



University of Genoa



Royal Boskalis Westminster N.V.

A check on the efficiency of an air bubble screen through the use of an artificial tracer: a test in the Port of Genoa (Italy)

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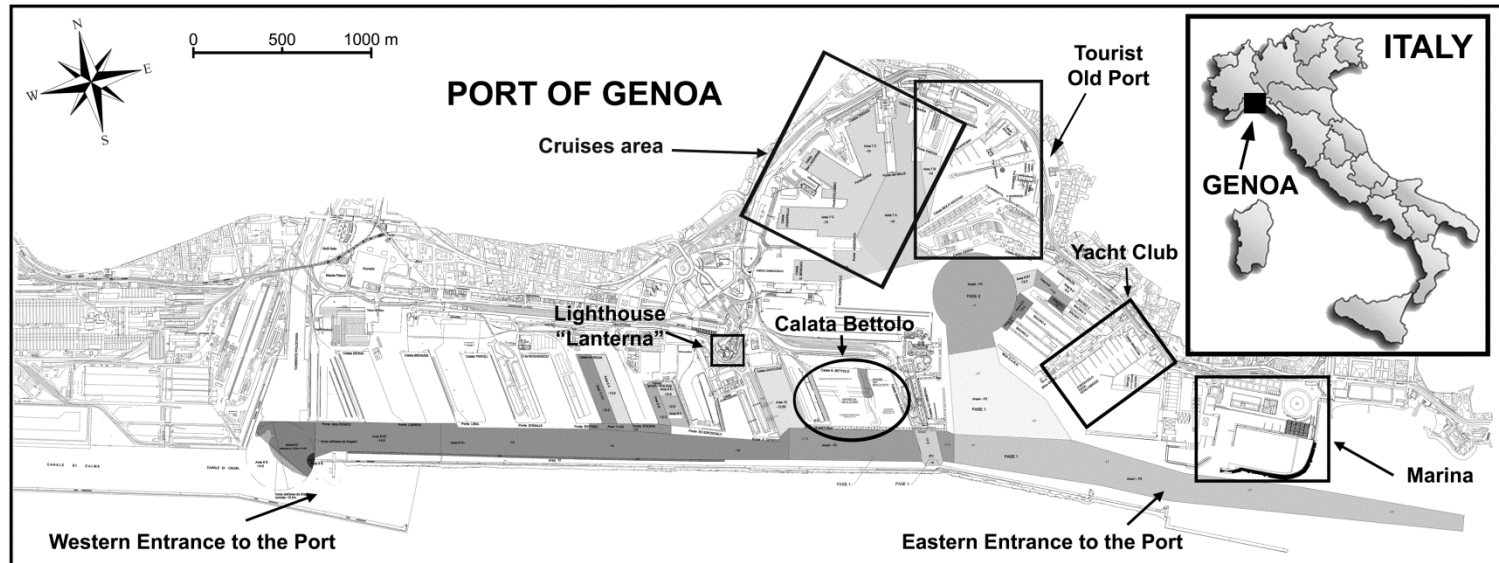
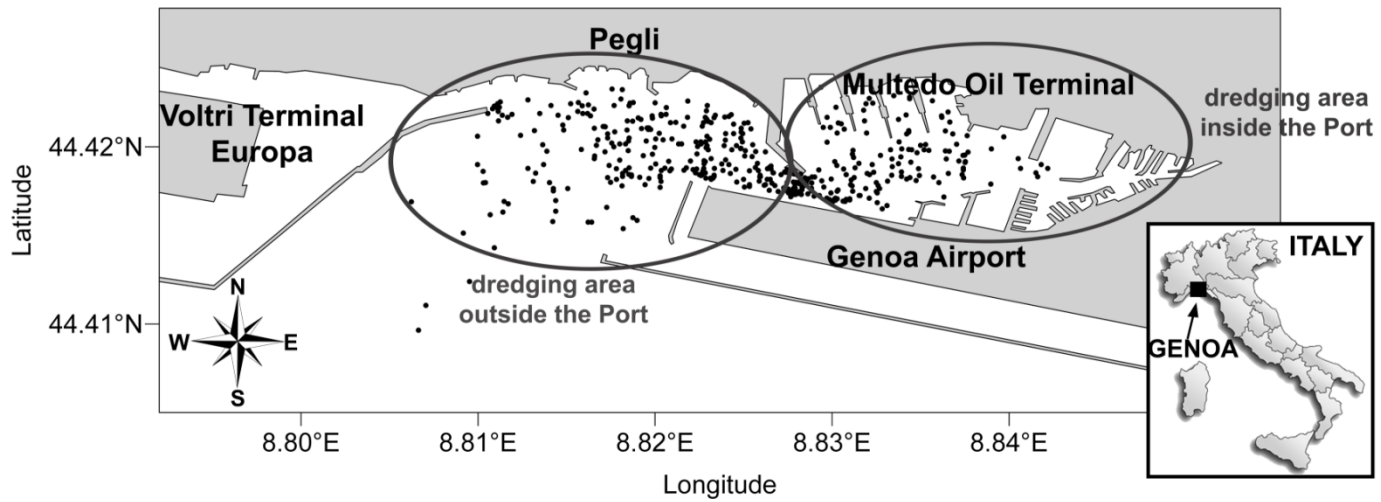
⁴ ARPA Liguria, 8 Via Bombrini, I-16149 Genoa, Italy



Port Authority of Genoa



Ligurian Environmental
Agency







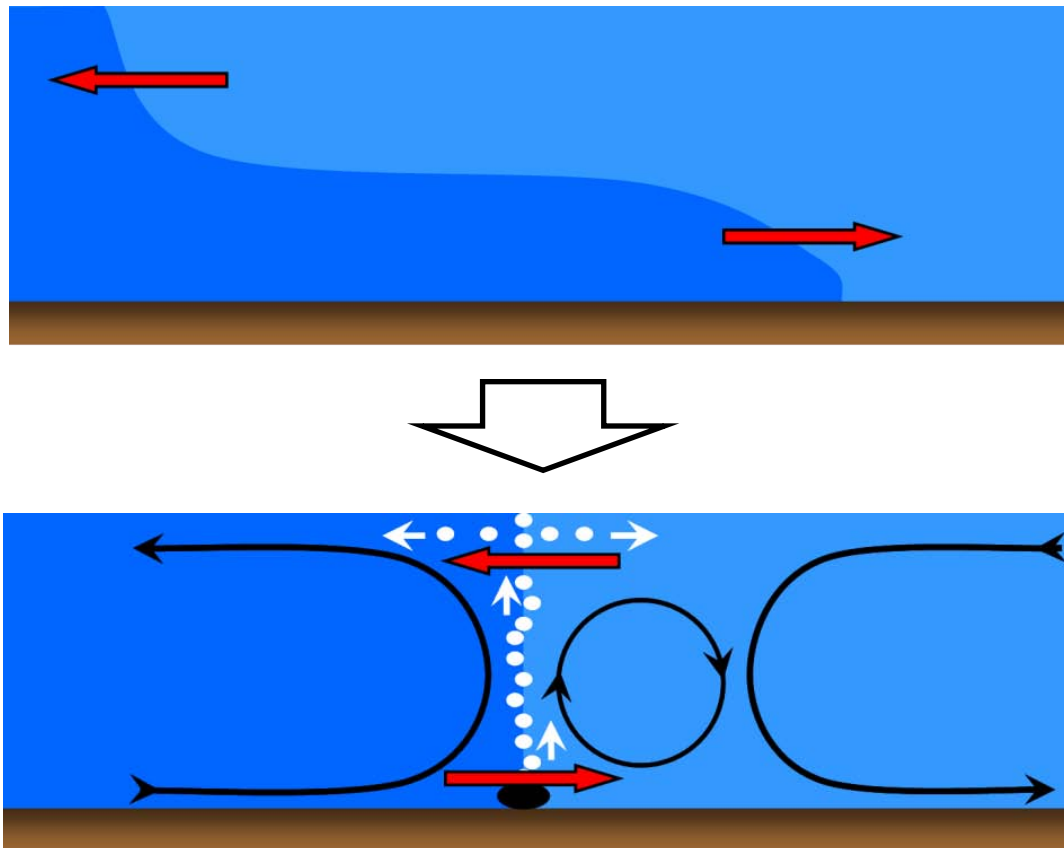
October, 2013

Principle of the Air Bubble Screen

Sediment-laden water exhibits larger density compared to clear water

Rising bubbles cause a vertical current of air and water to flow towards the surface

Generation of flow away from the barrier at the surface



Suspended Sediments



Noise reduction

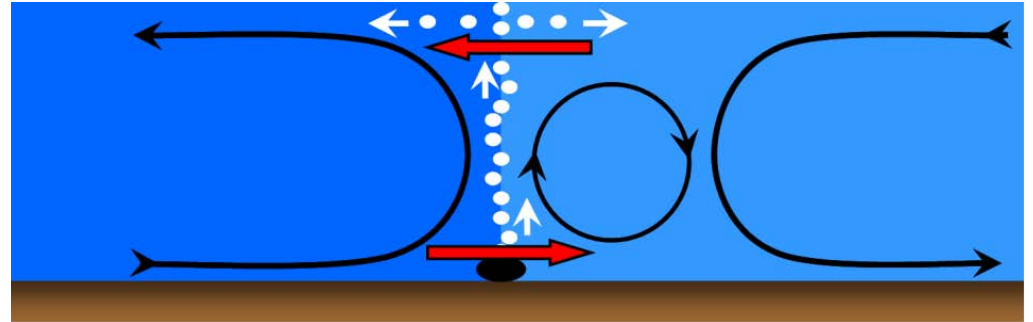
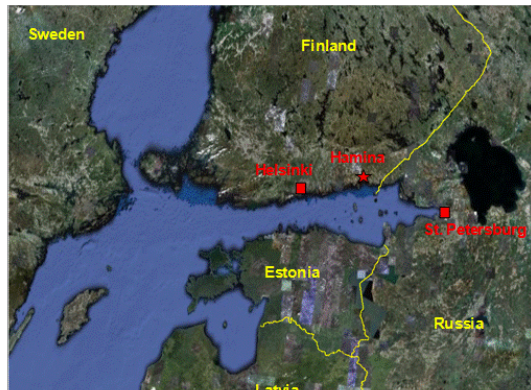


Saline vs Fresh Waters

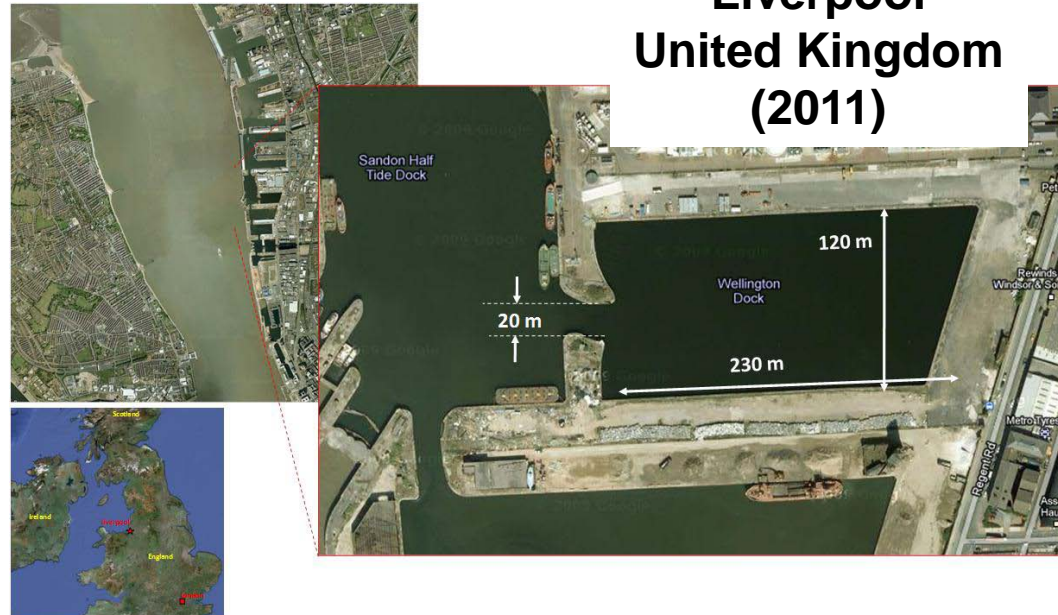


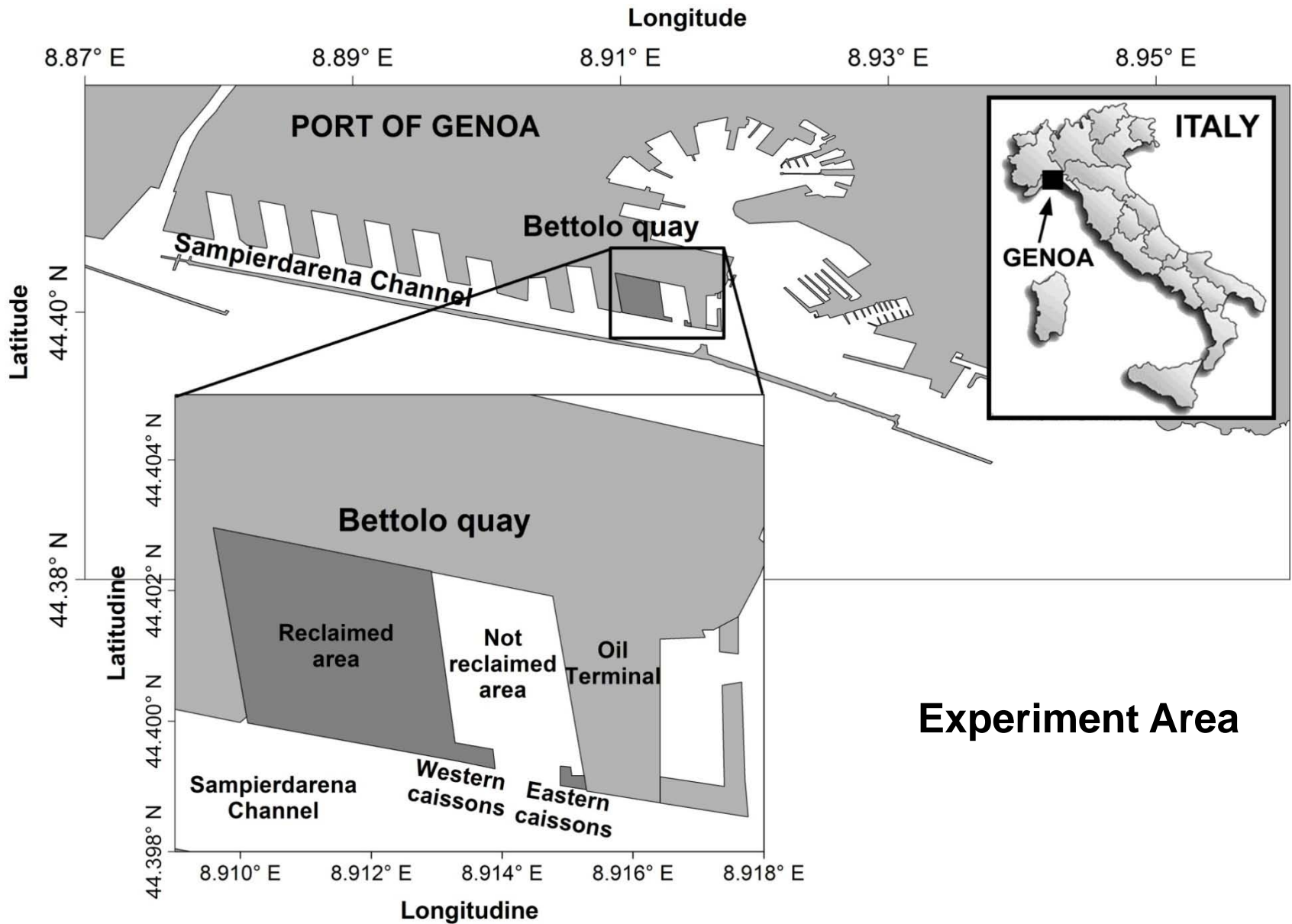
Boskalis Field Experiences

Hamina Port Finland (2009)

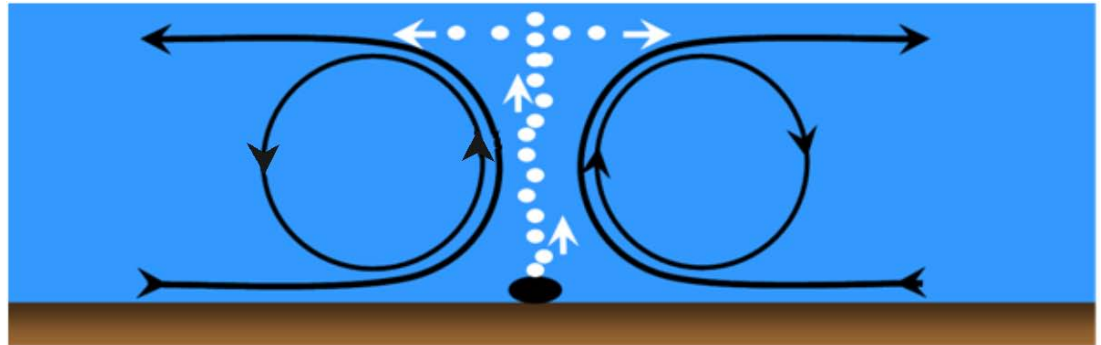
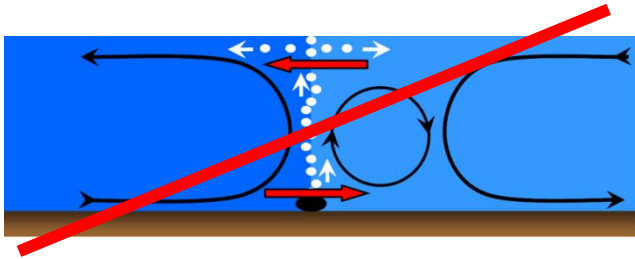
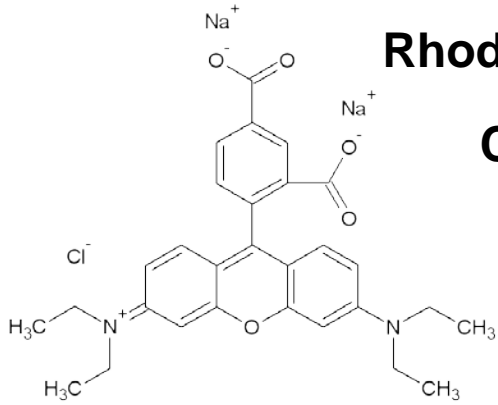


Wellington Dock Liverpool United Kingdom (2011)





Rhodamine Water Tracer



Longitude

8.87° E 8.89° E 8.91° E 8.93° E 8.95° E

PORT OF GENOA

Bettolo quay

Sampierdarena Channel



Environmental conditions and technical approach

Latitude
44.40° N

44.38° N
44.404° N
44.402° N
44.400° N

Latitude

Bettolo quay

Reclaimed area

Not reclaimed area

Oil Terminal

Sampierdarena Channel

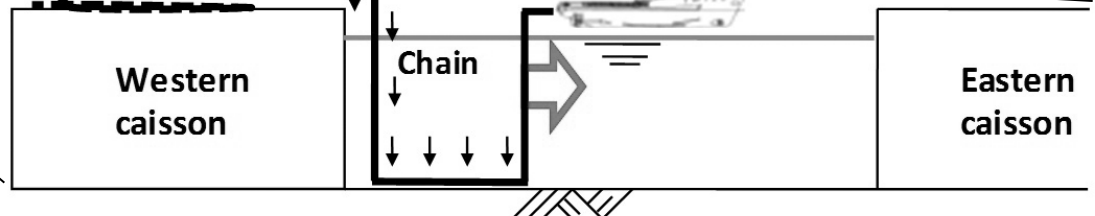
Western caissons

Eastern caissons

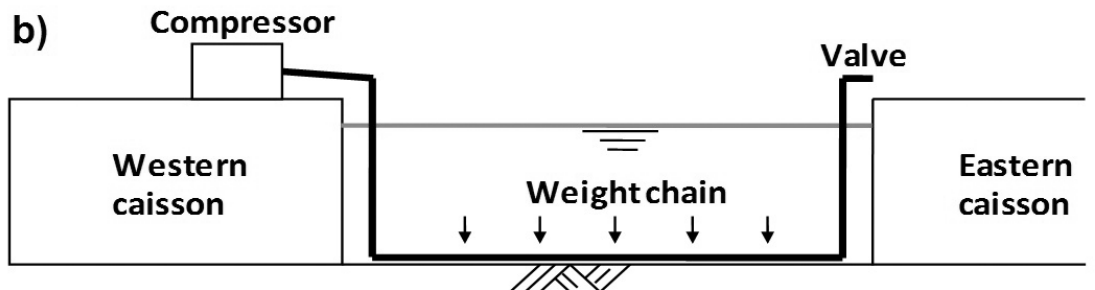
44.398° N 8.910° E 8.912° E 8.914° E 8.916° E 8.918° E

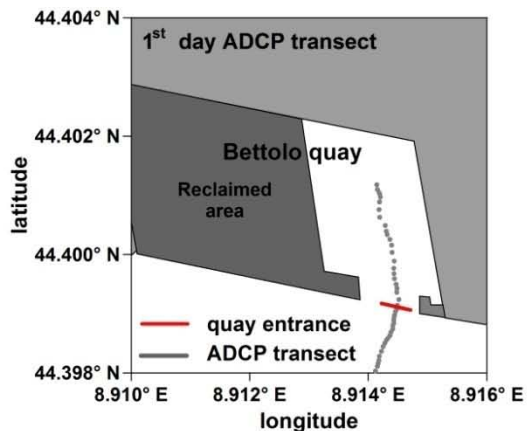
Longitude

a)

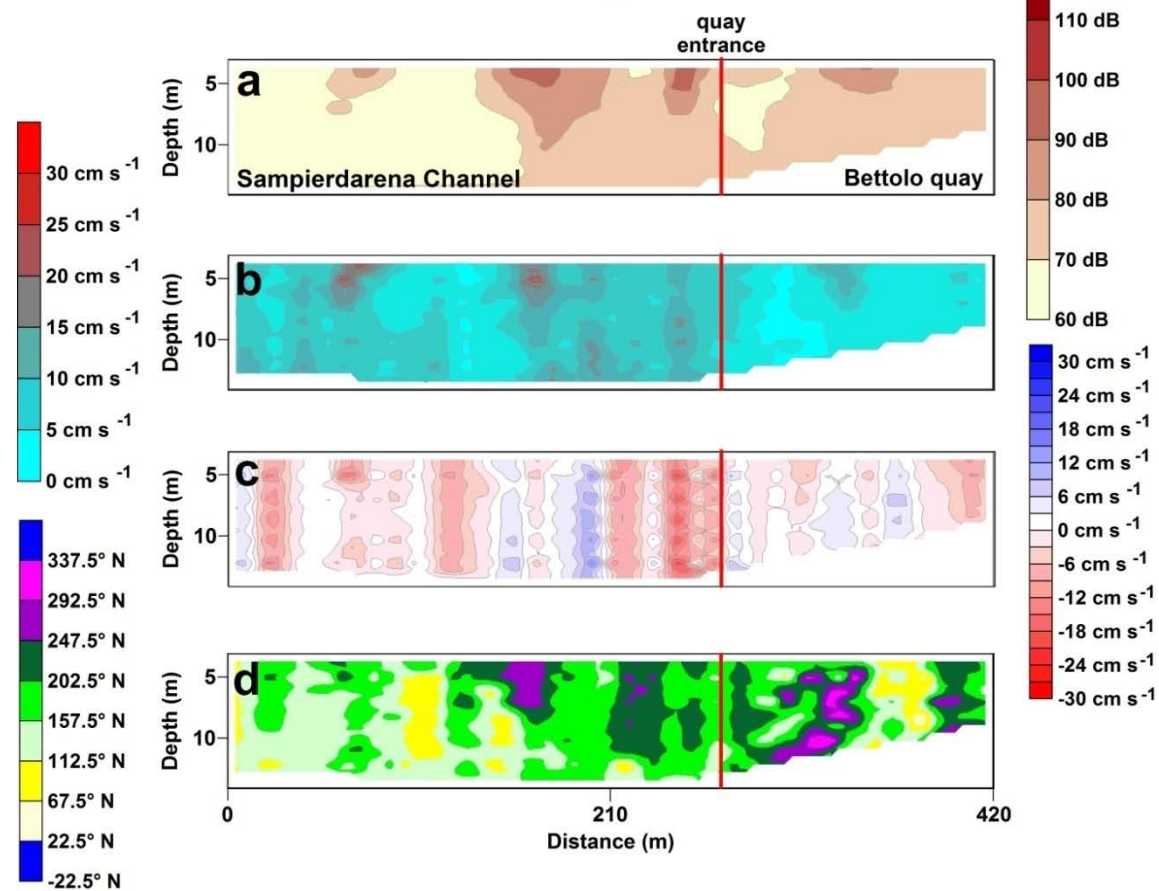


b)





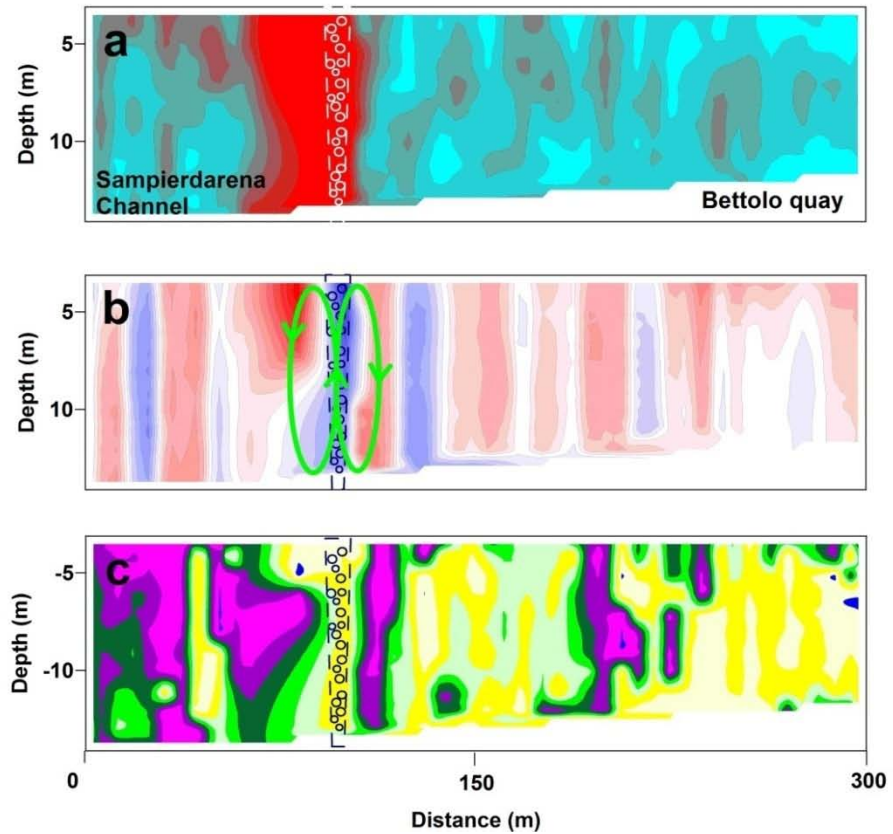
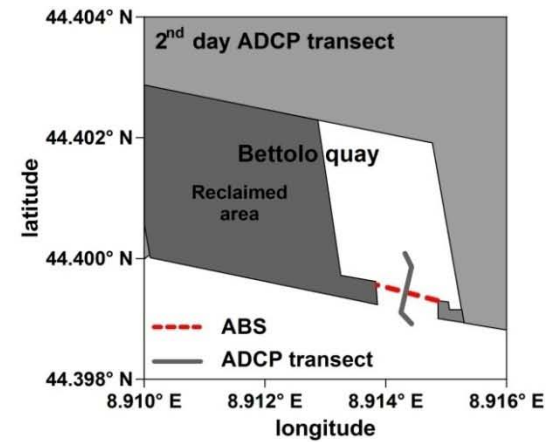
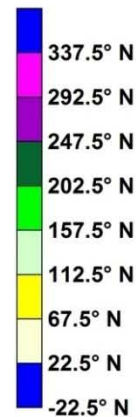
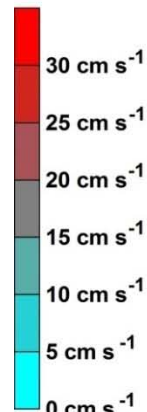
1st Test Day : no ABS



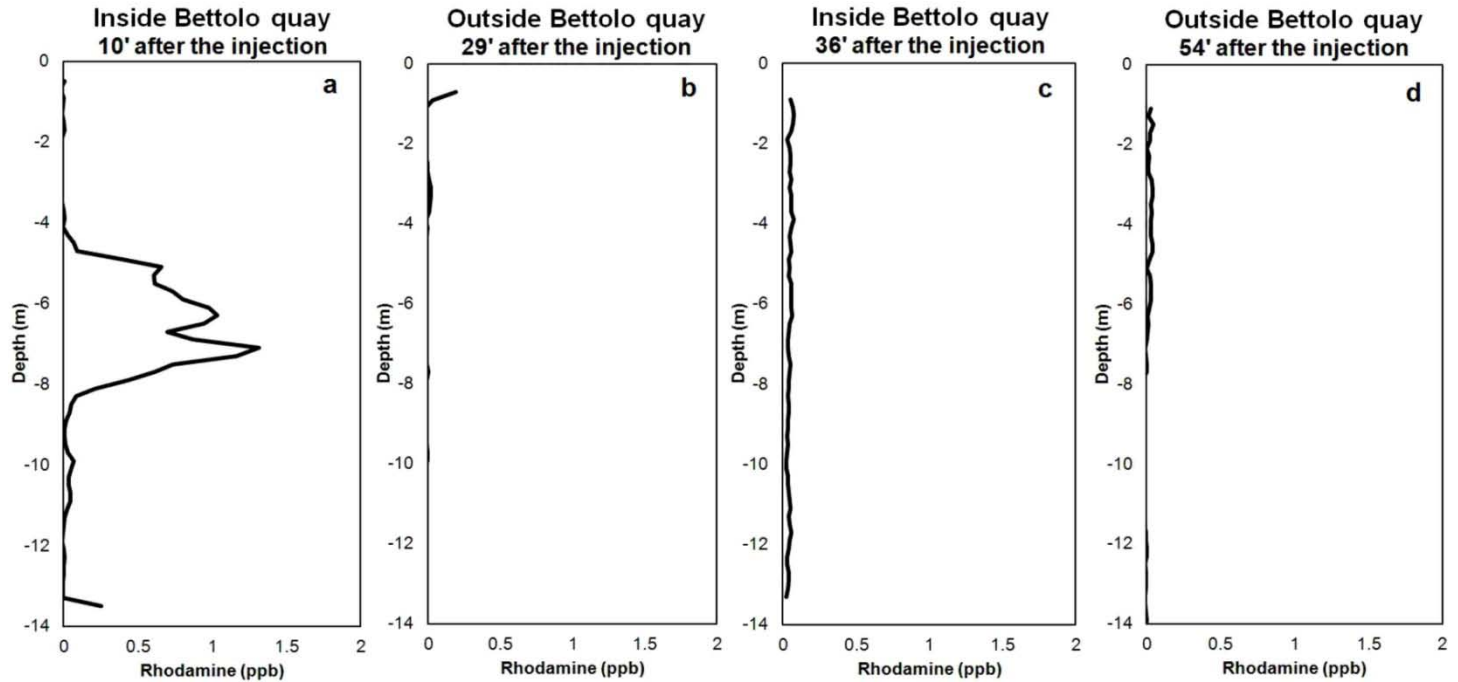
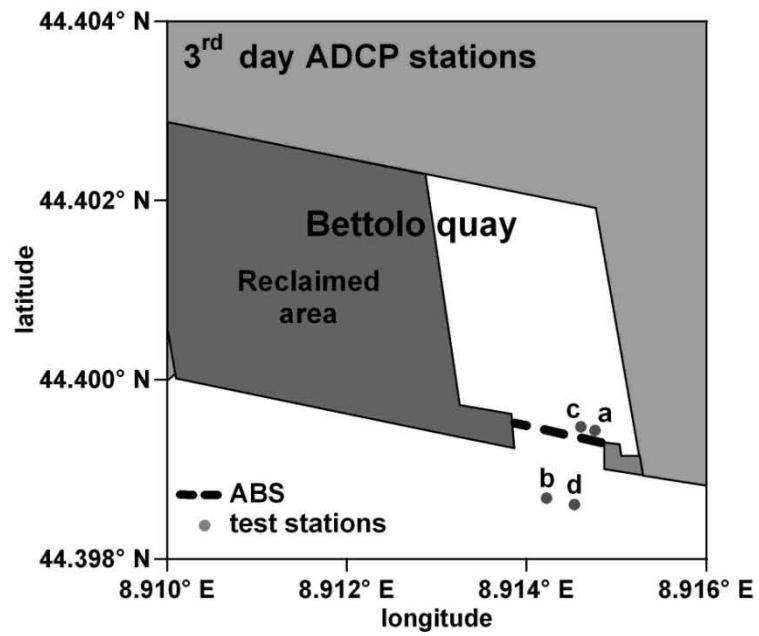
Weather conditions	Mean water temperature (°C) (Surface – Bottom)	Mean water salinity (Surface – Bottom)
Cloudy (rain during the night), wind from S, calm sea	22.6 - 22.6	38.1 - 38.1

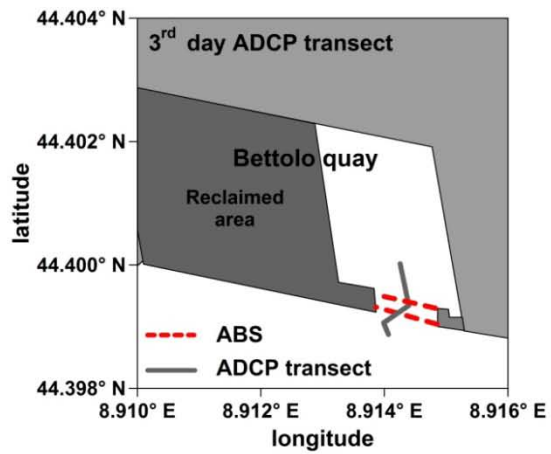
2nd Test Day : one ABS

Weather conditions	Mean water temperature (°C) (Surface – Bottom)	Mean water salinity (Surface – Bottom)
Cloudy (rain during the night), wind from SE, calm sea	22.8 - 22.7	37.7 - 38.1

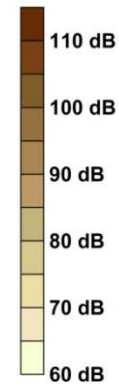
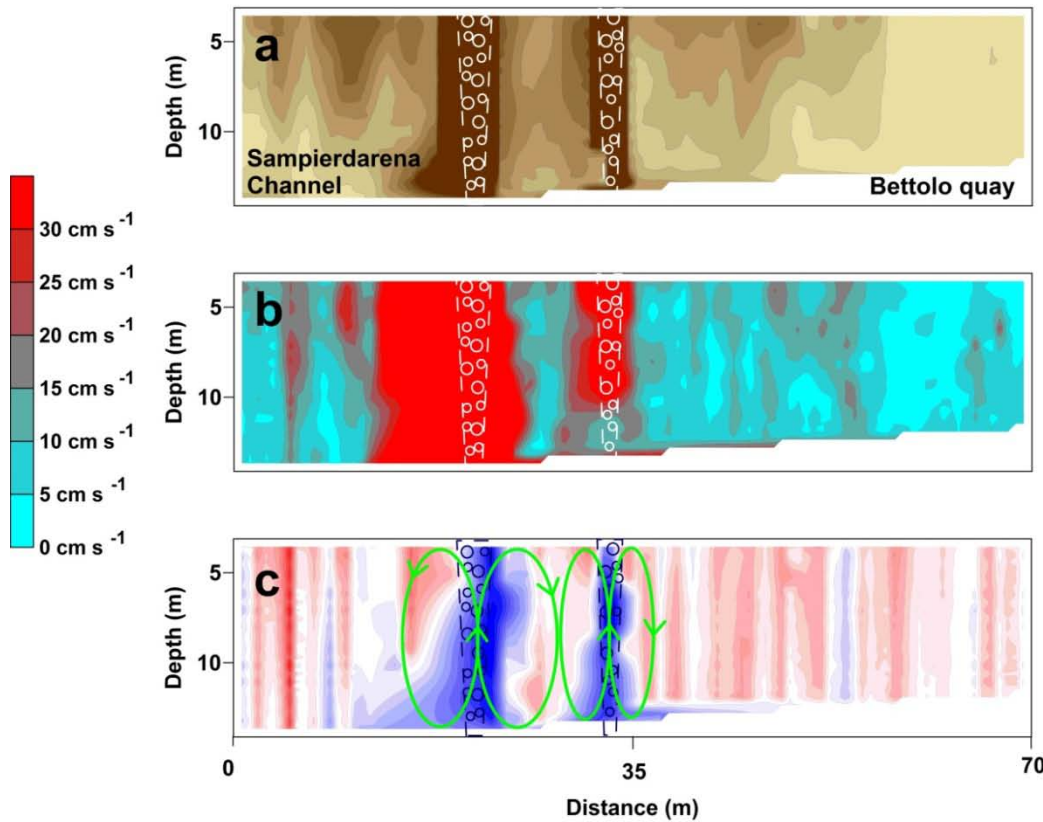


3rd Test Day :
one ABS
+
Rhodamine WT injection

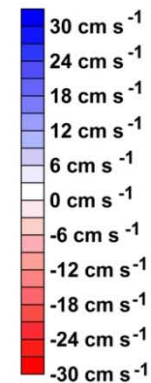




3rd Test Day : two ABSs



Weather conditions	Mean water temperature (°C) (Surface – Bottom)	Mean water salinity (Surface – Bottom)
Cloudy, stronger wind from SE, calm sea	22.5 - 22.6	37.5 - 37.8

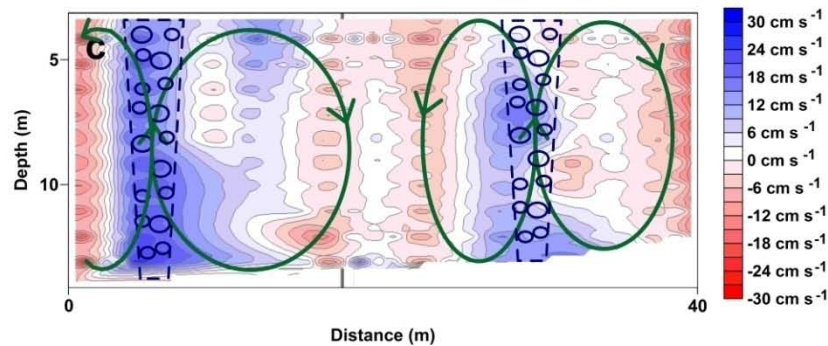
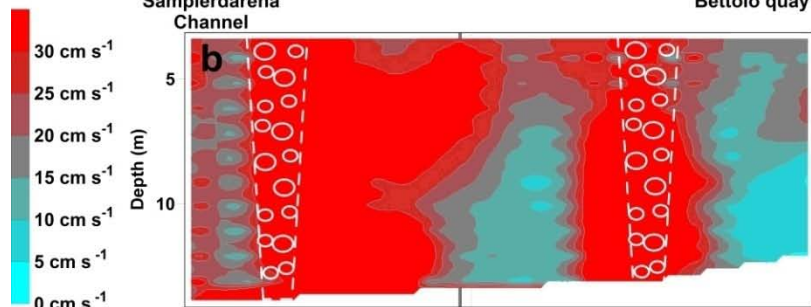
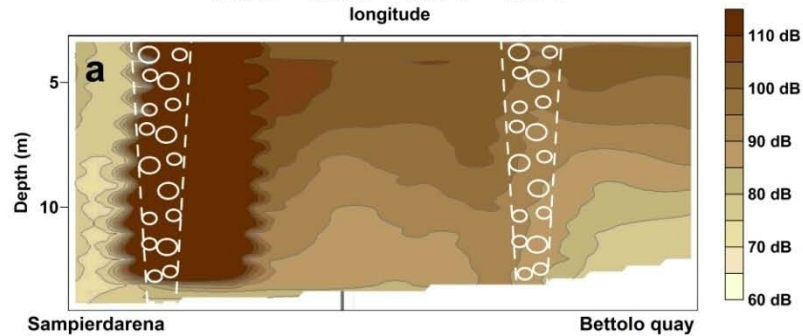
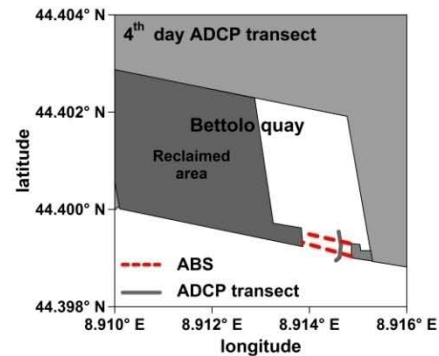


4th Test Day : two ABSs

+

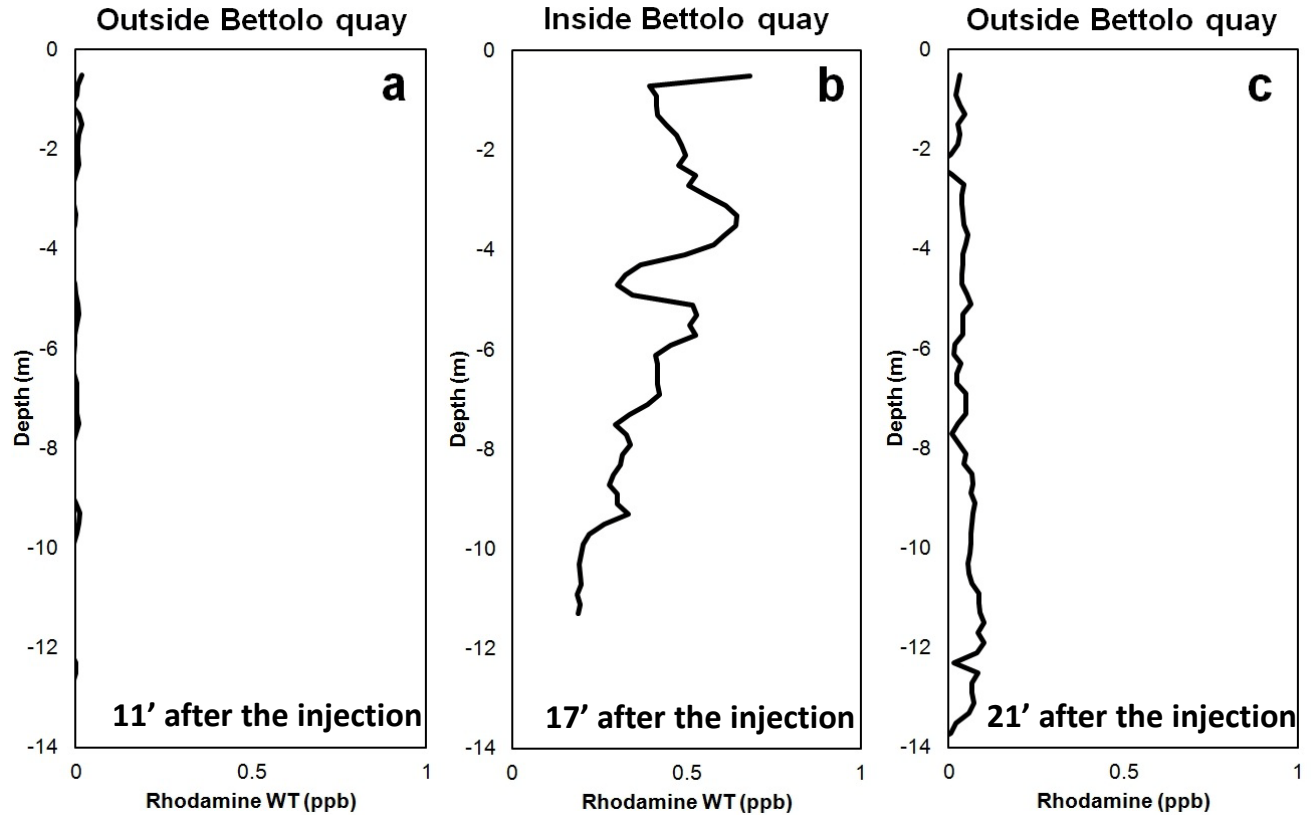
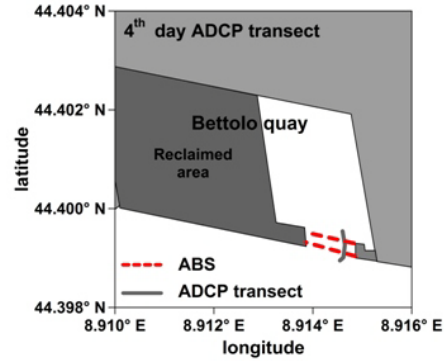
Rhodamine WT between them

Weather conditions	Mean water temperature (°C) (Surface – Bottom)	Mean water salinity (Surface – Bottom)
Cloudy, strong wind from NNE, calm sea	22.4 - 22.4	37.7 - 37.7

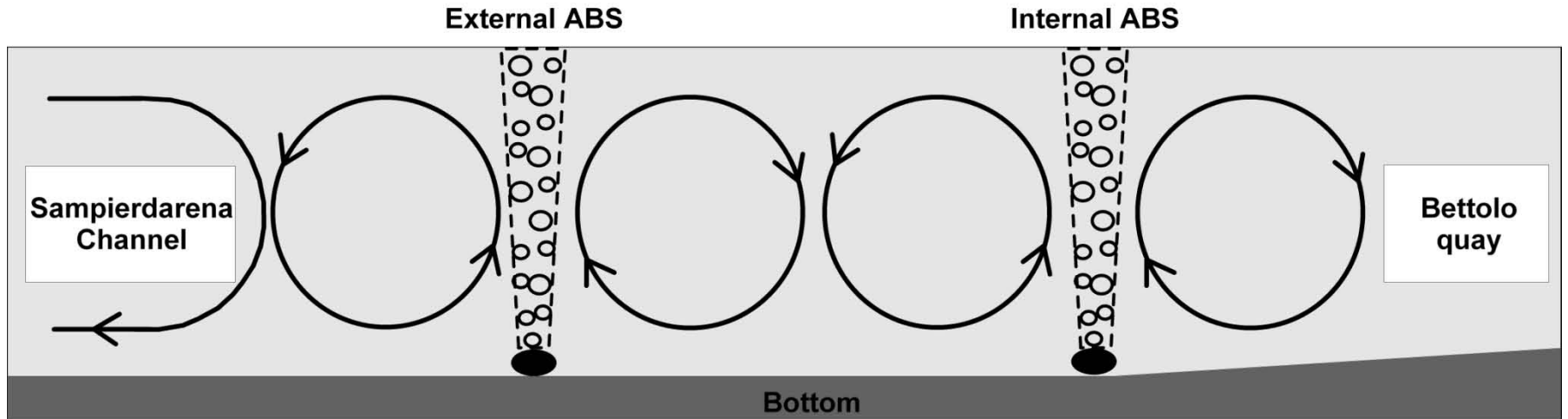


4th Test Day :
two ABSs
+

Rhodamine WT between them



FINAL CONSIDERATIONS





Authors wish to dedicate this work to the victims of the accident that occurred on May the 7th, 2013, at 11:04 pm when the container ship “Jolly Nero” has hit and broken down the Pilots - Coast Guard Tower of the Port of Genoa causing 9 deaths.

Our thoughts are with Them.