

# ID1- NAUTICAL AND ENVIRONMENT: PRESENT AND FUTURE OF ENVIRONMENTAL QUALITY IN AREAS OF ANCHORAGE IN MARINE PROTECTED AREAS

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*Abstract* – Recreational boating has experienced in recent decades a boom supported by the construction and development of port infrastructure. The establishment of marine protected areas attracts yachts and professionals seeking that prefer a well-preserved environment to develop their activities. Numerous studies have shown that the large volume of ships that frequent these areas has a significant impact on seagrass beds and other sensitive biological communities, due to the use of anchors and chains, which have a destructive effect of the seabed. There are different alternatives of “ecological mooring” depending on the type of substrate and desired strength. In Irta Marine Reserve (Peníscola, Spain) were installed a total of 33 mooring points using the Ellipse III anchoring system.

*Keywords:* anchorage, seagrasses, Ellipse, ecological mooring.

## INTRODUCTION

Traditional anchoring system causes extensive damage to the seabed. Anchors are inserted into the seabed and when anchor drag event occurs, remove any type organism. Moreover, the chains during swinging on changes in wind direction plow seagrass leaves and cause damage to numerous sessile organisms that habit these ecosystems (1). In recent years has created a new management model of nautical activities, based on the empowerment of areas that offer mooring systems of low impact. The installation of these systems requires a prior diagnosis of each case study to determine the type most appropriate and its goal is the conservation of seagrasses beds and sensitive biological communities.

Anchoring systems of low impact or “ecological moorings” are composed of two main elements, the anchorage and mooring line. Are based on two principles, firstly, the seabed surface affected by the anchor is minimized and then, that the mooring line is not in contact with the seabed, which is achieved by using intermediate buoys that maintain the floating line. In this way, prevents the erosive halo caused by concrete ballasts, which can move, and mooring lines to crawl with its consequent effect of plowing.

Anchors alternatives presented in the market that must be evaluated by substrate existing, cost, difficulty of installation, etc. In areas where there are seagrass and soft bottoms, two systems are mainly considered, some are installed using hydraulic hammers devices (Manta Ray, Duckbill, Sting Ray, darn, etc.) and others, by rotating (Ellipse, Harmony, Helix, etc.).

The first system consists of a metallic anchor made of composition metal of spheroid graphite and aluminum bronze, which is introduced into the substrate pushed along guides by using a hydraulic hammer. Once reached the desired depth, the anchor is blocked by a pull, remaining in horizontal position and offering great resistance. Depending on the size and depth of the full range of anchors, a resistance range between 10 and 150 KN is achieved. It can be installed on sandy bottom or seagrass beds.

The rotating system has two variants, one is a spiral-shaped structure made of galvanized steel that is inserted directly into the root ball of *Posidonia oceanica* (2). In case of finding areas with sandy substrate, may be installed other system composed of a principal axis that has helical structures of different diameters that are screwed into the soft bottom. Both structures can be produced in different sizes and offer the possibility of multiple assemblies, connecting up to 4 items using a bar of galvanized steel of 15 centimeters square section. Thereby can be achieved resistance range between 43 KN and 172 KN.

## STUDY CASE: IRTA MARINE RESERVE

The Irta Natural Park and Irta Marine Reserve, in the province of Castellón, Spain, are also spaces cataloged as a Site of Community Importance according to the Habitats Directive Natura 2000. In this area, the company Mediterraneo Servicios Marinos took place the installation of 33 anchorage points at a depth of 5.5 m, using the Ellipse III double and quadruple system assembly. For that were joined several items using a square bar of galvanized steel, for boats up to 20 m in length. Each element is of 2 m in height and has a shaft of 28 mm in thickness with two helical structures of 30 cm and a diameter of 40 cm, reaching a

weight of 28kg. At the top has a strongly welded to the main shaft which allows the attachment of the mooring line. The entire assembly reaches a weight of 86 kg. The metal is treated with a corrosion process in accordance with the rules of galvanizing NF ISO 1461 and 14713 and marked with the letters CMU or SWL specifying the maximum useful load.

## WORK TECHNICAL CONSIDERATIONS

- The system used was chosen after conducting empirical tests of resistance with different shooting angles and different substrates, which provided assurance about the capability of the anchorages in this area. The double system provides an equivalent resistance to 8 tons concrete ballast depending on substrate type.

- Previously, took place a campaign for review the substrate with air lance at points where it should install the anchorages to ensure that they could achieve the necessary thickness. In this campaign was determined the existence of a layer of compacted clay, which gave no problems during installation.

- With this system, in addition, the problem of the loss of depth at the point of anchorage that result from use of concrete ballast is resolved, since in shallow areas like this may be problematic.

- For installation of moorings was made a hydraulic instrument in the metalwork assembly shop of the company under the guidance of experts. This device was operated by two divers and a technical surface allowing the installation of anchors using a vessel of reduced dimensions.

- The mooring buoys used were the model AMR 650 40Q of Mobilis, with accessible loop in surface and made of high density polyethylene, suitable for areas exposed to currents and waves. This system protects the anchor line of propellers.

## REFERENCES

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