SEMI-AUTOMATIC METHOD OF FAN SURFACE ASSESSMENT TO ACHIEVE GORGONIAN POPULATION STRUCTURE IN LE DANOIS BANK, CANTABRIAN SEA

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ABSTRACT:

This study presents a semi-automatic method to estimate fan surface of a *Placogorgia sp.* octocoral assemblage using 3D point clouds in El Cachucho MPA at 550 m of depth.

The semi-automatic methodology uses fitting planes to assess colonies morphometries. Using Pix4D Mapper Pro and Cloud Compare software, size and morphometry of fan-shaped gorgonians and forest population structure were assessed. RMS of fitting planes shows that the geometrical figure chosen is suitable to retain the morphometric characteristics of the specimens of this species.

The adjustment of semi-automatic values with a sample of manually digitized surfaces is validated (R^2=0.97). The results show that gorgonian population was mostly dominated by small colonies. The population structure distribution shows a high proportion (~22%) of recruits (< 0.05 m^2) of fan surface.
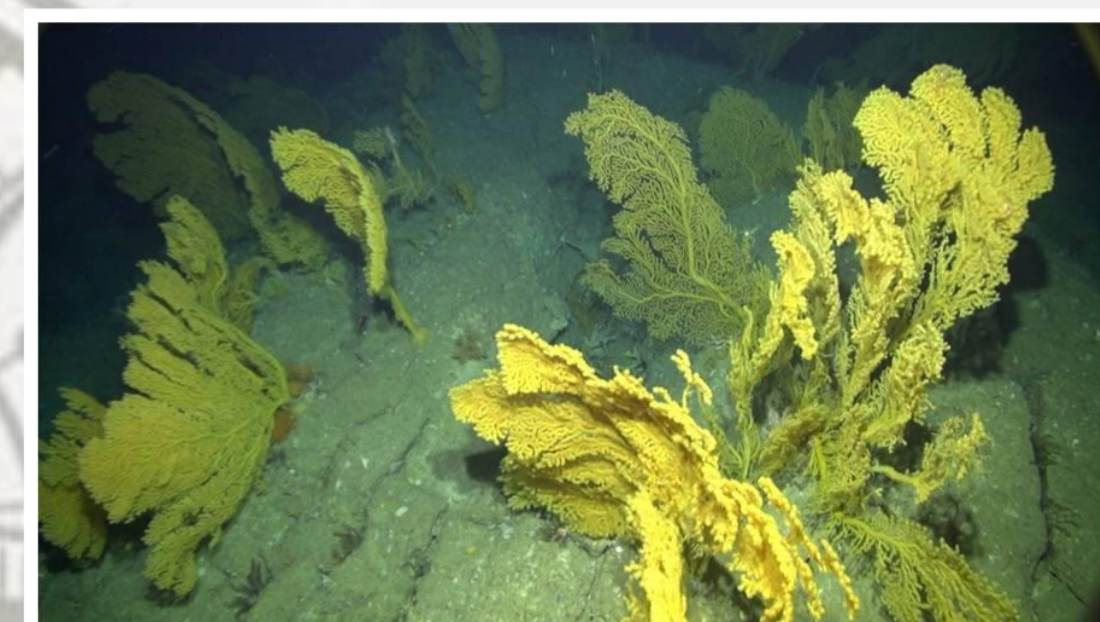
Study Area

"El Cachucho" is a Marine Protected Area on the Bay of Biscay (Le Danois Bank, Cantabrian Sea - Spain) included in the Natura 2000 network.
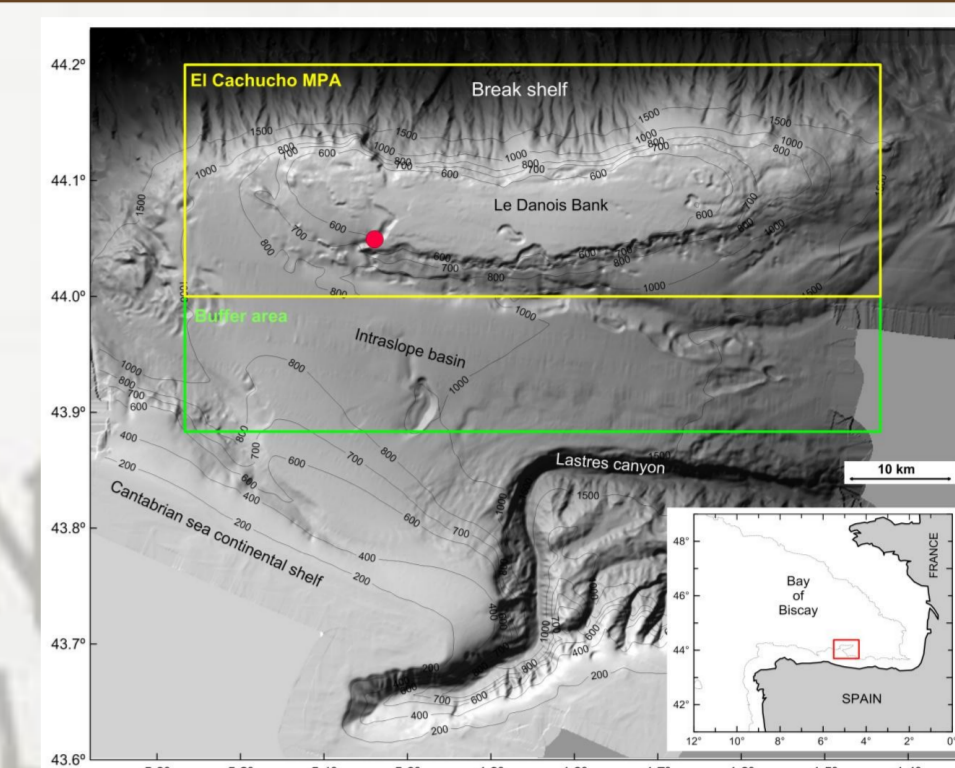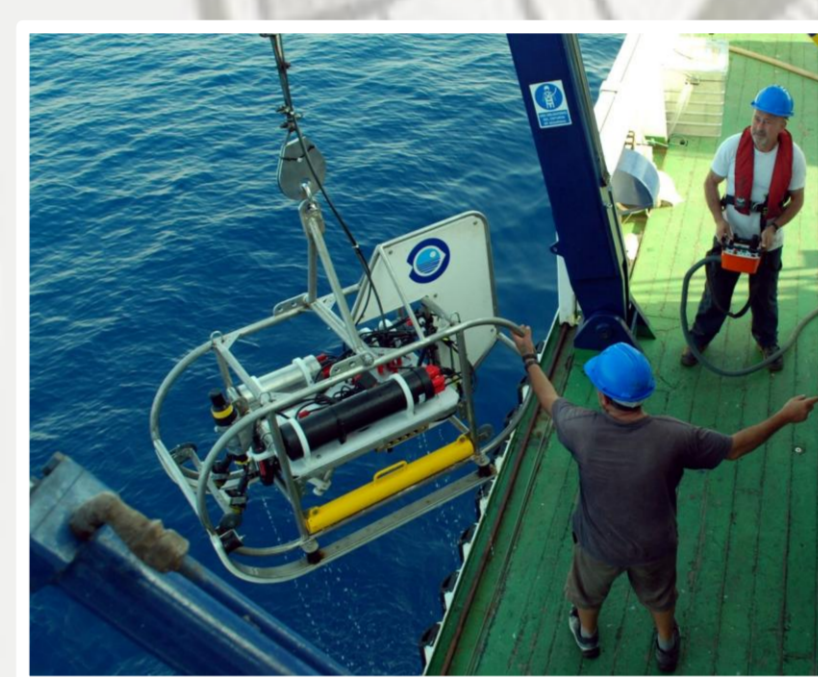
Gorgonian forest

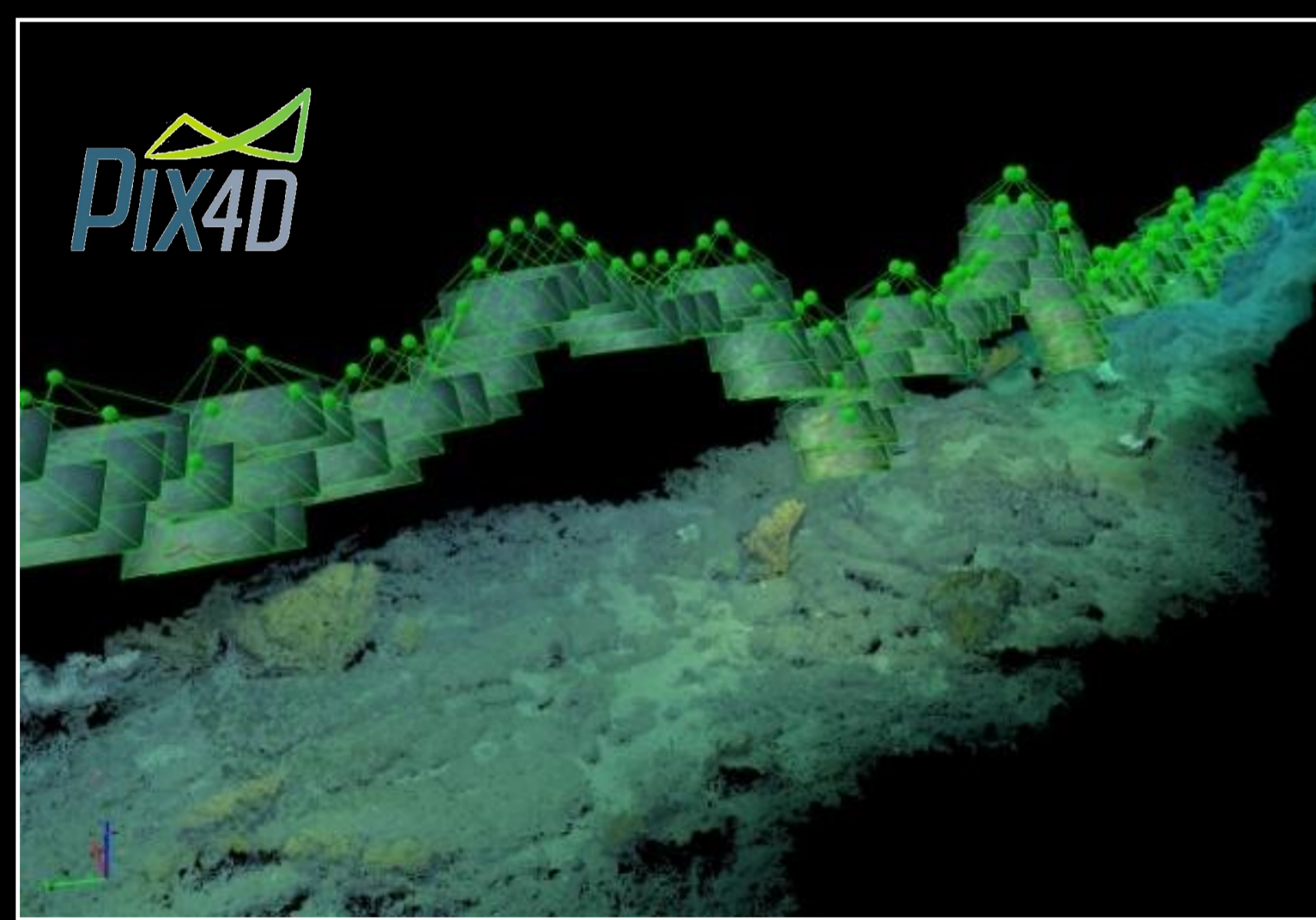## Data Acquisition
Non-invasive methodology

And more...

Video transects acquired in Le Danois Bank, during the ECOMARG-2017 survey (R/V Ramón Margalef) using the Politolana underwater towed vehicle .

Methods

Photogrammetric reconstruction:
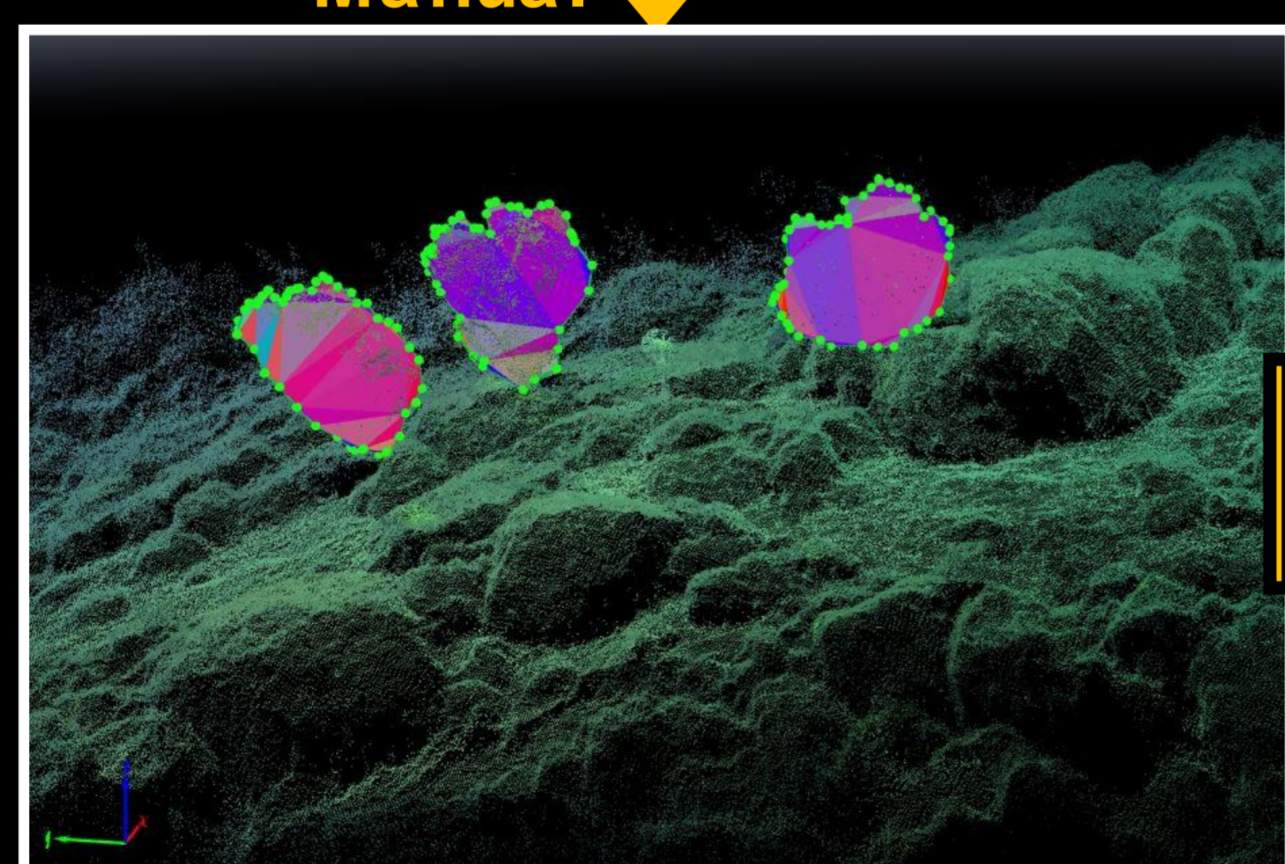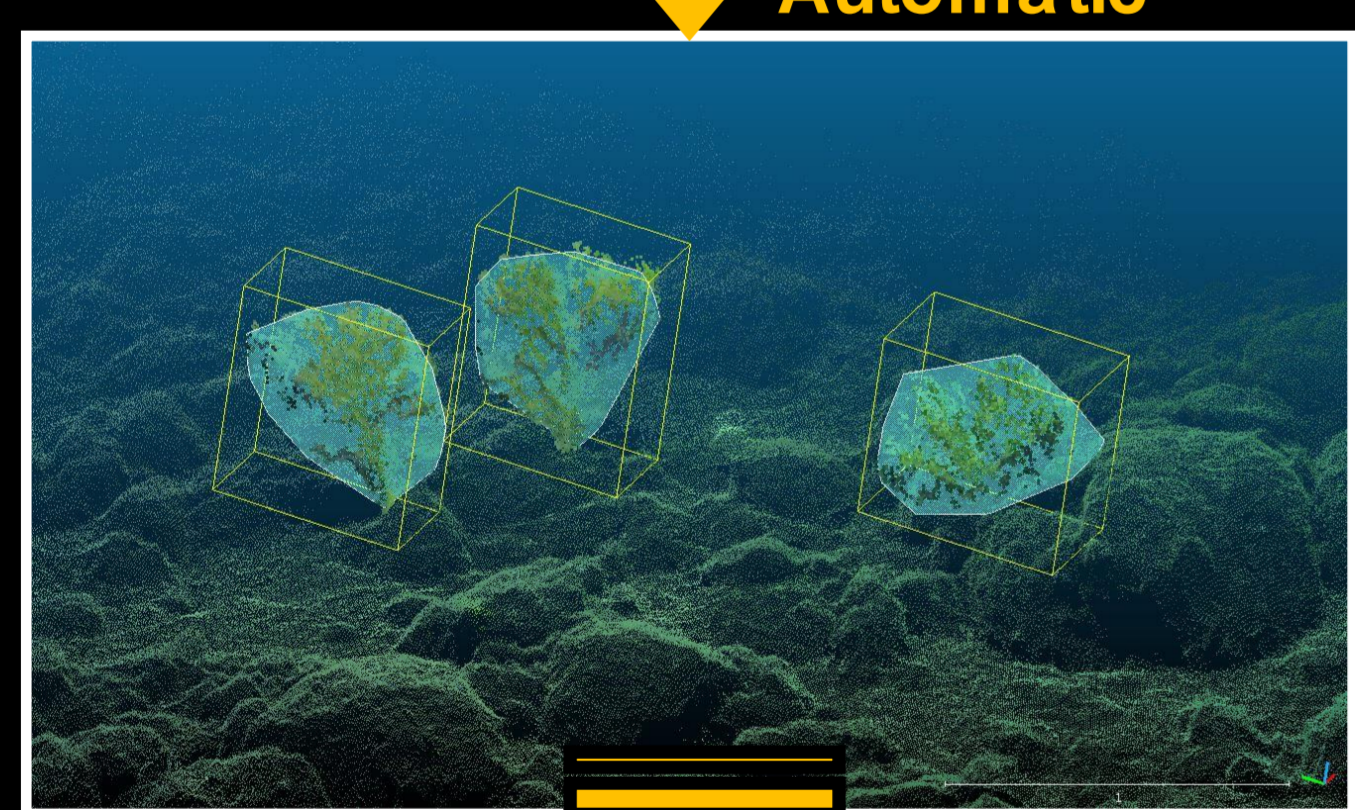**3D densified point cloud of gorgonian forest**

The *Placogorgia sp.* is a structuring species of the deep Cantabrian Sea; population structure and morphology inform on the overall health of this vulnerable habitat.

CloudCompare Fitting planes

Digitalization
3D fan surface = Σ irregular planar triangles

Automatic

Manual

?
=

VALIDATION

**FAN-SURFACE ASSESS**

Results

Fan-surface values

The difference between manual procedure based in the sum of planar triangles and semi-automatic method to adjust a unique fitting plane in 47 colonies was -0.134 m^2 and 0.059 m^2. Linear regression shows an adjustment of 0.97 for the R^2 value.

Gorgonian fan surface (m2)
R^2 = 0.9776
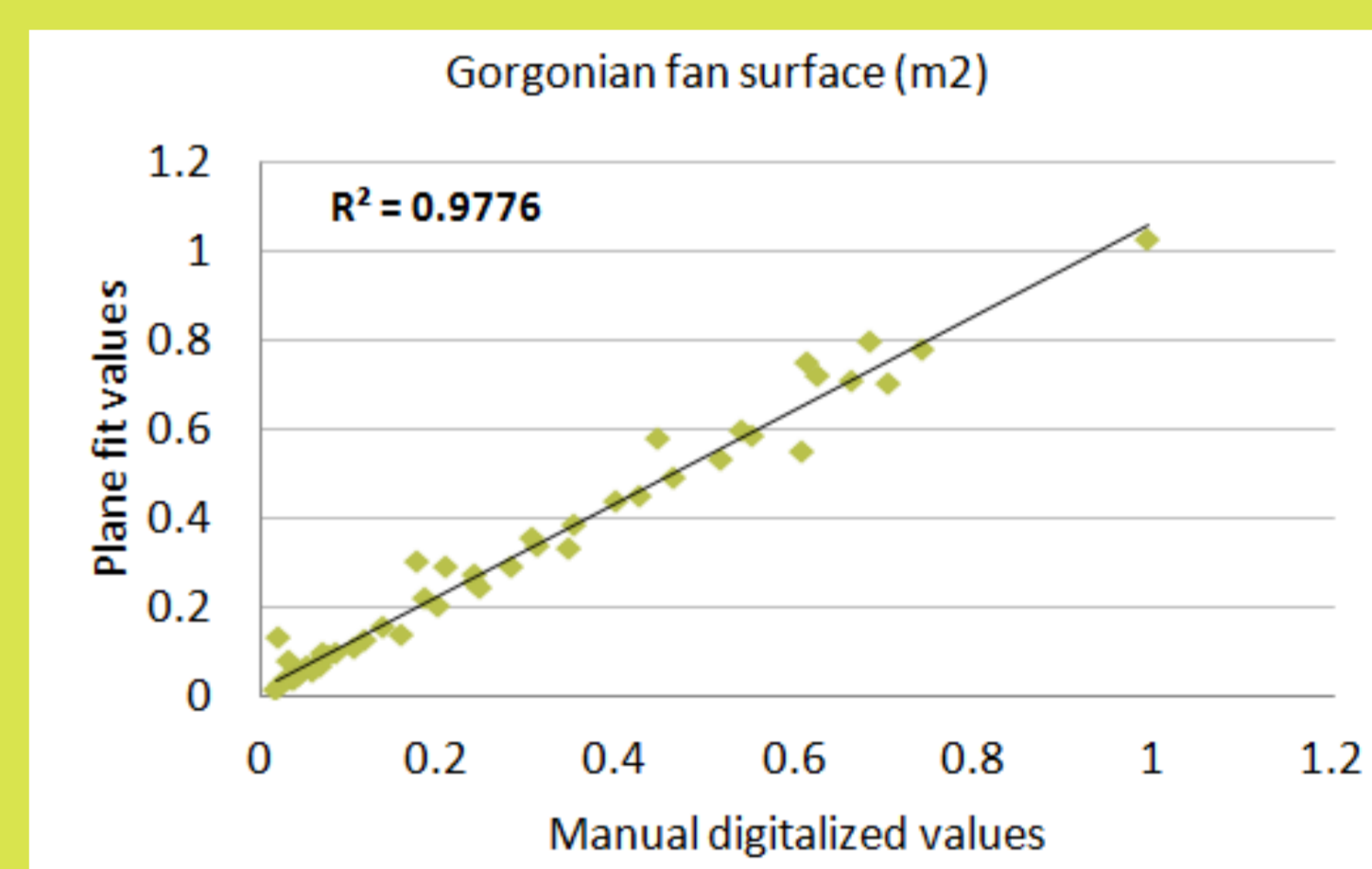
Population structure

Fan surface (m^2) of 188 gorgonians were semi-automatic assessed from 3D point cloud. The gorgonian surface results are grouped in classes and their frequency distribution calculated as an indicator of population structure. The *Placogorgia population was positively skewed, indicating the dominance of colonies less than 0.15 m^2 of fan surface.*

$y = 68.107x^{-1.078}$
$R^2 = 0.8748$
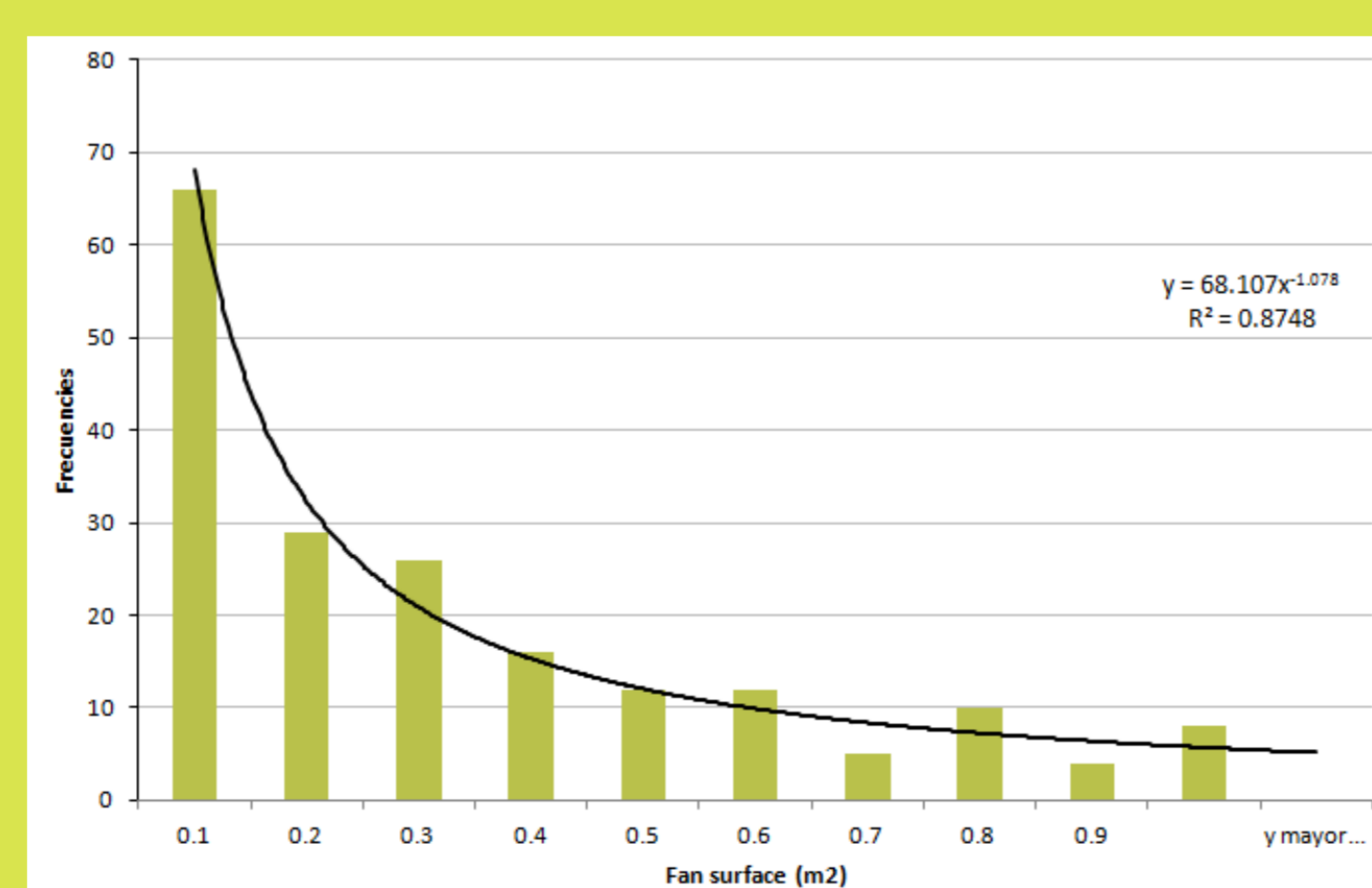
Plane fitting

RMS values associated with the adjustment of a plane to each point cloud. There are a majority of planes with very low RMS values; 58% of planes have an RMS below 0.03; average of calculated RMS is 0.03.

Plane fitting RMS
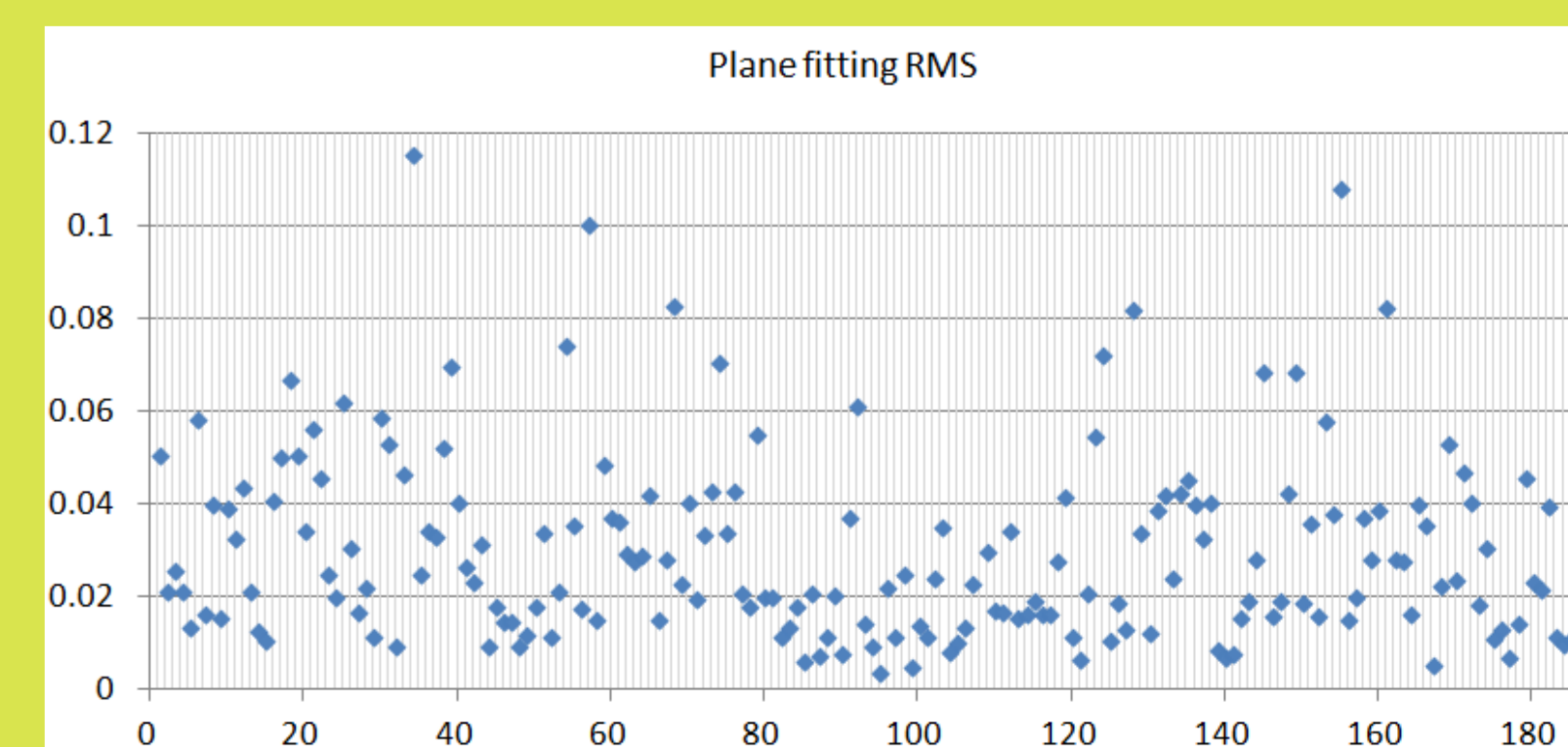
Conclusions

Photogrammetry represents a non-destructive, cost-effective tool for coral reef monitoring. This approach achieves greater resolution and quantitative measures, allowing the integration of information in a GIS environment. However, its application to deep-sea habitats is still in an early stage. The use of this methodological approach based on SfM techniques from images taken by a ROTV has allowed us to perform with accuracy and high resolution a population study of a gorgonian forest in the Cantabrian Sea bathyal ecosystem.