



## Review of the Nautical Sector in Andalusia

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### ABSTRACT

Andalusia is a region in southern Spain with almost a thousand kilometers of coastline on the shores of the Atlantic Ocean and the Mediterranean Sea. Previous research has pointed out that it would be interesting to address the question of the sustainability of marinas and the drivers for sustainable growth of this market in Andalusia. In order to fill this gap, this paper aims to answer two important research questions: What is the current situation of the nautical sector in Andalusia? And what is the future of Andalusian marinas? Firstly, the paper will shed light on the main characteristics of the nautical sector in the region and the drivers of market growth. Secondly, a theoretical framework will be proposed to determine the future need for moorings in different scenarios.

### 1. Introduction.

Andalusia is a region in southern Spain with approximately 8.5 million inhabitants. The region is characterized by its diverse landscape, which includes mountains, plains, and coastline. Geographically, Andalusia has 910 km of coastline in a privileged location and Mediterranean climate (Junta de Andalucía, 2015). Its numerous beaches, nautical facilities and moorings enjoy a unique environment, which for decades have not only been an important focus of leisure, but also a relevant economic engine in the region, see Rojo (2009) and García Barroso (2010).

According to Martínez-Vázquez et al. (2022) it would be interesting to address the issue of sustainability of Andalusian marinas and the economic activities developed to achieve sustainable growth. In this sense, a first step is to find the answer to the following research question: What is the current situation of the sector in Andalusia? The first goal of the paper is, therefore, to carry out a detailed analysis of the current health of Andalusian marinas. This preliminary analysis will be the basis for answering a second question: what is the future of the ports in Andalusia? This is an extremely complex question, due to

the number of parameters that influence on the supply and demand of moorings in the region. From a theoretic view point, the answer should be a methodological proposal to determine the demand, and this is the second goal of the paper.

The article is structured as follows. Section 1 is the introduction and presents the general objectives of the article. Section 2 makes a brief review of the literature that inspired the present research. Section 3 analyses the current situation in placeAndalusia, focusing on three fundamental aspects of the facilities: the occupation of moorings, the waiting lists and the type of user. This analysis is intended to answer the first basic research question. In Section 4, a methodological proposal is developed to define the determinants and future scenarios for the ports in placeAndalusia. The proposal is based on physical and socio-economic indicators and the definition of the theoretical scenarios are based on the growth expectations of the nautical market (pessimistic, optimistic and neutral). Finally, conclusions and future research are presented.

### 2. Literature review.

Ten years ago Kizielewicz and Lukovic (2013) noted that the phenomenon of nautical tourism in Europe, and in particular the marine industry, was insufficiently explored. In recent years, the issue of sustainability and the sustainable management of cultural and nautical tourism has been addressed, at least, in the cases of Portugal, see e.g. (Lopes et al. 2022) and

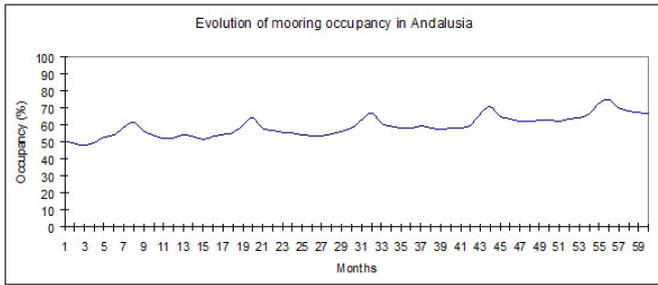
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Figure 2 shows the monthly evolution of the occupancy for the total number of ports for which data are available. Firstly, it is interesting to note that there is a moderate upward trend. Secondly, there is a certain seasonality of demand which is reflected in the existence of occupancy peaks corresponding to the summer periods. Finally, it is also interesting to note that occupancy begins to move towards the problematic zone (60-80%) from the summer of 2020 onwards, not only on an occasional basis but throughout the year.

Figure 2: Evolution of mooring occupancy in Andalusia.

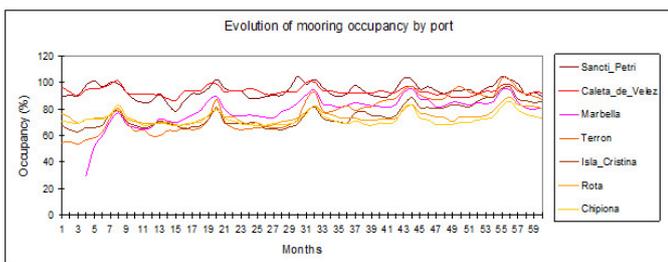


Source: Own elaboration. Data from APPA.

The above Figure 2 corresponds to the ports as a whole. What happens if we analyze each port separately? The answer is that occupancy is quite heterogeneous. On the one hand, there are some ports with very high occupancy, which can be considered saturated (e.g. Sancti Petri and Caleta de Velez ports). On the other hand, there are others with problematic or conflictive operation during peak periods (e.g. Marbella, Terrón, Isla Cristina, Rota and Chipiona) and other ports without problems due to low utilization (e.g. Garrucha and Adra for example). A common feature is that, in almost all ports, peaks of occupancy are observed in the summer months coinciding with the high season.

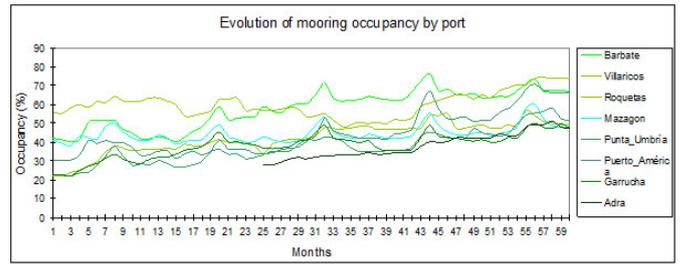
The following figures show the evolution of occupancy in ports with problematic management (see Figure 3) and in ports without problems (see Figure 4). In both cases, the ports are ordered from most to least problematic on the right hand side of the figures. It should also be noted that a port with low occupancy, e.g. Adra (most underutilized port), could also be considered to be in a problematic situation as its infrastructures are being wasted (underutilized).

Figure 3: Evolution of occupancy in ports with problematic management.



Source: Own elaboration. Data from APPA.

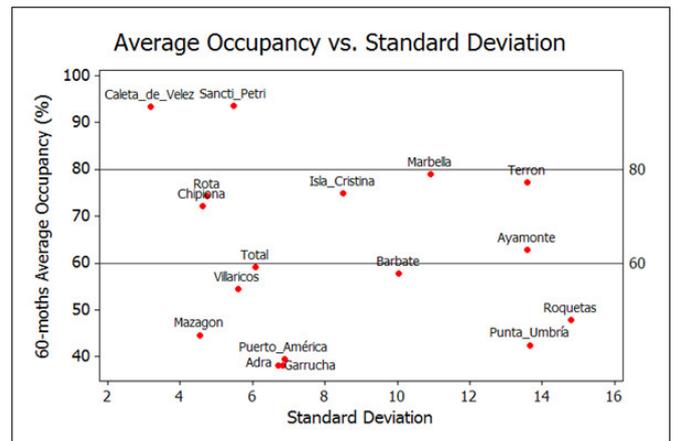
Figure 4: Evolution of occupancy in ports without problems.



Source: Own elaboration. Data from APPA.

An interesting aspect to be studied further is the variability of occupancy. As already mentioned, a larger deviation from the average occupancy in a port implies more pronounced peaks, i.e. a greater seasonality effect of demand. Figure 5 shows the average occupancy and the standard deviation observed in each port. It clearly distinguishes the 3 zones in which the ports are located according to the degree of occupancy.

Figure 5: Average occupancy (%) vs. standard deviation (h).



Source: Own elaboration. Data from APPA.

Ports on the left side of the above figure have a low deviation from the monthly occupancy measures, i.e. they are ports with less peak or seasonality of demand. This may suggest that they do not have as much capacity to capture transiting vessels during the summer and are consequently eminently used by yachts based in the port in question (all year round). The ports on the right side are more seasonal ports, suggesting that they still have some capacity to handle transient yachts during the summer. The data collected also suggest that ports in the province of Málaga (e.g. Caleta de Vélez and Bajadilla Marina) are in a situation of high occupancy, especially in the high season since the year 2017.

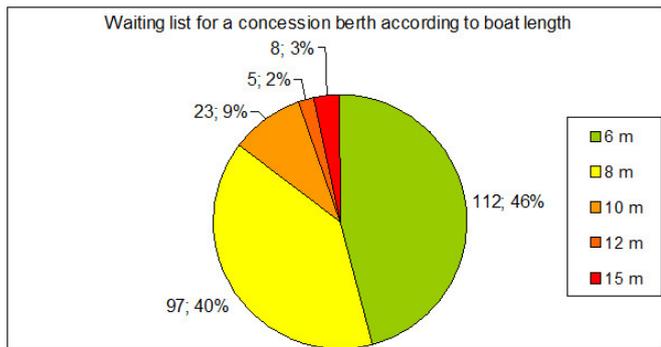
### 3.3. Waiting lists.

The occupancy of the ports gives an idea of the utilization of moorings, but to fully understand the latent demand it is necessary to know the register of mooring applicants. Unfortunately, this information is again very difficult to obtain, as the ports not

directly managed by APPA prefer not to share this information. In contrast, the ports directly managed by APPA share the waiting lists at <https://oficina.puertosdeandalucia.es/lista-de-espera/>

It is important to note that according to APPA records there are 10 ports with latent demand out of a total of 17 ports with no demand (for the rest there is no information). In total, in February 2022 (the month prior to the start of the war in Ukraine) there were 240 applicants for moorings and approximately 10% of these requests corresponded to individuals or legal entities (companies) with 2 or more applications. The moorings with the highest demand are those corresponding to small boat lengths (6 and 8 metres), which account for 86% of the mooring requests, see Figure 6.

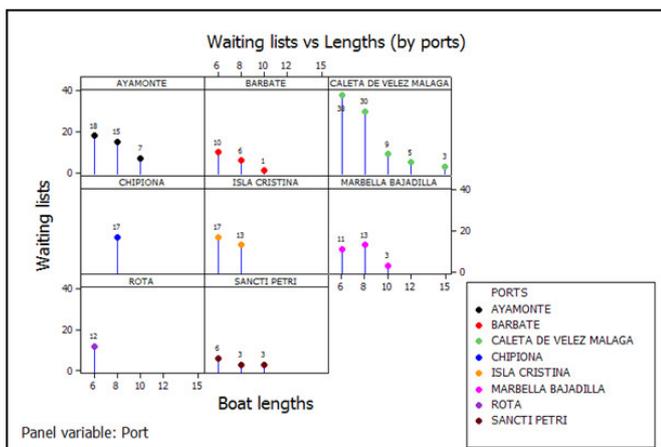
Figure 6: Mooring requests by length (m).



Source: Own elaboration. Data from APPA.

In the next step, the waiting lists have been cross-referenced with the length information to identify the exact demand in each selected port, see Figure 7. It is important to remark here that these figures show only a part of the Andalusian ports (i.e. those where waiting lists were publicly available).

Figure 7: Waiting lists for access to a concession berth.



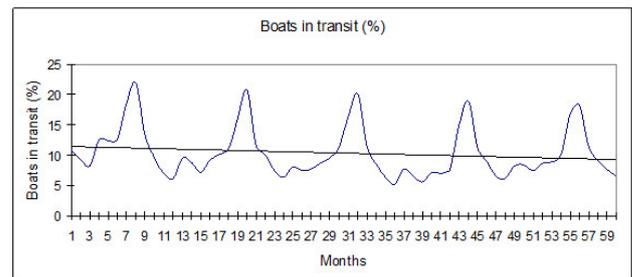
Source: Own elaboration. Data from APPA.

Once a general notion of the occupancy rates and waiting lists in a significant number of Andalusian ports has been presented, the next step of the analysis will be the characterization of the type of user in each facility.

### 3.4. Yachts in transit.

In order to characterize the users, we will now focus on the origin of the yachts. In this respect, the vast majority of leisure boats in the region are moored in their "home" port and have a basic contract with the APPA, either ordinary (signed for a period of one year), special (for a renewable period of two years) or long-term (for a longer period). However, there is a percentage of yachts that are in transit, i.e. using the facilities temporarily. Figure 8 shows the monthly evolution of yachts in transit in the ports of the region over the last 5 years.

Figure 8: Boats in transit at marinas (total).



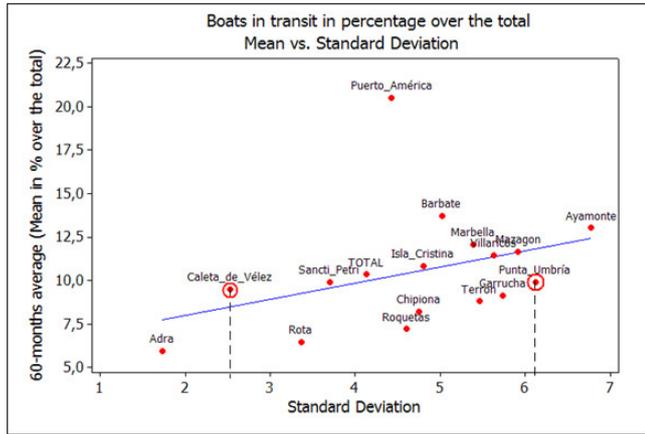
Source: Own elaboration. Data from APPA.

As with mooring occupancy, peaks are observed, in this case of transiting vessels, during the peak seasons. However, a different trend is observed. While the occupation in the ports as a whole was increasing, in the case of boats in transit it is decreasing, i.e. the % of boats in transit over the total is lower every year. Although the data may seem contradictory, in reality, what it is doing is to endorse the fact that the high occupancy of some ports makes it difficult to visit them, either in coastal navigation (from other ports in the region or other Spanish regions), or in foreign navigation (from Morocco or other areas of the Mediterranean). In short, if we assume that the Andalusian coastline remains attractive, this is just another sign that the current nautical-sports offer could begin to be insufficient.

On the other hand, if we represent the mean and standard deviation in Cartesian axes, as we did with the occupation but with the yachts in transit, we obtain an approximate representation of the activity of each port, see Figure 9. First of all, we observe a certain correlation in the port measures (mean and standard deviation). Only Port America, with approximately 20% of the yachts in transit, escapes this correlation. Overall, the percentage of vessels in transit during the last 5 years (60 months) has moved between 5% and 15% of the total.

To analyze the effect of the standard deviation it is sufficient to take a sample of two ports (Caleta de Vélez Málaga and Punta Umbría for example) and observe the evolution of the yachts in transit during those 60 months, see Figure 10. As with occupancy, the port with the highest standard deviation (Punta Umbría) presents more pronounced peaks in the summers. This can be interpreted as a greater capacity to receive short stays of yachts in high season. In contrast, the port with the lowest standard deviation (Caleta de Vélez-Málaga) lacks this capacity, either due to lack of attractiveness or lack of moorings to

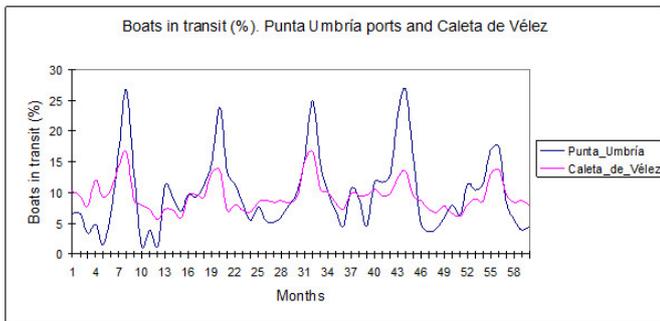
Figure 9: Boats in transit at selected marinas.



Source: Own elaboration. Data from APPA.

cover this demand for short stays. In general, each case can be analysed according to its particular characteristics.

Figure 10: Boats in transit at two selected ports.



Source: Own elaboration. Data from APPA.

Several conclusions can be drawn from the analysis of the current situation. Firstly, there is a reasonable amount of data to make projections and predict the future demand of nautical services in Andalusia. However, this demand is highly dependent on the location of the marina. Secondly, there are ports with high occupancy rates, while others have a medium or low occupancy rate. Thirdly, occupancy is not homogeneous throughout the year. Some ports have important peaks of high occupancy during the high season between October and March. A simple solution to cope with this problem is to increase the number of dry marinas and to convert spaces close to ports into storage spaces for small boats. This is already being carried out in some ports (e.g., Almerimar) with success (Martínez-Vázquez et al. 2022). All these aspects together with the uncertain international derived from the COVID pandemic and the war in Ukraine make complex to predict the future demand for nautical facilities in Andalusia. Although time series can be used to extrapolate current figures into the future, this method excludes other parameters that have an important influence on demand. Consequently, it is necessary to develop a more robust method that includes more related variables to predict demand. Having justified the need for a new method, the next section develops

the proposal.

#### 4. Methodological proposal for demand valuation.

##### 4.1. General characteristics of demand.

Nautical facilities, and especially marinas, have very complex demand parameters. Some of the factors that directly affect the market for nautical facilities are physical (length and type of coastline, maritime climate, bathymetry), others are socio-economic (population, tourism, income level and economic activity) and, finally, there are other non-quantifiable elements that also influence the market, such as maritime tradition, culture, nautical sports enthusiasts, etc. All these elements directly condition the demand for nautical leisure facilities in a given area.

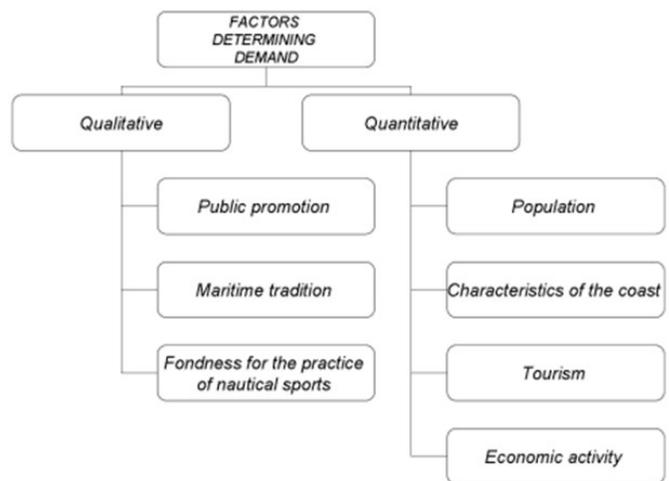
It is very unusual that a wide, permanent and diversified supply of facilities exists to cover the demand in all its importance and complexity. The real demand only becomes clear when there is an oversupply and especially when there is an oversupply of the main variable used to quantify the market, which is the number of moorings. This variable is the most common to calculate the capacity of marinas.

In short, the most complete models and techniques to study the market for nautical-recreational facilities in a given coast are based on considering the elements that condition the demand for moorings. Therefore, the demand for this variable is always analyzed indirectly in all studies and port plans, through the main elements and factors that condition it.

##### 4.2. Factors determining demand.

As mentioned above, the factors that directly affect the demand for moorings can be quantitative or qualitative, see Figure 11.

Figure 11: Factors determining demand.



Source: Own elaboration.

The former are based on representative magnitudes of the element conditioning demand, while the latter, which are impossible to quantify, are of great importance in determining how

demand will manifest itself in the future. The latter explain why coastal areas with similar levels of population wealth and income have very different demands for nautical facilities, or why even regions with harsh climatic conditions have a higher number of boats in relation to the population than other areas with climates more favorable to water sports. The most representative qualitative factors that are usually highlighted in all demand studies are basically the following three: public promotion, maritime tradition and fondness for the practice of water sports.

- Public promotion. Despite the fact that boats of all types are becoming more and more affordable for a wider public, public promotion is a determining factor in the development of this industry. In this sense, public subsidies for sailing and the construction of ports and marinas have traditionally been incentives to encourage the demand for boats, moorings and all related elements, including nautical tourism.

- Maritime tradition. Geographical and historical factors are two driving forces behind the increase in the supply of moorings. Some municipalities have a long and deep-rooted tradition linked to the practice of fishing which is the basis of their local economy. Today, this tradition is manifested through a gastronomic culture linked to the sea. The importance of this ancient industry in Andalusia has already been discussed in Vázquez (2003) and Paz Martí (2018).

- Fondness for the practice of nautical sports and recreational boating. Last but not least, there is a double phenomenon inextricably linked to the sea: the practice of nautical sports (often encouraged from childhood through sailing schools) and nautical leisure in general, see Rivera Mateos (2010). These aspects affect not only the demand for new boats, but also the equipment associated with them, the first of which is mooring. At the same time, the practice of some nautical sports can be a potentially source of conflict on the coast (González Ramallal et al. 2010).

On the other hand, the quantitative factors that affect the demand for moorings and that are usually highlighted in all studies on nautical facilities are the resident population, the characteristics of the coast, tourism and economic activity.

- Population. The amount of resident people near the sea is the first element that conditions the practice of water sports and recreational boating throughout the year and, therefore, is the first significant element of demand.

- Characteristics of the coastline. Perhaps the most important parameter to take into consideration when evaluating the global nautical demand in coastal municipalities is the length of the coastline measured in kilometers. Other parameters and conditioning factors are the specific bathymetry of the port and the wind, waves and currents of the coastal area where the port is located.

- Tourism. The demand for boats and nautical facilities grows with non-residents. This parameter can be analyzed through the number of overnight stays in hotels, the number of foreign passengers at the airports, etc. Tourism Indices can be used to reflect the importance of the activity or its relative weight in a region with respect to others or to the Spanish total.

- Economic activity. Logically, the demand for boats and

nautical facilities grows with the income level of the population. Likewise, nautical activity generates employment, and has an added value for the economy. With all other variables constant, demand is an increasing and proportional function of the variables representing the wealth of the resident population. These variables can be per capita income, employment generation, value added, or any other index of economic activity.

#### 4.3. Selected indicators and projected scenarios.

It is considered that the above factors, measurable through different magnitudes are adequate and sufficient indicators to explain nautical demand in Andalusia. The method for making demand projections consists of applying the ratios observed in Spain to Andalusia. The quantitative indicators that most directly affect the demand for moorings and for which precise information is available in Andalusia (and for the Spanish coastline as a whole) are: distribution of marinas and moorings, population and length of the coastline, tourist activity (described by the *Monitur* tourist index and the nautical tourism index) and economic activity (described by the generation of employment and the Added Value of the nautical sector). The sources of these indicators are diverse:

- For the population projections, the best resource is the official census, available on the website of the National Institute of Statistics (2023). Projections can be made at regional or local level by municipality, depending on the needs of the study. The population projection can be expressed as population per existing mooring in the region.

- To assess the characteristics of the coast, the best indicator is the length of the coastline measured in kilometers. These and other data can be obtained from the website of the Ministry for Ecological Transition and the Demographic Challenge (2023) which is a reliable source of information. As mentioned above, some parameters and constraints (such as bathymetry, average wind, waves and currents) are difficult to include in a regional-level perspective. In contrast, the length of the coastline can be easily combined with other parameters, e.g. the number of moorings per kilometer of coastline.

- To assess tourism potential in general and nautical tourism specifically, the selected source is the *MoniTUR* Report (2018). This report is published annually by *Exceltur* (an association made up of 34 of the most relevant companies in the entire Spanish tourism value chain). These companies provide the *MoniTUR* Tourism Index (TI) that comprehensively quantifies the relative competitive position of the tourism offer of the 17 Autonomous Communities in Spain. Specifically, *MoniTUR* evaluates the capacity of each Autonomous Region through 82 objective indicators. Among the 82 objective indicators used to construct the *MoniTUR* index, there is a specific index on the value of Nautical Tourism (NT). As a result, two indicators can be used, the number of moorings per unit of the Tourism Index (Moorings/TI) and the number of moorings per unit of the Nautical Tourism Index (Moorings/NT).

- Finally, to assess the importance of the nautical-sports sector in the economy, it is proposed to use two indicators measured by the National Association of Nautical Companies (ANEN 2021), which are the employment generated and the value added

to the economy. As a result, two indicators can be obtained, the number of moorings per unit of the Employment Index (Moorings/Employment) and the number of moorings per unit of the Added Value Index (Moorings/Value Added).

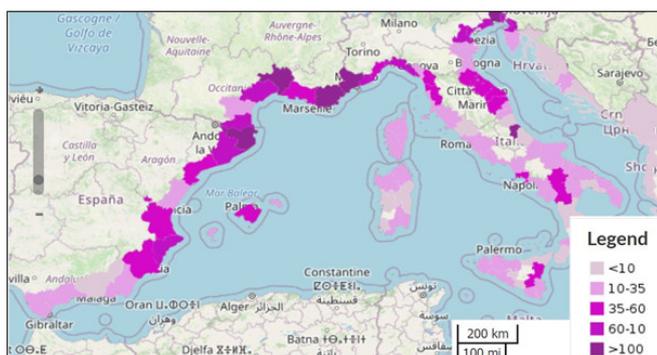
With the above mentioned ratios or representative standards of nautical facilities we have a clear picture of the sector itself (in relation to the length of coastline, population, tourism indices and economic activity). Consequently, a composite function can be drawn up for each of the Autonomous Communities of the Spanish coastline and specifically for Andalusia. The following hypotheses on the potential demand for moorings are proposed:

- In the neutral hypothesis the expected demand is the average of the minimum and maximum scenarios.

- In the minimum scenario (or pessimistic hypothesis) there is no change in demand. The number of moorings for the future population is obtained as an extrapolation of the current indicators in Andalusia.

- In the maximum scenario (or optimistic hypothesis) there is an important change in demand that is driven by the Administrations. The supply of moorings tends to be equal to that existing in the Spanish Mediterranean and to obtain it, the average indicators of the Mediterranean Autonomous Regions (Andalusia, Murcia, Valencia and Catalonia) are extrapolated. This scenario is inspired by the observed fact that in the western and central Mediterranean, adjacent stretches of coastline, even in different countries, tend to equalize their nautical offer. This is the case between the Costa Brava and the Côte d'Azur or between the Côte d'Azur and the Italian Riviera Ligure, see Figure 12.

Figure 12: Marina port capacity by number of moorings / km of coastline.



Source: <http://data.tools4msp.eu/maps/>.

The use of these indicators together with the scenarios expected by the Government of Andalusia can be used to easily determine the number of moorings need per 1000 inhabitants, the moorings / km of coastline, etc. in the short term, medium term or even in the long term. The determination of the number of moorings needed in each stretch of coastline is beyond the scope of this paper.

## Conclusions and future research.

Marinas are an important and dynamic element for the economy in Andalusia. This paper analyses the nautical sector and proposes a theoretical methodology to determine the future demand for moorings in Andalusia. The supply of moorings can be expressed as a composite function of the physical conditions of the coastline (length of coast), the existing population (inhabitants), the general tourist potential and the particular potential of nautical tourism (both in terms of Exceltur indicators), and the economic potential of the region expressed as the employment generated and the added value in the economy by the nautical sector.

The composite function can be constructed and then extrapolated into the future to make predictions for Andalusia and other regions. With the selected indicators, decision makers can consider three scenarios (optimistic, pessimistic and neutral). Although the method is a simplified theoretical approach, it can be used to roughly estimate the future demand of moorings in Andalusia. As mentioned above, the determination of the number of moorings needed on each stretch of coastline, as well as the selection of the most appropriate scenario, is beyond the aim of the present paper.

In sum, the two main goals of the study have been achieved. The data analysis has shed light on the use of nautical facilities, and the theoretical proposal has opened a window to predict demand avoiding the use of more traditional methods such as time series based on a single variable. In the future, it could be an interesting line of research to include more indicators with the same general methodology. In particular, indicators related to air pollution (e.g., CO<sub>2</sub> eq pollution units) and indicators related to ecological impact at sea (e.g., number of spills detected per 1,000 yachts).

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