

# Sanitary study of the Tagus river estuary

Presado P.<sup>1</sup>, Pereira S.<sup>1</sup>, Oliveira R.<sup>2</sup>, Fraga M.<sup>1</sup>, & Freitas R.O.<sup>1</sup>

<sup>1</sup> Portuguese System for Bivalves Molluscs Monitoring, Department of Sea and Marine Resources, Portuguese Institute for Sea and Atmosphere, Portugal

<sup>2</sup> Division of Aquaculture, Directorate-General for Natural Resources, Safety and Maritime Services, Portugal



## Introduction

The Influence Area (IA) of the Tagus River estuary has, according data from INE (2011), 2,822,424 inhabitants, with the largest population located in the municipalities of Lisbon (552,700 inhabitants), Sintra (353,702 inhabitants) and Loures (199,494 population). In the IA there is a significant production of cattle, pigs and poultry, which may influence the microbiological contamination of bivalve molluscs, mainly upstream of the Bivalve Harvesting Area (BHA), as a result to the excessive production of cattle and poultry in the Benavente area, next to the Sorraia river. Within IA, there are 95 Wastewater Treatment Station (WWTS) discharging into the Tagus River and it is serving a total of 3,868,349 equivalent inhabitants. From the 95 WWTS, 23 WWTS have more advanced treatment than secondary, 66 WWTS secondary treatment, 4 WWTS primary treatment and 2 WWTS have no treatment, influencing the microbiological contamination of bivalve molluscs (APA, 2014). This influence is supported by the results of the hydrodynamic particle propagation study carried out in this sanitary study (Picado, 2020). It should be noted that the Portinho da Costa WWTS discharges effluents through a submarine outfall at a depth of 25 m and approximately 25 m from the south bank of the Tagus River, which may have a slight influence on the bivalve molluscs at this location under neap tide conditions.

## BIVALVES

The bivalve molluscs species that are more frequent monitored at BHA of the Tagus estuary are: manila clam, cockle, warty venus clam and peppery furrow. In the sanitary study the microbiological analysis occurred every 15 days.

Table 1. Bivalve molluscs present in BHA of Tagus estuary.

Bivalve Harvesting Area	Code	Species	
Tagus River Estuary, downstream Vasco da Gama bridge	ETJ1	Manila clam	<i>Ruditapes philippinarum</i>
		Cockle	<i>Cerastoderma edule</i>
		Peppery furrow	<i>Scrobicularia plana</i>
		Mussel	<i>Mytilus</i> spp.
Tagus River Estuary, amount Vasco da Gama bridge	ETJ2	Warty Venus Clam	<i>Venus verrucosa</i>
		Manila Clam	<i>Ruditapes philippinarum</i>
		Cockle	<i>Cerastoderma edule</i>
		Peppery furrow	<i>Scrobicularia plana</i>



Figure 1. From left to right – Manila clam, cockle, peppery furrow, mussel and warty venus clam.

## MICROBIOLOGICAL ASSESEMENT OF BIVALVE HARVESTING AREA

In 1996 there was only one BHA, namely ETJ – Tagus river estuary. There was BHA classifications in 2000 and 2001 without limits (Despacho no. 5188/2000 of March 4<sup>th</sup>, Despacho no. 12262/2001 of June 9<sup>th</sup> and Despacho no. 14829/2001 of July 16<sup>th</sup>). In the following classification, published in 2003 (Despacho no. 13433/2003 of July 9<sup>th</sup>), the BHA was defined with the following limits: upstream area between Vila Franca de Xira and São Julião da Barra and downstream area between Vila Franca de Xira and Cova do Vapor to São João da Caparica beach. In the classification published in 2005 (Despacho no. 16167/2005 of July 25<sup>th</sup>), the limits were updated to the area between the Vila Franca de Xira bridge and the imaginary line that connects São Julião da Barra (right branch), Bugio and São João da Caparica beach on the left branch. On the right branch, the area between the limit of Cala Norte and Belém tower were excluded. These limits were maintained in the following classifications published in 2007, 2008 and 2010 (Despacho no. 9604/2007 of May 25<sup>th</sup>, Despacho no. 19961/2008 of July 28<sup>th</sup> and Despacho no. 14515/2010 of September 17<sup>th</sup>).

In 2013 (Despacho no. 15264/2013 of November 22<sup>nd</sup>), new limits were define for the area between the Vila Franca de Xira bridge and the imaginary line that connects S. Julião da Barra (right branch), Bugio and the limit of S. João da Caparica beach, on the left branch. On S. Julião da Barra (right branch), the area between the Cala Norte and Gibalta lighthouse were excluded. On the left branch the area between the Seixal channel and the Barreiro channel were excluded as well.

For the present study, 17 sampling harvesting locations (Figure 2) were selected. This locations represented the bivalve harvesting areas in the Tagus River estuary. Some were outside the BHA (Ponta dos Corvos and three points in Barreiro), in order to confirm its current contamination status. Sampling was carried out between November 2019 and February 2020. Some of the samples were collected three times more (than that was planned) because they required a bigger number of samples, spaced out in time, due to several factors, such as levels of microbiological contamination and location.

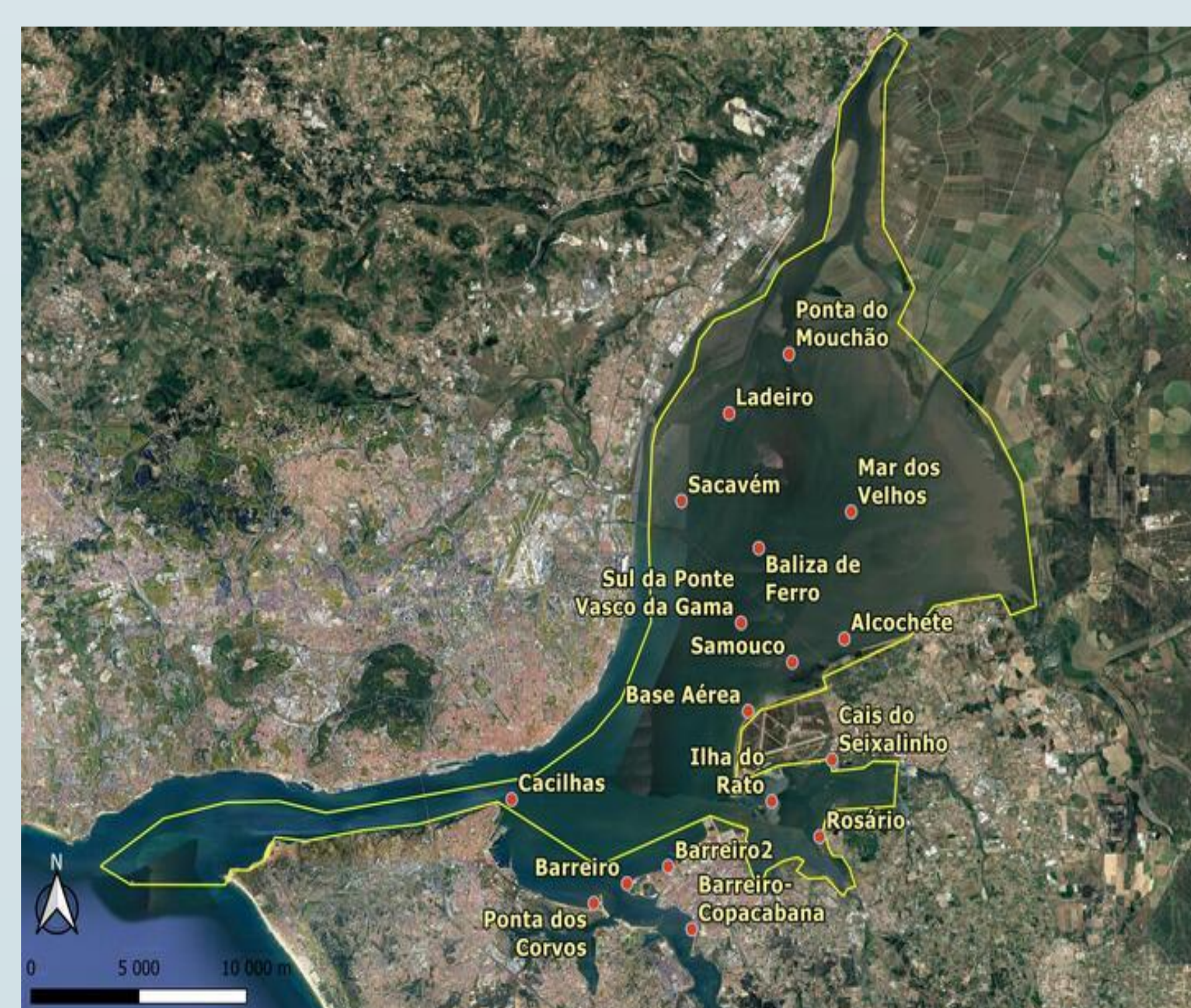


Figure 2. 17 Sampling harvesting locations

## RESULTS

In Despacho no. 4362/2020 of April 9<sup>th</sup>, were defined new limits and the BHA ETJ was divided into two distinct harvesting areas: ETJ1, downstream of the Vasco da Gama bridge and ETJ2, upstream of the Vasco da Gama bridge. This division was supported by the hydrological modulation study (propagation of particles originating from WWTS in IA) (Picado, 2020), the microbiological analysis results and data obtained in this sanitary study. In addition, the following changes were made in the ETJ1 harvesting area:

1. Inclusion of the beach between the end of Alfeite and Ponta dos Corvos, in Miratejo (Seixal);
2. Exclusion of the entire Baía da Moita/Montijo;
3. Exclusion of the surrounding area of the Montijo Air Base due to the possibility of building the new airport;
4. Exclusion of the surrounding North area of the Vasco da Gama bridge (area negatively influenced by the discharge of treated effluents from the Beirolas WWTS).

In the ETJ2 bivalve harvesting area, the Vila Franca de Xira branch was excluded as the Mouchão da Póvoa de Santa Iria to Sacavém/Tranção river mouth. According the Despacho no. 4362/2020 of April 9<sup>th</sup> the end of the this BHA limits became the south end of Vasco da Gama bridge.

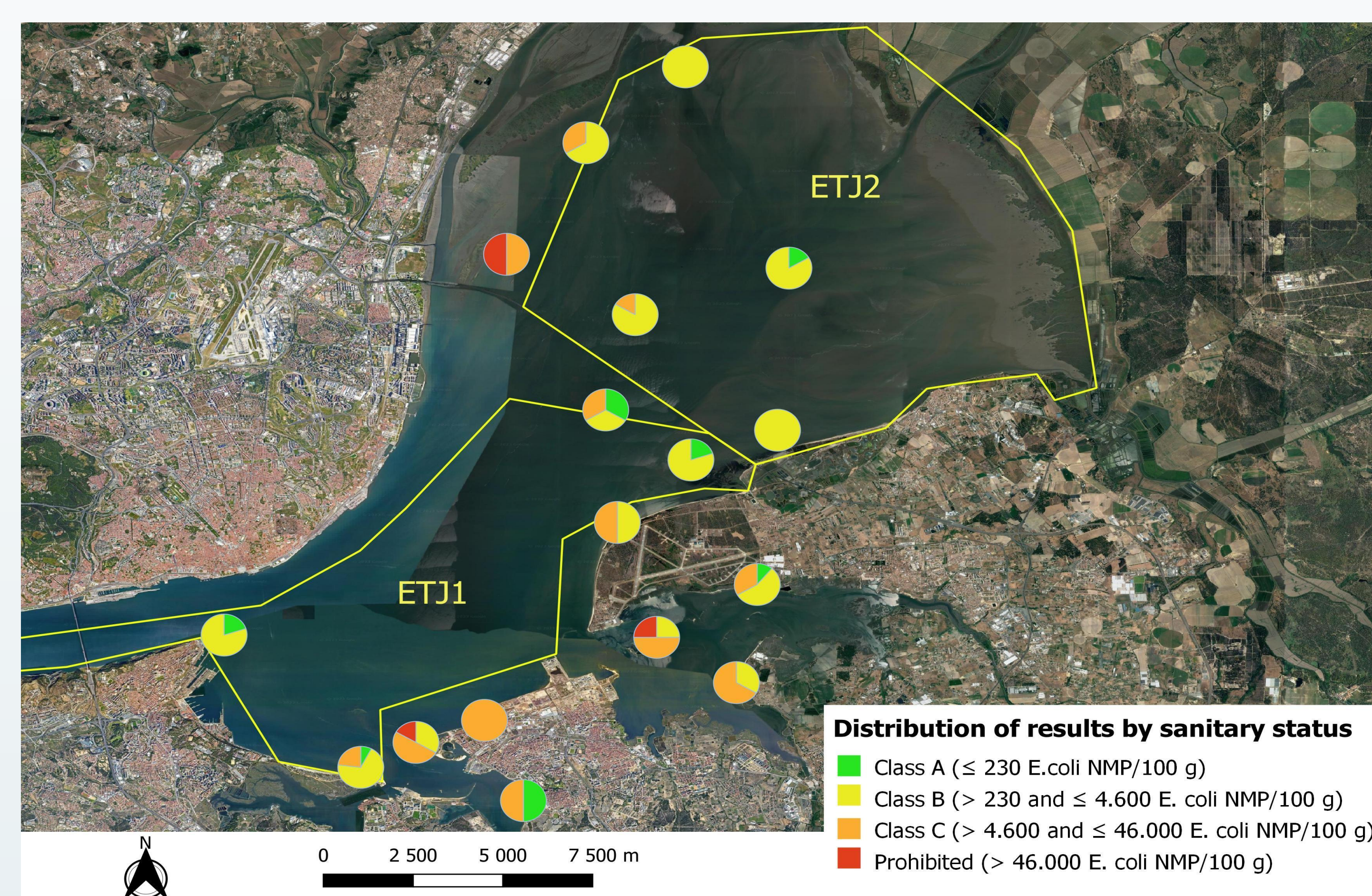


Figure 3. Distribution of results in 17 sampling locations by sanitary status.

## CONCLUSION

Figure 4 shows the final image of the new delimitation of the bivalve harvesting area of the Tagus estuary. It is important to highlight that sanitary studies such as this one, prove to be extremely important for a deeper and more robust knowledge about the microbiological contamination of bivalve mollusc harvesting area and, therefore, building and making decisions in accordance with the scientific reality of each area.



Figure 4. New delimitation of the harvesting area of Tagus estuary.

## References

- APA. (2014). Data base of Hydrographic Region Management Plans. Portuguese Environment Agency.
- INE. (2011). 2011 Census – XV general population census and V general housing census. National Statistics Institute. Available at: <http://mapas.ine.pt/map.phtml>
- Picado, A. (2020). Hydrodynamic study of the Tagus Estuary and the propagation of particles study from WWTS in the Tagus Estuary IA. Center for Environmental and Marine Studies (CESAM) at the University of Aveiro. Personal communication and received by email.

## Acknowledgements

This work was supported by:  
SNMB – Monitor (16.02.01-FMP-0043)  
SNMB-MONIT II (MAR-02.01.02-FEAMP-0177)  
SNMB-MONIT III (MAR-02.01.02-FEAMP-0213).

