MEMORIES OF SALT AND SEA: ANCHOVIES MADE FROM SARDINES

OLHÃO, AN INDUSTRIAL VILLAGE

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ABSTRACT

By the end of the 20th century, the study of the process of sardine anchovying brought the author of this paper back to her childhood memories of early industrial Olhão. The modern procedure is very similar to that used in old times, when women worked long hours, leaving their household and children to the care of sisters and neighbours, and every art and craft in the village evolved around the needs of fisheries and canning factories. In terms of personal experience, this conference marks the closing of a cycle, interlinking memories, life experiences and knowledge, thus bringing a precious heritage of the past to the present.

KEYWORDS

sardines, salt, fish processing

During the 20th century fish canneries were present all over Olhão, giving the town an immediately distinctive identity: the loud sound of the sirens calling women to work once the fish was landed (as it had to be processed upon arrival at the docks), the pungent smell from the fish-meal factory *Safol* which, mixed with low-tide odours from the salt marshes, poisoned the air on hot summer days, the chimneys emerging from the white-lime cubic houses, like tall, red-brick towers...

For those who lived close to Olhão, canneries were all the more important as they provided employment to armies of women whose life pace was actually dictated by the sound of the factory horn. Without a regular work schedule or a fixed salary, they would leave their household and children at the first sound of the sirens and work non-stop until the landed fish were all gutted, trimmed, cleaned and packed in cans; when the catch was good, they would work long hours and earn good money; when fish was scarce, there was no work and no income.

Before women could begin their work, the buyers decided at the dock which fish to buy and which should be processed. The carrier, who did not play any decisive role, rushed to carry the fish load from the docks to the factories. Once again, no fish meant no work and no money available (Piloto 1997, 51).

And then there were the fishermen, most of them also employees of factory owners. Fishermen, their families and their employers, all deserve attention but have to be dealt with elsewhere, in a different approach to Olhão as a place rich in characters, of people who, based on their hard and unique lives, even developed an own kind of dialect (Algarve 1987, 12).

Canneries were the driving force behind many other ancillary businesses, crafts and skills, from salt beds to salt-cleaning and salt-packing factories, from printing businesses *(litografias)* where metal sheets were printed and shaped into cans, to metalwork shops.

Every canning factory had its stoker, busying himself with fire and steam, operating boilers and retort autoclaves, being responsible for the precision work of the riveting machines and for ensuring that lids and cans were hermetically sealed (Júnior 1996, 9–10). The stoker's labour depended on the arrival of fish and the size of the lot. Fresh fish is a highly perishable commodity which can only be stabilized by sterilization of the filled and sealed can, i.e., only after its full processing, forcing men and women to work continuously until all fish were inside the retorts.

The pressure for continuous, long hours of work was so intense that canneries were among the first factories to serve meals during working days, installing modern canteens where a midday full meal was provided, as well as changing and toilet facilities for women. Cannery female workers entrusted their household chores to the care of neighbours or relatives (often to an elder, pre-adolescent daughter, young enough not to work), turning the neighbouring *bairros* (quarters) into communities of mutual help.

Olhão maintained a continuous production of metal utensils – trays, baskets, carts. Corrosion, degradation caused by salt, brine, heat, steam and high humidity, together with fish oil and its oxidation products, imposed a permanent struggle to repair and manufacture equipment – a reason why Olhão had an important metal industry settlement.

This was the Olhão I remember from my childhood. Here I heard stories of a great-grandfather who was a blacksmith and in whose shop the metal cross of the main church was forged; I saw women who earned their living by working outside their homes. All this made me understand from an early age that the presence of canneries made Olhão and its population different from other neighbouring towns such as Faro.

I always recall eating canned fish – tuna and mackerel fillets, whole sardines, skinless sardines (*"sans peau et sans arêtes"*, as I remember reading on printed cans) – and noticing that anchovies were different tiny little cans, filled with dark red fillets, salty and bitter, so different in flavour, and even in their shorter shelf life.

Soon I realized that the processing of anchovies was different from the regular heat-sterilized canned fish. Many years ago – perhaps around 1987 – my father took me to visit Mr Manuel de Sousa's old factory, where I heard with astonishment that they did not use any sterilizing retort because "... we don't produce canned fish, only anchovies [in cans]".

In addition to the natural curiosity that made me want to become a biologist, my research skills gained at the University of Lisbon had recently been enhanced by a training programme in Food Science. This was carried out at a university in northern England, and provided me with the opportunity of a two-year stay at a major North Sea port called Grimsby, which – like the neighbouring city of Hull, just across the Humber River – also had a long tradition of fishing and fish processing.

Before starting my research work on frozen fish quality, I attended a Fish Science post-graduation course. Thus, when I came back to Portugal, I could say I knew a lot about food processing, canning, packaging, hygiene and food safety, quality assurance manuals and industrial codes of practice. However, I had never heard of semi-preserved fish before.

In my new job as assistant lecturer at the Instituto Politécnico de Faro (Polytechnic Institute of Faro) I became involved in the development of a Food Technology degree (the very first of its kind in Portugal). Soon I took the opportunity to investigate food-processing traditions in southern Portugal. Assisted by a few dedicated students from the degrees of Food Technology, Marine Biology and Fisheries (from the former Polytechnic Institute of Faro and the University of Algarve, presently all part of the University of Algarve), I visited factories, described and studied their processes.

Later, when the time came to find a research topic for my PhD thesis, the idea of studying the industrial processing of anchovies emerged naturally, as an almost irrepressible urge.

I read everything I could find, in a time when documental resources were only available in printed format and kept in libraries. My first computerized bibliographic search took me on a trip to Lisbon and the first results I got (by land mail, one week later) were references to another fish also known as anchovy (*Pomatomus saltatrix* L.), a big bluefish which is eaten fresh, wide open and grilled on charcoal at the coastline of the Algarve – but that has nothing in common with canned anchovies.

While talking with master craftsmen in factories, with women working on the canning line and industrialists, I learned that anchovies preserved in small cans are prepared with anchovy (*Engraulis encrasicholus* L.), cured for long months inside buckets or concrete vats, between layers of salt, and covered with a heavy lid at room temperature. After the curing process, the fish are cleaned, filleted and packed in small cans or glass jars, covered with olive oil or other vegetable oil, and lids are riveted to the body of the cans using the same equipment that seals heat-sterilized canned sardines or tuna. Just like that, either flat in the can or rolled around a caper, covered in oil, anchovies have a long shelf life and do not require any additional care other than keeping the container sealed.

In the meantime, I realised that this process has been done in much the same way since immemorial times and that knowledge about it has been passed on from master craftsman to apprentice; it is still very similar to the processing of the ancient Roman *garum* described in ancient historical documents (Lepierre 1945). I came across similar processing traditions in Argentina, the Baltic Sea shore and the European shores of both the Mediterranean and the Atlantic (Perez-Villareal and Pozo 1992).

I also learned that quality anchovies were prepared using fresh anchovies, landed in the fish docks of Olhão and Vila Real de Santo António, in the Algarve. However, when the catch was poor or became too expensive, companies would import buckets of salted fish from South America to be further processed in their factories. Sometimes this resulted in a low-quality product, loaded with rancid off-fla-

Figure 1 – Women working on fresh fish

Figure 2 – Gutted, beheaded fish, packed with salt

vours and biogenic amines, which was poorly valued by Portuguese consumers.

To overcome this problem, during periods of big sardine (*Sardina pilchardus* W.) catch, some factories replaced anchovies with sardines. This new raw material behaved similarly to anchovy during processing – with good-quality fresh fish submitted to good manufacturing practices, canned anchovies produced from sardines became a pleasant, safe and praised commodity that consumers could not distinguish from the original.

The PhD research provided me with the opportunity to observe industrial anchovy processing at the new Marolhão factory, owned by Manuel de Sousa in Olhão. At the new premises, the fish is packed in salt inside tile-covered concrete vats instead of plastic buckets, and the workforce of mostly women use modern toilet facilities equipped with showers. In the factory building, older cans with more than 50 years are exhibited as museum items.

At the same time, I started preparing my own anchovies with sardines from the same batches processed in the factory, trying to replicate the industrial process at a pilot scale in the food processing laboratory (Food Engineering Department, University of Algarve).

For several years I visited the factory regularly, talked with the master and female workers, and watched over several days when the main work was to eviscerate and behead sardines – there was fresh, bright-red blood running through the floor and it was impossible to leave without bloodstains on my white coat and apron. In these particular days, the food served at lunch in the factory's canteen was mainly grilled sardines, because those were the days of abundant, fresh, fat sardines in the market (Figure 1).

I watched the pile of sea salt decrease in size at the same pace as the vats were filled with odd layers of fish and salt.

I obtained permission to insert thermocouples at different levels to record temperature changes during the maturing process. In addition, I also needed a "ride" on the forklift in order to reach the bottom layers of the 1.2-meter-wide, cubic-shaped vats.

I watched the loaded vats bulging with salt, their content higher than the walls at the beginning, though looking less full the day after and beginning to drip brine. On the second day there I was, watching the heavy concrete lids being placed on the top by the skilled manoeuvring of the forklift. On the following days I observed the brine overflow, a liquid coming from below the lid and pouring out.

I smelled the odours of each phase of the process, from the salty and fishy smell in the very first days, when the bright-red blood evoked the death of the fish, to the smell of anchovies: there were many odours, and my memory keeps them all (Figure 2).

Figure 3 – Washing mature fish in hot brine

Figure 4 – Fish filleting

Figure 5 – Oil covers the fish completely, with minimum spillage

Then, three or four months later, the supervisor informed me that he was about to open and unload a vat. In those days, it was the task of women to wash the fish in hot saturated brine and prepare the fish fillets. This process went on for days and weeks, vat after vat, at a pace defined by the availability of manual labour (Figures 3 and 4).

I witnessed the fortitude and resilience of those women day after day: wearing rubber gloves and galoshes, standing on their feet all day, they had a hard job eviscerating sardines in the first days of the process – a difficult task that I guess toughened them up. These same women were called to wash the fish in hot brine, using the same rubber gloves, and then sit down bare-handed to clean, fillet, trim and pack it in little cans, filling them with oil overflowing but avoiding unwanted waste. This is a highly-skilled precision work that they perform meticulously as if they were embroidering! They do it accurately and quickly, while talking, singing, and sometimes arguing, as if their manual work did not need any attention, as if their legs or backs did not ache, as if this was the only, but also the most interesting, possible job – I only saw tired faces outside the processing line, never at work.

I tried to sit by their side and do their work, but my hands had a lot to learn: I was clumsy and slow and was soon advised to give up... I insisted on learning in order to be able to perform the same operation at the laboratory, but I never reached their standards and the cans I had packed did not pass the quality control check: in the factory line every can was packed perfectly at first try (Figure 5).

At the same time I was working hard in the laboratory, collecting samples from both processing methods (at the factory and laboratory) in order to characterize physical, chemical and sensorial parameters.

Before this period of intense contact with the factory's daily life, I spent a long time at the university laboratories testing analytical methods. I used standard methods whenever possible but often had to adapt published methods or create new ones that suited the peculiar characteristics of my samples.

I trained a taste panel (seven volunteers recruited among university staff) to use their sensorial skills to recognize the characteristics of mature anchovies and to decide when fish is ready for canning – which is something the supervisor does empirically, as learned from the one before him who once taught him his job.

One of the main reasons that drove my attention to anchovy quality was the frequent reports of fish poisoning caused by the consumption of anchovies containing toxic levels of histamine and other biogenic amines, such as putrescine, cadaverine and tyramine. Although ripe anchovies are sterile, due to the low level of available water to support microbial growth, there was a concern that histamine production could be an unavoidable consequence of the processing methods (Rodriguez-Jerez *et al.* 1994). These amines are associated with several toxic food and their production is common in high-protein commodities

whose processing methods involve extended protein degradation and microbial growth over long periods, as happens in old, ripe cheese or other fermented food.

Similarly, sardines are often linked to scombroid fish and scombroid poisoning, which is identified as a food poisoning through high levels of histamine, present in fish as a consequence of bacterial growth that provides enzymes responsible for the conversion of histidine (the amino acid, present after protein degradation) to histamine. This was another argument questioning the safety of anchovies produced from sardines (Ababouch *et al.* 1991).

It took a lot of work to study the presence of biogenic amines in several samples, from raw sardines to fully-matured anchovies, which were analysed using a top-resolution high-performance liquid chromatography (HPLC) method; however, the above mentioned toxic products were not present in any of the samples, which leads to the conclusion that toxic substances do not develop if good-quality raw materials are used and industrial processes comply with food hygiene standards.

On the other hand, the extensive degradation of fish, driven both by the pressure exerted by the lid and osmotic pressure, eases the product from large amounts of fat and lowers its protein content, in such a way that anchovies are rich in interesting nutrients, such as amino acids and long-chain fatty acids, minerals and probably antioxidants (Ayensa *et al.* 1993).

Anchovies can be considered nutritionally adequate and safe; because of their intense salty flavour, they tend to be used in small quantities and consumed only on special occasions.

The conclusion of my research is that, without any doubt, anchovies prepared with fresh, good-quality sardine, complying with good manufacturing practices, are safe and present the right sensorial attributes. Thus, the processing of sardines may be a solution both for drainage of excessive sardine catches (if any) and to solve anchovy scarcity, providing anchovies at competitive prices. During industrial processing, the maturation period of fish can be adjusted to manual labour availability without any loss in terms of quality.

After years away from the theme, my current work brought me back to food-processing practices in the Algarve. I recently had the chance to visit a modern fish cannery in Olhão, a fish curing unit in Vila Real de Santo António, a modern fish farm at the Guadiana river mouth and a salt production and packing cooperative company in Castro Marim.

The opportunity of returning to this topic provided me with a broader view of my earlier research. I took time to re-read many of my old references with the eyes of a reader, not those of the author of a PhD thesis. In 2014 I had the chance to visit Olhão and looked for the red-brick chimneys – I did find a few, but only because I knew where to look for; nowadays the distracted tourist will have difficulty

Figure 6 – Old brick factory chimney surrounded by modern buildings, hosts a stork's nest

in finding one (Figure 6). Fortunately one of them is now integrated into a 21st-century building (the Auditório Municipal).

Although fish canneries are no longer the driving force behind the economy of Olhão, the catch, landing, production and processing of fish is a very serious business in the Algarve today. Canneries operating now are modern, top-quality industrial units, processing fish according to best practice standards, exporting small quantities of good-quality, highly-prized products.

It is with pleasure that I see some of those businesses bearing the imprint of the University of Algarve (and, in a different scale, my own), for marine biologists, food engineers, biotechnologists, dieticians and economists who graduated there are everywhere to be found. I came across some of my earlier students caring for the maintenance and increase in fish stocks, production lines, quality control, adequate consumption and marketing.

This may not be a gold mine, but it appears to be a story of success, where tradition and history, combined with study, research and development, have played an important role in moving a community forward. May the newcomers understand such legacy and safeguard this unique heritage of the past, promoting wise and sustainable fish consumption as part of healthy eating habits, as well as industrial fishing, fish farming and fish processing in order to provide the market and consumers with good-quality fish and shellfish at reasonable, affordable prices.

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