

Impacts of sand extraction and deposition on the ecosystem recovery rate in the southern coastal zone of Portugal

T.Drago^{(1,2)*}, R.Taborda^(2,3), S. Teixeira⁽⁴⁾, M.Rosa⁽¹⁾, J. P. Cascalho^(2,3), M. Tuaty-Guerra⁽¹⁾, M. J. Gaudêncio⁽¹⁾, J. Gonçalves⁽⁵⁾, P.Relvas⁽⁵⁾, E. Garel⁽⁶⁾, L. Júnior⁽⁶⁾, V. Henriques⁽¹⁾, P.Terrinha^(1,2), J. Arteaga⁽¹⁾, A. Ramos⁽⁷⁾

(1) Instituto Português do Mar e da Atmosfera, Lisboa, Portugal

(2) Instituto Dom Luiz, Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal

(3) Departamento de Geologia, Faculdade de Ciências, Universidade Lisboa, Lisboa, Portugal

(4) Agência Portuguesa do Ambiente, ARH-Algarve, Faro, Portugal

(5) Centro de Ciências do Mar, Universidade do Algarve, Faro, Portugal

(6) Centro de Investigação Marinha e Ambiental, Universidade do Algarve, Faro, Portugal

(7) Centro de Ciências do Mar e do Ambiente, MARE-NOVA, Caparica, Portugal

(8) Centro de Ciência Viva Tavira, Tavira, Portugal

* Corresponding author, e-mail: tdrago@ipma.pt



Objective

To characterize the impact of sand extraction and deposition on the marine/beach ecosystems and simultaneously, assess the respective recovery rate

The pursuit of these objectives will help to determine the Environmental Status of the seabed that has been subject to the extraction/deposition of sediments for beach feeding.

This is an ongoing project!

Study areas

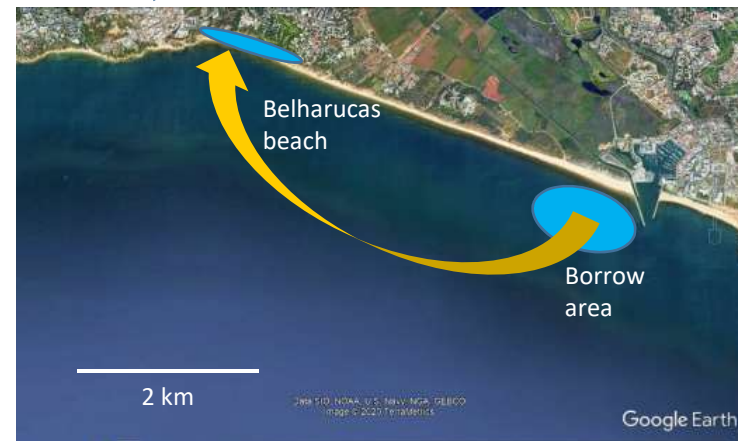


Long term study (planned for the near future)

Former borrowed areas offshore:
Faro-Ancão - 2010
and Albufeira - 2014

Short term study (2017-2020)

Dredging from inner shelf
borrow area and deposition
at Belharucas beach



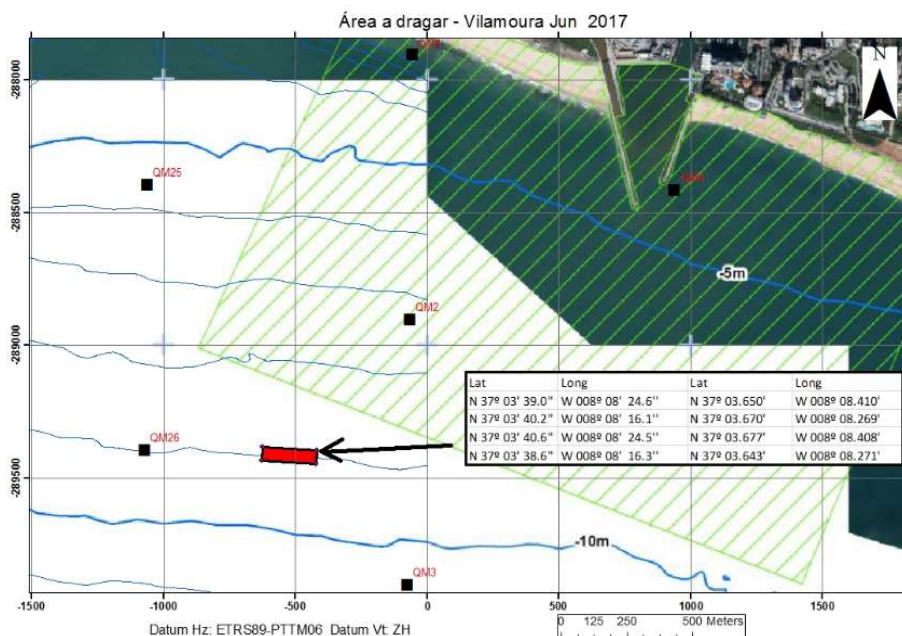
Short term study (2017-2020)

Nourishment of Belharucas beach

(Promoted by ARH-Algarve, APA (Portuguese institution responsible for littoral management))

The present work includes the acquisition and processing of: morphology data, sediment analyses, oceanographic data, benthic communities characterization in two study areas:

Small pit area (sand extraction)



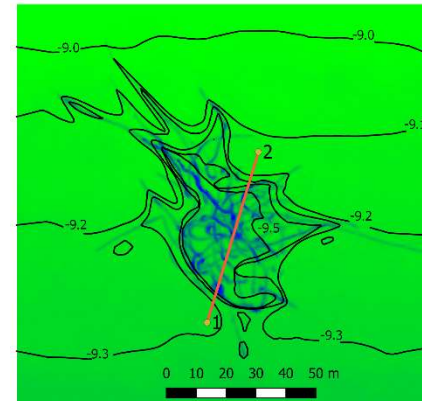
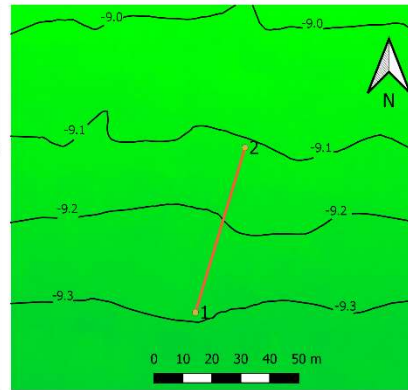
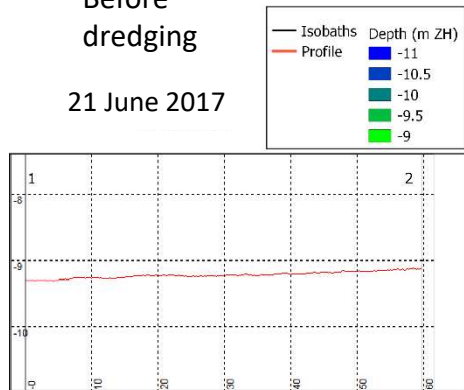
Belharucas beach (sand deposition)



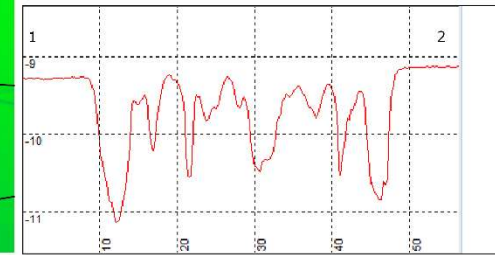
Small pit area - Multibeam surveys

Before
dredging

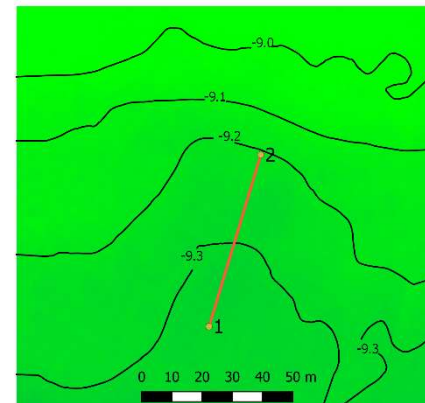
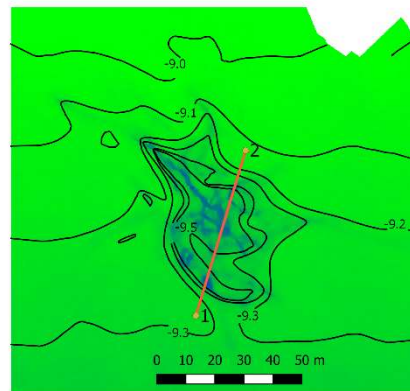
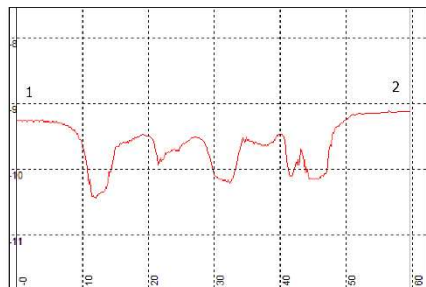
21 June 2017



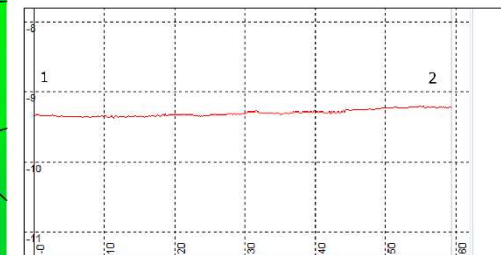
13 Julho 2017



20 Oct. 2017

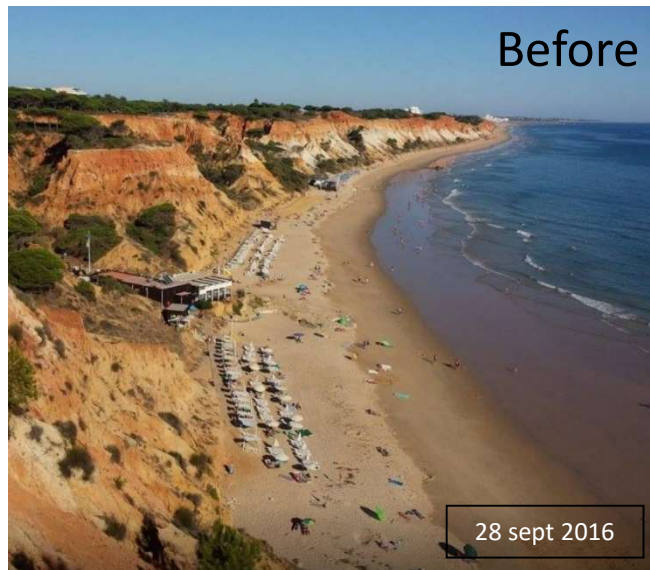


16 May 2018



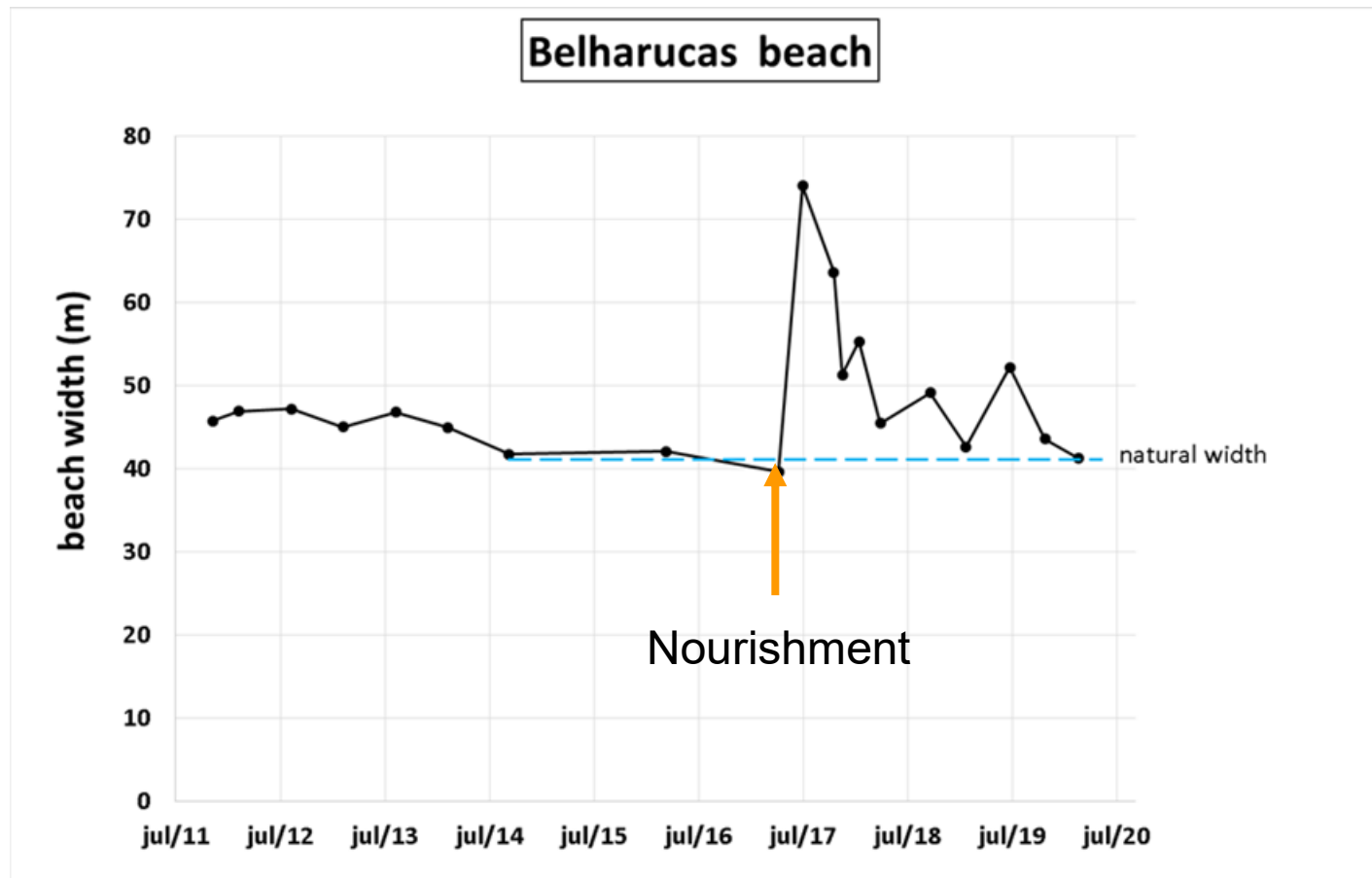
Almost completely recovered!

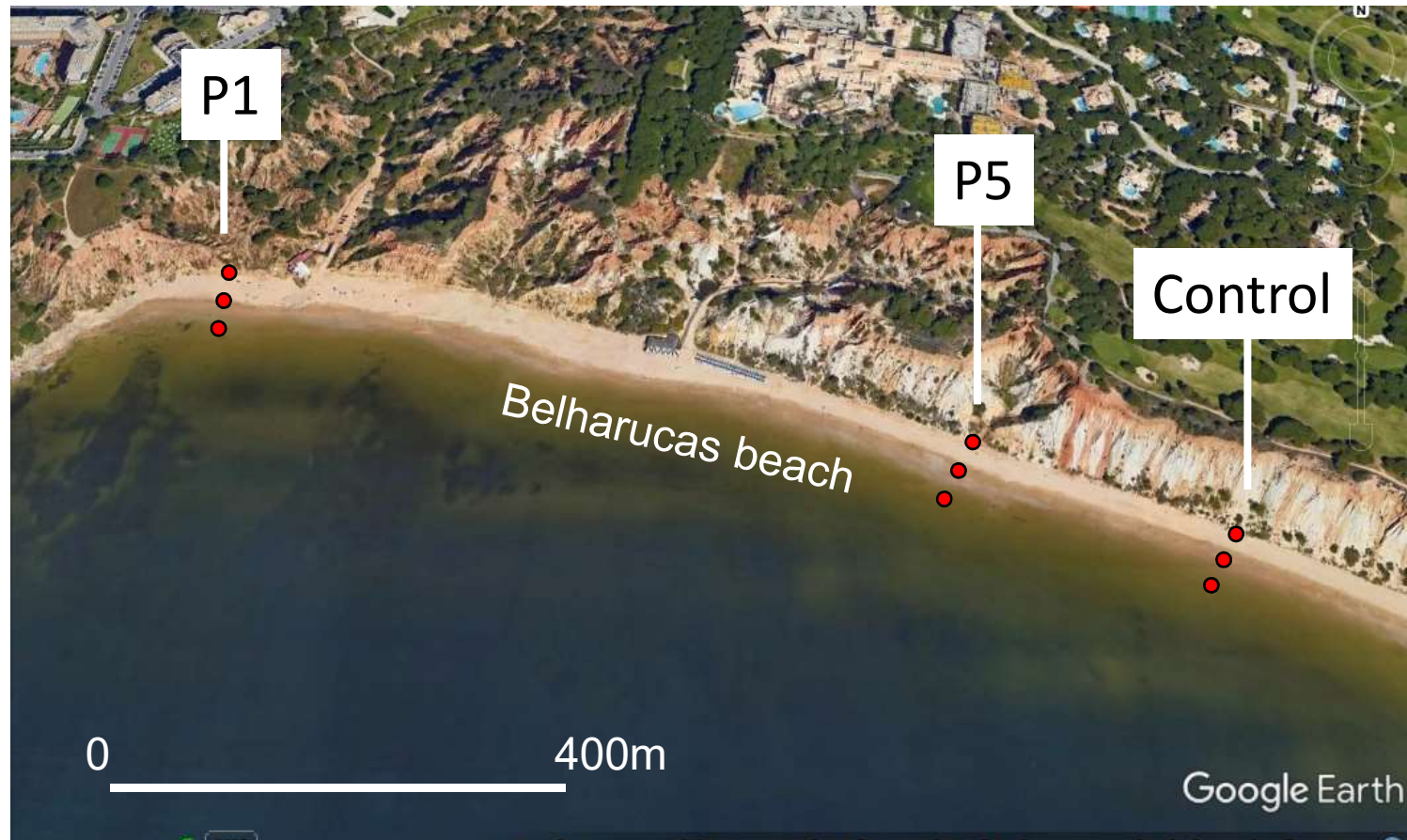
Belharucas beach nourishment April-Jun 2017



Belharucas beach - Width evolution

Presently, the Belharucas beach width is only 1% larger than its “natural width”



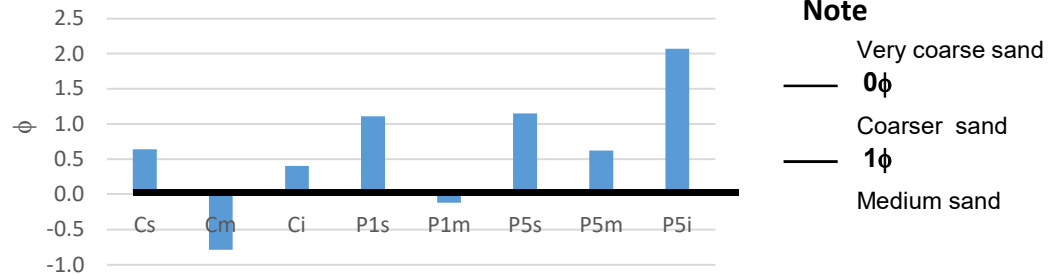


Sampling locations along profiles P1, P5 and Control (at supralittoral, mediolittoral and infralittoral)

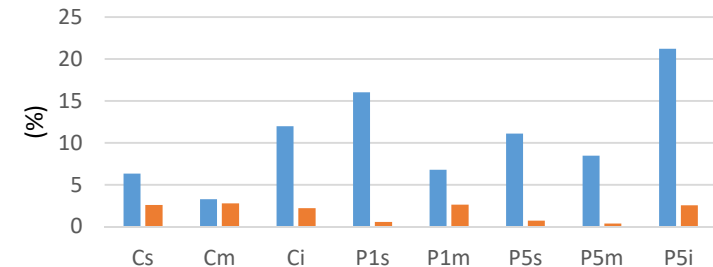
Belharucas beach – Sediment analysis

24-4-2017 – before nourishment

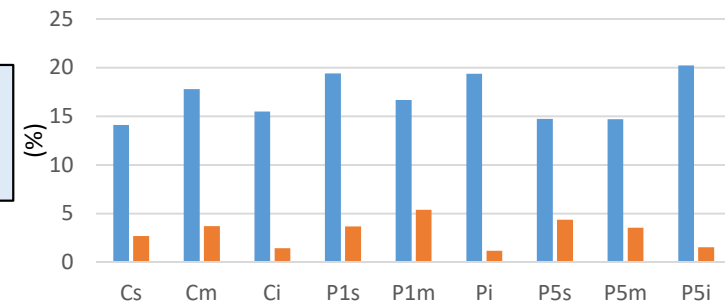
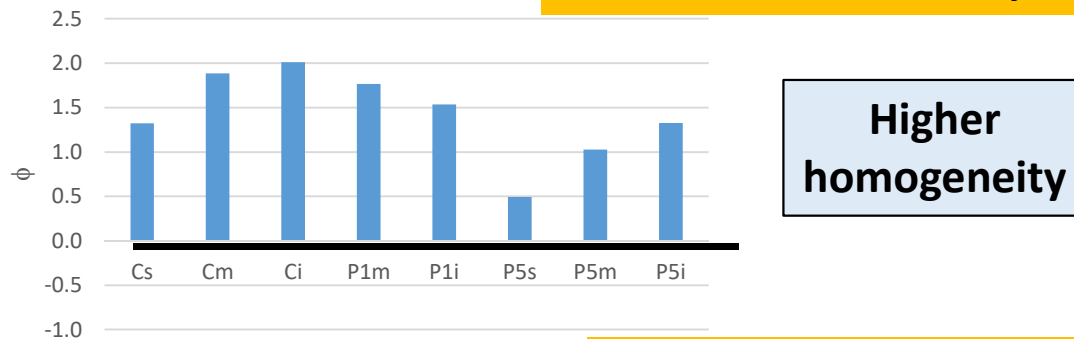
Mean grain-size (ϕ)



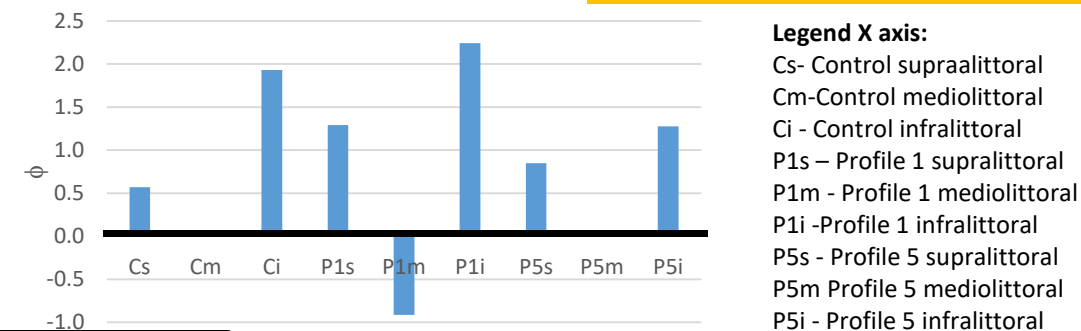
Carbonates and organic matter (%)



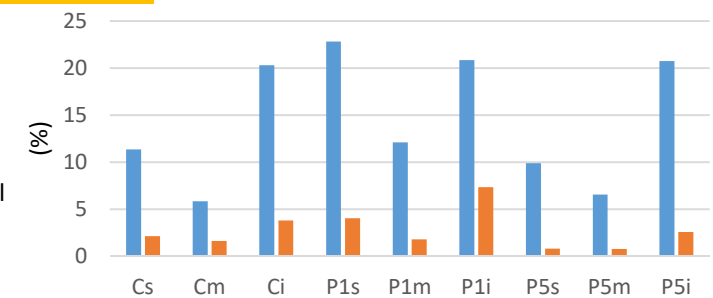
11-07-2017 – immediately after nourishment



22-02-2019 – 20 months after nourishment



Legend X axis:
 Cs- Control supralittoral
 Cm-Control mediolittoral
 Ci - Control infralittoral
 P1s – Profile 1 supralittoral
 P1m - Profile 1 mediolittoral
 P1i -Profile 1 infralittoral
 P5s - Profile 5 supralittoral
 P5m Profile 5 mediolittoral
 P5i - Profile 5 infralittoral



Carbonates (%) Organic matter (%)

Some few conclusions



Yet to be known (work in progress):

- Benthic macrofauna monitoring results (at small pit area and Belharucas beach);
- Small pit area sediment characteristics and benthic macrofauna monitoring results;
- Establishment of sedimentary transport pattern (based on tracers experiment and wave and currents data);
- Recovery rate determination and contribution to Marine Strategy Framework Directive - "D6 Sea-floor integrity"