-glaciaire du niveau marin, ou du fait de grandes tempêtes entraînant l'érosion du substrat. L'hypothèse d'une submersion de sites précéramiques par remontée du niveau marin est renforcée par la découverte d'une couche de tourbe vers 5 m de profondeur datée autour de 4000-5000 ans avant J.-C. et contenant des restes d'arbres d'eau douce témoignant d'un environnement terrestre.

Mots-cles: Précolombien, Antilles, Paysages Submergés, Archéologie Sous-marine, Holocène

While the issue of submerged prehistoric remains has been addressed for several years in different regions of the world (Faught et al. 2011, Evans et al. 2012, Billard et al. 2016), Caribbean underwater archaeology is almost totally focused on the remains of historical periods and more particularly shipwrecks (Guibert et al. 2017). The rare underwater pre-Columbian remains identified to date are located at shallow depths on coastal margins such as the Los Buchillones site in Cuba (Cooper, Valcárcel Rojas, R. and Calvera Rosés, J. 2010), the Îlet Colas and the Îlet Chasse in Guadeloupe (Guibert et al 2013) or Fond Banane in Martinique (Bérard, 2018). Their underwater character is linked to a relatively recent process of coastal retreat associated with the global phenomenon of sea level rise (Cooper and Boothroyd 2011).

The discovery in recent years by amateur divers of a significant quantity of pre-Columbian lithic remains further offshore and deeper in the Grand Cul-de-Sac Marin (Guadeloupe) has thus appeared to us as an original element capable of bringing a new perspective on this issue of pre-Columbian underwater sites in the Lesser Antilles. It questioned us in other terms on the nature, chronology and mode of formation of this type of deposits.



In 2016, we undertook our first underwater archaeological survey in the Macou sector of the Grand Cul-de-Sac Marin. The first aim of this operation was to better document the nature of the remains on the seabed and their distribution. Finally, our second objective was to collect data that would provide precise information on the chronology, over the last few thousand years, of the sea level rise process in the Grand Cul-de-Sac Marin.

The Geographical and Geological Framework of the Discoveries

The Grand Cul-de-Sac Marin de Guadeloupe is a 20 km wide coral lagoon located between the Basse-Terre and Grande-Terre (Figure 1). The southern edge of the lagoon (Figure 1, zone B) is a shallow transition zone with the mangrove (A) which fringes the Guadeloupe coast. Its central part (C) is quite deep, 10 to 15 m, dotted with sub-affloring pinnacles. This seabed gradually rises northwards to form a high limestone bottom oriented east-west (D) and whose depth varies between 2 and 3 m. It carries in places a reef barrier (E) almost emerged (0.5 to 1 m) beyond which the seabed plunges ("dropping" F) more or less rapidly towards the sea (G).

This complex is traversed by Pleistocene underwater valleys, the most remarkable of which is the Passe-à-Colas (H), a south-north meandriiform incision more than 30 m deep that could represent the former submerged lower reaches of the Grande Rivière à Goyaves, which is currently the largest river in Guadeloupe and whose mouth is located in the western part of the Grand Cul-de-Sac Marin.

The remains discovered are located on the shoals (D) at depths between 2.50 m and 4 m. This shoal is made up of coral limestones forming a sub-horizontal slab which has a softly undulating morphology but generally quite smooth. These limestones were probably deposited at different periods of the Middle or Lower Pleistocene.

The Pre-Columbian Archaeological Context and First Discoveries

Several pre-Columbian settlements have been identified on the coasts of the Grand Cul-de-Sac Marin (National archaeological map, Ministry of Culture). There are several Early and Late Ceramic Age habitat sites, grinding stones and petroglyphs. To the west, on the Basse-Terre side, the sites are located close to the coast (Chancerel and Faillot, 2002, Casagrande et al. 2010), while to the east, on the Grande-Terre side, the settlements are generally very clearly distant from the coast from which they are separated by the coastal swamp forest (Stouvenot 2010, Van den Bel 2014). A late pre-ceramic occupation has probably been identified north of the coast of Grande-Terre (Stouvenot 2007).

Three settlements are also known on the islets that dot the Grand Cul-de-Sac Marin. Like most islet settlements in the Lesser Antilles (Bérard et al. 2005, Antczak et al. 2015), they can all be linked to the Late Ceramic Age. On the Îlet à Christophe many shards of pottery attest to the presence of a habitat, while the occupations of the Îlet à Colas (Guibert et al 2013) and the Îlet à Fajou (Stouvenot 2006) seem very probably oriented towards shellfish gathering. The l'Îlet à Colas deposit corresponds to a currently submerged settlement dated between 1050-1190 A.D. located on an islet once much larger and victim of marine erosion and sea level rise (Guibert et al 2013). The "Lambi Line" site on the Îlet à Fajou is a 600 m long linear shell mound, resulting from shelling activities on *Lobatus gigas* probably repeated over long periods (Stouvenot 2006).



As for the pre-Columbian remains immersed in the Grand Cul-de-Sac Marin, before our research, a small volcanic rock pestle was found in 2005 4 m deep and 2.7 km from the coast by Mr Robin, an underwater hunter (Prepasub 2012). Then, different dives carried out between 2012 and 2014 by M. Boulanger and F. Nouailhas (Boulanger et al. 2012, Stouvenot et al. 2017) made it possible to identify more than 200 lithic pieces distributed in two sectors (Figure 2):

- mainly over a shoal area west of Macou Island and extending approximately 2.2 km east-west and 1 km north-south at depths between 2.50 m and 4 m
- and for some pieces: on the borders of the Passe-à-Colas (H)

Characterization of the Site and the Collected Remains

Following these important discoveries, a systematic survey campaign was conducted to determine the spatial distribution of the remains and to complete the collection. The objective was to obtain new information likely to enable us to better characterize the nature of the deposit as well as its mode of formation. Surveys were concentrated in two sectors (Figure 3): Macou A where the first coins were collected, and Macou C and D where systematic surveys were carried out. The strategy was to prospect a set of 11 circular zones (or spots) 60 m in diameter. Each spot was explored by two scuba divers who covered the bottom in concentric paths around a central buoy. Each lithic element was photographed in situ and then collected. The tracking was carried out following a method of alidade type doubled by a crossing of the time stamping of the photographic files and the tracking of a GPS buoy (Figure 4).

Following this work the distribution of the artefacts shows a wide dissemination and does not seem at first sight to present any particular organization. It is however advisable to remain cautious because some pieces could have been dispersed by the swell. The main characteristics of this distribution are as follows:

- It is a spreading of pre-Columbian objects extending over several kilometres between the Passe à Colas and Macou D.
- The remains are placed on a rocky seabed.
- The remains have been discovered at depths ranging from 2 to 4 m. However, the more important depths have not yet been explored.

Concerning the remains collected, the collection (Figure 5) is composed of 158 lithic pieces for a total weight greater than 335 kg. They are composed of andesite-type volcanic rocks, materials that are totally absent in their natural state in the Grand-Cul-de-Sac Marin. Half of the pieces weigh between 200 and 1600 gr but there are also about ten pieces weighing more than 10 kg. In the series, there is a lack of small pieces, at this stage we cannot determine if it is the result of a sampling bias, a hydrodynamic sorting or an archaeological reality. Correlatively, the pieces collected are essentially of the "macrolithic tooling on central mass" type, with an almost total absence of *débitage* elements. These pieces correspond to the fruits of the various collection operations on the seabed between 2 m and 3.80 m deep in the Macou sector.



The collection presents various taphonomy problems that strongly impact its analysis and in particular the reading of macroscopic traces of fabrication and use. The first of these problems concerns the high number of objects incrustated by concretions (this concerns 14.5% of the collection). These concretions obviously harm the observation of the surface of the pieces but in some cases their thickness harms the very apprehension of the morphology of the latter. For this reason, the study presented here should be considered preliminary. A complete study can only be undertaken after treatment of the collection for the controlled removal of these concretions. A second problem always concerns the surface conditions of the pieces. Many of them show, distributed over most of their surface, alterations marked by small cups (10% of the total pieces) and in some cases large areas of desquamation (16.5% of the total pieces). The different patinas of the desquamated areas show that the process took a relatively long time. This makes it impossible to read surface conditions (traces of use and fabrication (bush-hammering, polishing)) on parts with these stigmas. Only their general morphology can then be apprehended and inform us about their status. An important risk exists in particular concerning a possible confusion between the alterations of type cupule and stigmas of percussion. These alterations appear preferentially located on the flat surfaces of the pieces. Thus, 41% of the pieces in the series are concerned by these analytical difficulties linked to taphonomy problems.

The 158 pieces in the series can be divided into five categories: *débitage* remains (1), prepared tools (21), those bearing only macroscopic traces of use (55), pieces introduced on the site but showing no macroscopic traces of arrangement or use (79) and finally some large thermal flakes (2). The *débitage* remains consist of a single pebble bearing traces of flakes removals. The tools can be divided into different types. These include axes and adze blades (11), manos (7), mortar and pestle. Elements with traces of use can also be divided into different categories. This includes a hammerer, a possible edge grinder, a set of elongated pebbles with impacted surfaces and a rich series of grinding/polishing stones (26). As far as the manuports are concerned, they are essentially elongated pebbles whose morphology seems comparable to those bearing traces of percussion. It is on the basis of this first classification that a real typological and morphological study of all these pieces is being carried out.

Thus, if this corpus can be qualified as usual in a pre-Columbian habitat context, it allows to date not to support any cultural or chronological attribution. Even the absence of ceramics cannot be considered significant from the pre-ceramic period because the shards, small and light, could have been dispersed off by the swell.

New Data Concerning the Post-Glacial Sea Level Rise Process in the Grand Cul-de-Sac Marin Area

The question of the status of the pre-Columbian lithic remains immersed in the Grand Cul-de-Sac Marin is obviously closely linked to that of the variations of the coastline and sea level. An exceptional discovery made in 2014 (Boulangier et al. 2015) allowed us to obtain original data concerning this last question. During a dive at the "Macou B" locus, 2.5 km from the coast and 4 m deep, a large scouring basin showing a layer of peat visible over 2 m thick and 50 m long was identified. This peat contains many tree trunks. We also spotted two stumps of trees in a position of life: a palm tree and a specimen of *Pterocarpus officinalis* (identified by Daniel Imbert,



Université des Antilles, personal communication), both taxa subservient to freshwater swamp forests.

Three samples were taken within this layer, distributed between 4.1 m and 5.6 m depth. They allowed the realization of radiocarbon dating. Thus, the portion of this organic layer that could be dated was gradually put in place during the 5th millennium BC. This local information (Figure 6) complements and refines the data on the overall post-glacial sea-level rise process in the western Atlantic (Feller et al. 1990, Toscano & Macintyre 2003, Khan et al. 2017) (Figure 7). Although still limited and to be extrapolated with great caution, these initial results are extremely promising. They testify to the important potential of this zone of the Grand Cul-de-Sac Marin for the treatment of this central question of the dynamics of sea level variation during the last millennia in the Guadeloupean archipelago but more widely within the Caribbean space. Linking these data with the chronology of human occupation of the Lesser Antilles will be an essential contribution to our understanding of the process of setting up underwater pre-Columbian remains in general and in the Grand Cul-de-Sac Marin in particular.

Discussion

These initial results, although already rich in lessons, do not however allow us to provide a definitive answer to the various questions linked to the presence of pre-Columbian lithic remains on the seabed of the Grand Cul-de-Sac Marin. Three hypotheses seem to us to be possible to discuss at this stage without it being possible to decide in favor of one or the other.

The first, which we will call the "perils of the sea hypothesis", corresponds to a process of immersion of archaeological furniture linked to a succession of seafaring accidents (Figure 8): shipwrecks, losses overboard during navigation, detachment of lithic parts having known secondary use as fishing device weights (nets, fish traps). Various implications would be linked to this first hypothesis. First, this scenario involves an open and navigable sea and thus events occurring during a period when the sea level was substantially the same as the current level. Secondly, the number of objects identified and their wide dispersion would imply that the formation of the pre-Columbian underwater "site" of the Grand Cul-de-Sac Marin would be the result of a series of sea accidents independent of each other during a significant period.

A second hypothesis, which we will call the "erosion hypothesis", corresponds to a scenario in which the immersion of pre-Columbian remains would be linked to the dismantling of settlements installed on sandy islets subsequently subjected to erosion linked to large cyclones or sedimentological modifications. Such islets are formed, like the "motus" of Polynesia, thanks to zones of less hydrodynamic energy, for example at the plumb of extensive shoals whose edges break the swell. The Îlet à Caret in the Grand Cul-de-Sac Marin (Figure 9) could represent an example of such a process. This is undoubtedly also what happened for certain islets of the Grand and Petit Cul-de-Sac Marin whose historical archives relate the disappearance in the 19th century (Yvon 2012, Guibert et al 2013). Such formation/disappearance of sandy islets may therefore also have occurred earlier.

The third and final hypothesis, which we will call the "submergence hypothesis", corresponds to a scenario in which the immersion of pre-Columbian remains would be linked to



the process of postglacial rise of sea level which would have had the consequence of progressively submerging lands bearing or containing the archaeological remains of Amerindian settlements initially settled on land that emerged. The effect could have been a simple submergence covering the layers or, more often, an erosion followed by a dispersion of the archaeological remains, the most massive elements of which could have remained in place. In the context of a simple submergence phenomenon, the seabed on which the remains now rest should be considered as the ground on which they were originally located. In view of the curve of the late Holocene seaward rise that we have been able to refine at the level of the Grand Cul-de-Sac Marin, this would imply that the remains discovered could date from a period probably prior to the end of the 3rd millennium BC, a period in which large islands still remained in the Grand Cul-de-Sac Marin (Figure 10) and in particular in the Macou A and Macou C zones where most of the remains were found. To date the oldest direct date of human presence in the Guadeloupe archipelago is in the second half of the 3rd millennium BC (Fouéré et al. 2013). However, indirect evidence could indicate a previous human presence (Siegel et al. 2015) as has been clearly documented further north in the Lesser Antilles (Bonnissent 2008). As part of a phenomenon of dismantling the sedimentary layers, the remains discovered could not be dated after the beginning of the 1st millennium BC, the date on which the submergence of the sectors where they were discovered is almost total.

Finally, it should be noted that these three hypotheses are not exclusive and that it is also possible that the three modes of formation add up or combine and that we are in the presence of a complex polygenic deposit, which would obviously complicate the study and interpretation.

Conclusion and perspectives

Thus, although the reality of these original remains is an established fact, the questions relating to their dating and method of deposit are still far from having found a satisfactory answer. In order to try to improve our knowledge in this field, a new research mission is scheduled for 2018. It will focus on two major issues: clarifying the status of the remains and, more broadly, of the deposit, and collecting samples to determine the chronology of the sea level rise process over the last few thousand years. Thus, a modification of prospecting procedures is envisaged. We need to refine our collecting process and explore deeper areas. In addition, test pits will be undertaken in an attempt to uncover remains in a stratigraphic context. Finally, paleo-environmental coring will be carried out in the thick organic layer discovered in 2013.

Acknowledgments

We thank here all the members of the Association Archéologie Petites Antilles who contributed to the field activities: Marc Boulanger (with his boat) and François Nouailhas, the two persons who discovered the first evidences, Jean-Sébastien Guibert, Eric Rolland, Jean-Jacques Maréchal, Daniel and Dominique Néretti. Very enriching discussions were held with several researchers: Jean-Sébastien Guibert, Frédéric Leroy (DRASSM), Daniel Imbert, botanist at the University of the French West Indies, who made the first identifications of the tree trunks found in Macou B, and Dominique Bonnissent, Regional Curator of Archaeology of Guadeloupe. The project received funding from the Underwater and Submarine Research Department (DRASSM), the Guadeloupe National Park, the Guadeloupe Regional Council and the University of the French



West Indies. Several radiocarbon dates have been supported by the Artemis program (maintained by a French public consortium). We also thank Claude Bouchon, Director of the Marine Biology Laboratory, for the availability of the association's working quarter.

References Cited

Antczack, Andrzej, Ma. Magdalena Antczak, Sébastien Perrot-Minnot, Konrad A. Antczak and Olivier A. Antczak

2015 Rapport de la prospection archéologique des îlets Frégates, Long, Métrente et Thierry, Martinique, Unpublished report, SRA Martinique, Fort-de-France, 64 p.

Benzoni, Girolamo

1565 La historia del Mondo Nuova ; la qual tratta dell'isole, & mari nuouamente ritrouati [...], Appresso Francesco Rampazetto, Venetia.

Bérard, Benoit

2018 Le site précolombien sous-marin de Fond-Banane, Sainte-Luce (Martinique), rapport d'étude, Unpublished report, AIHP/GEODE EA 929, Université des Antilles, Schoelcher, 45 p.

Bérard, Benoit, Sandrine Grouard, Nathalie Serrand

2005 L'occupation post-saladoïde du sud de la Martinique : une approche de l'idée de territoire. Communication orale, XXIst Congress. AIAC 2005. Port-of-Spain, Trinidad.

Billard, Cyrille, Marie-Yvane Daire, Chloë Martin, Yves Billaud, Catherine Bizien Jaglin, Antoine Chancerel, Dominique Cliquet, Fourment Nathalie, Gandois Henri, Briagell Huet, Marine Laforge, Loïc Langouët, Luc Laporte, Large Jean-Marc, Frédéric Leroy, Elias Lopez-Romero, Jean-Laurent Monnier, Anne Ropars, Pierre Régaldo, and Luc Vallin

2016 Un premier inventaire des sites préhistoriques submergés au large des côtes françaises. Bulletin de l'AMARAI 29:5–49.

Bonnissent, Dominique

2008 Archéologie précolombienne de l'île de Saint-Martin, Petites Antilles (3300 BC - 1600 AD). Thèse de doctorat. Aix-en-Provence : Université Aix-Marseille I - Université de Provence. <http://tel.archives-ouvertes.fr/tel-00403026/fr/>

Boulanger, Marc, Jean-Sébastien Guibert, François Nouailhas, and Christian Stouvenot



2012 Découverte archéologique fortuite. Site de « Macou A ». Guadeloupe. Rapport de prélèvement. Association Archéologie Petites Antilles. Rapport remis au DRASSM. Unpublished report

2015 La station « Macou B ». Tourbe et vestiges forestiers immergés. Rapport préliminaire de découverte mai 2014. Grand-Cul-de-Sac-Marin. Guadeloupe. Association Archéologie Petites Antilles. Rapport remis au DRASSM. Unpublished report

Casagrande, Fabrice, Matthieu Hildebrand, Nathalie Serrand, and Sandrine Grouard

2010 BSR 2007 - SAINTE-ROSE. La Ramée (fouille 2007). 2006-2007-2008 - Bilan scientifique de la région Guadeloupe, des collectivités de Saint-Barthélemy et Saint-Martin, Service Régional de l'Archéologie. Direction Régionale des Affaires Culturelles Guadeloupe. Ministère de la Culture et de la Communication:85-89

Chancerel, Antoine, and Jean-Jacques Faillot

2002 BSR 2001 - BAIE-MAHAULT. Pointe Pasquereau. 2001 - Bilan scientifique de la région Guadeloupe, Service Régional de l'Archéologie. Direction Régionale des Affaires Culturelles de la Guadeloupe. Ministère de la Culture et de la Communication:19-20

Cooper Jago and Ricard Boothroyd

2011 Living Islands of the Caribbean: A View of Relative Sea Level Change from the Waters Edge. In *Communities in Contact: Essays in Archaeology, Ethnohistory and Ethnography of the Amerindian Circum-Caribbean*, Hofman L. Corine and Ann Duijvenbode (eds), pp. 393-406, Sidestone Press, Leiden

Cooper, Jago., Valcárcel Rojas, R. and Calvera Rosés, J.

2010 Recent Archaeological Fieldwork from the Region around Los Buchillones, an Indigenous Site on the north-central Cuban Coast. In *Beyond the Blockade: New Currents in Cuban Archaeology*. Kepecs, S., Curet, A. & de la Rosa, G. (eds.), University of Alabama Press, Alabama. 89-105

Evans, Amanda M., Joe Flatman, and Nicholas Flemming (editors)

2014 *Prehistoric Archaeology on the Continental Shelf: A Global Review*. Springer-Verlag, New York.

Faught, Michael K., and Amy E. Gusick

2011 Submerged Prehistory in the Americas. In *Submerged Prehistory*, pp. 145-157. Jonathan Benjamin, Clive Bonsall, Catriona Pickard, Anders Fischer. Oxbow Books, Oxford; Oakville.



Feller Christian, Marc Fournier, Daniel Imbert, Claude Caratini, and Louis Martin

1990 Datations C14 et palynologie d'un sédiment tourbeux continu (0-7 m) dans la mangrove de Guadeloupe (F.W.I.): résultats préliminaires. In Symposium international sur l'évolution des littoraux des Guyanes et de la zone caraïbe méridionale pendant le Quaternaire: volume des résumés. Cayenne, edited by ORSTOM. <http://www.documentation.ird.fr/hor/fdi:35535>. IRD Bondy

Guibert, Jean-Sébastien, Christian Stouvenot, Franck Bigot, Fabrice Casagrande, Sandrine Grouard, and Nathalie Serrand

2013 D'îles en îles. Étude archéologique de la frange sous-marine de l'îlet à Colas (Grand Cul-de-Sac Marin) et de l'îlet à Chasse (Petit Cul-de-Sac Marin). Guadeloupe. Rapport de sondages archéologiques sous-marins. Association Archéologie Petites Antilles. Rapport remis au DRASSM. Unpublished report

Guibert, Jean-Sébastien, Frédéric Leroy, and Christian Stouvenot

2017 Formation Processes of Maritime Archaeological Sites in Guadeloupe (French West Indies): A First Approach. In Formation Processes of Maritime Archaeological Landscapes, When Land Meets Sea, edited by Alicia Caporaso. Springer International Publishing : 189–209.

Khan, Nicole S., Erica Ashe, Benjamin P. Horton, Andrea Dutton, Robert E. Kopp, Gilles Brocard, Simon E. Engelhart, David F. Hill, William Richard Peltier, Christopher H. Vane, and Fred N. Scatena

2017 Drivers of Holocene sea-level change in the Caribbean. In Quaternary Science Reviews. Vol. 155 :13 36. DOI 10.1016/j.quascirev.2016.08.032

PREPASUB (Association)

2012 Catalogue de l'exposition « Racines sous-marines, les fonds marins racontent les Petites Antilles ». Conseil général de la Guadeloupe

Siegel, Peter E., John G. Jones, Deborah M. Pearsall, Nicholas P. Dunning, Pat Farrell, Neil A. Duncan, Jason H. Curtis, and Sushant K. Singh

2015 Paleoenvironmental evidence for first human colonization of the eastern Caribbean. In Quaternary Science Reviews. Vol. 129 :275 295. DOI 10.1016/j.quascirev.2015.10.014

Stouvenot, Christian

2006 Rapport de visite à l'îlet à Fajou Grand Cul-de-Sac Marin 22 mars 2006. Rapport n° SRA 333 , Basse-Terre, DRAC Guadeloupe. Unpublished report



2007 Sondages archéologiques sur le site de Pointe des Mangles 2 Une occupation de transition mésoindienne – néoindienne ? PORT-LOUIS - octobre 2005. Rapport n° SRA 369 , Basse-Terre, DRAC Guadeloupe. Unpublished report

2010 Le dépotoir précolombien du site de Belle Plaine. Une occupation troumassan-troumassoïde. Les Abymes. Guadeloupe Antilles françaises (fouille 2007) Rapport n° SRA 447. Basse-Terre. <http://hal.archives-ouvertes.fr/hal-00559473/>

Stouvenot, Christian, Marc Boulanger, Jean-Jacques Maréchal, Dominique Néretti, Daniel Néretti, François Nouailhas

2017 Macou 2016-2017. A recherche des vestiges précolombiens sous-marins entre l'îlet Macou et la Passe à Colas. Grand-Cul-de-Sac-Marin – Guadeloupe – Antilles françaises. Rapport de la mission Macou 2016. OA n° 2927 (arrêté 2016-21 du 15/04/2016). Association Archéologie Petites-Antilles. Unpublished report

Toscano Marguerite A. and Ian G. Macintyre

2003 Corrected western Atlantic sea-level curve for the last 11,000 years based on calibrated 14C dates from *Acropora palmata* framework and intertidal mangrove peat. In : Coral Reefs. Vol. 22 (3) :257 270. DOI 10.1007/s00338-003-0315-4

Van Den Bel, Martijn

2014 BSR 2013 - LES ABYMES, Belle-Plaine. 2013 - Bilan scientifique de la région Guadeloupe, des collectivités de Saint-Barthélemy et Saint-Martin, Service Régional de l'Archéologie. Direction Régionale des Affaires Culturelles Guadeloupe. Ministère de la Culture et de la Communication:139-141

Yvon, Tristan

2012 Les Ilets du Petit-Cul-de-Sac Marin et du Grand-Cul-de-Sac-Marin à la Guadeloupe, attrait économique et occupations coloniales aux XVIIIe et XIXe siècles. Bulletin de la Société d'Histoire de la Guadeloupe (163):17-41



Figures

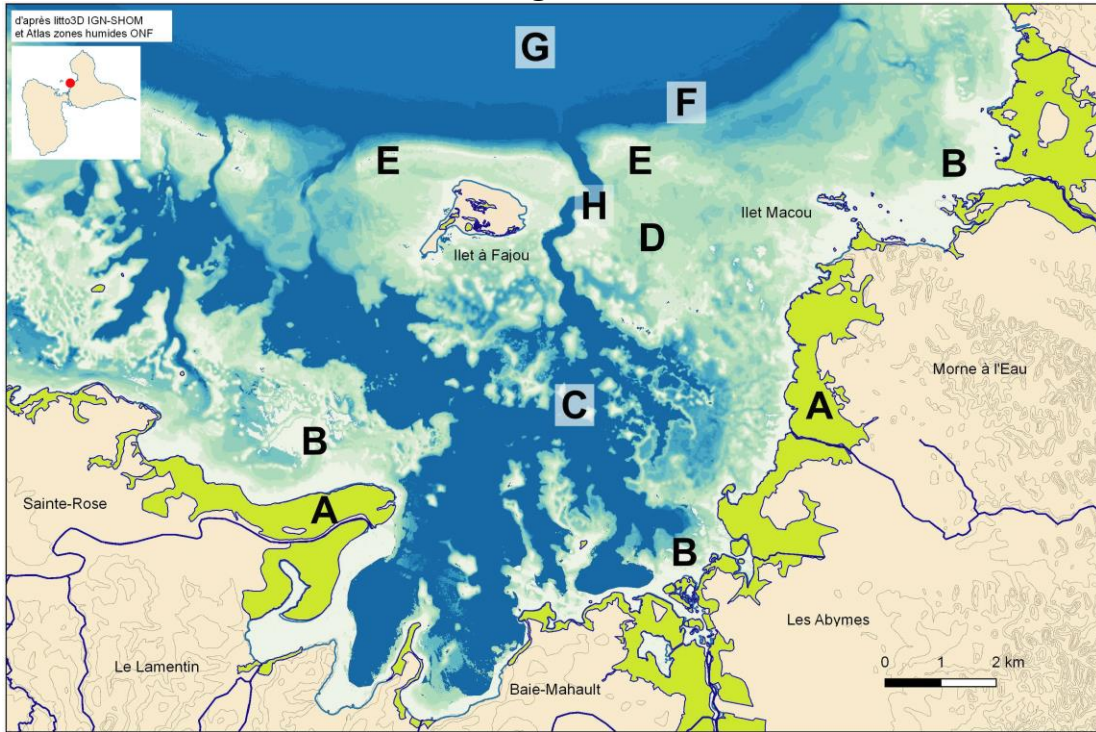


Figure 1 : map of the geographical zonation of the Grand Cul-de-Sac Marin

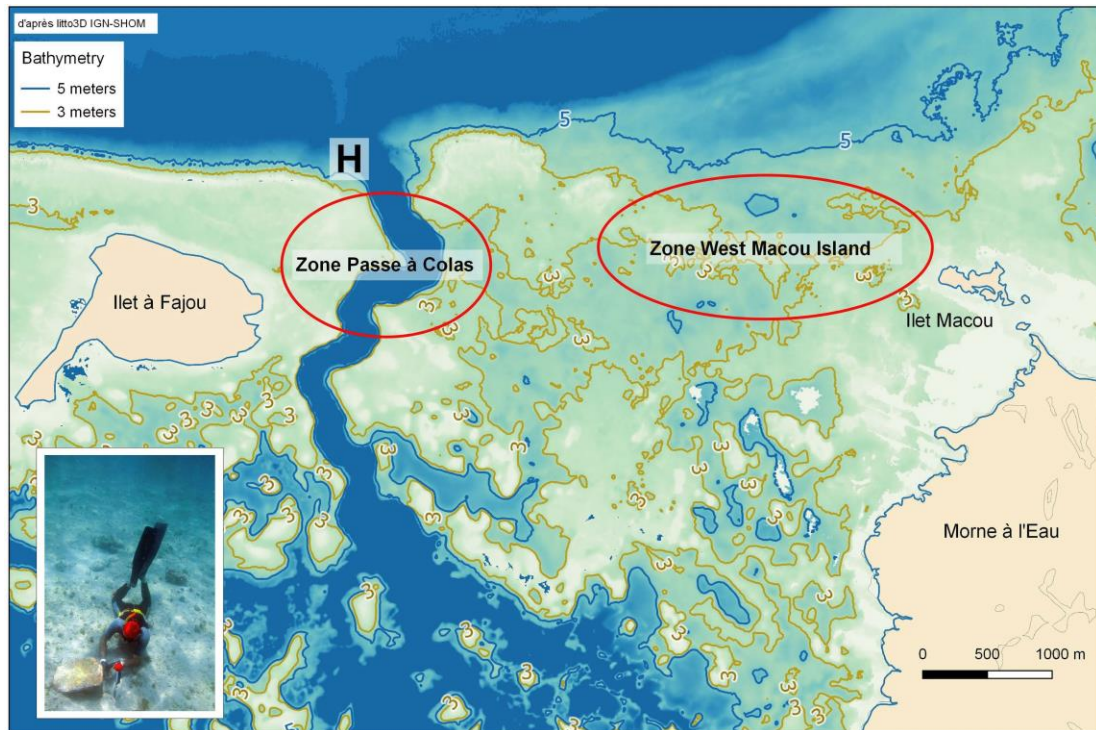


Figure 2 : location of first discoveries plotted in 2013 and 2014

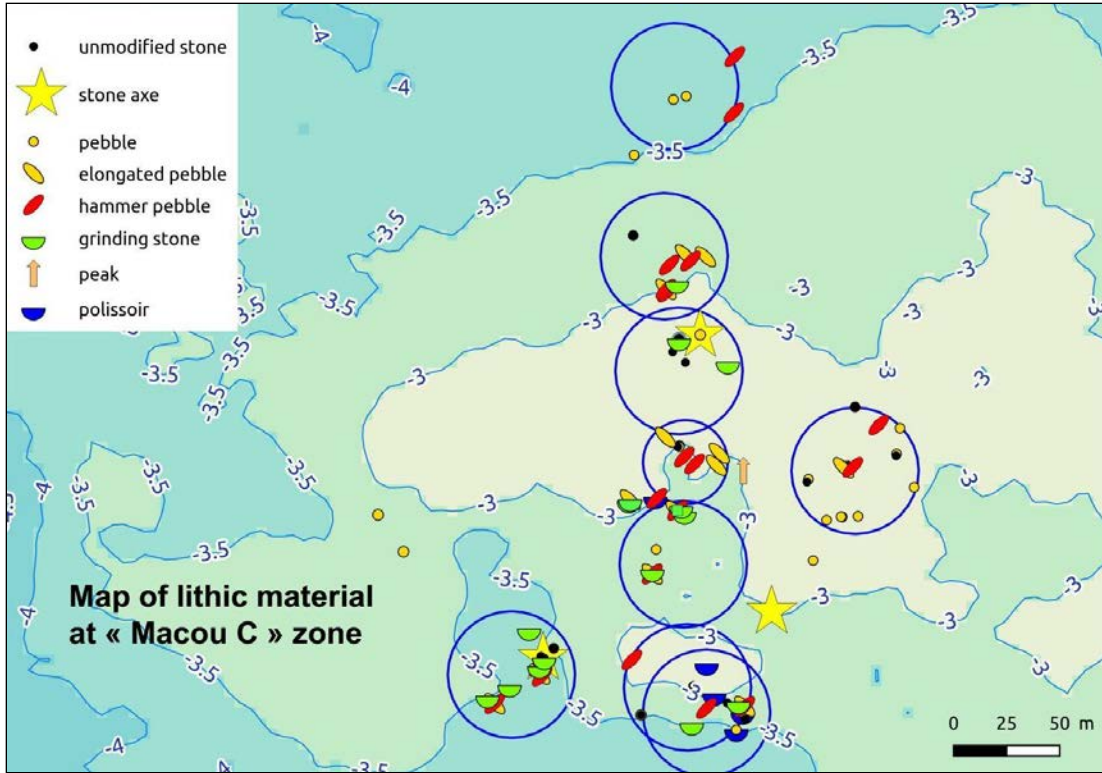


Figure 3 : map of the working area explored during the 2016 field survey

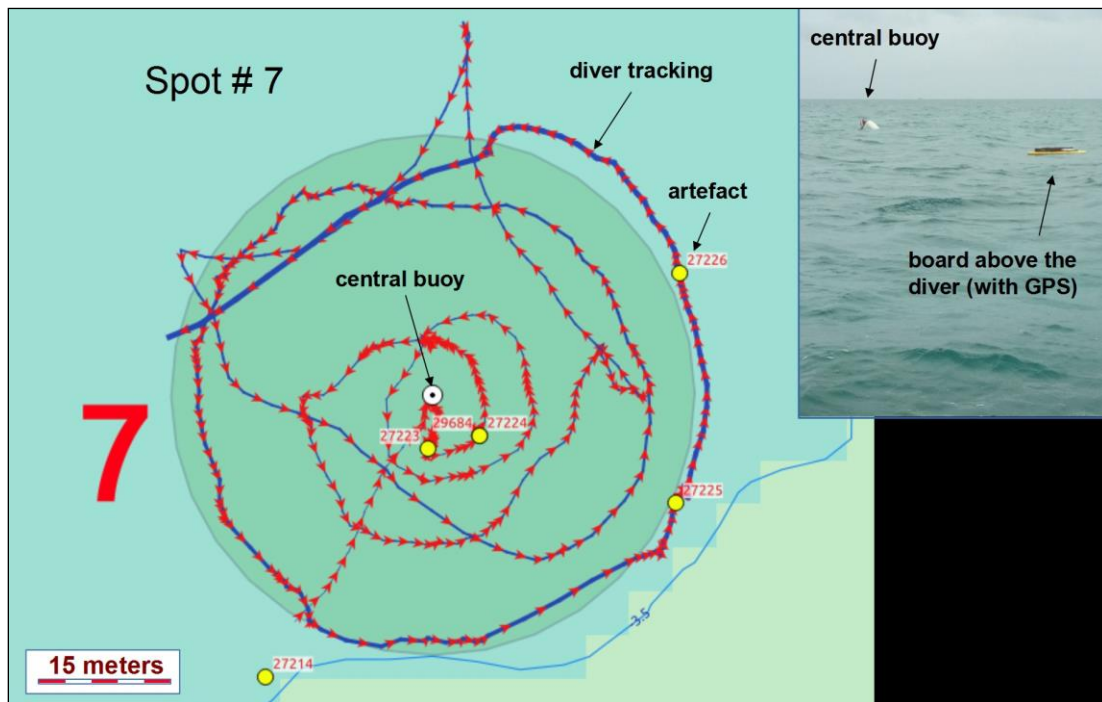


Figure 4 : example of a diver's tracking path recorded by a GPS buoy and location of artefacts calculated by interpolation with their timestamped digital photographs



Figure 5 : some examples of collected lithic artefacts

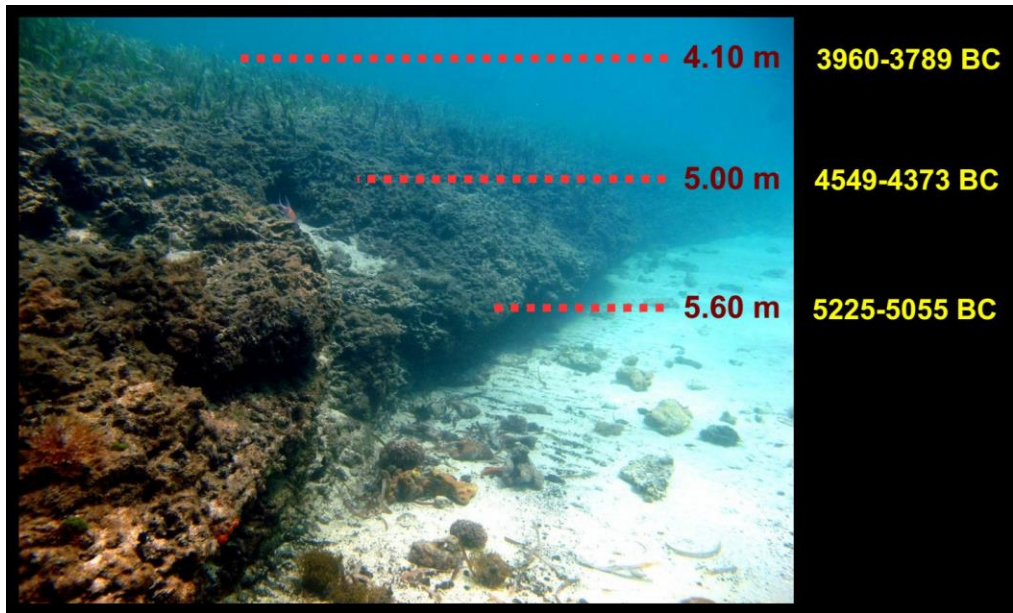


Figure 6 : photographic view of the stratigraphic location of the radiocarbon date samples collected in the peat layer Macou B

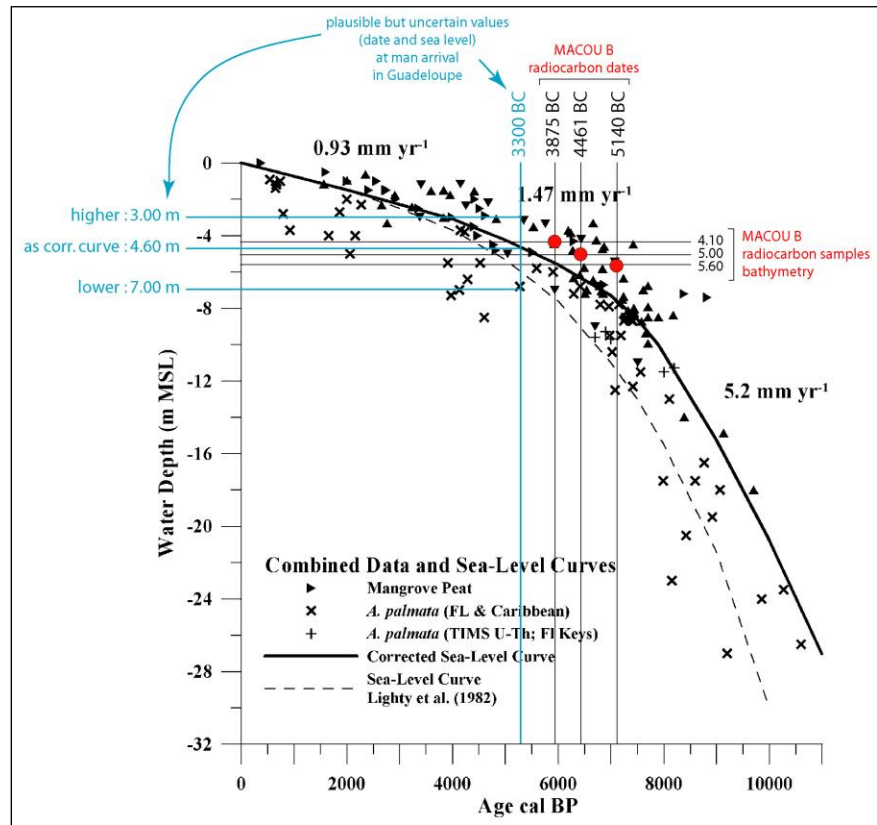


Figure 7 : Macou B radiocarbon dates superimposed with the Toscano & Macintyre Holocene sea level curve (2003:267, fig. 6)



Figure 8 : historical sketch of a dugout used by Native Americans of the Greater Antilles (Benzoni, 1565)



Figure 9 : views of Îlet à Caret, a "motus" like island (news-et-decouvertes.over-blog.com)

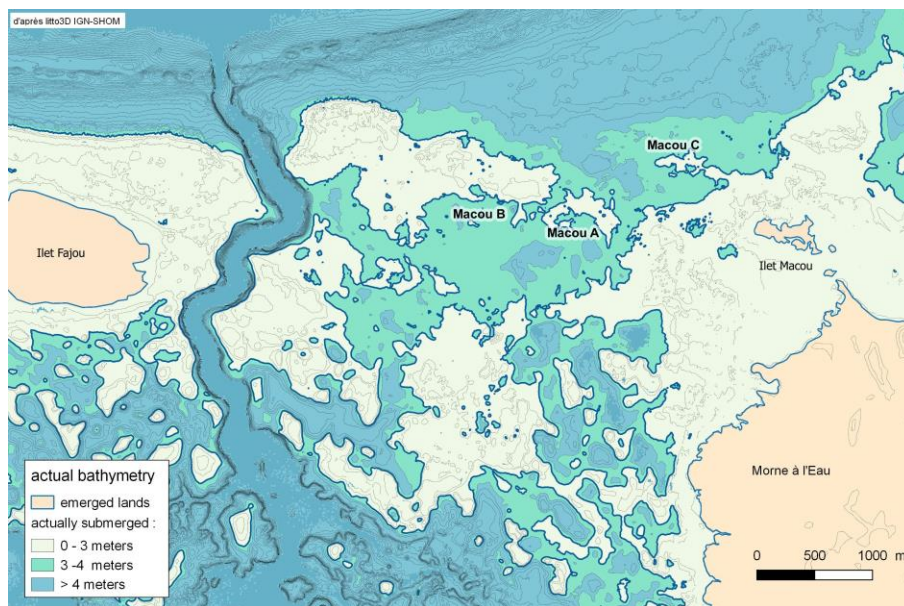


Figure 10 : palaeogeographical map reconstruction of the eastern part of the Grand Cul-de-Sac Marin around 3000 BC : at least the current depths around 3 m were then probably emerged