

	Finger-Tipping		Internal	Two external	Number of Rims
	on Body	on Rim	Rim Grooves	Rim Grooves at Neck	
1. Boucaud	1	3	1	—	9
2. Anse du Sud	—	2	—	—	5
3. Epinette	—	2	1	—	
4. Fougerais (F)	3	3	3	—	18
5. Paupelinière	—	2	1	1	9
6. Frenelle	—	—	—	—	1
7. Calais	—	—	2	—	3
8. Fougerais (B)	—	—	21	2	33
9. Tara	—	—	3	1	8
10. Birochere	—	—	—	—	2

Dr. Gouletquer told the meeting that Dr. Tessier had found his first salt making site ten years ago and was the first man to reconstruct the shape of the so-called 'auget' at La Frenelle in Brittany. This led to an explanation of similar sites along the Atlantic coast from the River Loire to the point of La Gironde. The 'auget' was made of white clay with thin walls. It was sun-dried and probably only used to dry wet salt crystals. Deposits had been found of several augets packed in piles within each other. Crystalline salt would have been obtained by natural evaporation

but no tanks or vessels which could have been used for this purpose had been found.

General discussion on shapes and sizes of containers followed and whether or not boiling took place. With regard to the large briquetage containers, Mr. Rodwell said that, in his opinion, these were used in Essex for the boiling of sea water and that this produced the green glassy slag which formed on the outside of the containers. Enormously hot fires were used which caused the clay to run, forming slag.



IRON AGE & ROMAN SALT-MAKING SITES ON THE BELGIAN COAST

H. Thoen

During the systematic examination of the Gallo-Roman settlement of the Belgian coastal plain, new information was obtained on salt-making in this area and earlier finds and publications were reconsidered.

The data acquired are mainly the result of intensive research into three fields:- the technical processes, the relation with the soil, and the chronology.

I. IRON AGE (Fig. 34)

The settlement of the coastal plain has always been strongly affected by the recurrent periods of transgression and regression which have resulted in a very complex soil structure. (Tavernier & Ameryckx 336)

Seen from a geological point of view, the outstanding event during the Iron Age has been the 'Dunkirk I' transgression, during which the Subboreal peat area was flooded via an extensive network of creeks, from about 500 B.C. till the beginning of our era.

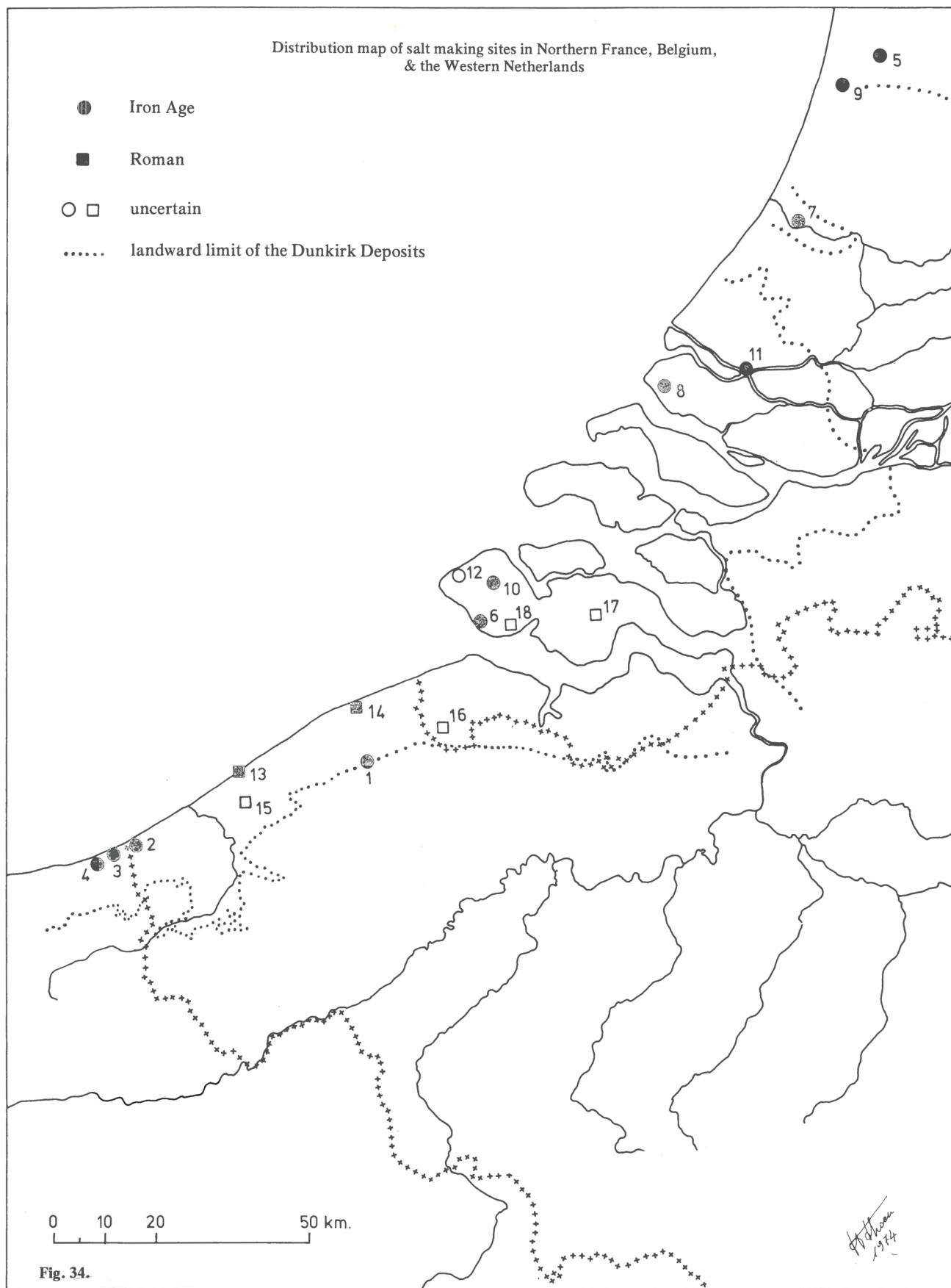
Little is known about habitation sites in this period. At the time of the Roman invasion the area was part of the territory of the-Menapii. (de Laet 86) In the Belgian coastal area only two settlements are known at present:- De Panne in the south-west and Bruges in the north-east. Both sites yielded traces of a salt-making industry.

A. De Panne (West Flanders, Belgium)

The settlement of De Panne has long been known. Archaeological remains, both from the Iron Age and Roman periods, were found in the dunes along the French-Belgian border and in the adjacent territory of Bray-Dunes (Département du Nord, France). Excavations before World War I (de Loë 88, 90, 91) (Cumont 71) and in 1920-30 (Rahir 266, 267, 268) brought to light numerous briquetage objects such as clay 'nails', evaporation pans, fragments of perforated clay plaques, flattened clay balls etc. The excavators, however, thought these objects to be part of a prehistoric pottery making site (de Loë 91, 92) (Rahir 266, 267, 268). Rahir identified the raw material used as being local clay from the coastal plain. He undertook to prove this by mineralogical and chemical analysis of the clay and of fragments of Iron Age pottery (Rahir 92).

Subsequently, however, it turned out that the analysed clay samples belonged to a Dunkirk II deposit, c. 300-700 A.D., so that Rahir in fact thought the pre-Roman pottery of De Panne to be made of post-Roman clay! (Loppens 205) The thesis of a pottery workshop was nevertheless not rejected, and it was not until 1952 that the possibility of a salt-making industry emerged by referring to similar finds from the Seille valley (Marien 212). A definitive conclusion was finally reached by Nenquin who lists De Panne as the only Belgian salt making site (Nenquin 243).

The next problem which arises is one of dating. Nenquin (243) and many authors after him (Bogaers 23) accept that briquetage was found in an Iron Age context as well as Roman. Two inscriptions discovered at Rimini have been repeatedly cited. They are dedicated by the *Salinatores Civitatis Menapiorum* and the *Salinatores Civitatis Morinorum* CIL XI 390/1 to L. Lepidius Proculus, a centurion of the Legio VI Victrix in Novaesium (Neuss) during the reign of Vespasian (69-79 A.D.) for services rendered to salt commerce (Favorel 113) (Will 367) (Bogaers 23). Excavation reports (de Loë and Rahir) reveal, however, that all the elements of briquetage were either discovered in an Iron Age context or where Roman occupation had disturbed the remains of the Iron Age strata; on no occasion were they exclusively Roman.



IRON AGE 1 Bruges. 2 De Panne. 3 Bray-Dunes. 4 Zuydcoote. 5 Assendelft. 6 Koudekerke. 7 Leiden. 8 Rockanje. 9 Santpoort. 10 Serooskerke. 11 Vlaardingen. 12 Domburg.

ROMAN 13 Raversijde. 14 Zeebrugge. 15 Leffinge. 16 Aardenburg. 17 's Heer Abtskerke. 18 Ritthem.

From this we conclude that there is no proof of salt-making during Roman times in De Panne and that this activity was confined to the local Iron Age community.

Dating the Iron Age material from De Panne has been a topic for extensive discussion. According to Marien, settlement has been dated to the La Tène II and III periods, continuing into the Roman occupation (Marien 213), but De Laet has pointed out that some of the material can be compared to finds from the early La Tène period (LT I & II) (De Laet 87). Final publication of the finds should settle this problem. In the meantime we emphasise that the choice of the Iron Age site was governed by physical-geographical factors (a beach flat protected from the sea by older dunes); its development is paralleled by the Dunkirk I transgression, so that settlement in the Early La Tène is acceptable. On the other hand, habitation came to an end during the final phase of the Dunkirk I, therefore probably during the La Tène III period. Continuity with the later Roman occupation, which began in the Flavian period, is improbable.

B. Bruges (West Flanders, Belgium)

We came across the briquetage finds of Bruges whilst 'digging' in the reserves of the Gruuthuse Museum. This material consists mainly of clay cylinders; it belongs to a site known as Fort Lapin, which is situated slightly to the north of the town. The finds were made around 1900 during harbour development alongside the canal from Bruges to Zeebrugge and belong to three different periods: Iron Age, Roman and the Middle Ages.

The excavations were undertaken by a geologist (Rutot 308) who cared little about the archaeological remains, but who fortunately paid attention to the geological context.

Contrary to De Panne, Bruges is not situated on the present coast-line, but some 12km inland, on the limit of the coastal plain and the sand region. However, the Iron Age settlement of Bruges, as well as that of De Panne, has a direct relation with the Dunkirk I transgression since the salt-making is situated along an active Dunkirk I creek. This is important in dating the site, as its development can only have been possible in the later stages of the transgression or, even more likely, at the beginning of the subsequent regression, thus probably during the La Tène III period. Again there has been no continuity with the later Roman settlement which dates back to the third century.

CONCLUSIONS

1. Both Iron Age settlements are directly related to the Dunkirk I transgression:-
 - De Panne developed on a protected beach flat when the transgression had flooded the greater part of the coastal area;
 - the salt-making site of Bruges came into being on a Dunkirk I creek ridge.
2. The technical process used is the one associated with briquetage. In Belgium it is typical for the Iron Age and has never been found in a Roman context. This has also been observed in Northern France (Zuydcote, Bray-Dunes) (Favorel 113) (Will 367) and the western part of the Netherlands (Assendelft, Koudekerke, ① Leiden, Rockanje, Vlaardingen and Domburg) (Helderman 153) (Modderman 232) (Nenquin 243) (Wind 371) (Dumontak & van den Berg 98) (van den Berg 347) which all can be dated to the Iron Age. (See Fig. 34)
3. **Dating**:- the relationship of the two settlements with the Dunkirk I transgression provides us with a relative chronology since De Panne came into being during the primary phase and Bruges during the intermediate or even final phase of the Dunkirk I transgression.

II. ROMAN PERIOD (Figs. 34 & 35)

Salt-making during Roman times is confirmed by ancient texts. We have already mentioned the inscriptions dating from the Vespasian reign, dedicated by the *Salinatores Civitatis Menapiorum* and the *Salinatores Civitatis Morinorum*. For Belgium these inscriptions have erroneously been related to salt-making at De Panne, since the briquetage finds must now be dated exclusively to the Iron Age.

The importance of salt-trading in our regions is also apparent from the altars which were dredged up from the East Scheldt, off Colijnsplaat (Zeeland, The Netherlands) a few years ago. Amongst the dedicators of these votive altars, erected c. A.D. 200 and dedicated to the local goddess Nehalennia, there were four *negotiatores salarii* (salt merchants, three of whom were from Cologne, the capital of Germania Inferior) as well as three *negotiatores allecari* (dealers in fish sauce, one of whom was from the Treveri territory) (Bogaers 23). These inscriptions are considered to be proof of the commercial relations with Britannia, but do not, of course, preclude the existence of a local industry.

In Belgium, we can mention two Roman salt-making sites: Zeebrugge and Raversijde.

A. Zeebrugge (West Flanders, Belgium)

In 1904, during harbour development works, a wooden construction was discovered in the peat. It consisted of a rectangular frame, extending over more than 700 sq.m which was divided into compartments by parallel rows of beams; these beams were linked two by two. The length of the beams was between 12 and 12.5m and the distance between the rows varied from 2.6 to 3m. The construction was held firmly in place by vertical driven piles. The total width was 22m, the overall excavated length about 31.5m at the western edge and about 39.5m at the eastern edge. The horizontal beams were of pine wood (*Pinus silvestris*), the piles of birch wood (*betula*). The whole installation was orientated north-west and south-east and sloped slightly downwards towards the east (de Loë 89, 93) (Gillès de Pélichy 94).

The interpretation of this wooden frame has aroused much discussion. The excavator thought it to be the sub-structure of pile-dwellings in a marshy area, similar to the so-called 'crannogs' of the British Isles (de Loë 89). The absence of any kind of floor and the deliberate slope make this theory difficult to accept. Others mentioned oyster-farming (Van Den Abeelen 346) and a Menapian harbour or landing-stage (Lambrechts 188) (Verhulst 355).

The first to think of salt-making was Breuer. He interpreted the construction as a saltern and linked the system with briquetage, the technical process of salt-making. (Breuer 29, 30) This view was not generally accepted because no briquetage was thought to have been discovered at Zeebrugge. We can, however, back-up the salt-making theory by some important arguments.

First of all there is no doubt about dating the frame. Its position on the Subboreal peat and below a Dunkirk II clay sediment indicates a construction in the Roman period. Arguments in support of salt-making are twofold:-

1. The presence of a number of small rectangular pans, used as moulds for salt-cakes. They appear frequently in Iron Age salt-making contexts; e.g. De Panne.

① Trimpe Burger (pers. comm).

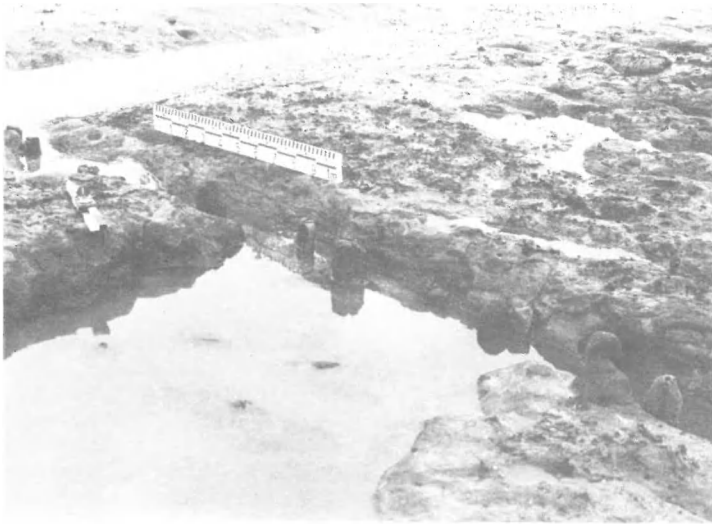


Fig. 35a. Vertically driven-in piles of a wooden saltern construction on the beach.



Fig. 35c. Salt cake moulds



Fig. 35b. Section of a pile showing stratification.

1. Modern clay with eroded peat
2. Silt layer of Roman salt making
3. Subboreal peat
4. Calais clay deposits

Fig. 35.

2. The soil map shows that there is a direct connexion between the site and the old network of creeks mentioned above when we discussed the finds from Bruges. This, probably together with artificial ditches, allowed access of sea-water at high tide into the wooden framework and its different basins which could be locked by its partitions. ②

B. Raversijde (near Ostend, West Flanders, Belgium) (Fig. 35)

The archaeological site of Raversijde has long been known for its finds of the Roman period and especially of the Middle Ages. (*Chocqueel 54, 55, 56*) It is situated partly on the present beach between the towns of Middelkerke and Ostend. The mediaeval peat-cuttings are normally visible at low tide. The Roman strata have been greatly disturbed by the Dunkirk transgressions and later by the mediaeval settlement.

In April 1973, whilst discussing the Belgian coastal plain during the Roman period for my doctoral thesis, Mr. and Mrs. E. Cools, both amateur archaeologists from Ostend, drew my attention to a number of piles driven-in vertically on the Raversijde beach. This initiated the beginning of new and more systematic research which had to be carried out under extremely unfavourable and difficult conditions. ③ The results of our work on the Roman Age are given for the first time in this paper. We were able to ascertain that the character of this large Roman settlement was mainly determined by salt-making.

Our findings were as follows:-

1. Construction and process (Fig. 35a) — although we only discovered some rows of piles and some stretches of ditches, there is a remarkable similarity with the Zeebrugge construction. At Raversijde, however, there must have been several of these; remains have been recognised scattered over a distance of nearly two kilometres. Here, as well as in Zeebrugge, sea-water was caught in a system of basins. The latter were connected to a network of ditches, which in turn received the water from a creek. This had direct communication with the sea through a gap in the dunes.
2. Stratigraphical position (Fig. 35b) — the wooden construction was made on the peat. The piles pierce the Subboreal peat-layer and their bases protrude into the Calais deposits of probably Atlantic date. During Roman times a finely sedimented clay layer was deposited on the peat surface. From this clay layer a number of Roman objects have been recovered.
3. Technical implements (Fig. 35c) — as in Zeebrugge a number of small salt-cake moulds were found which show a remarkable and very specific ornamentation.

② The system described above was proposed in our doctoral thesis on "The Belgian coastal plain during the Roman period" presented at the State University of Ghent on April 3rd 1973. A fortnight later we came across a similar construction on the beach at Raversijde, near Ostend.

③ The site is accessible only at low tide. Continual shifting of the sand, the construction of breakwaters, repair work on the dyke, touristic activities and uncontrolled digging turn any serious attempt at research into a nightmare. Work on the Roman settlement is carried out by myself with the assistance of Mr. & Mrs. E. Cools, who work closely together with my colleague F. Verhaeghe (RUG) on the Mediaeval site at Raversijde.

4. Chronology — the chronological elements consist mainly of local pottery from the coastal area; they belong to the end of the second and third centuries. Carbon dating of wood samples taken from the piles give the following results:-

1602 ± 83 B.P. = $348 \pm$ A.D. 83

1871 ± 83 B.P. = $79 \pm$ A.D. 83 ④

By the technique described above, concentration of salt sea-water or *brine* was obtained by natural evaporation. The next operation was extracting the *salt* by boiling the brine, thus by artificial heating. There are some clues which indicate that it was done by peat fires in small ovens. The peat fuel supplied the briny ashes, from which also salt was extracted after purification, mixing with sea-water and evaporation. It is possible that the ovens which have been found at 's Heer Abtskerke (Zeeland, The Netherlands) must be ascribed to a similar process. In the same context a lot of scoriae were found, the so-called 'zel-as', a waste product of peat fires. ⑤ Similar ash-layers were also discovered in Zeeland (The Netherlands) at Aardenburg and Ritthem, and recently in Leffinge (West Flanders, Belgium).

GENERAL CONCLUSIONS

1. Within the coastal regions of northern France, Belgium and the western Netherlands salt-making sites from both the Iron Age and the Roman period have never been found in the same place. The location of these sites has indeed been influenced primarily by the coastline which shifted repeatedly as a result of the different phases of transgression and regression. This movement of the coastline resulted for instance in an Iron Age salt-making site at Bruges, on a contemporary Dunkirk I shore, whilst a Roman salt-making site was discovered several kilometres to the west, at Zeebrugge, after the coastline had retreated during the subsequent so-called Roman regression (Fig. 34).
2. As regards the technical aspect, briquetage was in general use during the Iron Age. During Roman times a more industrialised form of salt-making appears, namely by means of elaborate wooden constructions fixed into the peat layer, along ditches and creeks which were directly connected with the sea. Salt was probably also produced by artificial heating in small ovens (peat-fires). The only briquetage elements which remain are the so-called salt-cake moulds which are notable for their remarkable ornamentation (Fig. 35c).

④ Institut royal du Patrimoine artistique, Brussels. (unpublished)

⑤ Trimpe Burger (pers. comm).

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