

# Education and attitudes towards marine conservation using whale-watching platforms in Peru

**ABSTRACT** Since the ban of whaling in the 70s, whale-watching became an economically important activity worldwide. In addition to the economic benefits that whale-watching represent for coastal communities, the activity is promoted as a platform for education and conservation awareness of marine biodiversity. However, just a small handful of studies have evaluated this role on people taken this type of tourism. In countries such as Peru where cetaceans species are still in jeopardy, whale-watching may play an important role promoting the protection of these mammalian species. Herein, we present the results of a study that aimed (1) to determine the degree of knowledge regarding cetaceans ecology and conservation status and (2) to evaluate if whale-watching tours serve as platforms for education and conservation awareness in people. We interviewed people taking whale-watching tours during humpback whales breeding season (winter-spring 2014) in northern Peru. A total of 323 persons were surveyed using closed-ended questionnaires and open-ended interviews before and after whale-watching tours. The results revealed an overall lack of knowledge concerning the presence of species of cetaceans in Peruvian waters, particularly those Peruvian participants. However, 98.4% of the persons indicated that they have learned about humpback whales conservation and marine biodiversity treats after tours. Participants were more willing to change their behavioral intentions towards cetaceans conservation and environment protection after whale-watching experience. Our results suggest that whale-watching platforms, when implemented with adequate interpreters, can serve as alternative source of environmental education and conservation awareness. This important to consider in countries such as Peru where by-catch and direct hunting have considerably decimated cetaceans populations.

## INTRODUCTION



- Despite the negative effects that whale-watching originates on cetacean species social behavior and reproductive aspects [1, 2], the activity still promoted worldwide as a tool to create awareness of iconic cetacean's conservation [3, 4].
- In Peru, around ca. 3000 cetaceans per year are directly and indirectly hunted for human consumption or used as bait in shark fisheries [5]. People education may play an important role in helping the conservation of these species. Whale-watching may be an alternative platform to educate people about conservation issues of marine biodiversity.
- This study aims to (1) determine the degree of whale-watching users knowledge regarding cetacean's ecology and conservation status and (2) evaluate where whale-watching tours serve as platforms for education and conservation awareness in Peru.

## METHODS

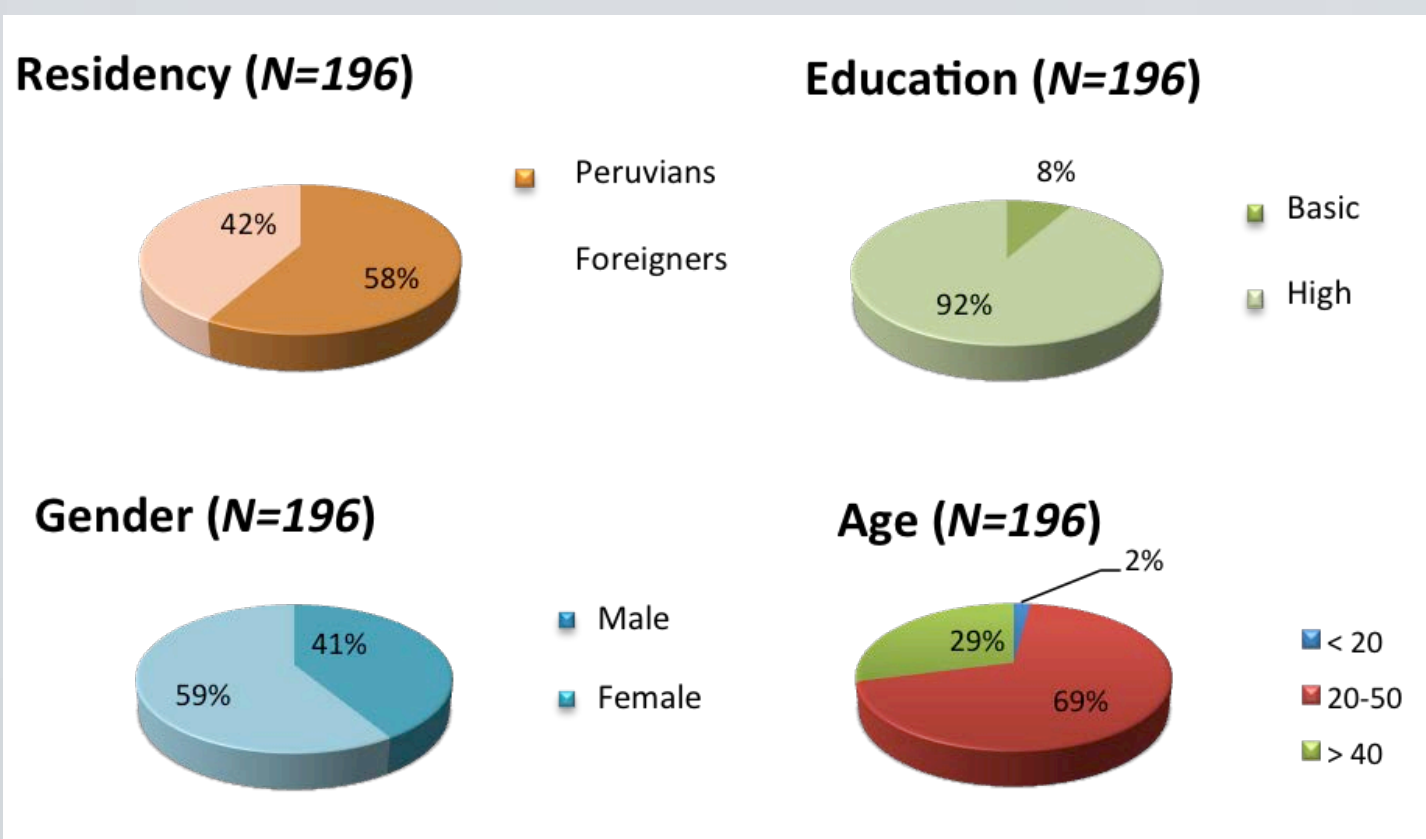
- 323 questionnaires were distributed of a total of 2894 persons before and after whale-watching tours at Los Organos (4°10'38.23"S, 81°8.27'4.83"W) northern Peru, during humpback whale breeding season encompassed between the 1<sup>st</sup> of August and the 30<sup>th</sup> September 2014.



- Surveys included pre- and post-tour closed-ended questionnaires answered before and after whale-watching tour and open-ended personal interviews after tour.

## RESULTS

### Pre-tour questionnaire



**Figure 1** Socio-demographics. 61,68% (N = 196) of 323 participants completed the questionnaires.

### Post-tour questionnaire

	All participants (N=196)			Peruvians (N=114)		Foreigners (N=82)		Model	Pearson P value
	Yes (%)	No (%)	Not sure (%)	Yes (%)	No (%)	Yes (%)	No (%)		
Do you feel you have learned something after the trip?	98.47	1.53	0.88	99.12	0.88	97.56	2.44	0,772 (1)	n.s.
Do you consider you had a successful sighting?	96.43	3.57	94.74	5.26	98.78	1.22	2,264 (1)	n.s.	
Do you think whale-watching contributes to marine mammals conservation?	95.41	4.59	97.37	2.63	92.68	7.32	2,390 (1)	n.s.	
Do you think that money, time and effort should be invested in their conservation?	98.98	1.02	100	0	97.56	2.44	2,089 (1)	n.s.	

Note: n.s. = not significant; (df) freedom degrees. Pearson correlation test P value. Minitab v.17.

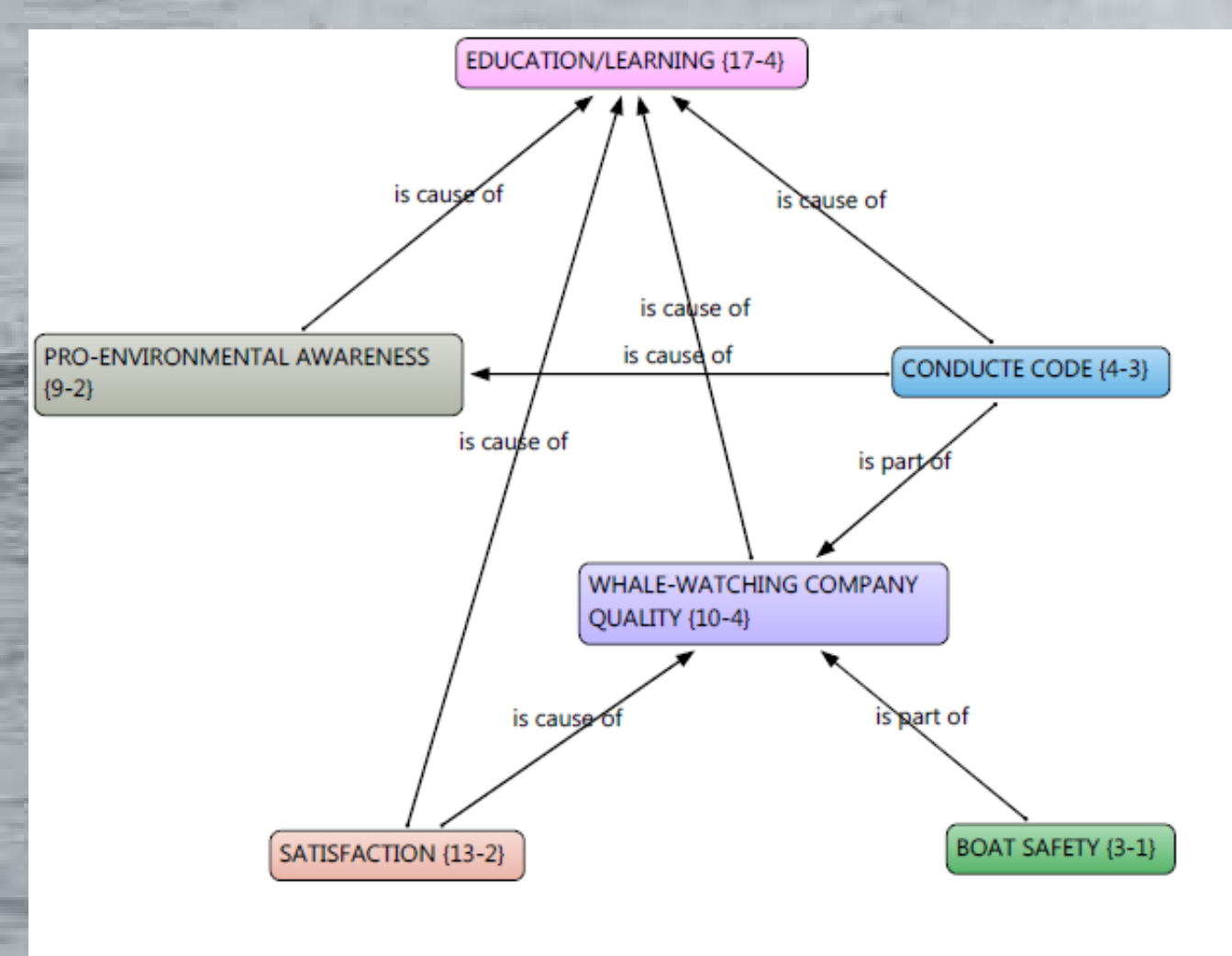
**Table 3** Descriptive analysis on satisfaction, education and conservation attitudes of Peruvian and foreigners participants.

	All participants (N=196)			Peruvians (N=114)			Foreigners (N=82)			Model	Pearson
	Yes (%)	No (%)	Not sure (%)	Yes (%)	No (%)	Not sure (%)	Yes (%)	No (%)	Not sure (%)		
Have you seen whales before?	33.16	66.84	0	30.7	69.3	0	36.59	63.41	0	0,745 (1)	n.s.
Can you recognize any specie?	43.88	56.12	0	41.23	58.77	0	47.56	52.44	0	0,777 (1)	n.s.
Did you know that whales inhabit Peruvian waters?	18.37	14.29	67.35	14.91	2.63	82.46	23.17	30.49	46.34	36,914 (2)	****

**Table 1** Previous whale-watching tour participant's knowledge regarding whale biology and ecology.

	Residency				Mean	SD	Kruskal-Wallis P value
	Not important at all (%)	Less important (%)	Important (%)	Very important (%)			
Knowing that the boat is following guidelines	0.5	5.6	38.8	55.1	3.4847	0.6282	F < P****
Learning about whale biology	0	2.04	48.98	48.98	3.4745	0.54946	F < P****
Learning what I can do to help support marine conservation	0	5.6	43.4	51.02	3.4541	0.60165	F < P****
Having the boat maintain a safe distance from the whales	1	4.6	45.4	48.98	3.4235	0.63186	n.s.
Learning about marine environment	0	6.1	47.96	45.92	3.398	0.60324	F < P**
Seeing other wildlife (sea turtles, sea lions, sea birds...)	0	6.1	54.08	39.8	3.3367	0.58955	F < P*
Learning about whale conservation	0	10.2	52.04	37.76	3.2806	0.64675	F < P*
Being as close to the whales as possible	7.1	23.5	43.9	25.5	2.8	0.87431	n.s.

**Table 2** Analyses of Likert-type scale items regarding visitor's expentacies and interests toward whale encounters before whale-watching trip. Kruskal-Wallis test showed that generally Peruvians were more interested than foreigners on whale watch experience.

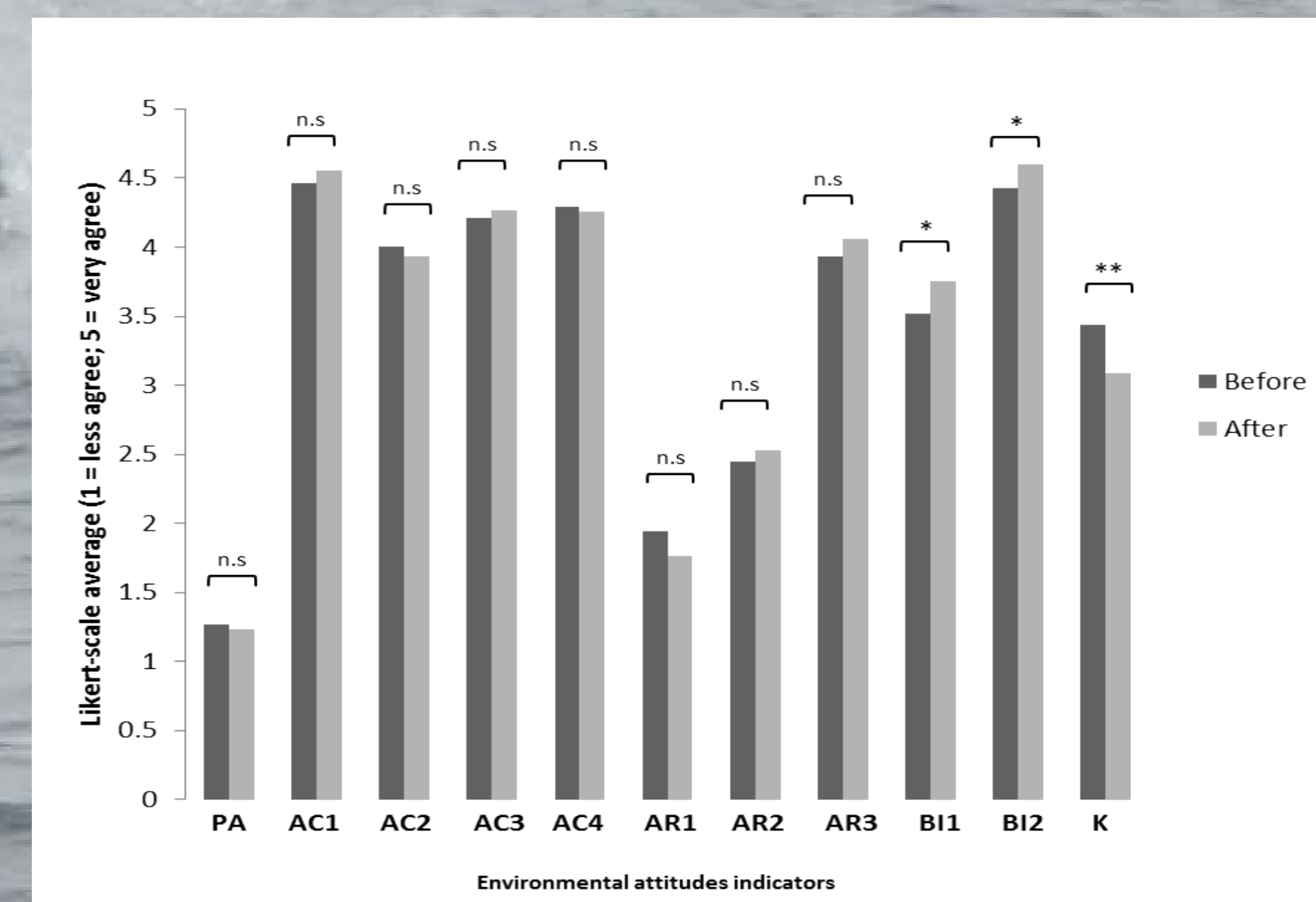


**Figure 2** Semantic network analysis after open-ended personal interviews. Pink colors represent more frequent statements uses in oral interviews. Numbers indicate times that one statement was saying and the times of co-occurrence with others statements. N = 20. Atlas Ti.5 software.

	Educational level (N=196)				Residency (N=196)				All participants (N=196)			
	Basic (%)	Superior (%)	Model	Pearson P value	Peruvians (%)	Foreigners (%)	Model	Pearson P value	Pre-tour (%)	Post-tour (%)	Model	Pearson P value
Others	16	90.56	1,655 (1)	n.s.	88.6	95.12	2,564 (1)	n.s.	91.33	82.14	7,184 (1)	0,007*
Mammalian-cetacean	0	9.44	11.4	4.88	11.4	4.88	11.4	4.88	8.67	17.86		

Note: M = Male; F = Female; n.s. = not significant; \* P < 0,05; \*\* P < 0,01; \*\*\* P < 0,005; \*\*\*\* P < 0,001.

**Table 4** Descriptive analysis to evaluate whale-watching participants' knowledge regarding whale's biology.



**Figure 3** Attitudes towards marine conservation pre and post-tour. Opinions of participants on eleven statements: PA Problem awareness; AR Attribution of responsibility; AC 1 Awareness of consequence; BI Behavioral intentions; K Knowledge. Significance levels (Kruskal-Wallis test) are indicated, n.s. = not significant; \* P < 0,05; \*\* P < 0,01; \*\*\* P < 0,005; \*\*\*\* P < 0,001.

## CONCLUSIONS

- Whale-watching can serve as an alternative platform for learning about marine species and its environment, especially for local communities where formal environmental education in schools and universities seem to provide scarce information on the issue.
- Closeness and proximity to whales and marine environment promote users to realize about the well/bad performance of whale-watching activity, as they became more concerned regarding whale-watching impacts on whales behavior. Thus, whale-watching in Peru must be performed under whale-watching regulations and legislation.
- Whale-watching interpretation must to highlight human behavior consequences on whales and its environment, in order to promote conservation awareness.
- Long term studies should be performed in order to assess if behavioral intentions changes towards a pro-environmental attitude are behavioral changes or just an intention to act.

## References

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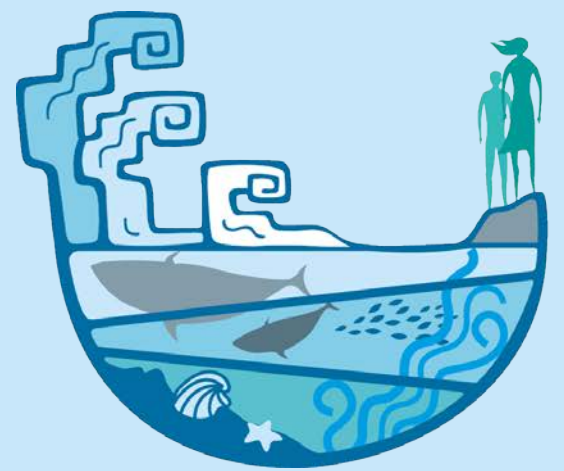
[2] Marine Mammal Commission. 2007. The Marine Mammal Protection Act of 1972 as amended 2008.

[3] Orams, M. B. 1994. Creating effective interpretation for managing interaction between tourists and wildlife. *Australian Journal of Environmental Education* 10(2):21-34.

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Título:  
SPATIAL EVALUATION OF  
COLLISION RISK BETWEEN  
SMALL CETACEAN SPECIES, FIN  
WHALES AND SHIPPING IN  
MEJILLONES BAY (23°S,  
NORTHERN CHILE)

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## 1. OBJECTIVE

The aim of this study is to determine the spatial distribution of small cetaceans and large whales and whether they overlap with maritime traffic routes in order to assess any potential collision risk and contribute to the Marine Spatial Planning of Mejillones bay.

## 2. METHODS

From March 2016 to March 2017 a total of 138.5 hours of land based surveys from Punta Rieles cliff (61.5 m height) in Mejillones bay with a total station were performed.

Five opportunistic boat-based surveys were performed during the study period.



Figure 1. Punta Rieles cliff Land based observation point view and total station.

## Study area

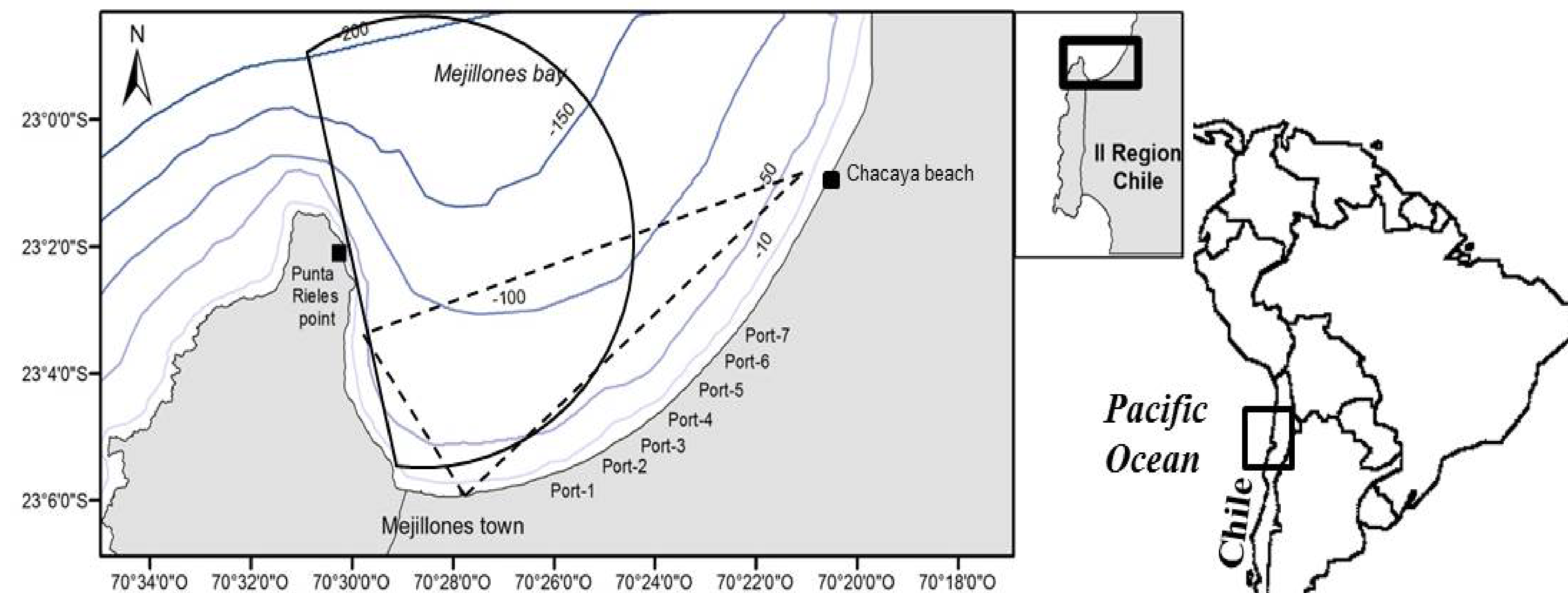
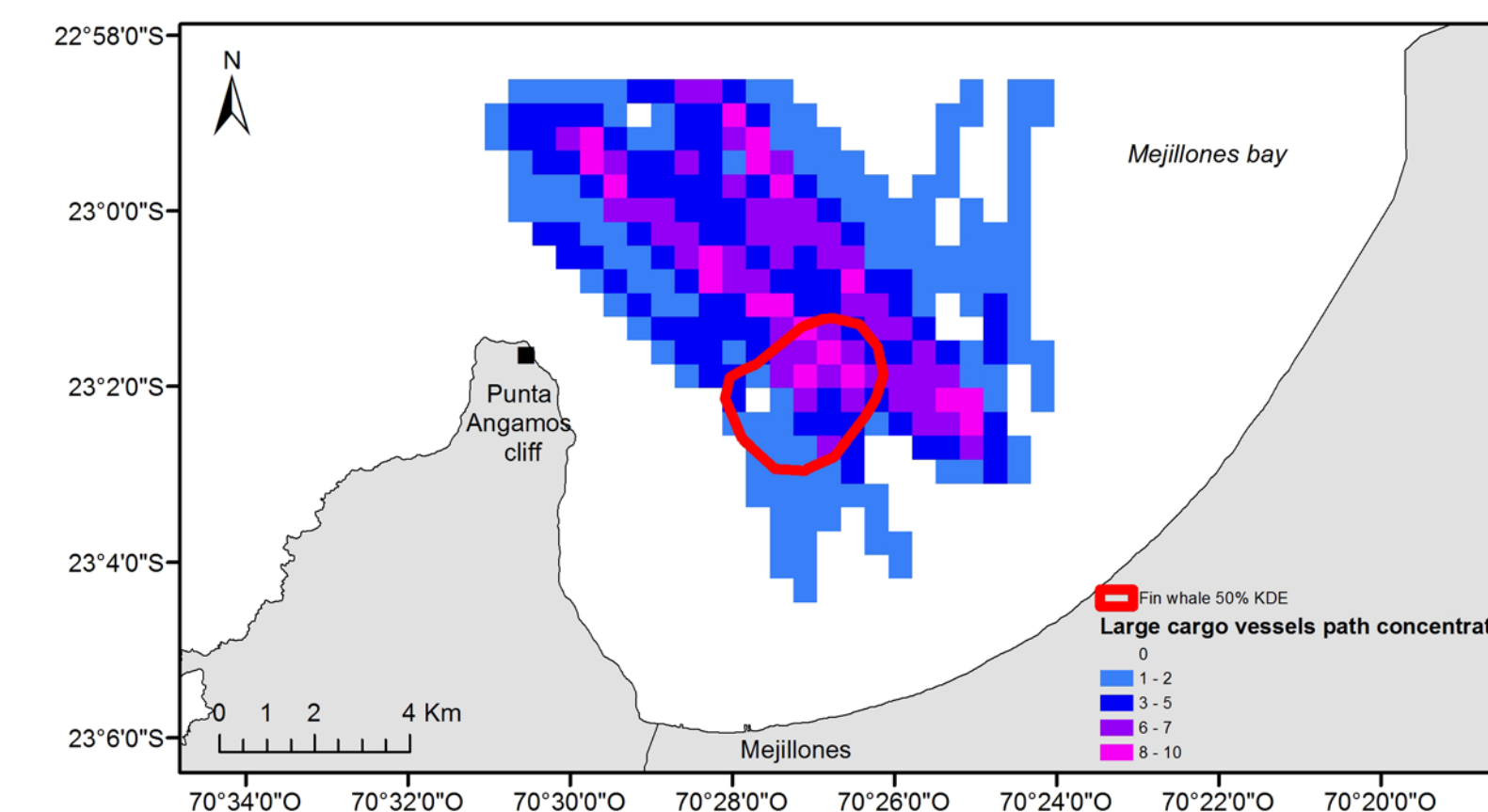
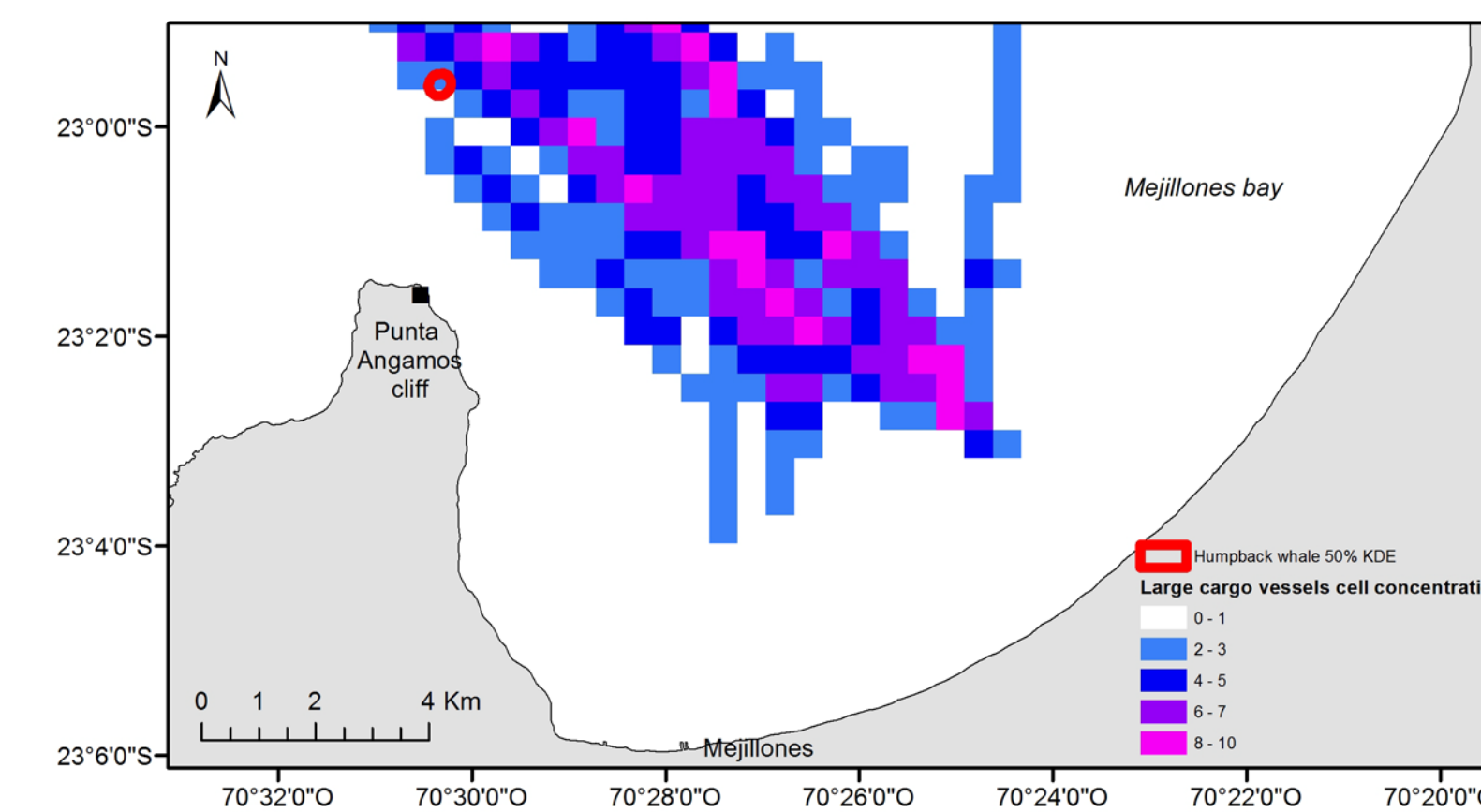


Figure 2. Mejillones bay study area. Semicircle of visibility into Mejillones bay with the total station in land-based surveys. Dash line indicates boat-based surveys navigation path.

## 3. RESULTS

- Humpback whale and fin whale's 50% KDE home range overlap with Large-cargo vessel's navigation route.





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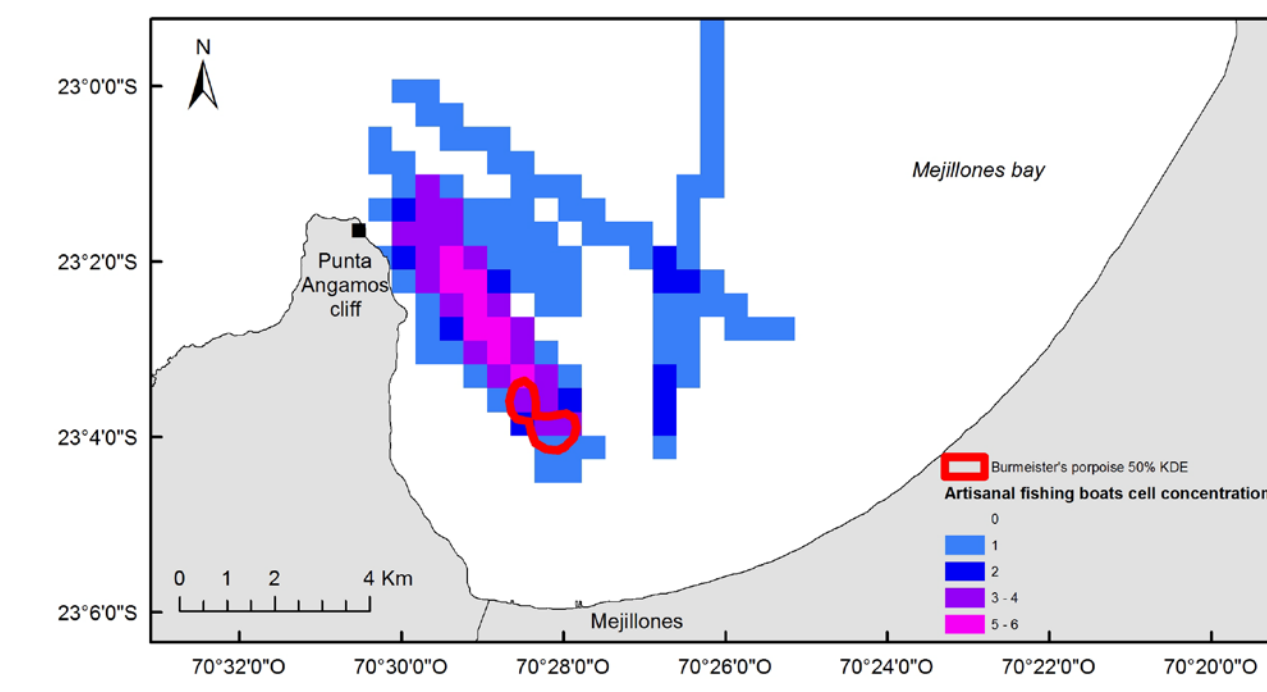
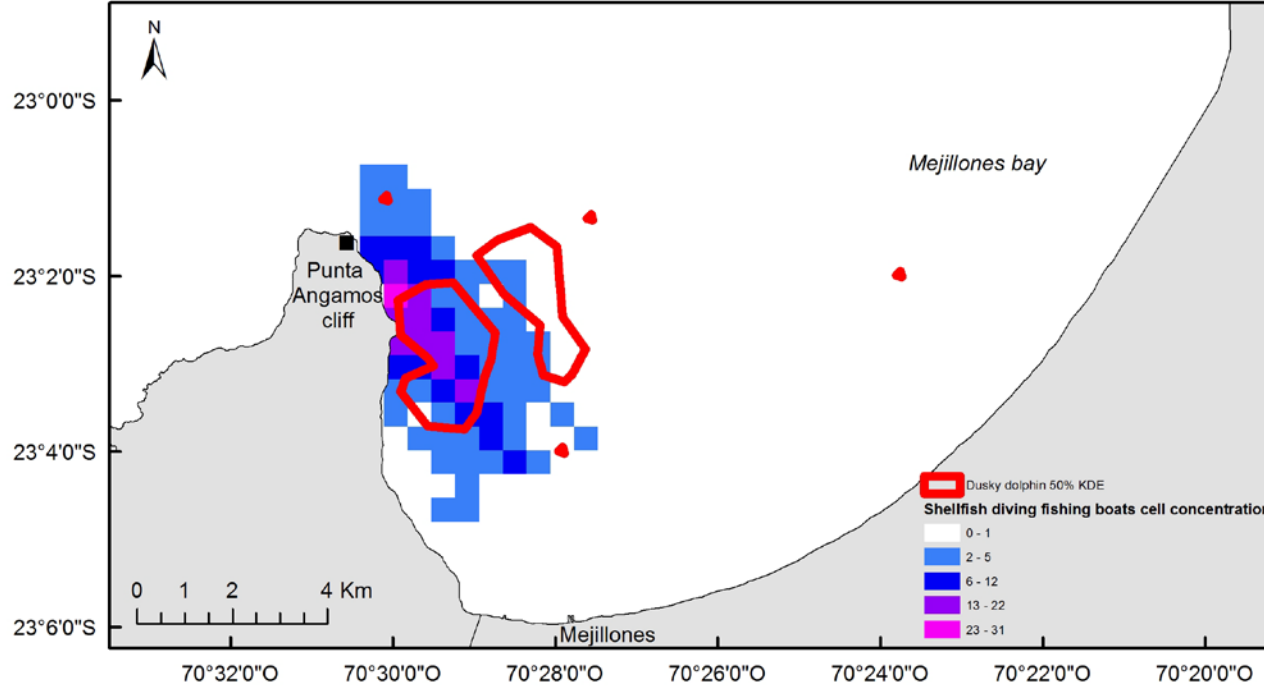
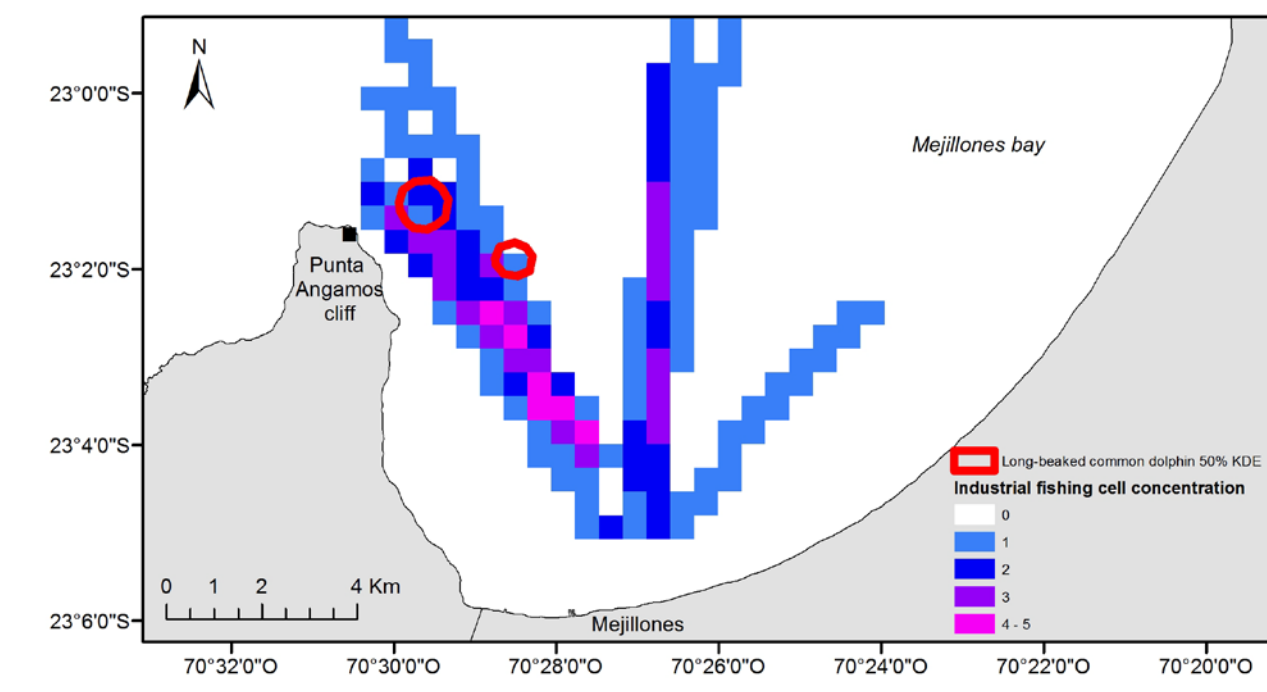
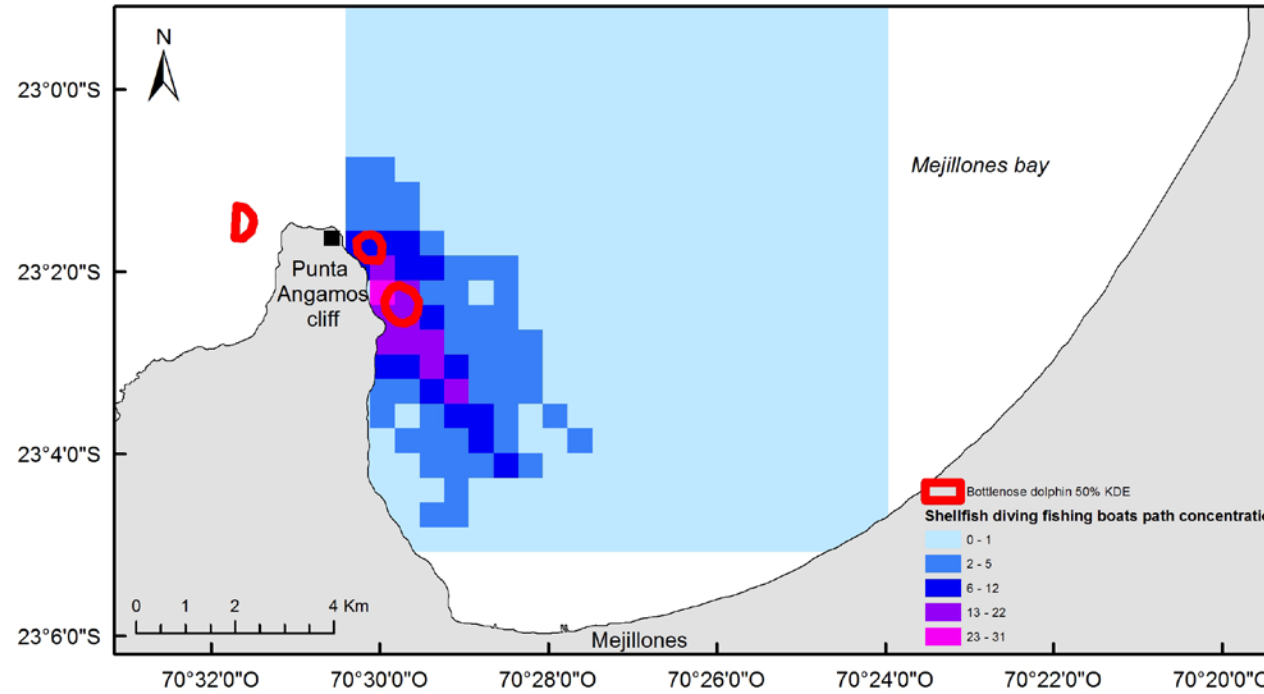
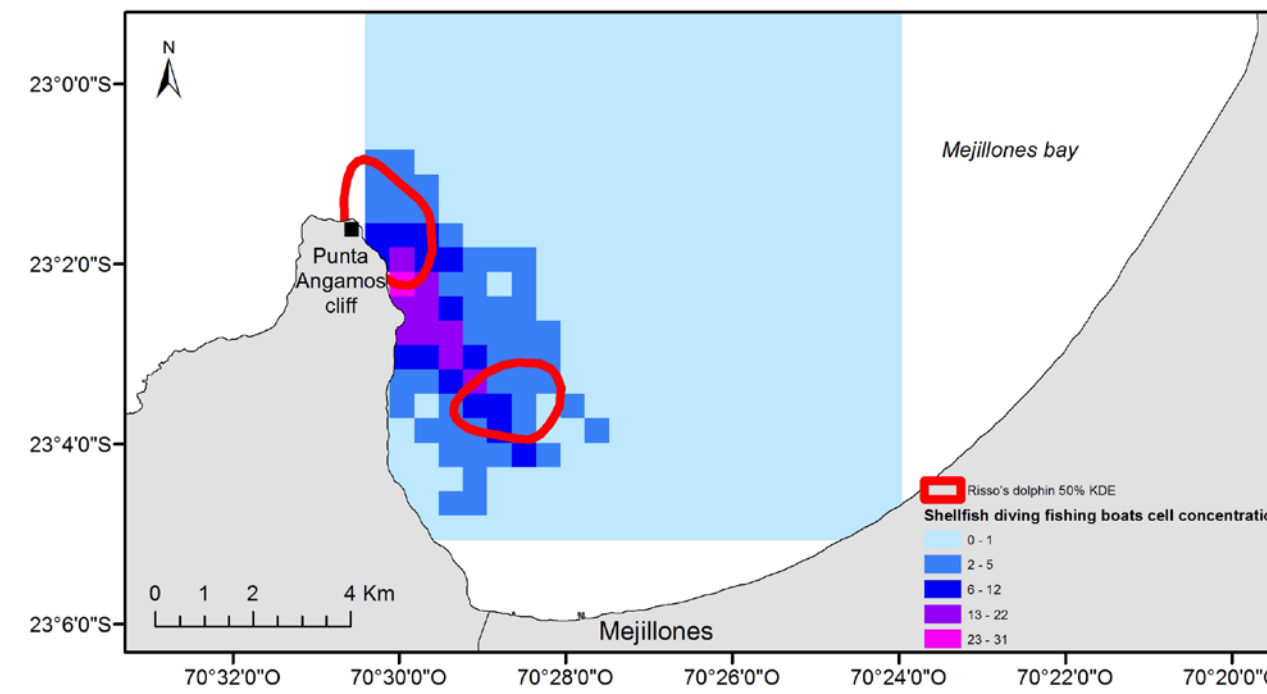
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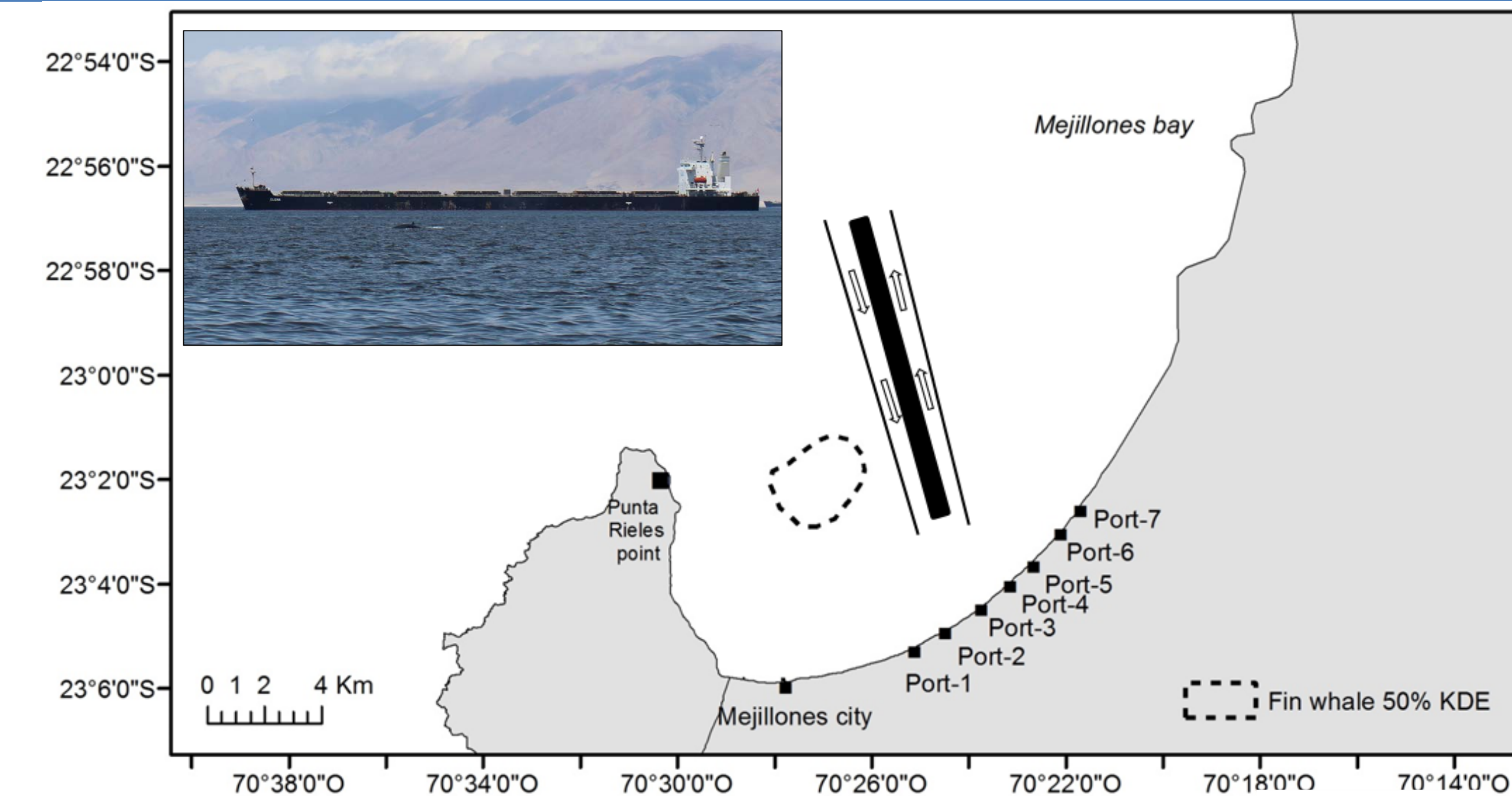
- Bottlenose dolphin's and Risso's dolphin's 50% KDE home range overlap with artisanal fishing diving boats navigation route. Long-beaked common dolphin's 50% KDE area overlap with industrial fishing boats; Dusky dolphins with artisanal fishing-diving boats and Burmeister's porpoise with artisanal fishing boats



### 4. CONCLUSIONS

- 1- Potential collision risk between fin whales, humpback whales and large-cargo vessels and between small cetaceans and fishing boats is imminent in Mejillones bay
- 2- Mean navigation speed of large cargo vessels, artisanal and industrial fishing boats exceeds the permitted speed of 10 knots.
- 3- We strongly recommend the creation of a **Traffic Separation Scheme** of large cargo vessels and an **"Area to avoid"** the home range of cetacean species within Mejillones bay.

### PROPOSED TRAFFIC SEPARATION SCHEME AND AREA TO BE AVOID



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