

Food Conservation in Antiquity: Methods and Techniques

حفظ الأغذية في العصور القديمة: الأساليب والتقنيات

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Abstract:

Food preservation in ancient civilizations was crucial for ensuring a consistent food supply throughout the year. Techniques such as curing meats and creating fish sauces were widely employed during this period. This paper seeks to explore the application of these preservation methods, the resulting products, and their importance in the realm of food preservation. The research findings will shed light on the different methods and techniques used for salting food and making fish sauces, as well as the crucial role these practices played in extending food shelf life and enhancing flavor variety.

Keywords:

smoking, drying, conservation, salting, fish.

المخلص:

كان حفظ الأغذية في الحضارات القديمة أمراً بالغ الأهمية لضمان توفير الإمدادات الغذائية على مدار العام. وقد استُخدمت تقنيات مختلفة في هذا المجال، مثل تمليح اللحوم وصناعة صلصات السمك، على نطاق واسع خلال تلك الفترة. تهدف هذه الورقة إلى استكشاف تطبيق هذه الأساليب في حفظ الأغذية، والمنتجات الناتجة عنها، وأهميتها في مجال الحفظ الغذائي. وتُبرز نتائج البحث تنوع الطرق والتقنيات المستخدمة في تمليح الأطعمة وصناعة صلصات السمك، والدور الحيوي الذي أدته هذه الممارسات في إطالة عمر الأغذية وتحسين تنوع النكهات.

الكلمات المفتاحية: التدخين، التجفيف، الحفظ، التملح، الأسماك.

• Introduction:

Food preservation has always played a vital role in human societies, especially in ancient civilizations where food scarcity was a common issue. In this context, the development of effective preservation techniques was essential not only to prevent spoilage but also to enrich the variety of flavors in daily meals.

In ancient times, when means of transport and communication were limited, the preservation of food was of crucial importance in ensuring the survival of populations. Among the diversity of foodstuffs, fish, as an essential source of protein, deserves particular attention.

This study aims to investigate food preservation methods, focusing in particular on fish as a case study.. We will conduct a comprehensive analysis of how these techniques were applied, the products that resulted, and their importance in the field of food preservation.

By exploring this topic, we hope to illuminate the influence of these practices on the everyday lives of ancient peoples and the flavors of their cuisine. Through a detailed examination of these techniques, we seek to provide a new perspective on how our ancestors adeptly combined practicality with creativity to create an effective food system.

1. Methods and techniques for preserving fish :

In ancient times, most diets were primarily made up of animal products like meat and fat, along with milk, a variety of plants, grains, fruits, and vegetables, as well as their derivatives such as bread, oil, and beer. Certain foods necessitated particular processing or refrigeration before they could be safely consumed. A prime example of this is fish, which cannot be eaten right after being caught¹. The consumption of fish entails several steps that must be followed after its capture and prior to eating.

The consumption of various types of fish was one of the nutritional bases, the realisation of which depended on a number of factors that were sometimes difficult to control, in particular environmental and climatic phenomena affecting various areas of human activity. Despite

¹Patrier, J. « Temps et alimentation au Proche-Orient ancien : Conservation et stockage des denrées alimentaires ». In Luciani, Fr., Maratini, Ch. et Zaccaria Ruggiu, A. (eds.), *Temporalia. Itinerari Nel Tempo e Sul Tempo*, Contributi Della Scuola Di Dottorato in Scienze Umanistiche, Indirizzo in Storia Antica e Archeologia : Contributi della Scuola di Dottorato in Scienze Umanistiche Indirizzo in Storia antica e Archeologia (p.41-70). S.A.R.G.O.N. Editrice e Libreria Padova 2009, p.341.

these constraints, fishing was one of the most important economic and commercial activities.

1.1 Primary transformation :

The initial processing phase refers to the early procedures that affect the fish after it has been caught. This phase includes:

1.1.1 Evisceration :

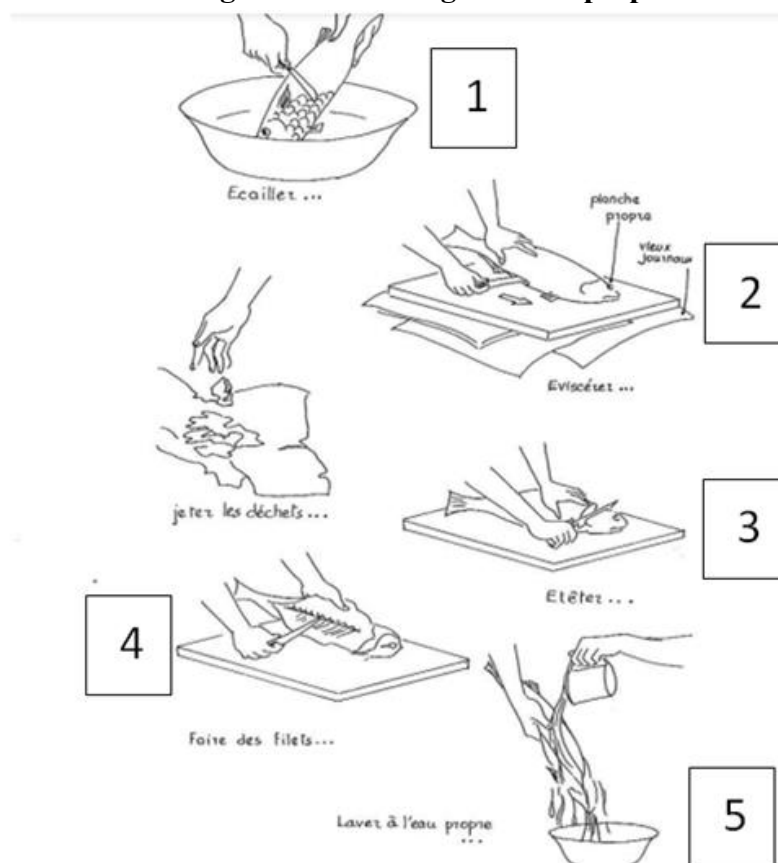
The final step in this procedure entails the extraction of all internal organs from the fish, which is performed to prevent early decomposition and to guarantee that the product remains fit for consumption (see **fig1.2**).

1.1.2 Heading:

This process involves removing the head from the fish and is carried out for aesthetic, conservation or preparation reasons (see **fig 1.3**).

1.1.3 Cleaning:

This is a process that removes all impurities, blood and residues that may adversely affect the final quality of the fish. The cleaning process is crucial for health considerations. (see **figure 1.5**).

Fig.1. The first stages of fish preparation.

Source : (Gret, 1993, p. 98).

1.2 Secondary transformation :

Secondary processing involves the preservation of fish through methods such as drying, smoking, and salting. The primary objective of these techniques is to extend the food's shelf life by inhibiting bacterial growth, which can lead to severe foodborne illnesses. The fundamental principle underlying these methods is the removal of moisture, thereby enhancing the fish's edibility over an extended duration.

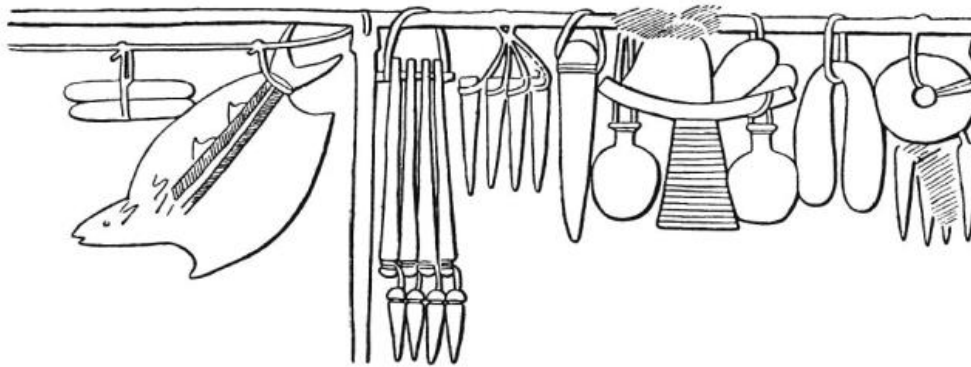
1.2.1. Drying :

Drying is one of the conservation techniques that has left no archaeological remains, as it is simple to carry out and requires no special installation²; However, its practice is evidenced by various depictions from the East, particularly in Egypt, as illustrated in earlier examples.

² Botte, E. Salaisons et sauces de poissons en Italie du Sud et en Sicile durant l'Antiquité. Publications du Centre Jean Bérard. 2009, p. 15.

Additionally, this technique is reinforced by the ongoing use of traditional methods in certain regions around the globe³(see fig 2).

Fig.2. Scene from Ti's Tomb Saqqarah (after Miss M. Murray).

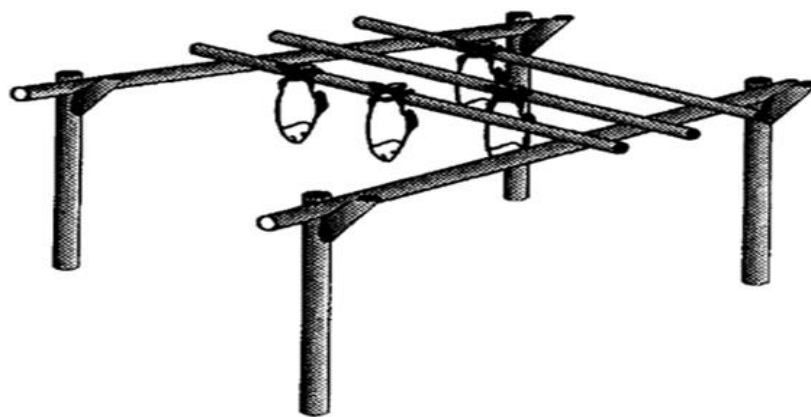


Source :(Keimer Louis., 1938, p.224)

Optimal drying requires the choice of pieces of the same size, to ensure that drying is synchronised⁴ Sometimes, before hanging and exposure to air currents, the fish is mixed with salt to speed up absorption of the liquid and ensure better drying⁵.

To dry, the fish can be hung on sticks arranged horizontally or on racks. The duration of the drying process depends on the species, size and climatic conditions⁶ (See fig.3).

Fig. 3. Fish drying technique



³ Ibid. p. 14.

⁴Maas-van Berkel, B., Boogaard, B. van den, Heijnen, C., Goffau-Markusse, M. de, et Bardon, J. La conservation du poisson et de la viande. Agromisa, 2005, p.39.

⁵ Botte, Op.cit. p. 14.

⁶ Maas-van Berkel et al., Op.cit.pp. 41.44.

Source : (Maas-van Berkel et al., 2005, p. 40)

1.2.2 Smoking :

Smoking is among the most ancient methods of food preservation, akin to salting and drying. As noted by C. Knockaert, its origins can be traced back to prehistoric eras⁷. Identifying facilities dedicated to smoking fish proves to be as challenging as locating those used for drying⁸, primarily because the smoking process involves the use of ovens and chimneys, which are not present in the drying method⁹.

Some of the techniques used today are reminiscent of ancient processes, which has led some researchers to consider the hypothesis that modern traditional techniques should closely align with ancient operating methods¹⁰(see fig 4).

Fig.4. Fish smokers in Togo.



Source : (Ngounou, 2020)

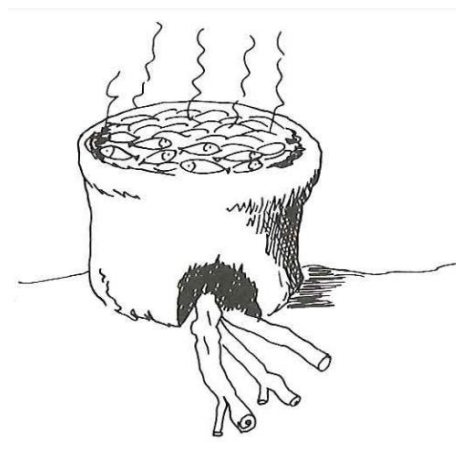
⁷Knockaert, C. Le fumage du poisson. Editions Quae, 2002, p.9.

⁸ Botte, Op.cit.p.15

⁹ Doukellès & Mendōnē, 1994, p. 228.

¹⁰ Botte, Op.cit.p.15

Fig.5. Fish smoking technique.



Source : (Gret, 1993, p. 123).

The process of smoking fish entails the suspension of a part of the fish above a source of low heat, enabling the gradual dehydration of the flesh without cooking it. This smoking stage is frequently preceded by a brief salting and drying phase, which helps to extract some of the fish's moisture¹¹(see fig 5).

There are three methods of smoking: cold smoking, where the product is not cooked; hot smoking, where the maximum temperature is 30°C, allowing optimum cooking without drying out; high-temperature smoking, where temperatures vary between 65°C and $\pm 100^{\circ}\text{C}$; and smoke-drying, where temperatures vary between 45 and 85°C and the product, which has finished cooking, continues the drying process¹².

1.2.2 Salting :

Food preservation techniques like smoking and salting have been used since ancient times. In particular, salting plays a crucial role in extracting moisture from fish and inhibiting bacterial growth. The terms ‘salsa-mentum’ and ‘salamenta’ refer to different forms of cured fish, whether whole or filleted. Made up of sodium and chlorine, salt acts as a preservative while also enhancing the flavor of food, which is why it is widely used in cooking.

¹¹ Botte, Op.cit.p.15; Maas-van Berkel et al., Op.cit.p.48.

¹² Maas-van Berkel et al., Op.cit.p.48.

It is noteworthy that, although salting is crucial for fish preservation, ancient literary texts tend to emphasize sauces and culinary techniques rather than the salting methods themselves. It is through the research of palaeoichthyologists that we have gained a deeper insight into the historical and commercial significance of these preservation practices. Indeed, preserved fish, whether salted or stored in brine, was instrumental in the evolution of the food trade, facilitating the transportation and storage of seafood over considerable distances. In Greek, the term *τάριχος* refers to salting, which was not confined to fish but also extended to meat and, by implication, to the mummification of human remains.¹³

The salting process involved the use of dry salt, which was applied directly to the surface of whole foods, particularly smaller fish, or in slices for larger types such as tuna¹⁴. Another method consisted of layering salt and fish in large cement vats designed for this purpose. According to Mr. Ponsich and Mr. Tarradell, the quantity of salt used was twice that of the fish, and the entire salting process took about twenty days to complete¹⁵(see fig 6).

¹³Botte, Op.cit.p.16.

¹⁴Ameur, Y., et Tagurti, M. « Salaisons, sel en Byzance orientale à l'époque antique. In Hassen, M. (éd.), *Savoir et Savoir l'aire En Ifriqiya Dans l'Antiquité et Le Moyen Age : IVème Colloque International*. U.R peuplement et mise en valeur en Tunisie à travers l'histoire « PEMIVAT », 24-25 avril 2009 (p.11-41), kairouan : université de Tunis. 2012, p. 22.

¹⁵ Ponsich, M., et Tarradell, M. (1965). *Garum et industries antiques de salaison dans la Méditerranée occidentale*. Presses universitaires de France, 1965, p. 103.

Fig.6.Dry salting technique.



Source : (Maas-van Berkel et al. 2005,p.31)

The alternative preservation method involved brining, which consists of immersing a food item in a saline solution, referred to as brine, for a varying period of time.¹⁶

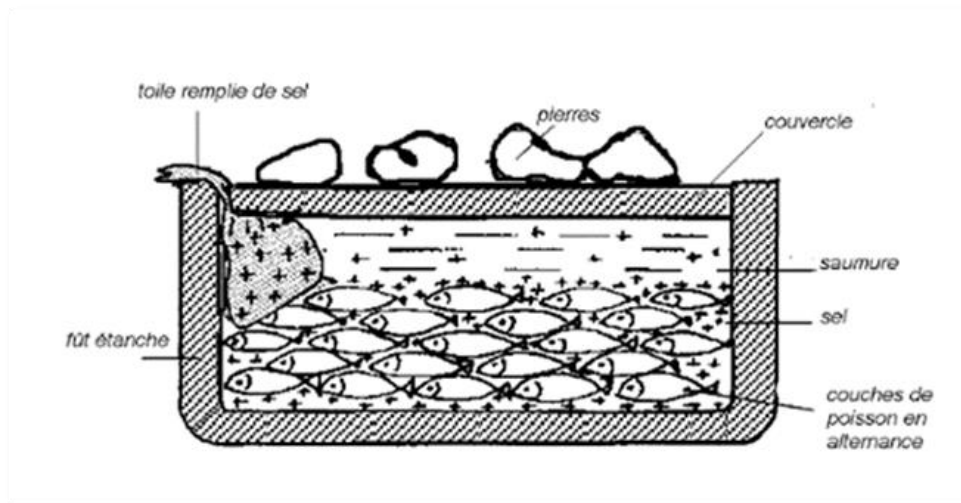
Cato describes the steps for successful brining and preparing a good brine to season food: 'Fill an amphora with pure water, the neck of which is broken, and expose it to the sun. Hang a sachet of common salt in it, which you should shake and replace as it dissolves. Repeat this operation several times a day until the salt has not dissolved for two days. You can tell that the solution is saturated when you dip an egg into the water and it floats to the surface. This will give you a brine suitable for seasoning meat, cheese and seafood.. » (Caton l'Ancien, De l'agriculture, 80)¹⁷. This technique of testing with an egg is referenced by

¹⁶ Desse, J., & Desse-Berset, N. (1993, janvier). Pêche et surpêche en Méditerranée : le témoignage des os. Publications scientifiques du Muséum national d'Histoire naturelle, Paris, p. 73 ; Etienne, R., et Mayet, Salaisons et sauces de poisson hispaniques. E. de Boccard, 2002.p. 45.

¹⁷ Les agronomes latins Caton, Varron, Columelle, Palladius, publiés sous la direction de M. Nisard. Firmin-Didot, 1877.

Aristotle (Aristoteles, 1863)¹⁸, and it is likely that Cato incorporated it into his writings. A mid-twentieth century publication on home canning suggests a comparable approach, utilizing an 'old potato' to evaluate the concentration of brine, which has a water/salt ratio of 1/3. This ratio aligns with the salt saturation level of a brine solution.¹⁹(see fig.7)

Fig.7. Fish salting technique with brining



Source : (Maas-van Berkel et al., 2005, p.29)

Fish have the ability to produce their own brine, enabling them to undergo maceration for extended periods, from several days to months. They can also be dried before the salting process.²⁰ An experiment by E. Botte showed that sardines lost a considerable amount of water within the first 24 hours. This phenomenon, linked to osmosis, occurs when water is drawn from the muscle tissue to dilute an external environment that is high in salt, with a greater concentration of Na⁺ and Cl⁻ ions than in the muscle tissue. The goal is to reach a concentration equilibrium between the two environments.²¹ Salting is a preservation method that has left its mark on history, unlike drying and smoking, which did not require any specific structures.

¹⁸ Aristote, La Météorologie, 2,3

¹⁹ Cheddad, A. « Pêche et industries annexes en péninsule Tingitane », In González, J., Ruggeri, P., Vismara, C et Zucca, R. (eds.), Le ricchezza dell'Africa. Risorse, produzioni, scambi: L'Africa romana. Atti del XVII convegno di studio. Sevilla, 14-17 dicembre 2006, Volume primo, 2008 (p.387-404), Carocci, p. 176.

²⁰ Slim, L., M. Bonifay, J. Piton & M. Sternberg, « Les fabriques romaines de salaisons de poissons à Neapolis (Nabeul, Tunisie). Travaux 1999-2005 », in : J. NAPOLI (éd.), Ressources et activités maritimes des peuples de l'Antiquité, actes du colloque (Boulogne, 12-14 mai 2005) (p.203-222). Boulogne, Centre de recherche en histoire atlantique et littorale (Les Cahiers du Littoral, 2-6), 2008, p. 171.

²¹ Garnier, N. « Analyse chimique des sauces et des conserves de poissons : Un état de la question ». In E. Botte et V. Leitch (Éds.), Fish et Ships : Production et commerce des salsamenta durant l'Antiquité (p. 17-35), 2020 Publications du Centre Camille Jullian, Garnier, 2020, p. 21; Grimal, P., et Monod, T. « Sur la véritable nature du « garum » ». REA 54(1), 27-38., 1952, pp. 33-34.

In these methods, fish or meat was subjected to sunlight or placed in a smokehouse until the moisture naturally evaporated. As the water content decreased, the salt penetrated the flesh, facilitating longer preservation. Various salting techniques can be identified based on the preparation methods, the degree of salting, the type of fish (whether fatty or lean), and the specific parts utilized (such as those near the head or tail).

Various sources indicate that the term *τάριχος* was used to describe whole fish, whereas the term *τέμαχος* referred to portions of salted fish or meat²². Tuna could be divided into several sections, including slices from the neck and nape, akin to the shoulders, as well as the belly, which was particularly favored, and the tail²³. Additionally, there were several distinct types of cuts, such as *Tetragona*²⁴, which had a quadrangular shape, *Trigona*²⁵, which was triangular, and *Cubia*, which was cubic²⁶. Pieces resembling oak planks, taken from the tail, were known as *Meladrya* and were considered to be of lesser value²⁷.

Fish can also be preserved in their entirety. Archaeological excavations of shipwrecks have enabled researchers to reconstruct the bones, verifying that their structural integrity was maintained²⁸. The techniques employed for fish preservation consist of full salting (fully cured), partial salting (semi-cured), and light salting (lightly cured) ²⁹.

It could also be half-cooked, keeping the scales, or preparing it scaled. ³⁰ The various fish species required to satisfy the highest customer standards.³¹. The salted fish served as a staple for slaves and peasants due to its affordability; however, the lower belly of salted and prepared tuna was so expensive that it became a food reserved for the wealthy³².

²² Botte, Op.cit.p.16.

²³ Ibid., p. 38.

²⁴ Pline l'ancien : Histoire naturelle, livre XXXI (E. Littré Trad.) dans la Collection des auteurs latins de M. Nisard. 1877.

²⁵ Idem .

²⁶ Athénée, *Deipnosophistes*:III, 116b

²⁷ Dumont, J.La pêche du thon à Byzance à l'époque hellénistique. *REA* 78(1), 1976,p. 110.; Etienne & Mayet, Op.cit.p.38.

²⁸ Etienne & Mayet, op.cit.p.39.

²⁹ Ameur & Tagurti, op.cit. p.23.

³⁰ Dumont, op.cit. p. 110.

³¹ Botte, Op.cit.p.33; Etienne & Mayet, op.cit. 38.

³² Dumont, op.cit. p. 110.

Table 1. Cured meat products according to ancient sources.

Products	
<i>salsa-mentum</i> (salted fish)	
<i>Tetragona</i>	Quadrangular in shape
<i>Trigona</i>	Triangular in shape
<i>Cubia</i>	Cubic in shape
<i>Meladrya</i>	took on the appearance of oak planks

Source :(Hamani)

- **Conclusion:**

This study highlights the significant role of food preservation methods employed in ancient cuisine, particularly through the techniques of drying, smoking and salting. The objective extends beyond merely prolonging the edibility of fish ; it also involves enhancing the flavors of the culinary practices of that era.

The primary goal of these preservation techniques is to maintain the fish's edibility over extended periods. By eliminating moisture, these methods inhibit the growth of harmful bacteria that could lead to severe foodborne illnesses. Consequently, these processes not only facilitate the preservation of fish for future consumption but also ensure the safety of the preserved products. Furthermore, an examination of these techniques and their resultant products has provided insights into the diverse flavors that were not typically associated with ancient cuisines.

Thus, a deeper understanding of these traditional methods enriches our comprehension of the foundations of modern culinary practices and showcases the resourcefulness of ancient civilizations in managing their food supplies.

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