

## **Session 51. Salle 08. Food and trade in Early Modern Spain (2) - From Early Modern to the present day: an Anthropological view of Tuna Fishing**

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*Being captain of a tuna trap: practice, knowledge, and skills for the sustainability of an age-old mode of fishing.*

### *ABSTRACT*

Tuna fishing has historically been based on a complex network of socio-labor interactions involving a significant number of fishers having a variety of specific functions. Tasks have been divided into three main stages: preparation and deployment of the fishing gear; harvesting activities inside the trap, and dismantling of this impressive fishing tool. The captain emerges as the key figure watching over this wide range of activities, since all the technical tasks necessary for the different stages of the fishing to be properly executed depend on the captain (as well as others, as an intermediary between the company and the crew). His sensorial and intellectual skills and practical learning ability continue to underpin the operation of this centuries-old fishing mode, although the latest changes in the technical and economic organization of blue fin tuna fishing have changed the socio-cultural landscape of the traps. A theoretical reflection is given of the concept of vernacular expertise based on a description of these skills and their historical evolution (18th century onwards). The analysis focuses on tuna traps on the Andalusian Atlantic coast (SW Spain), and reviews the history of the fishery from the late 18th century to the present day; i.e., the historical period during which the previous fishing gear, the so-called “mobile” tuna trap (the *almadraba de tiro* or *almadraba de vista* (alternative names)) has been replaced by the “static” tuna trap (the *almadraba fija* or *almadraba de buche* (alternative names)).

### **1. Introduction**

Blue fin tuna fishing is an ancient practice that still continues today along the western coast of Andalusia (in Tarifa, Zahara de los Atunes, Barbate and Conil, and other places around the Straits of Gibraltar) (fig.1). There have been great changes over the years with respect to both the technical systems used and the social, political and economic networks involved (Florido, 2005). A tuna trap is a passive form of fishing primarily used for catching blue fin tuna (*Thunnus thynnus*) in huge trap nets. This is done at two different times: during the so-called *Almadraba de derecho* (in an inward-bound trap), when the fish swim close to the Andalusian coast in the Straits of Gibraltar during their genetic migration from the Atlantic to their breeding grounds in the Mediterranean Sea's warmer waters, which are ideal for spawning; and on the return journey, the *almadraba de revés* (in an outward-bound trap), as the tuna again pass through the Straits in search of the food on which they gorge in the Atlantic. The fishing cycle

3<sup>o</sup> Conférence Internationale d'Historie et des Cultures de l'Alimentation. Tours, Francia. 2017. IEHCA (Institut Européenn d'Historie et des Cultures de l'Alimentation repeats itself almost identically each year: it begins in March, with the fishing gear being prepared and deployed, and continues from summer (inward-bound) to early autumn (outward-bound) and ends with the fishing gear being taken in and the repair of the vessels and equipment during the winter.

**Fig.1. Map of present-day tuna traps at the Andalusian Atlantic Coast (Strait of Gibraltar, Cadiz)**



**Source: Own.**

Fishing for blue fin and other types of tuna is rooted in the Phoenician/Punic/Roman period (García-Vargas & Florido-Corral, 2010: 241). Up to the 1980's, the tuna economy was based on fish processing and marketing (curing and salting fish from earliest times and canning in oil from the beginning of the twentieth century). However, the fact that this mode of fishing continues today can be explained by tuna having become a much sought-after commodity on the Japanese market (by virtue of deep freezing). From the late medieval period, tuna-trapping was a major factor in populating the coast, both for the Castilian Monarchs and the more prominent noble families, until families of entrepreneurs took over tuna-trapping in the mid 19th century.

For seven centuries, Andalusian Atlantic tuna-trapping consisted of two major technical and socio-economic systems: up to the 18th century, the so-called *vista* and *tiro* trap (a “spot and pull” system with moveable nets) was managed by the nobility (the Duchy of Medina-Sidonia), which had been granted a monopoly to deploy fishing gear by the crown. The gear was formed of large moveable beach-seines which were operated by people on the shore pulling them tight as the tuna passed through. In the 18th and 19th centuries the Spanish crown wanted to release fishing from ducal control and withdrew the monopoly from the Duchy. The system used from then on was a fixed trap, which was more efficient at catching tuna and required fewer people for its operation.

## 2. Historical development: from the “mobile” *vista* or *tiro* tuna-trap to the “static” *buche* trap.

Descriptions of Iberian tuna traps using the mobile *vista* or *tiro* system have existed since the start of the Modern era. Documents in the Archive of the Duchy of Medina Sidonia make it possible to schematically reconstruct fishing operations (Santos, 2007, 2017), and can be synthesized as: i) the initial sighting of the tuna schools by the so-called spotters, the *torreros* or *atalayas*, who give the order to the *arráeces*, the skippers of the boats, some of which are on land and others anchored out at sea, to cut off the advance of these large pelagic fish with nets called *sedales*. ii) Still following signs from the *torreros*, the boats would round up the tuna in *boles*, that is, surround groups of tuna that are eventually hauled ashore in another, thicker net, called the *cinta*, to be clubbed to death there and sent off for their subsequent processing.

Fig 2. Plan of the Conil mobile tuna trap, 1765. (Detail). Source. A.D.M.S.

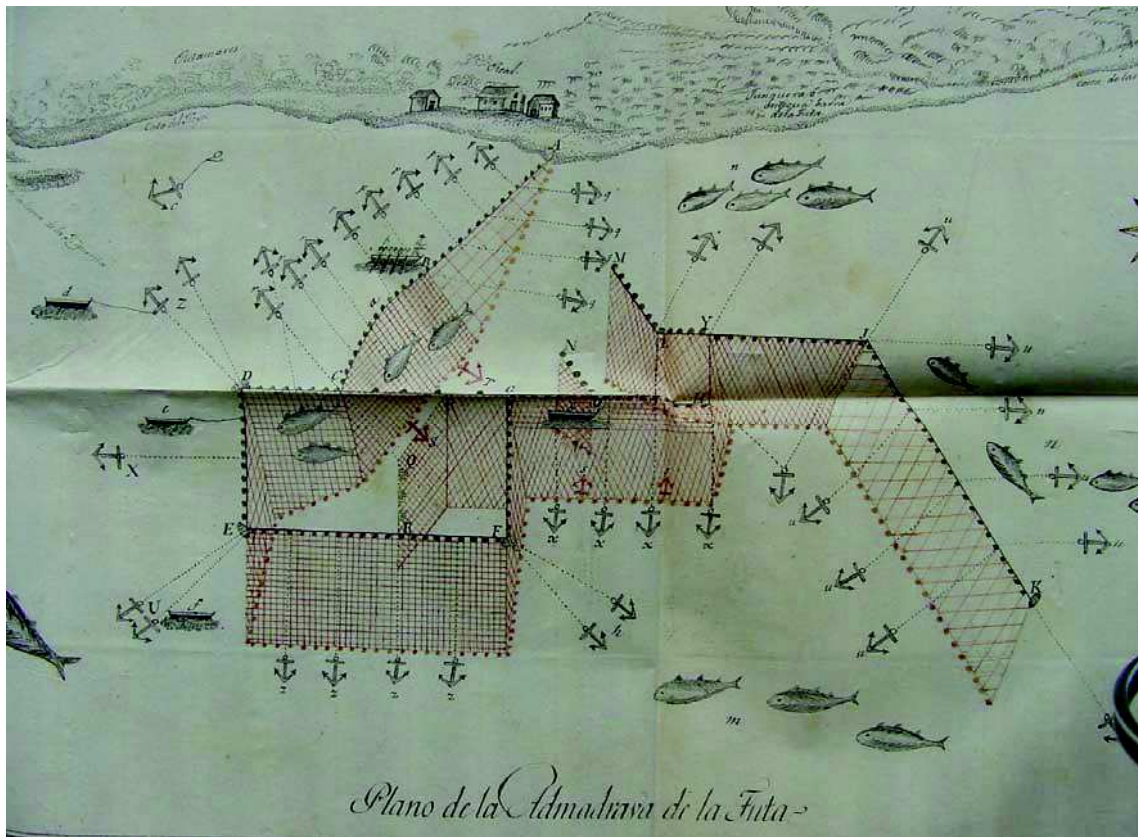


This plan shows the two fishing phases, the surrounding of the tuna and their being hauled ashore. On the right, vessels can be seen surrounding the tuna with their thinner filiform nets in response to signals given by the “spotters” on the watchtower (right). The hauling in phase can be seen on the left: the shoremen pull on the ends of the thick net, dragging the tuna in toward the shore, where they are hauled up on land by men with hooks and knives. They are being



supervised by an overseer, a *veedor*, on horseback. Behind them, men and carts are waiting to take the tuna off to the salting shed.

Fig. 3 Plan of the Tuta (Huelva province) static tuna trap ca. 1820. Source. A.D.M.S.



This is an outward-bound trap that captures the tuna as they are on their return journey from the Mediterranean to the Atlantic. All the basic trap gear can be seen, except for the dividing nets found in larger modern-day traps and the “killing net”. The stepped compartments or chambers can be seen that feed the tuna into mouth of the trap enclosure (N: *atajo* (a mobile net used to move the tuna forward through the different chambers); M: *legítima* (a net that prevents the tuna from taking a wrong turning at the entry to the trap), as can the different gauges of mesh in the various sections of net, which depend on where they are set.

In economic terms, tuna fishing used to feed into a business with wide-ranging implications, and one that has been an international concern in both ancient and modern times (García Vargas & Florido, 2010, Franco and Moreno, 1982) whilst also supporting some of the Duchy’s major financial functions (Guillaume Alonso, 2006; Salas Almela, 2006). And this entire economic structure was dependent upon the know-how of the tuna-trap fishermen. From the very outset, late-medieval period chronicles highlighted the spectacle of this type of fishing as being something extraordinary, worthy of admiration, and this is a view that has not diminished over time. As Sáñez Reguart recognized toward the end of the 18th century: *this is a type of fishing that is both cunning and interesting and as of this time its equal has not been seen that is able*

3° Conférence Internationale d'Historie et des Cultures de l'Alimentation. Tours, Francia. 2017. IEHCA (Institut Européenn d'Historie et des Cultures de l'Alimentation to go as far as the fishing industry has achieved on an observant practice (1791, I, p. 11).

Watching the way that a mobile tuna trap works enabled one to enjoy, in the first instance, the wisdom of the “spotters” (*torreros* or *atalayas*), able to gauge the size and worth of schools of tuna from their vantage points at the top of watchtowers. Second, witnessing the fishing operations made us realize how difficult it was to organize and coordinate the different vessels involved in capturing the tuna *bol*, criss-crossing nets to cut off any possible escape routes, striking dread into the fish through the gaps left between the mobile nets until they close and totally encircle the fish; it revealed the great physical strength required to bring the tuna ashore and dispatch them with hooks and cleavers. Finally, the dead tuna flesh has to be prepared with the utmost care, for which sheds and industrial factories were built both as tuna trap chandler’s and places where they could be stored<sup>1</sup>, and also for tuna processing. Using archive documents, Álvarez de Toledo (2007) describes a traditional salting method and modern process, in the Valencian style, performed by specialists, which from the mid 16th century on enabled more products to be exported at better prices.

The complex social and labor structure of the Iberian Atlantic tuna trap fisheries was organized into “guilds” during Spain’s Ancien Regime (pre 19th century) (Álvarez de Toledo, 2007, Santos, 2017). The absolutely essential role played by the “spotters” or lookouts during this time should be highlighted. As Álvarez de Toledo (2007: 35) points out, decisions on fishing were taken at *juntas*<sup>2</sup> or general meetings, at which the opinions of the *spotters* held great sway. The days that each fishing season would start and end were fixed on the basis of visual information about the coursing tuna and climate factors. Once they had signaled the beginning of the day’s fishing, the *spotters* used a *toca* (a piece of white linen) to warn the captains and skippers of the boats, large and small, about any changes in direction that the tuna schools were taking as they watched the fish approach the coast. The visual expertise of these men was also praised in documents of the time (Pérez de Messa, 1595), as perceiving –“*they sensed*” says this author the *smel* [sic] of tuna - and being able to estimate the approximate number of fish by the hue of the dark patch under the surface and the size of the wash caused by

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the tuna's gliding through the water<sup>3</sup>. Sharp eyesight was, therefore, a key work skill of theirs: whether to calculate the number of approaching tuna; whether to set the net and, if so, how this should be done; whether to foresee unfavorable weather that would deprive them not only of the fishing and, more especially, the gear, but also seamen of their lives. It was, therefore, a key and well-paid job (Álvarez de Toledo, 2007, Santos, 2017) that required very specific know-how and that was learned through early socialization and handed down from fathers to sons. They were aided in their work by *junior lookouts, skilled lookouts* and *apprentices*.

Over and above all the tuna trap labor guilds stood the captain, who communicated directly with the Duke and Duchess, and on whose shoulders fell full responsibility for the fishery in both technical and labor terms. In a precious document from the Duchy archive, the letter to the Duke from Captain Joseph S. López de Messa (1725) (in Santos, A. 2017: 43), the writer gives an extensive account of the environmental factors that affect the various points where tuna traps are set, and compares Conil to Zahara: tides, currents, storms, winds, the turbidity of the waters depending on the prevailing winds, the presence of killer whales.... Lastly, he acknowledges that the skill of the seamen of Conil is a key factor in the success of the fishery *as they have their roots and are raised in* [tuna trapping] (*ibid.*, in Santos, 2017: 44). In particular, the crisis that the fishery was going through at the beginning of the 18th century, more due to social and political factors than environmental ones, was leading to the loss of the skill of *spotting*, as the *spotters* were now old men with no apprentices to follow in their footsteps.

This same captain was the author of the *Treatise on Tuna Trapping* found in the Medina Sidonia Ducal Archive (Santos, 2017). The treatise discusses the viability at

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<sup>1</sup> The 16th century, Duchy-owned *Chanca* (fish processing factory) in Conil (Cadiz province) is one of the oldest industrial buildings in Europe. There were also numerous independent fish processing facilities that bought tuna for salting. One novelty introduced at the Conil factory was "sweet" tuna and the "refining" technique. During the same period, the Duke of Medina Sidonia had another factory-fortress built a few miles to the south, on the beach at Zahara de los Atunes, in an attempt to win new markets, although today it is in a poor state of repair. The so-called "Mesón del Sol" (1554) was opened there, and buyers flocked to it from all over Andalusia, eastern Spain, Castile, Italy and Flanders (Álvarez de Toledo, 2007).

<sup>2</sup> This is where the skilled men, captains and other personnel with technical responsibilities came. Not only were technical issues in relation to fishing decided here, but also socio-labor affairs. The system was flexible and put into operation to solve any problems *ad hoc* (*Ibid.*).

<sup>3</sup> These fish come by the sea close to the shore and, before they arrive at the place where the boats are positioned, a man placed as a lookout atop a tower near the water spies them. And that man's knowledge is such that when the tuna are a league or more away, he perceives their approach, and spies them beneath the water by dint of the movement and duskiness of the water, and can almost say how many they are in number, and when they draw near to the boats, the lookout makes a sign with a cloth or a bonnet to those on the boats (Pérez de Messa, 1595).

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that time of setting in Conil a fixed tuna trap of the type that was already being set on the Algarve, in Portugal. For the captain of the Conil tuna trap, the main difficulty lay in the stronger currents along the coast of the Straits, which could break up the trap and wash it away, as did indeed occur when the trap was laid as an experiment in 1727 and 1728. One of the difficulties that had to be overcome was opposition from local fishers, as the new system not only required fewer men, but, at least during the first few years, would require the incorporation of technicians and outsiders, from both the Spanish eastern (Mediterranean) coast and from Portugal who were acquainted with this kind of system. There were also protests at the static *buche* trap test at Zahara in 1746 (Álvarez de Toledo, 2007: 81). This was a critical time for the mobile “*spot and pull*” system, and one that led the Duchy to contract Friar Martin de Sarmiento to carry out a detailed study of the fishery crisis (Sarmiento, 1757). With the *de facto* consolidation of the use of the *buche* system along the Huelva province coast at this time, in his enlightened thinking the Benedictine friar decided on the more “rational” technique of the fixed tuna trap, due to the lower fixed capital cost.

It was at that moment that the inexorable change from the mobile system to the fixed system began, with the Spanish Admiralty becoming progressively more involved in the conflicts that characterized the establishment of the *buche* trap despite resistance from the fishermen’s guilds (Santos, 2017). One indication of the growing interest in coastal regions is the trip made along the Spanish coast by Antonio Sáñez Reguart in the 1780’s, which gave rise to his extraordinary *National Dictionary of the Art of Fishing* in five volumes (1791-1795).

Demographically and socially, the progressive implementation of the fixed tuna trap was to spark the migration of labor that has characterized the Cadiz province tuna traps up to the end of the 20th century: the incorporation of technicians and workers from the Valencia area, the Andalusian Mediterranean coast and the western coast of Huelva province, places where the *buche* trap was already tried and tested (Santos, 2017: 50). Be that as it may, the progressive implementation of the *buche* trap was what entrenched capitalism in fishing, which moved industrialization forward and developed trade and commerce on a variety of scales (from regional to international). Neither did it prevent a monopoly being restored in 1928, with the implementation of the National Tuna Trapping Consortium (1928-1971), a partnership between the State and the leading tuna entrepreneurs, who managed to oust the competition and surpass the monopoly of the Ancien Regime (Florido, 2013).

### 3. The captains' knowledge and their role in the fixed tuna trap labor culture.

Mobile *vista* or *tiro* tuna traps had already required a wide range of technicians —the role of the *spotters* has already been highlighted— to be coordinated under the supervision and command of the captain, but his technical role was to be enhanced with the *buche* trap. A relationship of trust between the captains and the business owners had been essential and would continue to be so throughout this period, but was now reinforced by the key technical and socio-labor role played by the captains in this fishery. Sáñez Reguart stresses technical skill as a key issue in the success of tuna traps. The captain:

*should have a definite practical knowledge in order to set the trap in a place suited to the laying of such fishing contraptions, with due attention paid to the shape and position of the coast, the prevailing winds therein, the currents and their directions or variations, the fathoms of depth and the quality of the sea bottom (Sáñez 1791: 19).*

First, accurate knowledge is required of the place where the gear is to be laid that includes a large number of climatic and oceanographic factors: depth, slope, type of sea bottom, dominant winds, frequency of storms, etc. Second, it was essential to have consummate knowledge of the material characteristics of the gear: the materials used, the size, types of net, the balance between the types of float (cork) and ballast (stones and anchors, initially anchors and so-called “lead weights”, composed of iron chains), and also the way all the components fitted together and complemented each other, on a much higher scale than any man could handle from a boat. The captain has to know how to *set up* the gear, how to assemble it (in fact, many captains have previously been outstanding “netters”), supervising all the tasks for the preparation of the gear, from the ropes and lines to the nets, taking special care to ensure that the size of each component matches the needs of the place where the trap is to be laid. In other words, a tuna trap is a structure that a captain visualizes as a scale model in his head but then has to fashion into an in-situ “real”-scale and much larger trap, without being able to make use of any other devices apart from his sense of spatial orientation, his pinpoint knowledge of the gear, and his experience. It is even more difficult when the technical system that has been conceived as an abstract idea has to be taken and adjusted to the local environmental and maritime conditions. This can only be achieved through a process



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that the captain, with the help of his technicians, has experienced season after season, based on his knowledge. Thus, when the Duke of Medina Sidonia decided to implement use of the *buche* fixed trap in the coastal waters near the Straits, where the sandy, gently sloping sea bed was exposed to strong currents, the first attempts failed, even though captains had been brought in from Sicily, Valencia and Portugal who had already worked with this fishing system on their own coasts. These technicians were more than able to transfer this fishing process from one geographic area to another, but putting the gear in place in new fisheries was always a risky affair, and one that could always be improved from one season to the next as the captain gained a detailed awareness of each location.

Lastly, the captain's social and labor functions were no less important. These can be summarized as his relationship with the *crew* (he had to find the seamen and build a relationship of trust with them), his ability to give orders, his relationship with the trap owners, the incentive to work, his choice of appropriate technicians; not forgetting his concern for conveying and communicating orders, and also his secure built-up body of knowledge –that which is directly related to the political dimension of knowledge, which cannot be broadcast far and wide, and in which secrecy is a practice that holds a captain's entire track-record together.

In order to combine this set of different types of knowledge in a theoretical concept, reference can be made to “labor cultures” (Palenzuela, 1995: 13)<sup>4</sup> and, within these, the concept of “intellectual means of production” (Godelier, 1979; Breton, 1990). These are a set of specialized areas of knowledge, including cognitive, sensorial and emotional aspects, which enable the appropriation of the land and its establishment as a *locus* for human action. In other words, an attempt will be made to synthesize the forms of appropriation, by means of knowledge that is passed down, that the fishers have generated historically for the technical, territorial and symbolic mastery of a geographic area which, for social subjects who have no links to the sea, would seem to be beyond control. It is through labor cultures that this appropriation is achieved and is perpetuated over time by the passing down of knowledge from one generation to the next, and one group to the next, that results from population movements, from the application of inherited knowledge to new settings, and from overcoming mistakes through *learning*

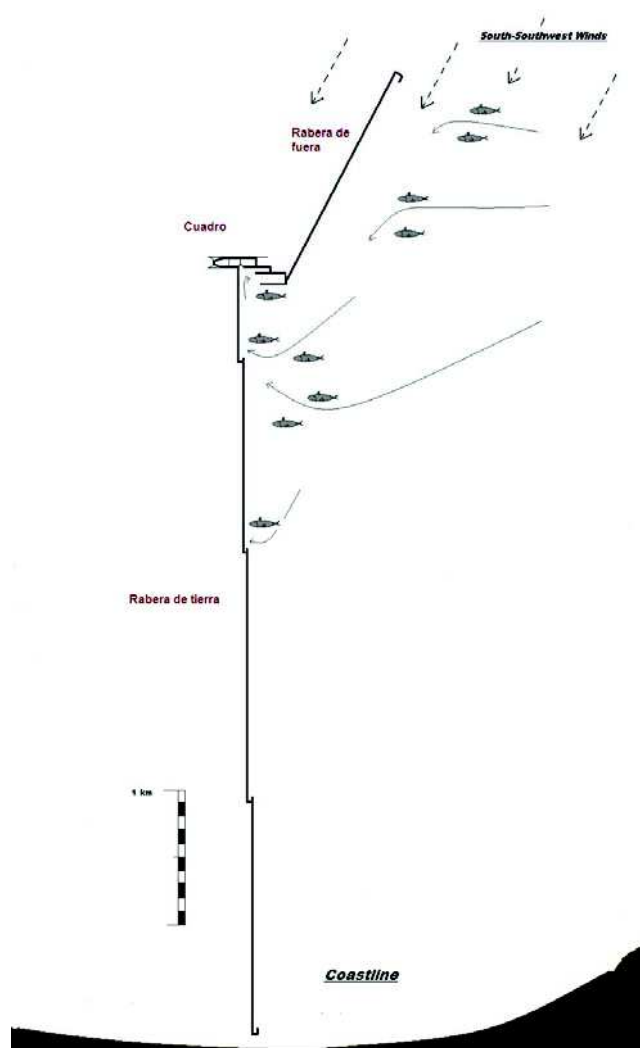
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<sup>4</sup> *Set of theoretical and practical knowledge, behavior, perceptions, attitudes and values that individuals acquire and construct upon their introduction into labor processes and/or the internalization of labor ideology, all of which models their social interaction outside the specific labor practice and guides their specific cosmovision as members of a particular collective* (Palenzuela, 1995: 13).

by doing. And, precisely, these knowledge systems shape one of the key components of their culture. The following summarizes the captains' most outstanding cognitive abilities and skills in each of the stated phases.

*The structure of the gear.*

Although fixed or static tuna traps grew in size from the end of the 18th to the end of the 20th centuries, the structure remained virtually the same during the entire period. Technical innovations during the current decade, in a context of severe restrictions on catches and the new market demands (Japan) will not be taken into account. A blueprint of the typical tuna trap model is therefore as follows:



- A rectangular central enclosure (the *cuadro*), divided into three internal chambers (*cámara-buche-bordonal*) which allow the tuna to be herded in. The last of these three chambers is the *copo*, the “death chamber”, where the tuna die when a ground net (the *copo* or “killer net”) is hoisted up by the boats.
- Two groups of nets that are attached to the “enclosure”, one at right angles to the shore (the *rabera de tierra*) and the other at an angle out to sea (the *rabera de fuera*). The function of these two nets is to stop the tuna that are approaching the coast in their tracks, confuse them and direct them toward the mouth of the “enclosure”. The mouth is situated on the shore side of the rig.

Fig. 4. Idealized diagram of the inward-bound tuna trap (west to east). Prepared by author.

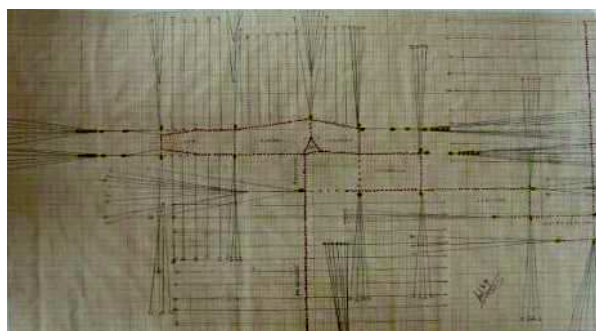
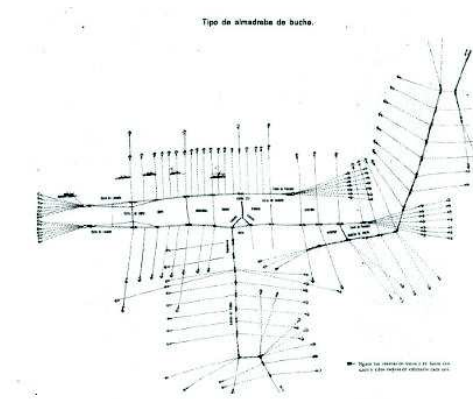
These parts of the gear are not laid willy-nilly, but rather to seek to benefit from the tuna's natural navigational instinct: when the fish come nearer the shore because of strong winds, clear waters or killer whales, they get caught up in the arms of these side

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nets, and their automatic response is to try and swim out to sea, where the enclosure and its mouth await them.

The entire system is held rigid, firm and stable, able to stand up to currents and tides without losing its shape thanks to a balance between the forces of the large floats (the so-called *perros*), buoys and huge iron anchors. It is essential to know exactly where each anchor is, to tighten all the ropes and cables, and the angles of the cables, properly and keep to the strict order in which the anchors have to be dropped, and all this emanates from the meticulous mental control that the captain has over the entire structure and which he habitually records on maps and in notebooks.

**Figs 5-6 . General plan of Conil (Cadiz province) tuna trap (inward-bound) in the 1920s and today.**



**Source: Rodríguez Santamaría (1923) and Manuel Ligeró (Conil tuna trap captain)**

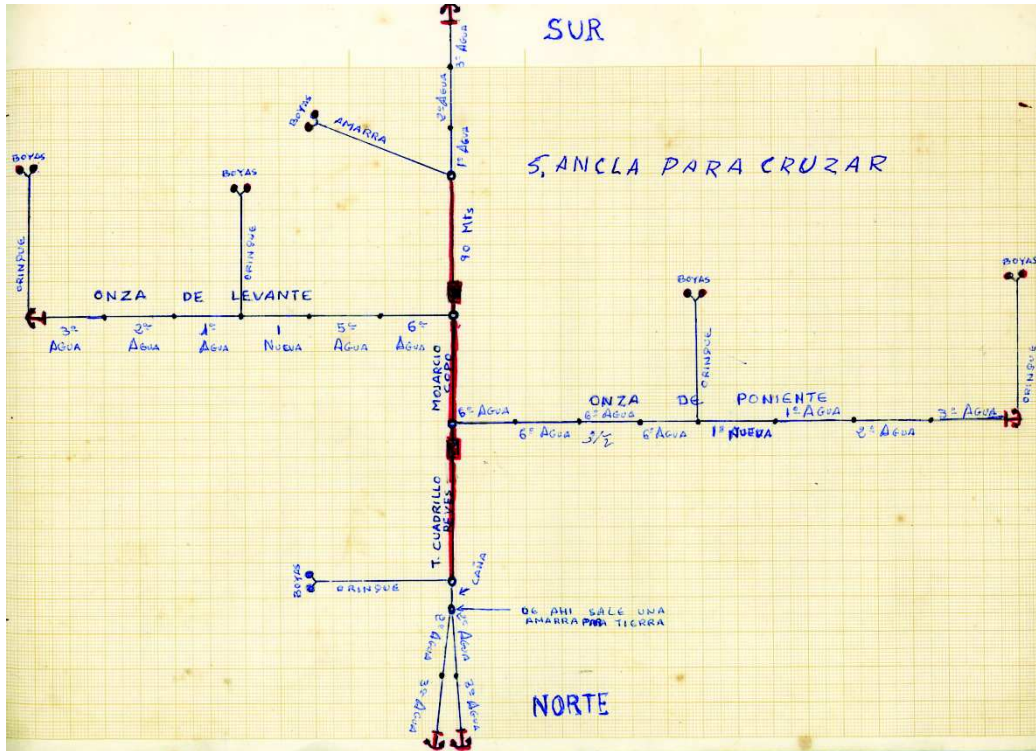
#### *Laying and lifting the gear.*

As an old captain from Benidorm (Alicante province) stresses, there is a difference between “*throwing the ropes, the nets and all the other paraphernalia into the sea and laying a tuna trap*”. The first and trickiest operation when laying a tuna trap is to choose a suitable site and to put the “enclosure” in place, for which the sea bottom, currents, passages and the “homing instinct” of the tuna all have to be taken into consideration. The traditional method used to select the place where the trap is to be set is literally based on “land marks”, points on land that are very evident, are at different distances and which are lined up by eye from the sea. The so-called “cross”<sup>5</sup> is placed at the point where two lines cross (four parts that are gauged by eye to come together at a single point). This is the place where a floating steel cable (called the “*mojarcio*”), which is the backbone of the trap, intersects another cable called the “*canto de tierra*”.

<sup>5</sup> A small cross is placed at the point that the two intersect in Sicilian tuna traps to ward off evil and attract a good catch (Zambenardi, in press).

All the gear is then laid in strict order to prevent any of the different parts snagging or interfering with any other. For the last two decades the captains have used the new Geographic Positioning Systems (GPS), but they continue to rely on the technical support of “land marks” for verification, because of the symbolic meaning that they have and their links to the area.

Fig.7. Plan of the Barbate tuna trap cross. Source. Juan M. Ruiz.



First the floats and ballast are dropped, and lastly the net. On the other hand, the lifting of the trap (the “leva”) basically consists of dismantling the trap in reverse order, meaning that first the net has to be detached from the cables and the ballast, and then the ballast, cable and anchors raised. Over the years, the captain will jot down any helpful pointers for this procedure in his notebook; it must be said that captains are always eager to improve the gear’s performance in the water in any way that they can and to review procedures as they go along when they obtain information about how the trap is behaving. In tuna trap vernacular, this never-ending process is referred to as “*cogerle el agua a la almadraba*” (letting the trap get the feel of the water). Captains and technicians learn from their mistakes as they acquire an understanding of the system and introduce innovations. These decisions are always the result of evaluating the very dynamic relationship between the rig and the maritime environment, changes in the materials and in the technical instruments used in the wide range of operations.



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The captains have learned a series of basic rules to make the gear “work”. Nets should not be allowed to stand straight (flat and stiff, except at the gates that guide the fish into the mouth), otherwise they would have to continually withstand currents, which would damage them. The height of the different sections of netting are adapted to the coastline, and nets with different gauges of mesh are used in different parts of the trap depending on the specific job that they have to do, with the killing net (the “*copo*”) having the densest mesh and also being the thickest.

For the gear to work in its setting, contending with currents, tides and all weathers, all the parts of the trap that hold it in place have to be drawn absolutely tight and taut but without raising the ballast from the sea bed or making the floats sink below the surface, as this would enable the tuna to escape. The length of every single cable also has to be known by heart (the unit of measurement is called the “*cana*”, a word of Italian origin, equivalent to a fathom or 1.8 m.), while trying not to give any information away that other technicians might learn.

Another rule passed on from one generation of technicians to the next is that the nets with more “waters” (seasons) behind them should be hung on the land line nearest the coast, an area of less strategic importance, whereas the nets made of new material should be hung in the enclosure, where the tuna are actually trapped. Up till mid century the material used to make the nets –vegetable fiber- also matched their importance: the killing net was made of hemp, which is stronger, whereas all the others were made of fibers such as abaca (*musa textilis*). When synthetic nets started to be used, for example, the captains realized that they had to increase the amount of ballast used, because the new materials were lighter and because the nets no longer needed to be tarred with charcoal to make them more durable.

The biggest changes in the last three decades have consisted of mechanizing tasks that had previously been done by manpower, although the captain’s cognitive expertise still reigns over the entire process.

#### *The hoist.*

The captain also plays a crucial role in the operations to lift the trap net to catch the tuna and other species. First, because the captain must have perfect knowledge of the dynamics of the tides on the coast where the gear is laid, as fishing has to be done during the “calm”, at first light, when the waters are flat. In the past, as he had to display his ability to adjudge the numbers of fish, to make out the quantity of fish inside the

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enclosure so as to make the decision to hoist. Two steps overlap at this time: what is known as “*ahorrar*” tuna (the use of a small boat and a net –the *atajo*– to drive the tuna out of any of the other internal chambers of the trap and herd them into the death chamber, a job done by the second and third officers), and the hoisting up of the killing net *per se*, in order to trap the fish. The captain traditionally made use of what was referred to as the “glass” for this, a wooden box with a glass fixture that enabled him to see deeper into the water; or he would draw on his accumulated experience to interpret certain signs and thus judge whether there were any fish and their approximate number. As the captains themselves state, tuna, more than be seen, are “*sensed*”, thanks to the blackness of the shoal or the wash on the surface of the water (the so-called *repío*).

The use of divers<sup>6</sup> in the middle of the 20th century enabled the captain to have “eyes” beneath the water and helped him to better keep his eye on the tuna, albeit indirectly. And this has been even truer in recent years, when the market’s demand for fresh tuna (Japanese buyers in particular purchase precise numbers of tuna) require tuna trap fishers to “*bleed off*” tuna, i.e., to kill only a small number of the tuna in the death chamber and return the rest to the main enclosure for future hoists.

With the help of his assistants (the second and third officers) the captain directs the operations to prepare the capture of the fish, and especially the “*hoist*”, the pulling up of the killing net. He needs to make sure that all the operations are carried out synchronously, first communicating by voice, and then by signs and gestures, as the din from all the shouting and the roar caused by the tuna thrashing in the water when the killing net is hoisted up make voice commands useless.

The recent history of tuna fishing is far from what could be seen throughout the 20th century. There is a world between the olden images of recently caught tuna being set upon by fishers who would cut off their ears and cut out their eyes and heart etc. to leave just the flesh to be dealt with in the salting sheds and processing factories, and the current images of the fish being hoisted up, their bellies and backs all smooth and glittering, and quickly cut into four large pieces and deep frozen to be consumed fresh. And there is the same great difference between the *hoist* of old, which could involve several hundred tuna, and those of the present day, which are “made to measure” to

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<sup>6</sup> Called “frogmen”. Their job is to tie and untie the nets from the cables and supervise the passage of the tuna through the trap. They also carry out checks of the entire trap, and have become vital members of the modern tuna trap fishery.

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cover the exact number of required fish, which compels the captain, with the aid of his *frogmen*, to fill the killing chamber with a number of fish that is as accurate as possible.

### **Final thoughts**

Tuna trap labor cultures include different types of vernacular knowledge, whether the skill of the *spotter* (inward-bound traps), or that of the captains and their assistants in the fixed or static traps. The accumulated knowledge of other workers in the jobs that they do should also be taken into account, such as the “*copejeadores*” (responsible for killing the tuna), the “*ronqueadores*” (who butcher the carcasses) and the salt curers (including women). However, this paper has focused on the figure of the captains who, in modern tuna trap fishing, embody the socially pertinent and politically validated technical knowledge required for tuna trapping.

It is impossible to relate in detail all the skills that they require in all of the operations and functions that they carry out (cf. Florido et al., 2017: 143 ff.) but prior information can be used to summarize them: i) the identification of suitable fishing grounds with clear water, where the killing chamber can be set; ii) monitoring the environmental conditions that favor the arrival of tuna in order to explore the prospects of a killing chamber hoist, such as clear waters produced by well-known local winds; iii) knowledge of the negative effects of local currents and tides in order to calculate the structure and layout of the gear needed to withstand them, during both the laying of the rig and the actual fishing; and other secondary factors, such as tuna pods being chased by killer whales and any relationship between the phase of the moon and the behavior of the fish.

What lessons can be learned from this knowledge system? One aspect that can immediately be highlighted is that what is being related is vernacular knowledge handed down over time thanks to the transfer of knowledge between different socio-ethnic groups. The Sicilians passed their knowledge on to the Spanish eastern (Mediterranean) coast, from where it was later brought, first to Portugal and Huelva province, and then to the Straits, where it has been learned by local fishers in the exercise of their trade. Hence such a diverse lexicon.

Despite this collective nature, know-how is put into practice on a *personal* level, through empirical procedures, based on learning from mistakes. It is, rather, a process in which experience, intuition, the senses etc. play a key role and afford it, in the Aristotelian sense, a pragmatic quality (a *techné*) which distances it from the

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abstraction-based *episteme* that seeks the universality of rational wisdom. Among the considerations on knowledge in *Nicomachean Ethics* (Book VI) a cognitive mode can be found that has traditionally been ignored in Western Modernity, and which adapts perfectly the vernacular knowledge of the tuna traps: *phronesis*. Knowledge's phronetic dimension refers to "know-how", to the wisdom that the actor acquires with experience, intuition, and which governs it ethically, in accordance with the values that have been established by tradition ([Linke & Jentoft, 2014](#)).

This is also an *incorporated* knowledge —it is worth noting once again the differentiation made by Francisco Varela (1999) between know-what (logo centric rationality) and know-how— which is obtained through working. As Marcel Mauss stated, the body is man's "*first and most natural technical object, and at the same time technical means*" (Mauss, 1983: 372). In this case, it is a succession of subsumed habits (*habitus*, according to Bourdieu, 1991); what is cultural made natural thanks to the fishers' effort, experience and senses. This is why it is translated into body language and moral attitudes and judgments: Aristotle's *hexis* and *ethos*, which inspired Bourdieu's concept: objective socio-cultural forms, which belong to a collective, but made *body, mind* and *spirit* by each of the collective's members, who embrace them with no external types of imposition and which are brought into play on a daily basis. As Herman Melville recognized in *Moby Dick*, it is fascinating for the outsider to observe the *habitual* and *unconscious* skill with which the fisher stays bolt upright in his boat, even when being tossed about by a rough sea. There is no better reference for a large part of know-how during fishing: habitual and unconscious practices, because they have been *subsumed*, assimilated into the fishers' bodies, as they reproduce collective and inherited know-how with their every gesture, their every maneuver.

These elements are rendered not only as physical (sensorial), but also ethical qualities, including the willingness for ongoing learning, this permanently inquisitive attitude, which used to be the only possible way to become a captain, to rise up the socio-labor ladder which was unregulated, despite having a hierarchy.

*"A maze to get it in your head, and you can't take a book to sea, you have to do it all on the fly. I've been second officer for twenty-something years. In the Consortium they were taking on captains from Valencia, but those of us who're officers today, we're from round here. That's a real headache; if you really want to learn, you can. There's no school here. I've been doing this all my life, since I was 18 or 19; my father was a second officer, I started by being his assistant, and that's how you learn"* (Barbate Second Officer).



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*“It got into me, took over my whole body, I really liked seeing the trap on the water. And the first thing I did was go down on the beach with a stick, and I started to sketch out a trap. I must’ve been 16 or 17”* (José Fernández “*El Pelao*”, Lepe tuna trap captain).

One fundamental issue is how to preserve this know-how and mindset. On the one hand, there are storage tools —such as notebooks, plans and maps, etc.— that the captains jealously guard, and so are not used as a means of social transmission, unless they can be handed down within the family (Mediterranean coast captains have often established intergenerational groups of this type). But learning is done, above all, through direct observation, pragmatically, and this is the only way that technicians can work their way up the labor scale, post by post, without any family help. They base it all on their ability to watch, to sense, perceive, and their permanent will in their work. The role of this other “kind” of captains and officers has been essential for keeping the tuna traps going, laying traps in new fisheries (in Morocco and Portugal, for example, and for getting the Cadiz province fisheries, the tuna traps in the Straits, back working from the 1970’s on). In this cognitive model, the ability to combine a broad spectrum of information and experience composed of successes and failures is key to the progressive consolidation of the confidence that the captain must transmit in order to legitimize his position, which in turn enables him to surround himself with the most suitable technical crew.

To conclude, it should be remembered that this type of knowledge transmission is a striking example of *tradition* (Philips & Schochet, 2004): it is both the facilitator and the result of continuity with the past, but with the past under permanent review so that it might be adapted to the present. This attitude is also part of cultural legacy and explains the continual mutation to which vernacular knowledge has been subjected historically, its interaction with new technological systems and the adoption of new systems, with some of the old forms abandoned and others preserved. There is no ideal tuna trap that can be moved up and down the coast and laid in different places, like some joker in the pack. Each rig is a device based on a general model but especially contrived for a particular setting. There is no schooling, in which the disciple first learns about the model on the theoretical level, and then has to apply it to some particular case, like a math *problem*. In this case, the problem is there from the outset: the technician learns about a specific device, and will continue to strive to adapt and improve it so that it might better fulfill its function of catching fish through, above all, implicit mechanisms.

And he will even endeavor to devise new, better tuna traps, as has been proven in the field work for this study.

*“I’ve always been into the tuna trap thing, really, a lot. I got passionate about the tuna trap as a kid and now it’s my life. I’m always thinking, ‘now I’m going to do it this way, and I’m not going to do it that way, and last year this turned out bad, so now I’m going to do it right’”* (Vicente Zaragoza, Benidorm tuna trap captain).

Marcel Proust referred to the lineage behind hunters’ and fishers’ knowledge because of its instinctive and almost divinatory nature, which can be considered another way of referring to its pragmatism. Carlo Ginzburg uses the concept of *presumptive paradigm* (Ginzburg, 1999)<sup>7</sup> to refer to this knowledge, stressing its ability to “*construct from apparently insignificant experimental data a complex reality that could not be experienced directly. Also the data are always arranged by the observer in such a way as to produce a narrative sequence*” (Ginzburg, 1999: 144).

In other words, it is the cognizant subject who constructs a discursive ecosystem via his knowledge, senses and attitudes (Aristotle’s technical and phronetic and Varela’s ethical know-how). The ecosystem is not defined from without here (it is not a scientific interpretation *by* the world), but is perceived, felt, constructed and defined from within (it is an interpretation *in* the world), a vernacular know-how that is experiential and practical. This is what Hornborg (1996) and Ellen (1996) defined as a *contextualist* paradigm to explain how ecological systems are culturally organized from a peculiar cognitive model: a way of knowing and doing in the world in which relationships are the component parts, rather than the parts of an environment themselves. To put it another way, such knowledge is neither “*a representation of something that exists outside it, nor merely a social construction, but [...] a negotiated **relationship** with nature that actually reconstructs nature in the process of representing it*” [emphasis in original] (Hornborg, 1996: 68). We would do well to take this tempered view if we are to be capable of integrating coastal societies and their labor cultures as a part like any other of the social ecosystems of which they form part, and thus guarantee their sustainability and the cultural diversity of the Mediterranean.

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<sup>7</sup> The presumptive or divinatory paradigm has been developed historically by a variety of collectives and in extremely diverse spheres of activity: physicians, historians, politicians, potters, carpinters, sailors, hunters, fishermen, women (Ginzburg, 1999: 147).

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