

## Neolithic flat-based pots from the Carnac Mounds in the light of Cycladic ‘frying pans’

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**ABSTRACT** – *A rare type of pottery, found in four single graves under earthen mounds in the Carnac region of Brittany, consists of a circular, flat-based vessel with a near-vertical wall. On the basis of the equipment known from elsewhere in the world, it is possible that the morphology of these dishes is related to processes involved in the production of salt. To help us in exploring their function, we chose to compare these vessels with another enigmatic class of pottery from the Cyclades – the so-called ‘frying pans’ – which seems to have functioned in a similar way, as an object-sign, and has been found in a maritime milieu and in high-status contexts.*

**IZVLEČEK** – *V zemljeni gomili v regiji Carnac v Bretaniji smo v štirih posameznih grobovih odkrili nov tip posode, za katero je značilna krožna oblika z ravnim dnom in skoraj navpično steno. Na podlagi predmetov, ki jih poznamo drugje po svetu, sklepamo, da je oblika teh skled povezana s pridobivanjem soli. O njihovi uporabi sklepamo s pomočjo primerjav s t.i. ‘ponvami’ s Kikladskega otočja, za katere se zdi, da so jih uporabljali v podobne namene, tudi kot predmet-znak in se pojavljajo v obmorskih okoljih ter v kontekstih, povezanih z višjim družbenim slojem.*

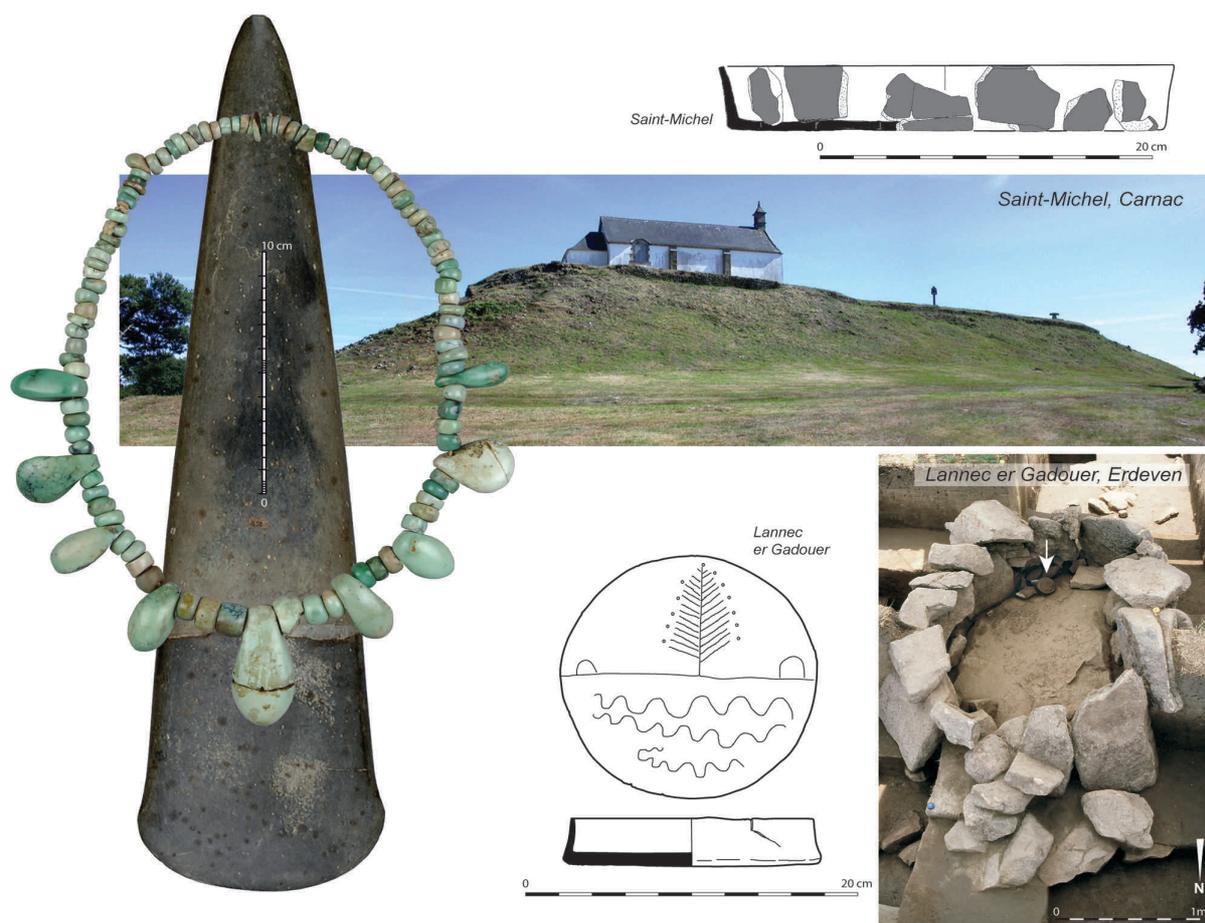
**KEY WORDS** – *frying pan; Castelic; salt*

### Observations on an unusual context

We would like to discuss a hypothesis concerning the function of an unusual type of pottery found in the Neolithic of western France: a flat-based circular dish with a near-vertical wall. This pottery type is unknown in the settlements and passage tombs in the region (4200–3500 BC), and is only known from four individual graves under mounds, dating to the preceding period (4600–4200 BC), and also from two contemporary, and regionally-specific ‘ceremonial’ contexts, associated with standing stones. This cultural context is marked by the development of the Castelic culture. The most famous of these tombs is the Tumulus Saint-Michel at Carnac (Fig.

1), one of the three largest and richest monuments around the northern edge of the Gulf of Morbihan (the others being Mané er Hroëck and Tumiac) which are famous for their polished axe heads of Alpine stone, and for beads and pendants of Iberian variscite. The Tumulus Saint-Michel is also the youngest of these three monuments, being dated fairly precisely to the middle of the 5<sup>th</sup> millennium BC (Cassen et al. 2012).

A typochronological comparison of the various vessels in question has revealed that there are points of similarity with some other flat-based vessels in



**Fig. 1. Two circular Castelic dishes from individual graves under barrows at Saint-Michel (Carnac) and Lannec er Gadouer (Erdeven). The arrow indicates where the dish had been placed, vertically, on the floor slab of the tomb; polished axe head and necklace made from Iberian rock. (Photos: Serge Cassen and Christian Obeltz; drawings: Serge Cassen and Gwenaëlle Hamon.)**

western Europe, from Italy to Catalonia, but these have been discussed elsewhere (Boujot, Cassen 1998) and we shall not return to them. We are not convinced by the widely-held interpretation of these flat-based vessels as 'lids'; and, bearing in mind the fact that the Carnac mounds contain objects of high social value, we have proposed an alternative function for these vessels. This interprets their particular shape as linked to the production of salt through brine evaporation, since similarly-shaped pots are known to have been used for such a purpose in ancient and modern Mexico, and also in Iron Age contexts in eastern France. Therefore, the hypothesis that the vessels were used in salt production seemed to us to be the most plausible interpretation (for references on this subject, see Cassen 2000).

The present article will attempt to clarify the situation by using two different, and geographically discrete, approaches. The first consists of the experimental production of sea salt using two replicas of one of the Carnac dishes, and an investigation of the

performance of the dish and the nature of the finished product. The second approach has involved research on similarly-shaped vessels from a context that is comparable both topographically and culturally (*i.e.*, the Early Bronze Age Cyclades); these vessels may have played a role analogous to that of the dishes in the Carnac region. Thus we hope to resolve a contradiction whereby a seemingly utilitarian object was deposited within an exceptional funerary context. Perhaps these pots were associated with a material – salt – whose status was, and remains, ambiguous.

### Experimentation

We know that, given the fact that salt occurs naturally in varying concentrations and in various forms (*i.e.*, as brine, salt-rich soils and sands, plants and rocks), people in the past – as today – had recourse to a variety of methods to extract it. We shall not consider the exploitation of rock salt here. Thus,

having gathered, trapped or picked up the raw material, the commonest means of extraction – sometimes after soaking the salt-bearing material in water to dissolve the salt – involves evaporation from a solution, either through natural drying in the sun or through artificial heating, to leave salt crystals. These may then be used in this state, or compacted into hard salt loaves of standard size and weight. In this form it can be stored and transported easily, and exchanged over long distances.

The use of fire to effect evaporation is the commonest method, irrespective of whether marine or territorial brines are involved. Heating concentrates the salt in the brine, and a variety of structures have been used for this purpose, ranging in size from small to large, some being set in the ground and others above ground, and ranging from a simple large hearth to smaller heaters and simple hot-plates. Most of the methods involve the use of a container for the brine, of various materials (bark, fired clay, stone, lead, tin), and the use of moveable supports (of fired clay, stone, cast iron *etc.*) to raise these containers above the source of the heat. The shape of the brine containers is virtually universal (Fig. 2): the containers are designed to allow the largest possible surface area to be heated, whether in the form of a horizontal vessel (like a frying pan), or as a vertical truncated cone.

As far as ceramic containers (also known as briquetage) are concerned, a differentiation can be made between those that are used to heat the brine to the point of crystallisation, to produce a moist paste that can be moulded in other containers, and those that are used both to boil the brine and to mould the crystallised salt into a cake of fixed volume that is

compact and easy to transport. The latter are usually used only once, since the cake of salt needs to be extracted by breaking open the vessel after the long process of gentle heating. However, examples are known where the salt is transported while still in ceramic containers, as in the Philippines (Yankowski 2007; 2010).

In order to test the possibility that the dishes with near-vertical walls from the Carnac chambers could have been used in a similar manner – not only for boiling brine to crystallise salt, but also for creating hard, easily transportable cakes of dry, non-hygroscopic salt – an experiment was carried out in summer 2011 at the museum at Carnac by Cyrille Chaigneau, Pierre Gouletquer, Gwenaëlle Hamon, Chloé Martin and Emmanuelle Vigier. Two facsimile dishes were made by a potter (J. Colivet). The original vessel from the chamber under the Tumulus Saint-Michel is circular in plan, with a diameter of 30.4cm and a wall thickness of 5mm. The diameter of the facsimiles is 31.4cm; their wall, slightly concave and with a squared-off rim, stands 5cm high and is 7–8mm thick, narrowing to 4mm near the rim. As was the case with the original vessels (Hamon 2000), the facsimiles were fired in a reducing atmosphere. Brine from the marshes between la Trinité-sur-Mer and Carnac was transported to the museum; this had a relatively low salt content (at a concentration of 10° Baumé rather than 20°, *i.e.*, 106g/l). In order to save time, sea salt was added to this brine to bring it to the desired concentration (around 350g/l, enough for a raw egg to float on the surface of the liquid).

One replica dish was filled with this brine and placed in a heating chamber constructed from earth

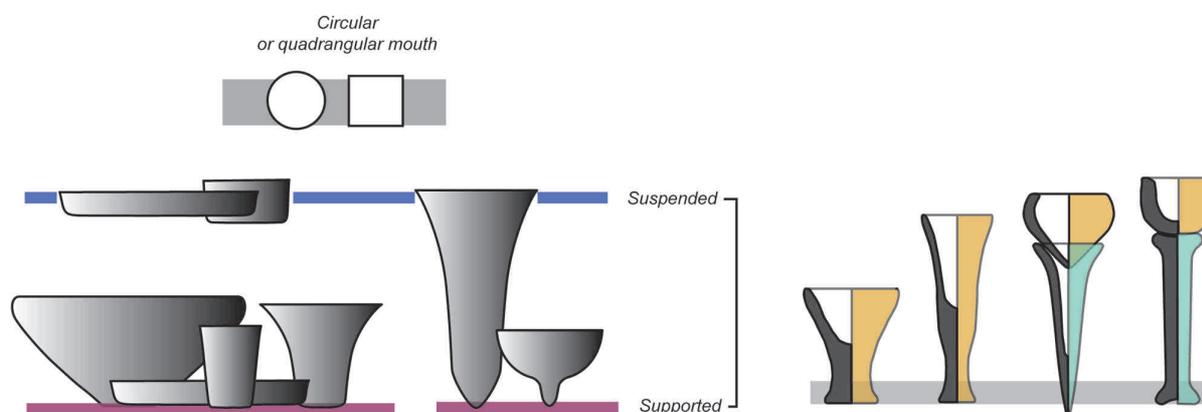


Fig. 2. Vessels used for heating brine and/or crystallising salt, and their position with respect to a source of heat. Left: examples from various late prehistoric contexts in Europe; right: arranged according to the morpho-technical evolution of Iron Age salt-production vessels as proposed by D. Kleinmann in 1975 for the Saale Valley in Germany. (Drawing: Serge Cassen.)

and stones, some 40cm wide, 50cm deep and 30cm high (Fig. 3). The vessel was suspended above the burning embers from a wattle-work structure around 20cm high. It was decided that it would be preferable to heat the brine using the radiant heat from the embers, rather than subjecting the vessel to the direct heat of flames. After 1 hour 25 minutes, a thick whitish crust formed. It should be noted that the time taken for this to occur could have been considerably shortened had the heating taken place in a closed environment. This crust was crumbly, taking the form of a semi-liquid paste when wetted.

A second experiment involved heating the salt paste gathered from the base of the first vessel in which the brine had been boiled. In order to facilitate removal from the mould, the interior of the base and wall was first coated with beeswax. The semi-liquid salt paste was then placed in the vessel and firmly tamped down by hand. The residual water that appeared on the surface was removed. The layer of salt paste attained a thickness of around 2.5cm. In order to accelerate the heating process, the structure used for heating was covered with a slab of local granite. The vessel was propped up on two stones, which raised it several centimetres above the embers. The process of solidification was very rapid,

taking only 25 minutes. After removal, a perfectly hard disc of salt (weight 950g), 29cm across and around 2.5cm thick, was obtained (Fig. 3). The vessel had withstood the process well, although small irregular hollows had formed on the surfaces, a phenomenon also noted on pottery dating to the final La Tène period (Daire 2003).

The results of these experiments demonstrated that the disc-shaped vessels with near-vertical walls found in the Carnac mound chambers could have been heated and used to boil brine in the same manner as their ethnographic counterparts. This is not surprising, although it does not prove that the pots were actually used for this purpose. However, the rapid formation of a crust of salt from the evaporation process, and its rapid transformation into a solid cake of salt following a second heating, did demonstrate the advantages of having a large surface area exposed to heat. This use of a broad-based vessel contrasts with the use of a vertical vessel, or one with taller walls, for carrying out the evaporation; with such pots, the height of the brine is reduced to one quarter during the process. The solid cake of salt produced using those containers is discussed further below, when considering discs of salt known from Mesoamerica and China.



**Fig. 3.** 1–2 Experimental heating of marine brine in the replica of the Castelic dish from the Saint-Michel tumulus. (Photos: Serge Cassen and Emmanuel Vigier, Musée de Carnac, 2011.) 3 The solid disc of salt after removal from the dish. 4 The glyph for *iztatl*, salt in the classic Nahuatl language (Kingsborough I 84 Codex Mendoza) and a Pre-Hispanic pot from Sayula (Mexico) used for heating brine (after Liot 2000).

## The Carnac vessels in the light of the 'frying pans' of the Aegean

Let us return to the Neolithic vessels. Their rarity, in contrast with the concept of briquetage (which is synonymous with the presence of large amounts of broken pottery), their incongruous presence among exceptional grave goods, and the fact that they are the only kind of ceramic object present in these graves do not a priori militate in favour of the idea that these vessels were the equipment of a specialist salt maker. Indeed, in our past publications concerning these vessels, we argued that, in the absence of obvious traces of salt and bearing in mind the change in sea level (whereby their find spots were further from the shore than they are now), they were unlikely to have been used for salt extraction. Now, however, we wish to pursue a radically different and more positive line of enquiry, by looking far outside the region. There exists a rare type of object in the archaeology of the Cyclades whose find circumstances and enigmatic function offer us an analogy with the Carnac vessels; by studying these, we hope in return to shed new light on the Morbihannais objects.

It was over the course of the Early Cycladic I and II periods (between 2800 and 2300 BC) that an unusual ceramic object appeared in rich graves and also in several settlements (where they are found in fragmentary form), although with the latter, since many were found a long time ago, their find circumstances were not always well recorded. Commonly known as 'frying pans' by the first commentators, it seemed that their function was to be sought by comparing them with baking plates, although archaeologists did not seriously propose that they had been used in such a way. The object consists of a circular, flat-based vessel with low walls, standing 3–5cm tall and with an average diameter ranging between 20 and 28cm. The flat (and occasionally convex) base is decorated on its exterior with incised or impressed designs, infilled with a white substance to make them stand out against the dark background. The presence of a quadrangular or bifid handle has allowed archaeologists to formulate various typological classifications, which also take account of variability in the largely spiral decoration (Fig. 4).

Over a hundred complete examples have been catalogued (Coleman 1985), but in comparison with the overall amount of pottery known from this period, this is a small number. The distribution is essentially insular, but fragments of several have been

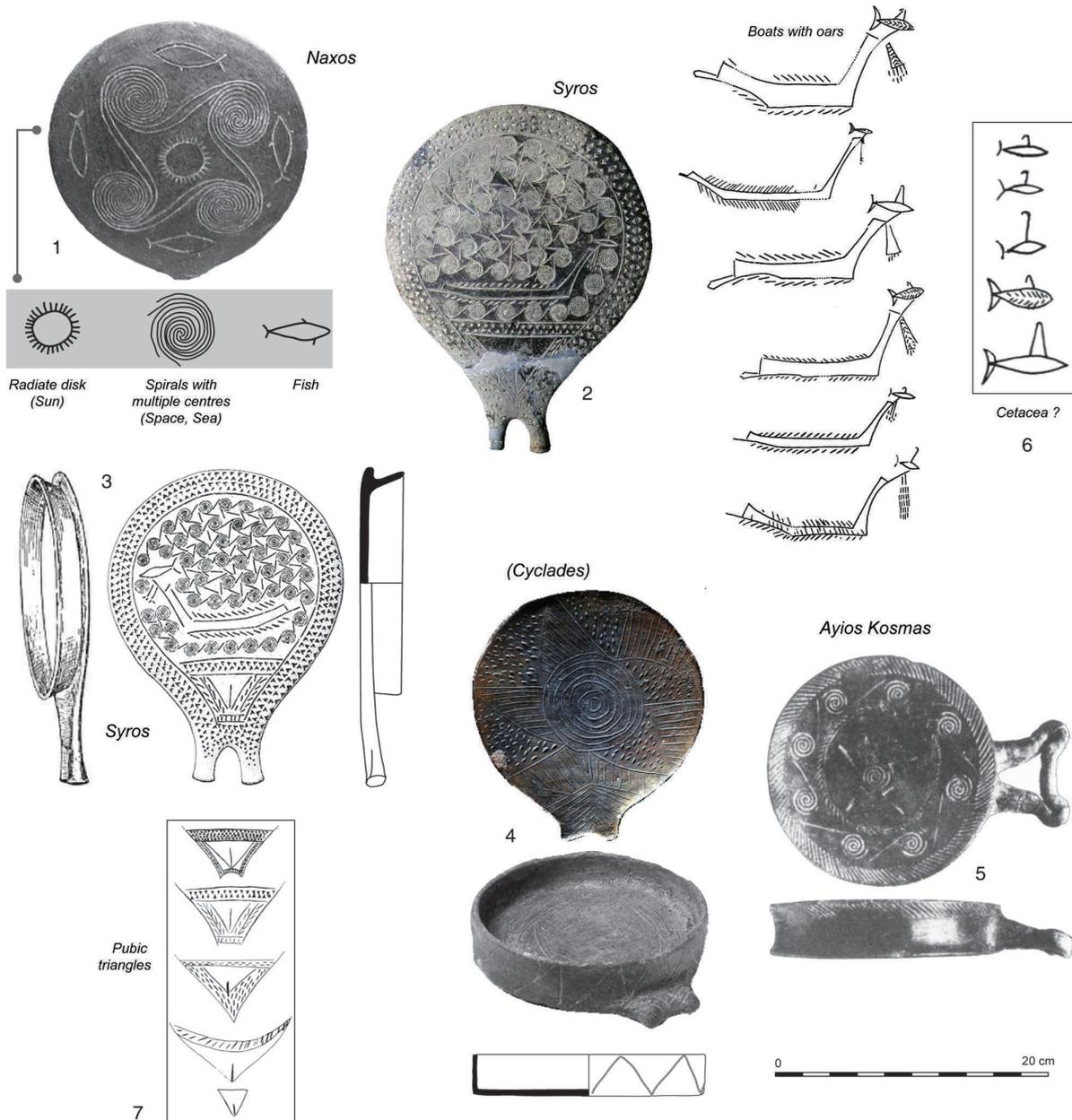
found on the mainland (in Attica, Boeotia *etc.*, and also in western Turkey); these are locally-made versions of Cycladic examples. A few examples were made from marble, and two imitations in bronze have been found at Alaca Hüyük in central Anatolia (Davis 1992). Two platters found in Crete are Cycladic imports.

Ever since their initial discovery, archaeologists and historians have been intrigued by the rich decoration and unique morphology of these objects and have sought to understand their function.

Although the normative term 'frying pan' is used without implying that this was the function of these objects, the fact that several (undecorated) fragments have been found in domestic contexts in the Aegean (at Agios Kosmas, Naxos and Manika) has nevertheless encouraged the idea that they could have been used for such a purpose (Coleman 1985). The surviving surfaces show no sign of scorching or burning, however. It has been assumed that they were used for the serving or consumption of food, perhaps in liquid form.

However, the practical use of the object seems to have been linked to a material that was sufficiently unusual to warrant its use as an 'object-sign' in individual tombs, and not just any tombs, but only the richest examples (*e.g.* only 32 out of the 600 excavated by C. Tsountas in 1899 on Syros). In these tombs, the objects accompany the famous marble figurines, obsidian blades and jewellery of precious metal (gold and silver). As for the other ceramic grave goods, none resembles the cooking equipment or everyday containers that are found in settlements.

The funerary context has allowed to suggest that these vessels, which are so well made and decorated on their exterior flat surface, could have served as a mirror, analogous to examples known in metal (Tsountas 1899; Mellink 1956). They could function as such with the addition of a thin layer of a liquid (water, wine, olive oil) on one side, creating a reflective surface. The facts that the decoration is only on the exterior and that the objects have been found close to the head of the deceased offer support for this suggestion. And if their colour seems to be too light – a characteristic that would hinder the optical phenomenon of reflectance – experiments have shown that the addition of a liquid would have darkened the surface and corrected this 'fault' (Papaathanassoglou, Geogouli 2009). Prior to the publication of the result of that experiment, Coleman



**Fig. 4. Cycladic 'frying pans' (with indicative scale). 1 Naxos (after Coleman 1985.Cat. No. 37). 2 Syros (after Coleman 1985.Cat. No. 18). 3 Syros (after Tsountas 1899; section after Rumpel 2010). 4 Unknown provenance, Museum of Cycladic Art (Foundation Goulandris, No. 99). 5 Ayios Kosmas (after Coleman 1985.Cat. No. 79). Details on the engraved and impressed designs: 3 representation of the sea; 6 representations of high-prowed boats with lateral oars, with (in box) representations of 'fish'; 7 representation of a female pubic triangle at the upper end of various objects (after Coleman 1985).**

had not been convinced by the 'mirror' hypothesis, regarding the objects as having poor reflecting capability. Consequently, he rejected the whole idea of the use of cosmetics and beauty products as part of mortuary rites. The experimental images obtained by Papathanassoglou and Geogouli do, however, show excellent reflectance under certain conditions. Furthermore, we should bear in mind that the primary purpose of the mirror might not have been to create a faithful image. The reflecting powers of mir-

rors have been used in numerous kinds of divination, and in effecting a passage to the otherworld. In Ancient Greece, it was deemed to be a premonition of death if one dreamed of seeing one's reflection in water (Artemidore of Ephesus, *The Key to Dreams*; Fraser 1911.538). The fact that the Cycladic examples were imitated in bronze in Anatolia – a region where metal mirrors are also known – does not in fact support the 'Mirror' interpretation. If it were necessary to polish the interior surface of the ceramic

version in order to affect reflectance, then why did these objects have a wall around their edge, which would hinder the process of polishing the surface?

Less plausible interpretations of these objects have been proposed, with some having suggested that these objects were used as instruments of navigation (*i.e.*, as an astrolabe – a poorly-founded hypothesis by *Faucounau 1978*); others have argued that they were tambourines; and *Rumpel (2010)* has proposed that they are representations of a tsunami, an unlikely interpretation, notwithstanding the fact that tsunamis feature in the mythology of the area. The 'lid' interpretation was suggested by *Treuil (1983)*, but no connection with any other vessel has been found in any tomb, and besides, the diameters of the 'frying pans' is far greater than that of the vessels in use. *Dugas' (1925)* idea that they were incense/perfume burners is not supported by any traces of heating on the vessels, and their morphology does not resemble that of known incense/perfume burners from archaeological or ethnological contexts. However, the presence of a quadrangular, footed 'grill', found beside an undecorated 'frying pan' and matching it in size (*Sparkes 1962.129, Pl. V*) suggests that some kind of heating was involved in the use of these vessels; but the 'grill' is reminiscent of Iron Age objects from eastern France that were suspended, or set on a flat surface, and were used in producing salt (*Rouzeau 2002*). Similar objects are known from a middle Lengyel context at Barycz in Poland, used in extracting salt (*Jodłowski 1977; Weller 2012*). This analogy could have operated in the sense that the Cycladic objects were representations (perhaps in miniature) of such objects. The fact that the use of a grill indicates that the vessel was not in direct contact with the heat source is pertinent to the idea that these vessels were used to form salt loaves.

It is the final hypothesis – *i.e.* the suggestion that these vessels were used to shape loaves of salt (*Doumas 1993*) – that has encouraged us to seek a similar interpretation for the dishes from the Morbihan, although we ignored it when one of us initially started to think about the Cycladic objects. The visual correspondence between the Cycladic and Breton vessels is matched, to a certain extent, by the decoration used (although the decoration on the Cycladic vessels needs to be more fully described).

Let us remind ourselves of the arguments used by *Christos Doumas* in 1993. The form of the Cycladic vessels seemed to him to have been determined by

the need to contain a liquid. The engraved and inlaid decoration, featuring the sun, the sea and a white substance, could have evoked the evaporation of sea salt using the heat of the sun. The salt would have crystallised in the vessels, and then been turned out by inverting the vessels without breaking them. The standard-sized cake thus produced would have been ideal for transportation, being stackable. The boats shown on the vessels could have been the means of transport and would have indicated trading and the accumulation of wealth consequent on this trade; the salt would have been used in inland locations for salting meat or other produce and adding to cheese. The salt cakes could indeed have been used as a form of currency. Thus, the 'frying pans' found in the tombs could have been a symbolic representation of wealth based on the extraction of sea salt, and not simply utilitarian vessels. Although this hypothesis has not been fully substantiated, the general argument seems to us to make sense; let us examine aspects of the proposition in more detail.

Five decorative motifs have been listed (*Coleman 1985*), four of which are found on the flat surface, while the fifth is always found on the bifid type of handle (Fig. 4). These motifs are as follows:

- A central, 'solar' motif, featuring a disc with projecting rays or triangular, star-like limbs;
- A spiral sign, with either one or multiple centres, which can be repeated over the surface, often articulating with a neighbouring spiral. In the opinion of some researchers (*Broodbank 2000*), this could represent waves of the sea;
- A boat, clearly asymmetrical, with a prow and stern. No sail or crew is shown, but there are lateral oars;
- A 'fish', 'attached' to the prow and shown in a vertical position as if leaping from the water. This fish has short fins, but the first of these is often accompanied by a large loop above the body, either open or closed. In our opinion, this could represent the spume of a cetacean (dolphin *etc.*), rather than an immense dorsal fin;
- An incised triangle, at the distal end of the handle, formed of two short juxtaposed lines. An identical motif has been used to indicate the sex of female stone statuettes and allows us to conclude that the motif on these vessels represents the pubic triangle.

The 'sun' and 'sea' are the most common motifs, while the 'fish' and 'boat' motifs are less common; and of the twenty boat motifs that have been catalogued, ten come from the island of Syros, which appears to have been the epicentre of the use of these 'frying pans'. On this island, many pots bear the 'pubic triangle' motif on their base.

### What can we deduce from these various observations?

- The radiating sun motif is always placed in the centre of the dish.
- Waves, albeit shown in stylised form, do seem to be what the spirals denote, and the presence of the 'fish' and 'boat' motifs accord with this interpretation.
- Thus, the unknown product that these 'frying pans' contained ought to be linked directly to the sun and the sea.

At the point where the two handles ('legs') converge (Coleman 1985.196), the pubic region thus clearly demarcated provides an orientation for the dish and accords with its circular form. The morphology is not strictly anthropomorphic – a representation of neither arms nor head, only (perhaps) a stomach – but it encapsulates, in this sex-specific figure, the marine world and may represent a fertile 'goddess' (Zietschmann 1935).

How are we to unite these sets of facts and images? We shall shortly see how Doumas approached this question; meanwhile, the following convergence can be perceived between the form of the vessels in question and the representations engraved on their outer surface:

- The form of the vessels is known elsewhere in the world among equipment used to heat brine or to mould damp salt into solid forms;
- The presence of a representation of the primordial natural elements of the Mediterranean (e.g., sea and sun) relates to a highly symbolic material that passes from liquid form to solid. (In Greek, the same term, with only minor differences, is used for salt and the sea: Kopaka, Chaniotakis 2003);
- The presence of another, explicitly feminine representation which emphasises the pubic region and stomach (or the umbilicus), brings to mind the many

ethnographic examples where salt is associated with the female sex. Salt is a Janus-like material which lends itself to the drawing of all the oppositions and mediations that relate to people, animals and things. Salt allows one to imagine ancient disjunctions and order the world according to its properties (Ivanoff 1993b). The current portrayal of New Guinea men as virile warriors is expressed by means of a salt-based symbolism (Coiffier 1993). Among the Nya-kyusa, salt and sperm are conceptually indistinguishable as the crystallised material that is introduced into the vulvas of women to ensure their fertility (Maertens 1978.60). In Bolivia, the brine spring of the Chimane is covered in multiple engravings of vulvas, from which the precious amniotic liquid that lies at the origin of salt flows (Daillant 2008). And in France, around the Châtillon-sur-Seine region (Burgundy), menstruating women are described as being 'salty' (Testart 1991.43). Among the Moken, salty water is believed to effect pregnancy and the birth of a marine mammal, since it brings life and acts as a woman in creating a being that is half-marine, half-terrestrial (Ivanoff 1993a.317). In the Manche region of France, when the first contractions of childbirth occur, a woman would traditionally hold grains of salt in her hands, and would have to strew it (Duclos, Morice 1984.56). In the Algerian massif of Zakkar, a pinch of salt is placed on the umbilicus of the newly-born (Servier 1972). Finally, on the coasts of Thailand, the Brine Woman is a being who gives the sea its saltiness (Le Roux 1993).

The representations found on 'frying pans' would therefore seem to be consistent with this coherent suite of imagery, and to accord with the idea that these vessels were directly associated with the production of salt. In this regard, we should recall the discovery of sea salt inside a vessel in the cave called Tis Ouranias to Froudi (Zakros, Crete, 1 kilometre from the sea; Kopaka, Chaniotakis 2003). Here, the vessel is represented by a fragment of a flat circular base; its wall had broken off. It belongs to the Minoan Bronze age (1900–1600 BC). Given the absence of its wall, it is difficult to be certain, but this vessel appears to resemble the dishes with near-vertical walls that are the subject of this contribution.

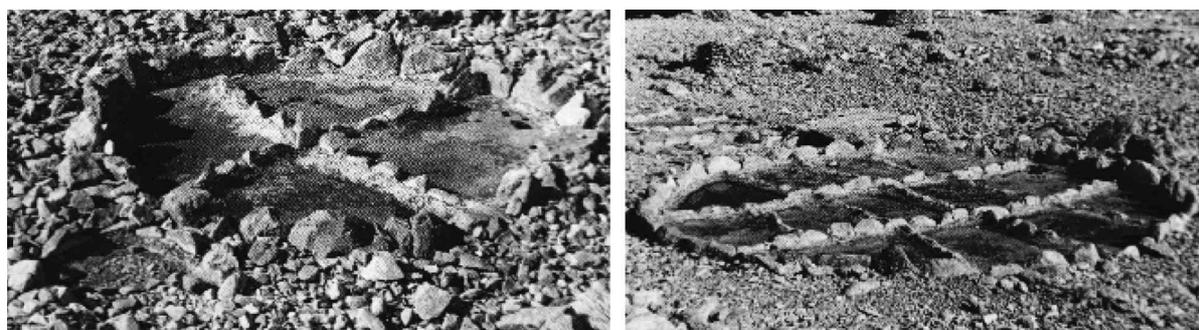
In view of Doumas' (1993) interpretation of the use of the Cycladic vessels, where he sees them as containers for brine that would be evaporated by the heat of the sun, there is a striking resemblance to the circular basins that are still used for the same purpose on the shores of the Magne peninsula in the southern Peloponnese (Fig. 5; Saitas, Zarkia 2001).

Elsewhere, the Greek place-name Tigani means 'frying pan'. These basins in the rock held brine that had previously been concentrated in trenches on the rocky shore, and are divided into compartments of varying shallowness in order to control the gradation in salinity from brine to crystallised salt. Furthermore, we should draw attention to what may be a representation of such basins on a unique marble vessel that exactly copies ceramic 'frying pans' in shape (except in lacking a handle) and was contemporary with them. This 'Dove vessel' (Fig. 5), probably from Dhaskalio (Kavos), had been deliberately broken and had a row of doves carved on its base; these doves divided the base in two (Getz-Gentle 1996). We should recall the extent to which doves are drawn to salt springs (Morin 2002.156); consequently, the association of these seemingly disparate elements (*e.g.*, salt and doves) could have been part of a symbolic system.

Let us return to the pre-Cycladic vessels and to their morphology, focusing now on the other family of 'frying pans', whose handle is quadrilateral rather than bifid. (Incidentally, with both quadrilateral and bifid versions, the 'handle' is more decorative than functional, and is an evocation of the actual handles that would have been present on real versions of the vessels). Regarding these quadrilateral handles – which in reality consist of two short 'legs' linked by a bar, or else are a single 'leg' of the same size –

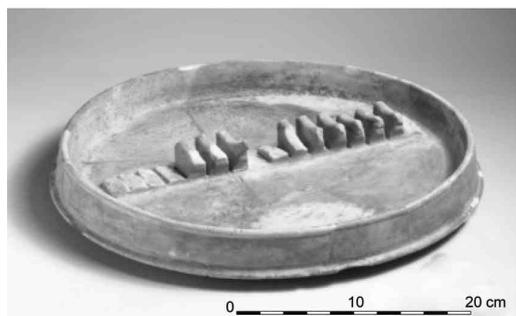
Machteld J. Mellink perceptively remarked that their formal variability suggests that they are copies of a wooden version, most probably a bunch of withies that were wrapped around the disc then twisted and attached at one end, serving both as a wrapping for the disc and as a handle (Mellink 1956). It should be added that several of these vessels have concave walls (Coleman 1985), unlike those of the vessels with bifid handles; this reproduces exactly the effect of compression under torsion. In short, the form of these vessels is more evocative of a flexible, organic container than of a ceramic vessel. In this regard, we can see the Cycladic vessels in a new light by citing one of several ethnographic instances where bark containers have been used, as among the Mangyan of the Philippines, to heat brine and crystallise salt (Postma 1977).

We therefore see that Dumas' hypothesis gaining in plausibility, although we cannot test it against original utensils – of which the ceramic versions are representations – since none of these is known to exist. It would be useful to undertake chemical composition of the ceramic dishes, focusing on the chlorine and bromine concentrations (through X-ray fluorescence analysis, for example); this analysis should be undertaken not only on vessels found in funerary contexts, but also on those found in settlements.<sup>1</sup> If these dishes were indeed used to produce salt, then additional confirmation comes



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**Fig. 5.** 1–2 Structures from the recent past used for brine evaporation by the heat of the sun at Magne and Tigani, Greece. (Photos: Y. Saitas.) 3 Marble dish (EC II), probably from Dhaskalio (Kavos), with a row of sculpted doves. (Photo: Museum of Cycladic Art, Goulandris Collection, No. 329.)

<sup>1</sup> An initial analysis would seem to have been carried out on the dishes from the tombs at Manika (Euboea). The results have not been published or commented upon, other than to suggest that they may have been contaminated by marine sand that had been placed on the floor of the tomb, as a layer upon which the deceased rested (Aloupi et al. 2001.53).

from the fact that the Linear B ideogram for salt takes the form of a disc with dots on it (*Kopaka, Chaniotakis 2003.63*). This is strikingly similar to the Mexican nahuatl glyph, which consists of two concentric circles, with the inner circle covered with dots (Kingsborough I 84, Codex Mendoza). Without doubt, this is the glyph for iztatl, salt (*Siméon 1885; Karttunen 1983; Wimmer 2006*). We do not know if these two identical signs relate to similar procedures in the past, but for the moment the fact that they are so similar is of note (Fig. 3).

Having reviewed the evidence for the Early Bronze age ‘frying pans’ of the Aegean, what may we conclude about the famous dishes found in the four tombs in the Carnac region? Does it help us to determine whether they were used in the production of salt, as we have proposed? Let us return to the inventory of facts and ideas that we have compiled; let us evaluate how our hypothesis might be viewed by archaeologists, in the absence of proof; and let us try to avoid circular argument:

- The Carnac region and the Cyclades are both excellent examples of marine environments. The former lies in a ‘Little Sea’ (Mor Bihan in Breton) which, since the 6<sup>th</sup> millennium BC, has provided a remarkable sheltered space. The latter, during the 3<sup>rd</sup> millennium, is a sea united by an exceptional constellation of islands. In both cases, the conditions existed for maritime communication.

- In these two regions, the vessels in question consist of fired clay dishes with low, near-vertical walls. They are similar in diameter, and in neither case is it easy to find counterparts among the utilitarian pottery that was made. In Greece, the examples of these vessels that have been found in settlements are fragmentary and undecorated, while in the Morbihan they are totally absent from domestic assemblages. In the latter region, fragments have been found in association with the megalithic complexes of symbolic architecture (at the stone alignment of the Grand Menhir and at the enclosures of Er Lanic; *Cassen, François 2009*).

- This uniqueness of the vessels, and their unusual morphology, has hampered attempts to identify their function in both regions.

- A feature common to both regions is the fact that the vessels have been found in tombs, and this sets them apart from everyday pottery. Moreover, the tombs in question contain rare grave goods. With

the Aegean examples, archaeologists have suggested that these represent wealth amassed from marine resources or from maritime trading (*Blackman 2002*), while for the Morbihan, the idea of a thalassocracy has been suggested (*Jullian 1908.492*).

- The distinction drawn in the Aegean between straight-walled dishes and concave-walled dishes also applies to the Morbihannais examples, in spite of the small number of vessels involved, with just a single example of a concave-walled dish known from a tomb in the Carnac region (*Closmadeuc 1865.Pl. V*).

- There is also similarity in the positioning of these dishes in the tombs in both areas, with the Aegean ‘frying pans’ having been deposited upright on their edge, resting against the wall of the tomb (at Manika and Haghios Kosmas; *Sampson 1987.22; Mylonas 1934.273*), while the one complete specimen of the four found in the tombs around Carnac was also found in a vertical position, resting on the side wall of the grave (*Boujot, Cassen 2000*).

- The decoration on the dishes in the two regions, which intimately links the shape of the flat dish to the motifs inscribed on the surface, underlines the symbolic character of these vessels, and qualifies them as ‘object-signs’. Viewed in this way, we can return to the interpretation of the wavy lines found on the dish found in the Lannec er Gadouer (Erdeven) barrow. These were initially interpreted as representations of snakes moving around in the Underworld (*Cassen 2000*). However, an alternative reading is now possible, whereby they are seen as waves of the sea. This was considered when the vessel was first published, but we did not accept the idea at the time, since one end of one of the wavy lines rises up vertically, like a snake’s head, and because genuine serpent designs have been found engraved on standing stones (at Manio 2 and Gavrinis). If we accept the ‘waves’ interpretation, however, this would provide a direct link between the dish and the world of the sea, thereby reinforcing the importance of marine imagery in the Morbihan.

Of course, it is a delicate matter to use evidence from Greece – itself not definitively proven to support an archaeological hypothesis about the Morbihan, especially when the two examples date to different periods of prehistory. However, it would be foolish to ignore evidence of certain common traits relating to technical know-how and to the world of symbolic imagery in two societies that were focused on the sea. To complete our study, let us consider and discuss

the two principal objections that could be raised to our hypothesis, in the context of the Morbihan.

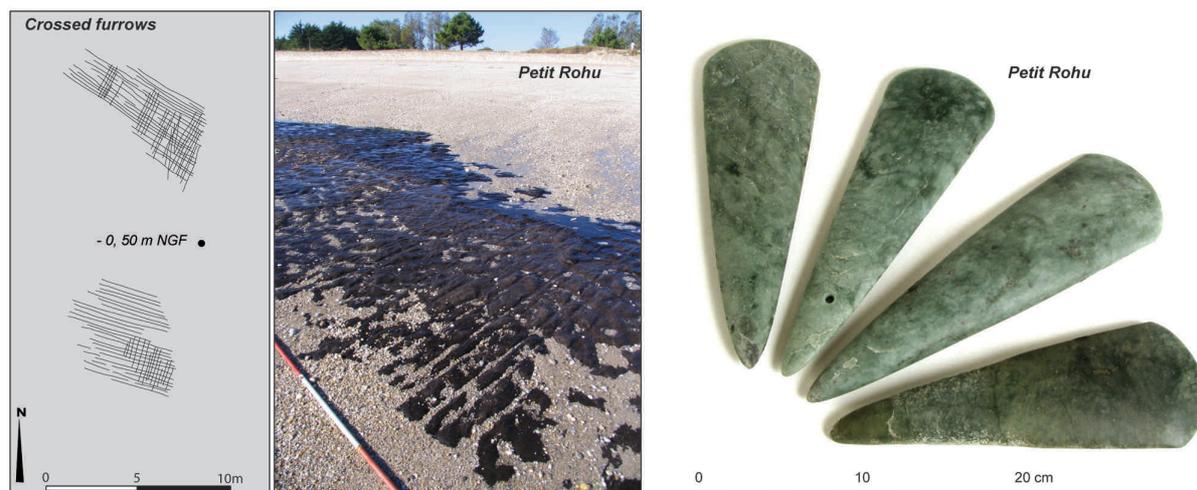
If these dishes were equipment used for the evaporation of brine and/or for the shaping of salt loaves during the 5<sup>th</sup> millennium, then where are the traces (*e.g.*, in the form of sherds, at the very least) of this activity? The example cited above of the use of flat containers of bark for heating sea brine among the Mangyan offers a possible answer to the question of the missing briquetage: there may not have been any in the first place. The same is true for the process of evaporation using the heat of the sun in split and hollowed tree trunks, as attested in Mexico and the Philippines (*Williams 1999; Yano 1994*). Whatever the case, the consistent positioning of the salt processing workshops on the high point of the beach in the Philippines means that, if the activity had been similarly located in the Morbihan, then all traces of it would have been destroyed by the 3–5 metre rise in sea level since the 5<sup>th</sup> millennium that we know to have occurred in the west of France. Similarly, if people had used the kind of basins and hollows in the rock that we have seen in the Aegean for the evaporation of marine brine through the heat of the sun, then these would be very hard to spot under the sea, being eroded or covered by sand and other material.

If these dishes were used as utilitarian containers for specialist salt extraction, and as such, were disposable vessels with a short use life, then why deposit them in exceptionally rich tombs, alongside axe heads and jewellery of Alpine (Jade) and Iberian (variscite) rock, exotic and rare materials brought from long distances? This enigma is harder to resolve, and applies as much to whatever the dishes may have contained as to the vessels themselves. The fact that one such dish, from the tumulus Saint-Michel at Carnac and black in colour, had been burnished to a brilliant sheen does not bring us closer to proving that it was used for salt extraction: as a rare type of object that demonstrates the skill of the potter and has an intrinsic quality (be it acoustic or visual), it could have been accorded a special value by virtue of these characteristics, indicating that it was distinctive and desirable and hence worthy of inclusion among a rich assemblage of grave goods. This type of argument has been used to account for the exceptional pottery of the Serra d'Alto culture in Italy, which could have occupied an equivalent special position in the politics and religion of its users to that of the large polished axe heads of Alpine jade found to the north and west of the Alps

(*Pétrequin et al. 2011*). In the Morbihan region, we may well be dealing with a case where it is the contents of the vessels, and not necessarily the vessels themselves, which were the marker of high status and the source of the vessels' power. It would be difficult to argue that the dishes contained cheese or honey, given that at least one such dish was deposited in an upright position, and that no other ceramic containers of foodstuffs were included among the grave goods in these tombs. If our preferred interpretation is that these dishes contained salt, it is not because salt would have been an ingredient in cooking, but rather because this material possessed cognitive power which could, under certain circumstances, be revealed. In other words, it was a special substance, bringing to mind Marco Polo's (*1289. Book 2, Ch. 38*) description of the disc-shaped cakes of salt, each around a kilogramme in weight, that were used in 13<sup>th</sup> century China. These cakes had no value unless marked by the Emperor's seal; thus marked, they became sacred objects, used in commercial transactions and as bridewealth. It would, however, be very difficult to identify these salt cakes in an archaeological context. To argue that this was the case with the dishes found in these Neolithic tombs consequently poses the difficult question of the status of salt, a substance that could have been traded as well as exchanged in ceremonial transactions. Even if we cannot envisage salt as a precious treasure in the same league as the jade axe heads with their complex biographies, we can nevertheless argue that, given its ambivalent qualities, salt could have been a sign of wealth in the Morbihan region, wealth that was controlled both by sea and on the land.

### Conclusions

Although salt can be used to preserve food, to improve lactation in domestic animals and as a nutritional supplement for those who rely for their subsistence on cereals, which have low mineral salt content, it is in fact a phenomenon in the full sense of the term, insofar as its production involves a transformation from a liquid to a solid state, and the dissolution of crystals. A mediator par excellence, salt is both a corrupter and preservative, and it lies at the heart of the process of differentiating the undifferentiated, and of the passage between worlds. We can see this in the fact that in many societies around the world, salt plays a unifying role in major life events, just as it is believed to have done at the beginning of time (*Van Gennep 1943*). Its capacity to be divided without losing any of its value, to last over the long term, and to be irreplaceable as a



**Fig. 6.** The beach at Petit Rohu, at Saint-Pierre-Quiberon (Morbihan). The peat under the sand is scored by criss-cross ard-marks. The four axe heads of Alpine jadeitite were found a few metres away. (Photos and drawing: Serge Cassen and Hervé Neveu-Derotrie.)

substance, has long conferred on salt a special place in various spheres, the domestic, technical, socio-economic and symbolic. A source of wealth, salt (or rather control of its production and circulation) cannot fail to be considered as a factor in the emergence of marked social inequalities among the inhabitants of the southern coast of Brittany from the 5<sup>th</sup> millennium (*Boujot, Cassen 1992.208; Gouletquer, Weller 2002*). In this regard, we should recall the remarkable and only recently-discovered, evidence for the production of salt loaves at Solnitsata-Provadia (Bulgaria), situated less than 50km from the rich graves at Varna (*Nikolov 2008; Weller 2012*). More specifically, we can imagine that salt had a role to play alongside the rare objects and rare materials which were deposited, accumulated and sacrificed as part of the ceremonies involved in the interment of exceptional individuals.

The form of the ceramic vessels from the tombs under mounds at Carnac, Erdeven and Locmariaquer is a circular dish with low, near-vertical wall; no parallel for such a vessel has yet been found in the contemporary domestic ceramic assemblages of the region. It seems plausible to us – on the basis of numerous societies around the world – that its morphology was dictated by its use in the *chaînes opératoires* involved in the production of salt, even though we cannot say that these dishes were used in the evaporation of brine or in the moulding of salt paste into loaves (or both). Similarly, we cannot be certain that the semiotic function of these dishes was symbolic or evocative of salt production. To help us decide how these dishes were used and what their significance was, we chose to compare

them to another enigmatic vessel form – the ‘frying pan’ of the Early Bronze Age Cyclades, which seems to have functioned in a similar manner as an ‘object-sign’ in a maritime milieu and in a high-status social context. At either end of these two geographical extremes, the former presence of salt is felt, even if we do not have direct evidence for it in the Morbihan.

It would be difficult to pursue our enquiry any further in the west of France, especially since the Carnac region has seen a rise in sea level such that the tombs in which the dishes have been found would originally have stood some 2km to 3km further inland than they are now. Nevertheless, we now know that we need to look for the following:

- One of the commonest methods used elsewhere in the world consists of raking the topmost layers of sand on the shore, to ‘wash’ them in filtration trenches, then collect the concentrated liquid and heat it in order to crystallise the salt. The process of raking the sand (or sandy sediment) would have been effected using a rake or, at a more intensive level, using an ard (at present in the Philippines, or during the Middle Ages until the 18<sup>th</sup> century in Normandy, France). Indeed, criss-cross ard-marks have been revealed under the beach at Petit-Rohu, 5km from Carnac (Fig. 6; *Cassen et al. 2010*), ard-marks on peat in a marshy location (which would also have been marshy during the 5<sup>th</sup> millennium). These latter marks are incompatible with cereal agriculture. This beach at Petit-Rohu is where four identical axe heads of Alpine jadeitite were deposited in pairs, identical to those found deposited together, and upright, in the chamber at the tumulus Saint-Michel.

● Trenches associated with salt production are often found in pairs, with one used for filtration and the other as a reservoir. Their walls were often lined to make them watertight, an important characteristic that facilitates their identification. The enclosure at Sandun, 200m from the shore of the ancient marine inlet at Brière (today, silted up), possesses a set of twinned, parallel trenches set behind ditches and palisades. The paired trenches have vertical walls, made watertight by being lined with clay. These features are excellent candidates for a radical reinterpretation of this complex as a centre of salt production (Cassen 2000; Cassen et al. 2008).

The objective of this archaeology of 5<sup>th</sup> millennium sea salt production consists of imagining the process, shifting our perspective and perhaps then finding elements that attest to the process of crystallisation: in other words, in revealing specific locations where the process took place, and in bringing to

light, and to our memories, the everyday containers used for evaporating brine and moulding salt paste.

#### ACKNOWLEDGEMENTS

*We would like to thank Mihael Budja for inviting us to contribute to this edition of Documenta Praehistorica. This article includes material first presented by Serge Cassen at the Prehistory of Wetlands conference held in May 2011 at the Museu de Arqueologia e Etnografia, Setubal, at the invitation of Joaquina Soares and Carlos Tavares da Silva. It has been enriched by the contribution made to that conference by Olivier Weller. We are also very grateful to N.C. Stampolidis and N. Papadimitriou for having provided answers to our questions about the 'frying pans' curated at the Museum of Cycladic Art in Athens. And we would also like to thank Alison Sheridan (National Museums Scotland) for her kindness in translating this text from the French.*

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