

# Trends in strandings of *Physeter macrocephalus* in the western Mediterranean Sea (1972-2019)



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## 1 INTRODUCTION

Since the studies of Brotons (1996) we know that the sperm whale is a resident species in the Mediterranean, a genetically different population from the Atlantic (Drouot et al., 2004). In the Mediterranean Sea, the sperm whale is distributed throughout the whole basin, from the Strait of Gibraltar, to the most eastern edge.

Tracking cetacean strandings is an effective method to study their mortality without needing a direct sampling. In addition, global data suggest that sperm whales are among the most frequently stranded species of large cetaceans.

In this context, this study has had three main objectives:

### OBJECTIVE 1

To analyze the annual spatial and seasonal trends of strandings in the basin.

### OBJECTIVE 2

To compare patterns between geographic areas within the study area.

### OBJECTIVE 3

To study the impact of commercial maritime traffic on this species.

## 2 METHODS AND STUDY AREA

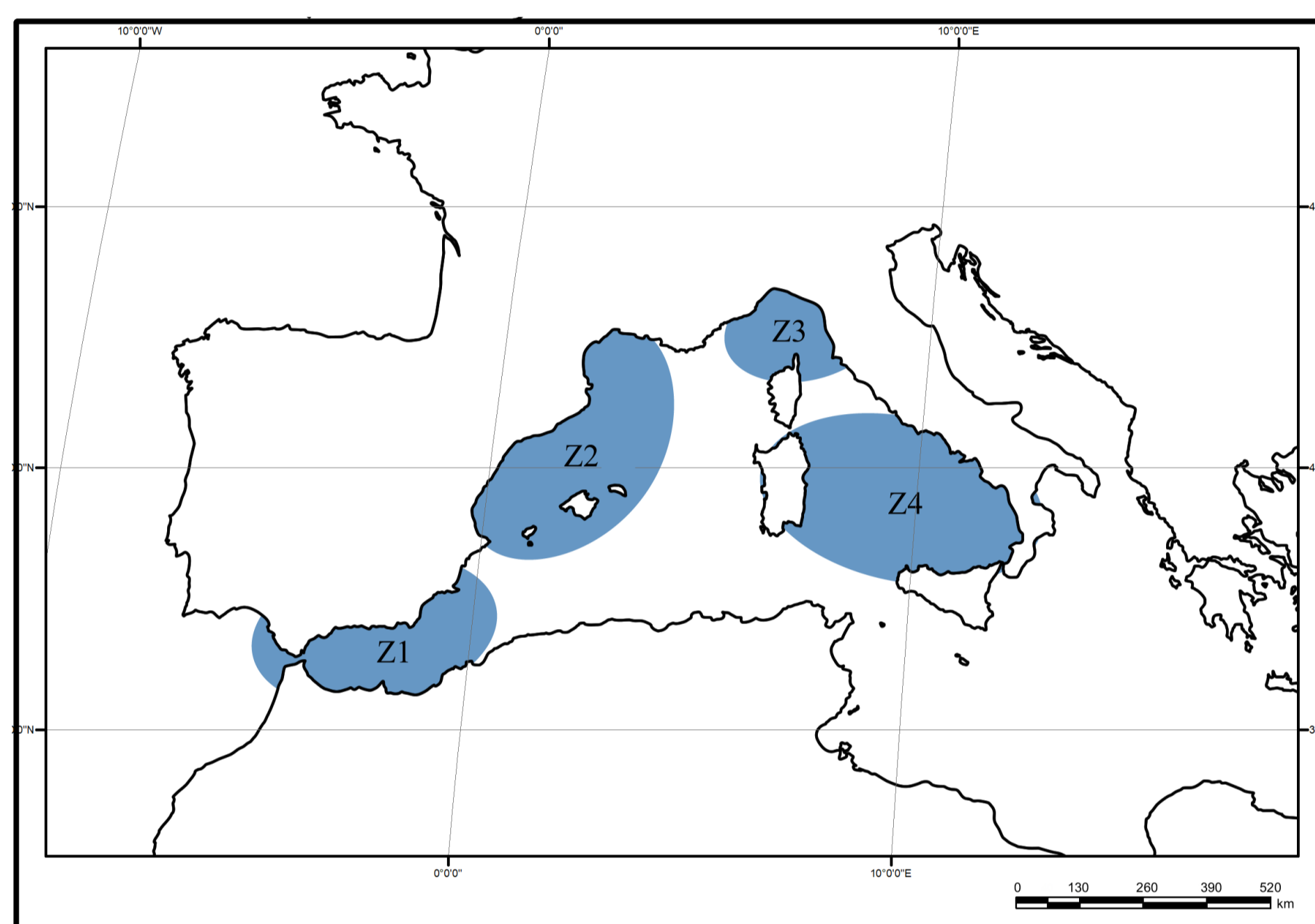
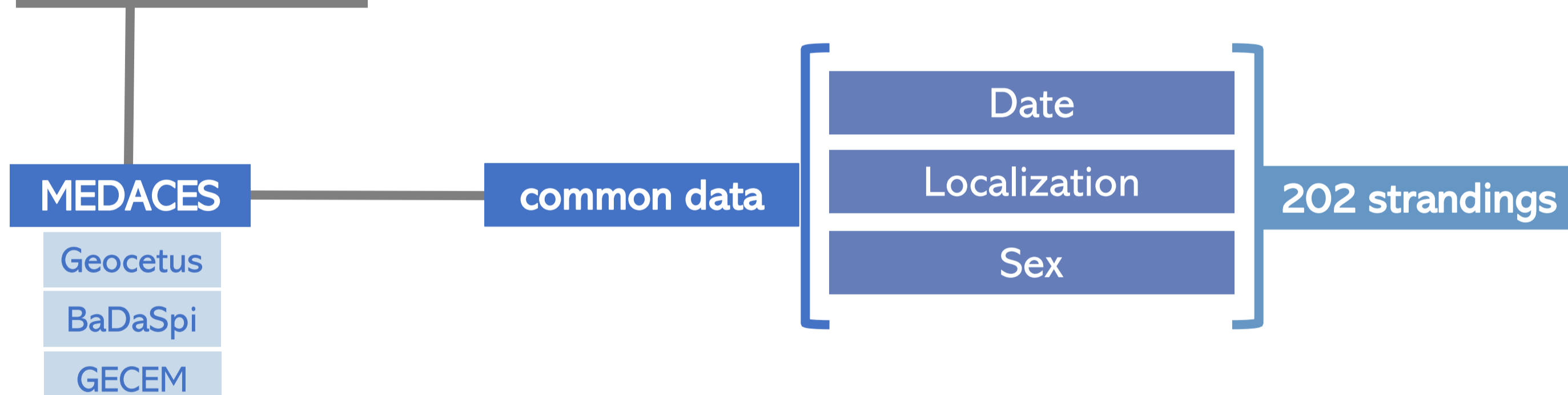


Figure 1: Areas of study determined from the subpopulations of *Physeter macrocephalus* resident in the western Mediterranean, described by Gannier et al., 2002.

- Z1** ZONE 1  
Strait of Gibraltar.
- Z2** ZONE 2  
Balearic Islands, Valencian coast, Catalan coast, Gulf of Lion.
- Z3** ZONE 3  
Ligurian Sea.
- Z4** ZONE 4  
Tyrrhenian Sea.

Stranding database was generated with data from different organizations:



Commercial vessels number data of the three main ports in each zone, was collected from official port's annual reports. Marine traffic density maps were created from EMODnet data. The information was arranged as follows:

Table 1a: Choice and organization of the values of number of ships moored in ports according to each zone.

Three main ports in each zone	Z1	Z2	Z3	Z4
	Algeciras, Málaga, Cartagena	València, Barcelona, Montpellier	Gènova, La Spezia, Bastia	Civitavecchia, Napoli, Cagliari

Table 1b: Categories generated for the subsequent analysis of maritime traffic.

Marine traffic (vessels/year)	A	B	C	D	E
	0-100	100-1000	1000-5000	5000-15000	15000<

## 3 RESULTS & DISCUSSION

### Trends and patterns in strandings

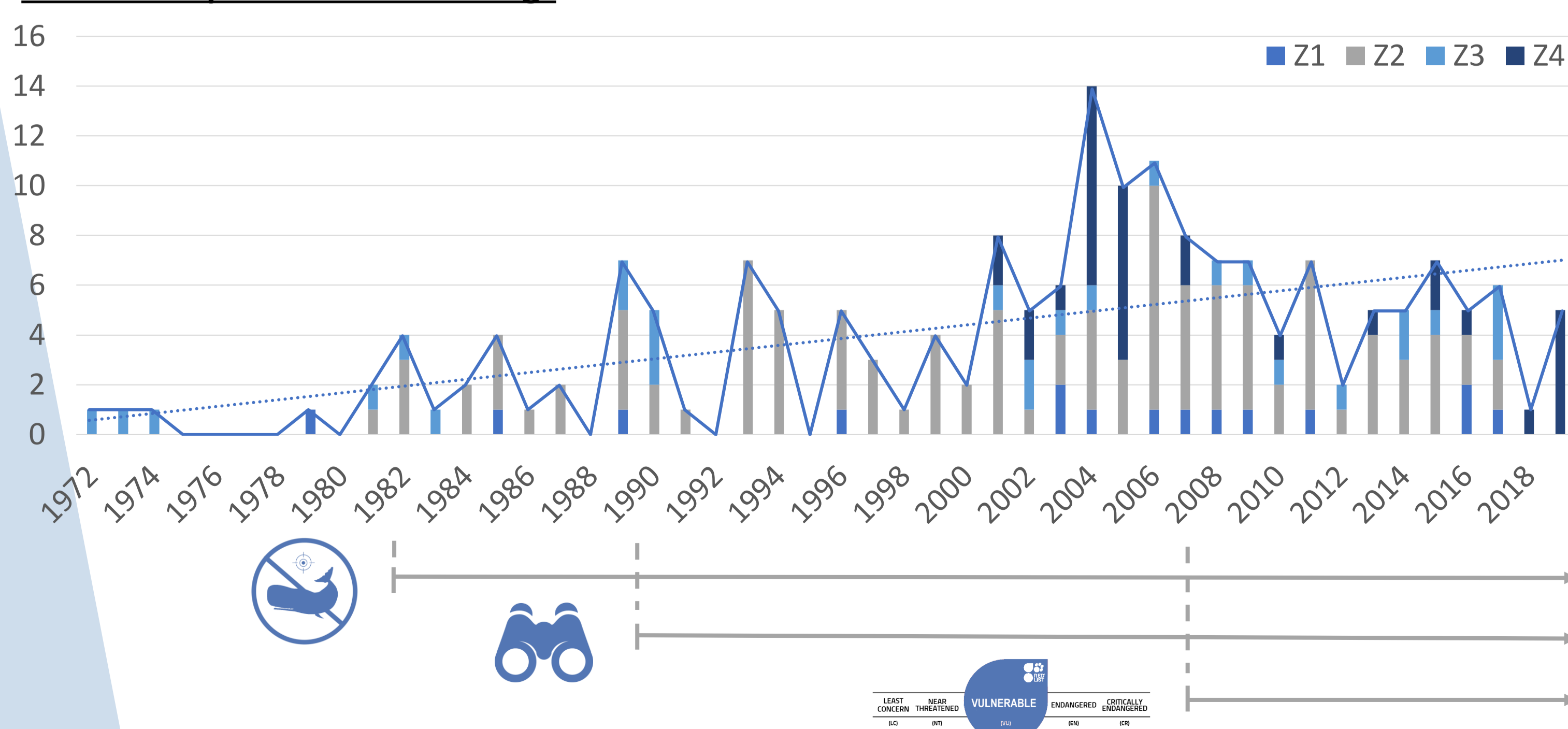


Figure 2: Number of strandings of *Physeter macrocephalus* represented annually by each zone between 1972 and 2019. Line graph combining total values and trend line.

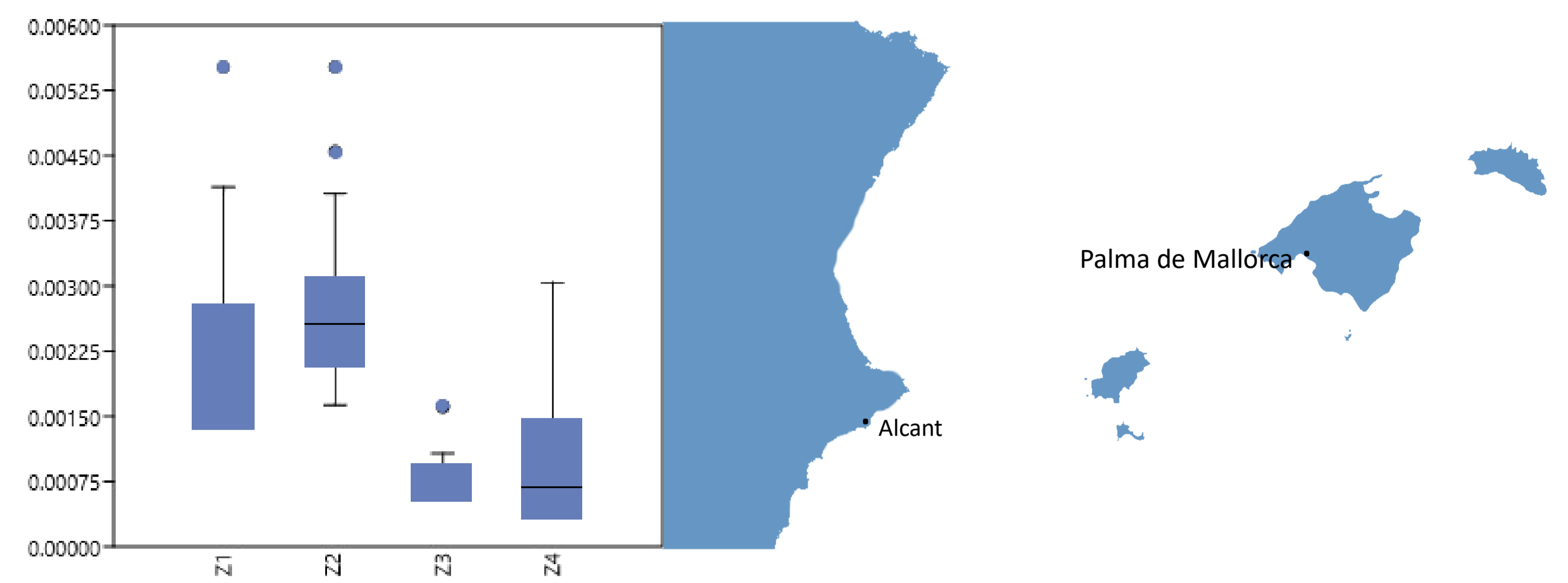


Figure 3: Strandings expressed in proportion to the length of the coasts for each zone of study.

Within zone 2, Alacant and the Balearic Islands must necessarily be understood as a single subzone, due to the large proportion of strandings.

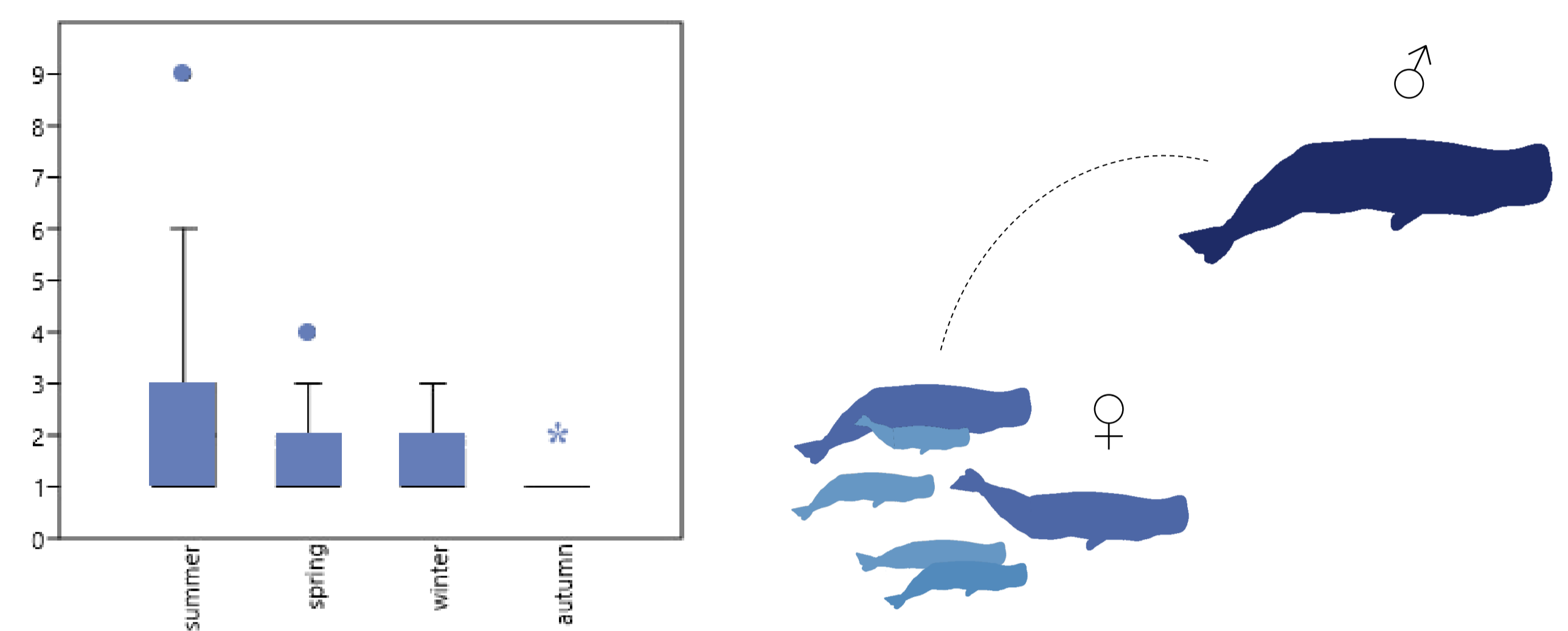


Figure 4: Seasonal representation of the average and the dispersion of the strandings.

### Marine traffic interferences

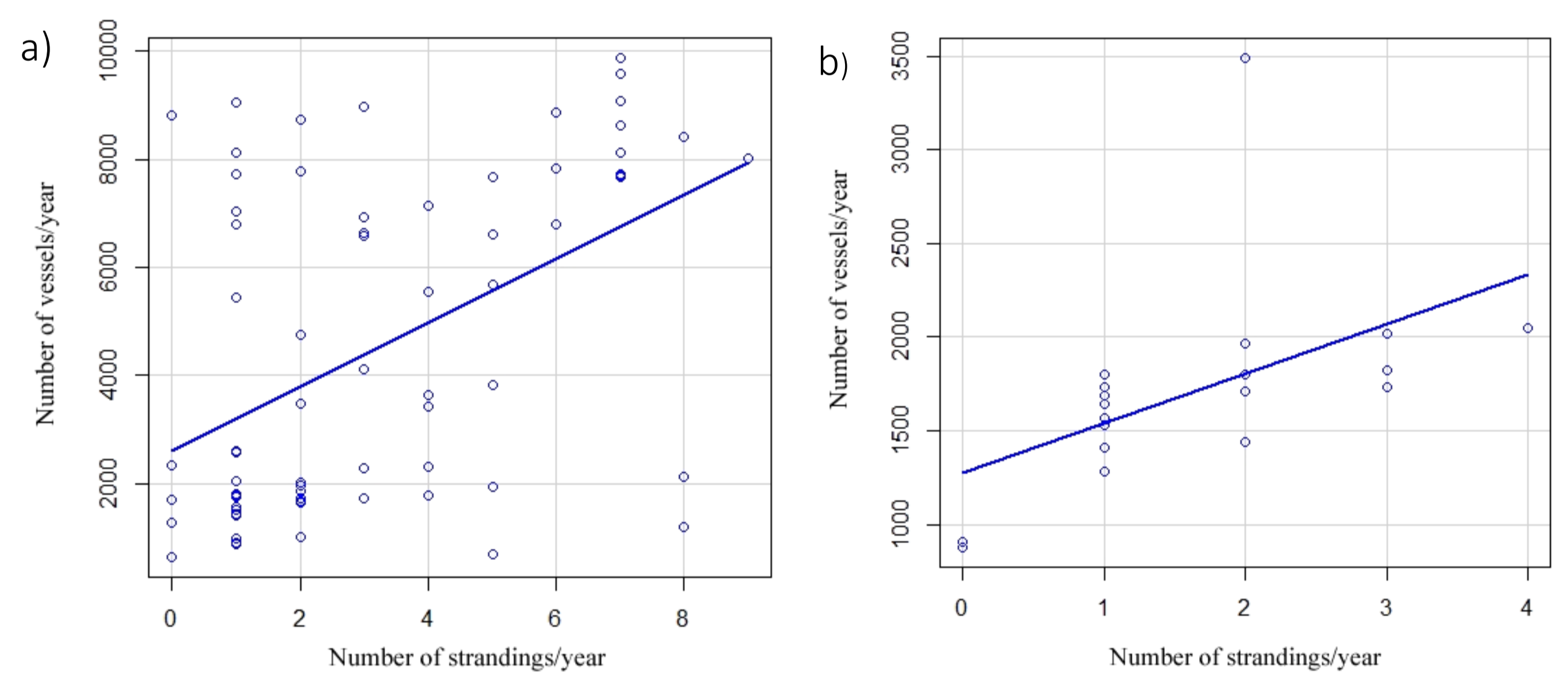


Figure 5: Pearson correlation. a) Total number of strandings depending on the total number of cargo ships that passed through the three busiest ports in the four study areas, for the same year. b) Same data for zone 1.

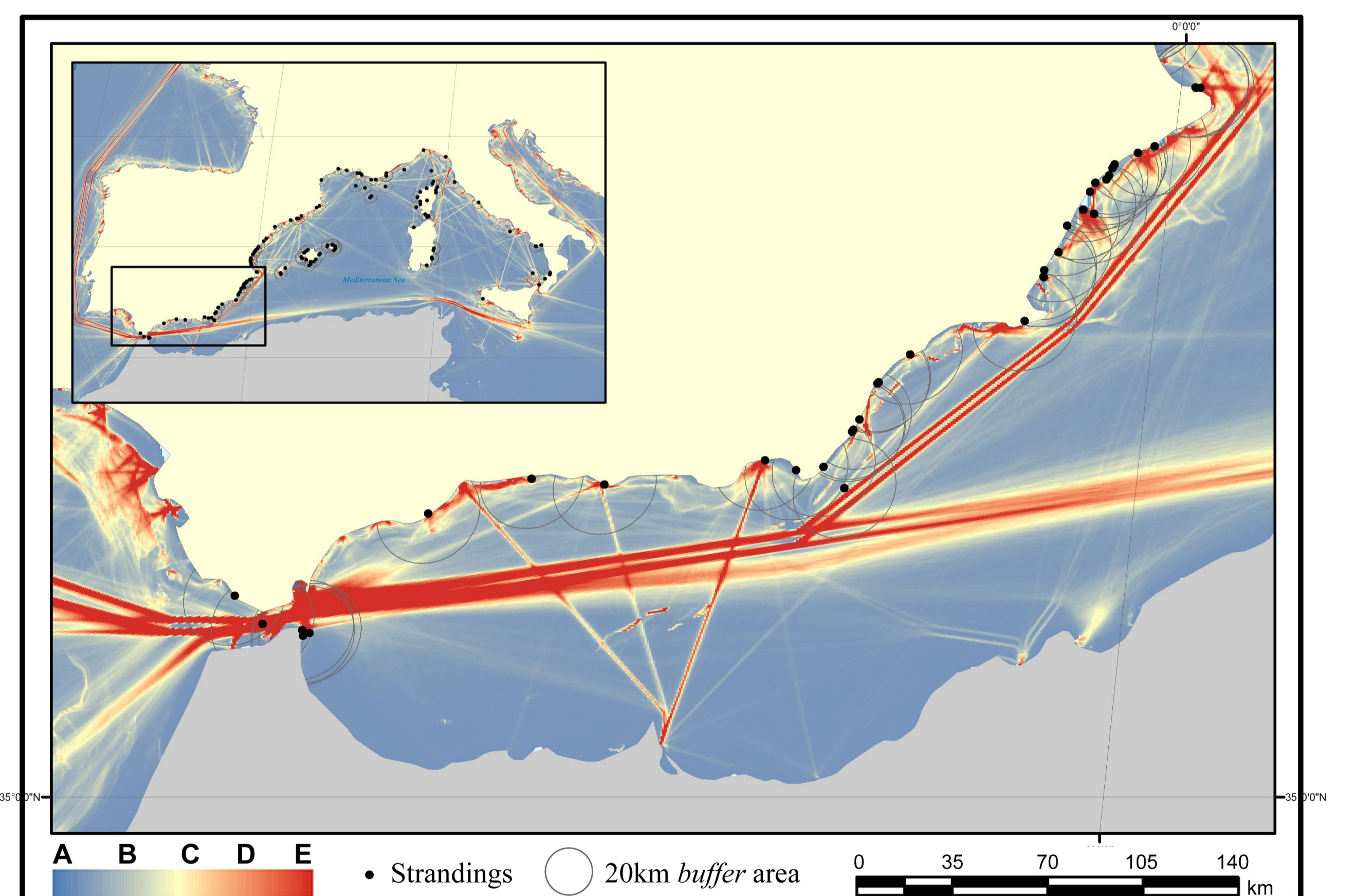


Figure 6: Representation of strandings located in zone 1 and their corresponding buffer area. Polygonal map of maritime traffic expressed in colors according to categories proposed

Table 2: Number of strandings of *Physeter macrocephalus* found within each maritime traffic category (A-E). Distribution according to the study areas.

Zones	Categories					Total
	A	B	C	D	E	
Z1	28	28	28	28	28	28
Z2	108	108	108	98	97	108
Z3	27	27	20	19	19	27
Z4	39	38	27	27	25	39
Total	202	201	183	174	169	202

Studies of sperm whale mobility in the Mediterranean (Dulau, 2007), show that in the studied basin, the maximum distance observed between year-on-year identifications was up to 175 km.



### MAIN REFERENCES

- Brotons J.M. (1996) Contribució a la caracterizació cetològica del Mar Balear. Bolletí de la Societat d'Història Natural de les Balears. 39. 47-58
- Gannier A., Drouot V. and Goold J.C. (2002) Distribution and relative abundance of sperm whales in the Mediterranean Sea. Marine Ecology Progress Series. 243. 281-293.
- Dulau, Violaine. (2007). Movements of sperm whale in the western Mediterranean Sea: Preliminary photo-identification results. Journal of the Marine Biological Association of the United Kingdom. 87. 195-200.