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INTRODUCTION

- The taxonomy of zoantharians is highly challenging due to a lack of clear morphological characters; although molecular techniques have helped to clarify high level-taxonomic relationships within the order.
- However, many issues remain at species level due to the limited resolution of DNA markers commonly used.
- Metabolomics approach showed promise to help distinguish closely related marine invertebrates like sponges¹ or even morphotypes for zoantharians².
- The Eastern Equatorial Pacific is one of the most poorly studied area for zoantharians diversity (Figs. 1 and 2).

STUDY AREA

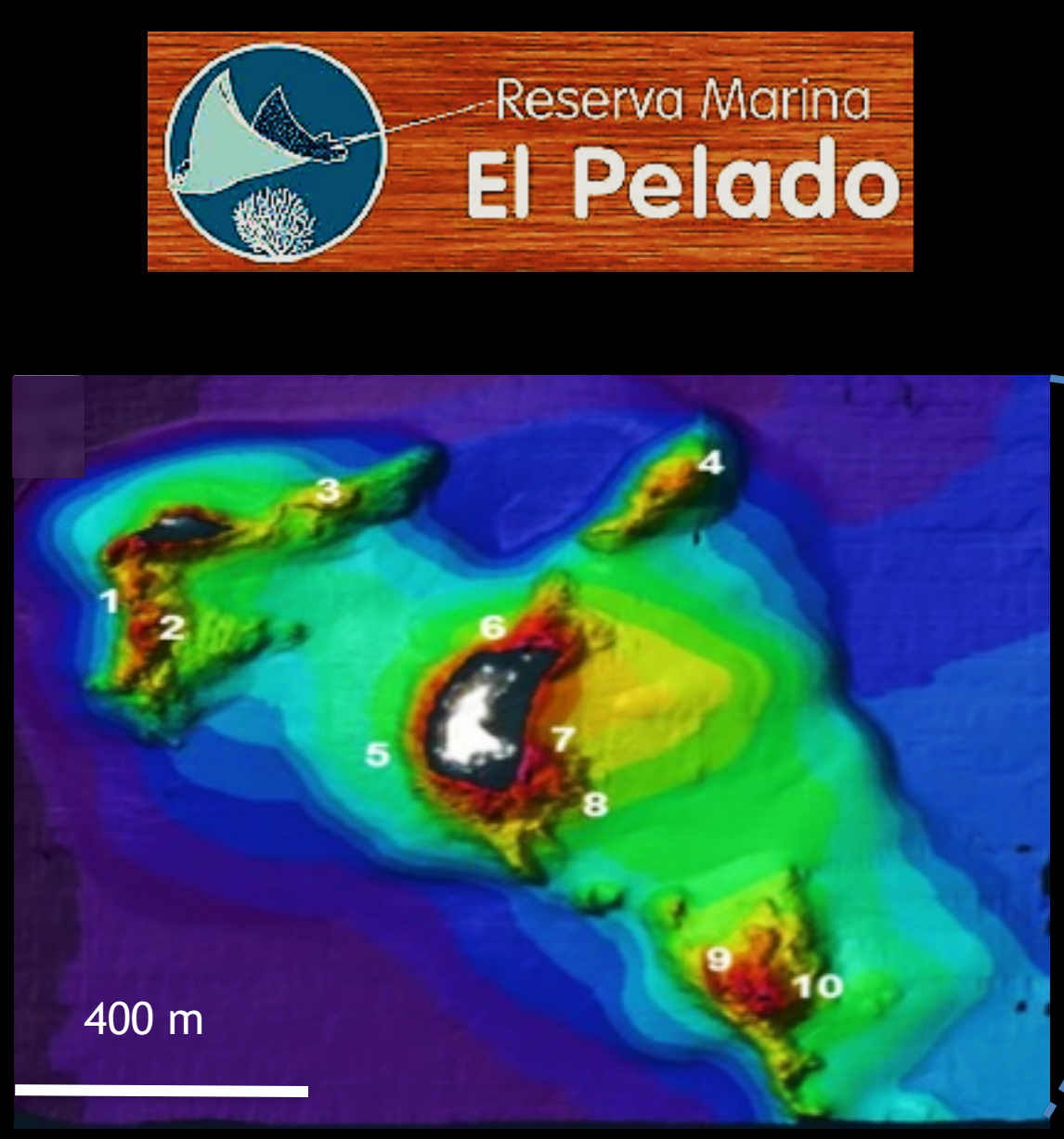


Fig. 1. Map of El Pelado Marine Protected Area with ten sampling locations zoantharians
The Pelado MPA was created in 2012, and covers 13005 marine hectares and 96 on land. It has an interesting diversity of marine invertebrates. This place is a preferred spot for recreational scuba diving.

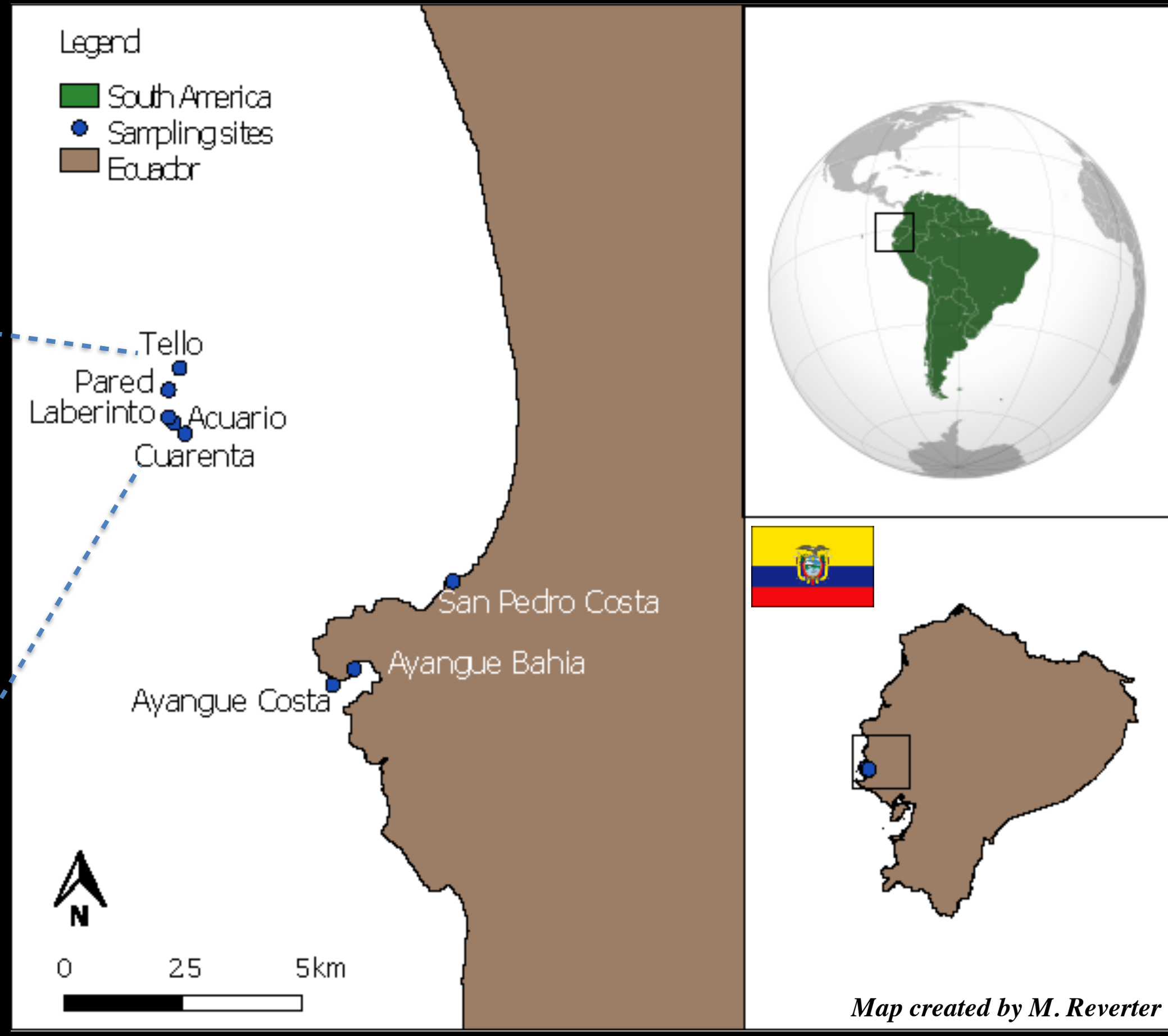
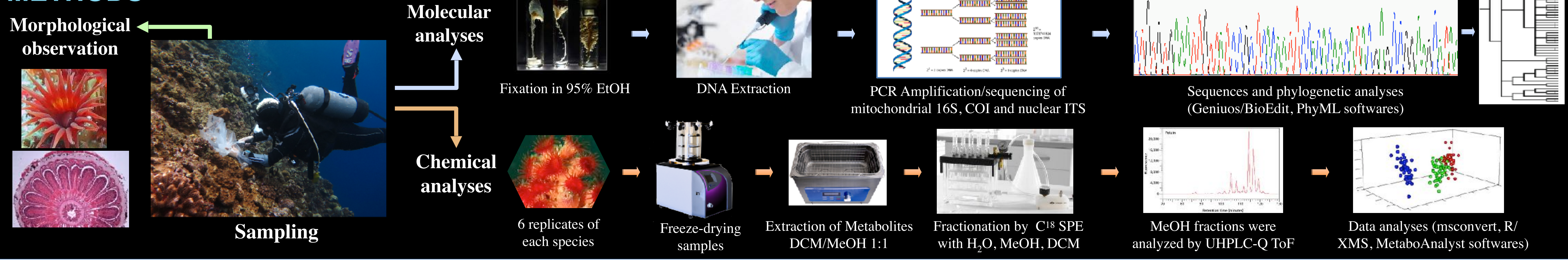


Fig. 2. Map of South America and Ecuador highlighting Ecuadorian coast
Map created by M. Reverter

OBJECTIVES

- Use a combined morphological and molecular approach to describe and classify zoantharian species of El Pelado Marine Protected Area (Fig.1).
- Assess the potential of metabolomics to help identifying and characterizing zoantharian species.

METHODS



RESULTS

Phylogenetic analysis

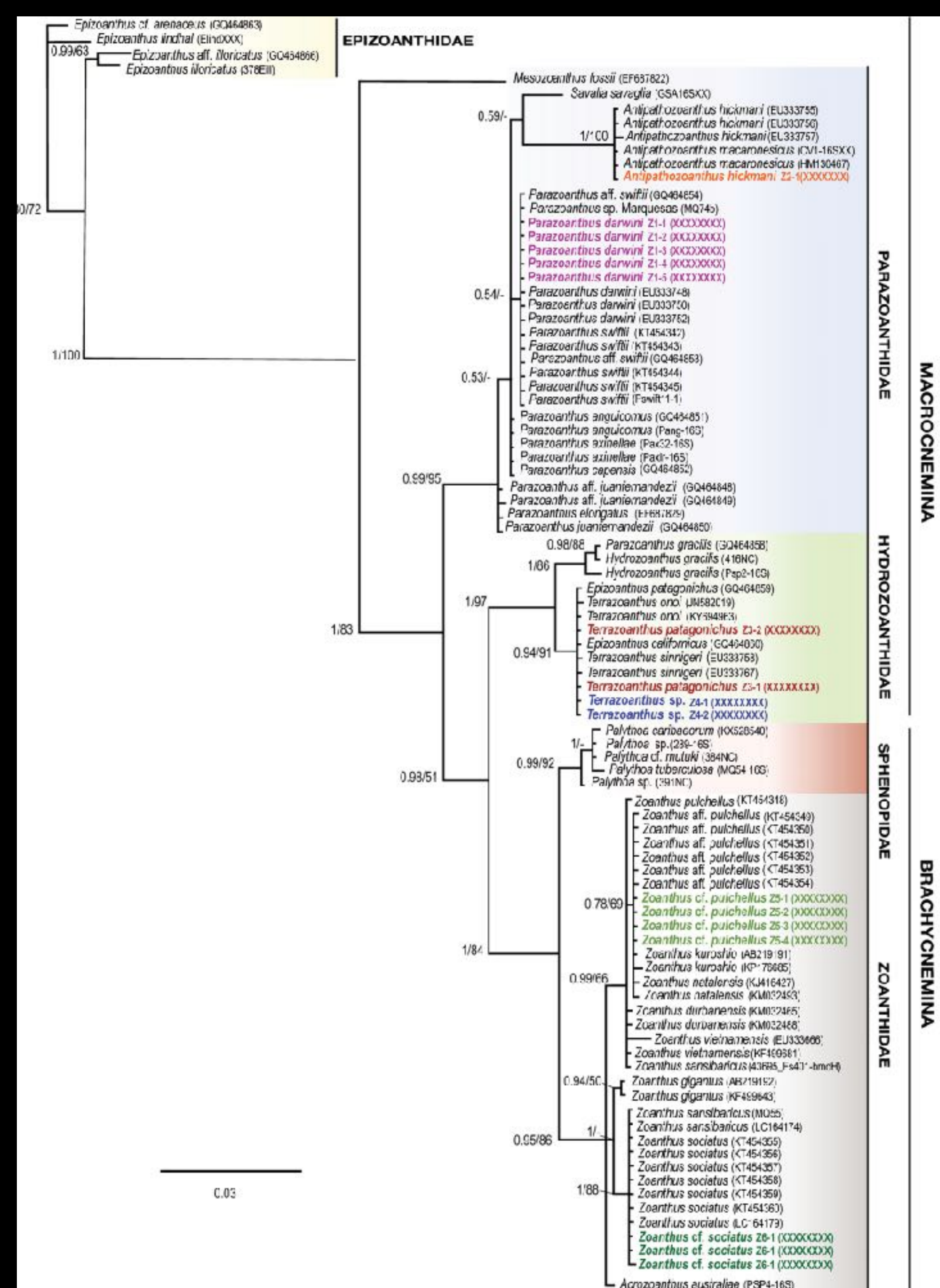


Fig 3. Phylogenetic Bayesian tree obtained from sequences of mitochondrial 16S ribosomal DNA (mt 16S rDNA). Bayesian and ML bootstrap support values over 0.75/75% are indicated by the nodes. Values below posterior probabilities of 0.75/75% bootstrap was considered as unresolved. Specimens from this study are indicated in different colors.

El Pelado - Ecuador Zoantharian Diversity

- In El Pelado Marine Protected Area, zoantharians are important components of the benthic fauna.
- Mitochondrial markers COI and 16S confirm the presence of six zoantharian species, some of them were reported from the Galapagos Islands^{3,4}. However, the molecular markers did not allow clear distinctions between closely related species.

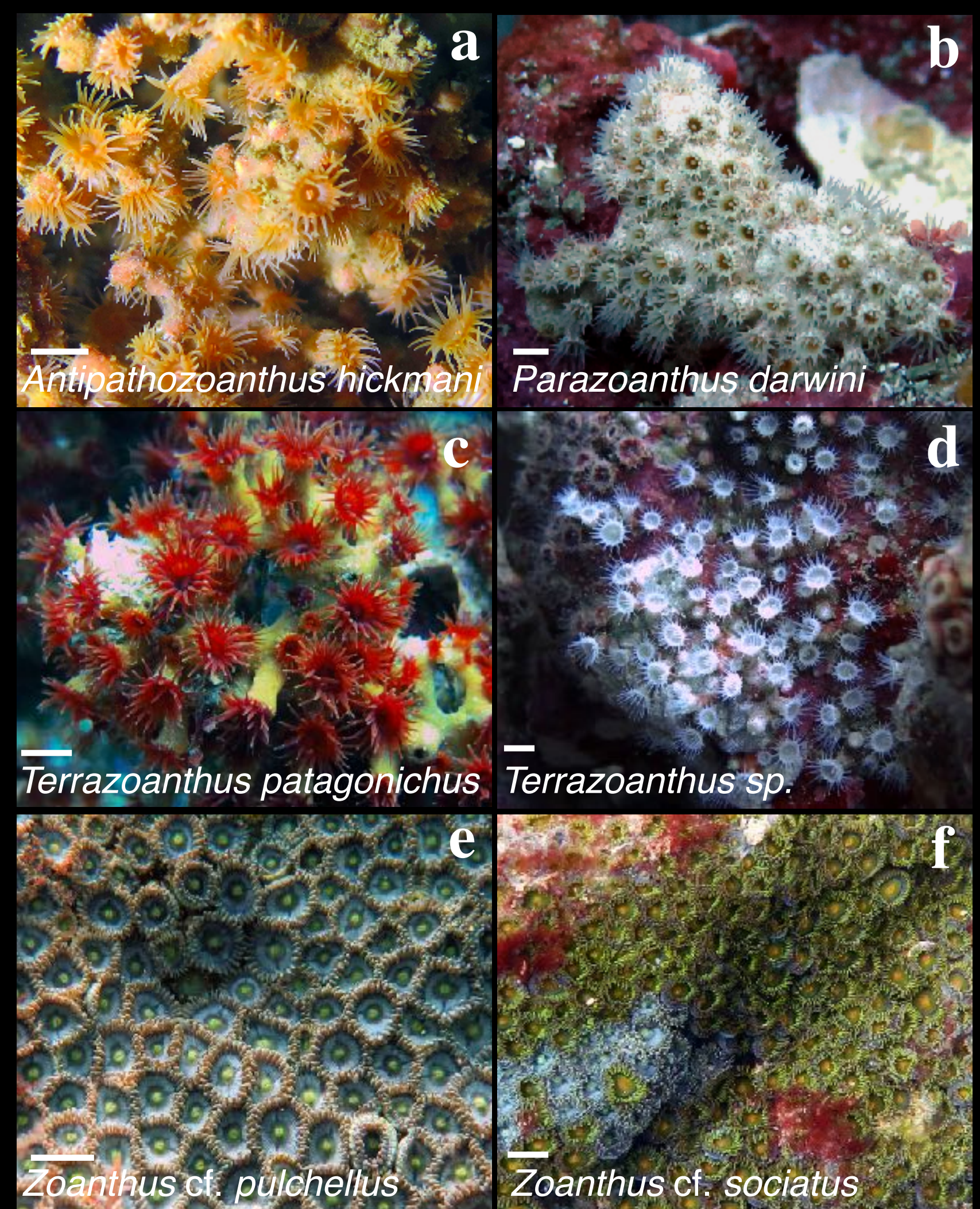


Fig 4. In situ photographs of the 6 species found at El Pelado MPA. Scale above the names indicate approximately 1 cm.

Phylometabolomics analysis

- Metabolomics profiles were both consistent between all replicates within a species and distinct between species, despite specimens being collected at different times, depths and locations.
- Specialized metabolites of the ecdysteroids and alkaloids families were identified as key biomarkers for an interspecific discrimination.

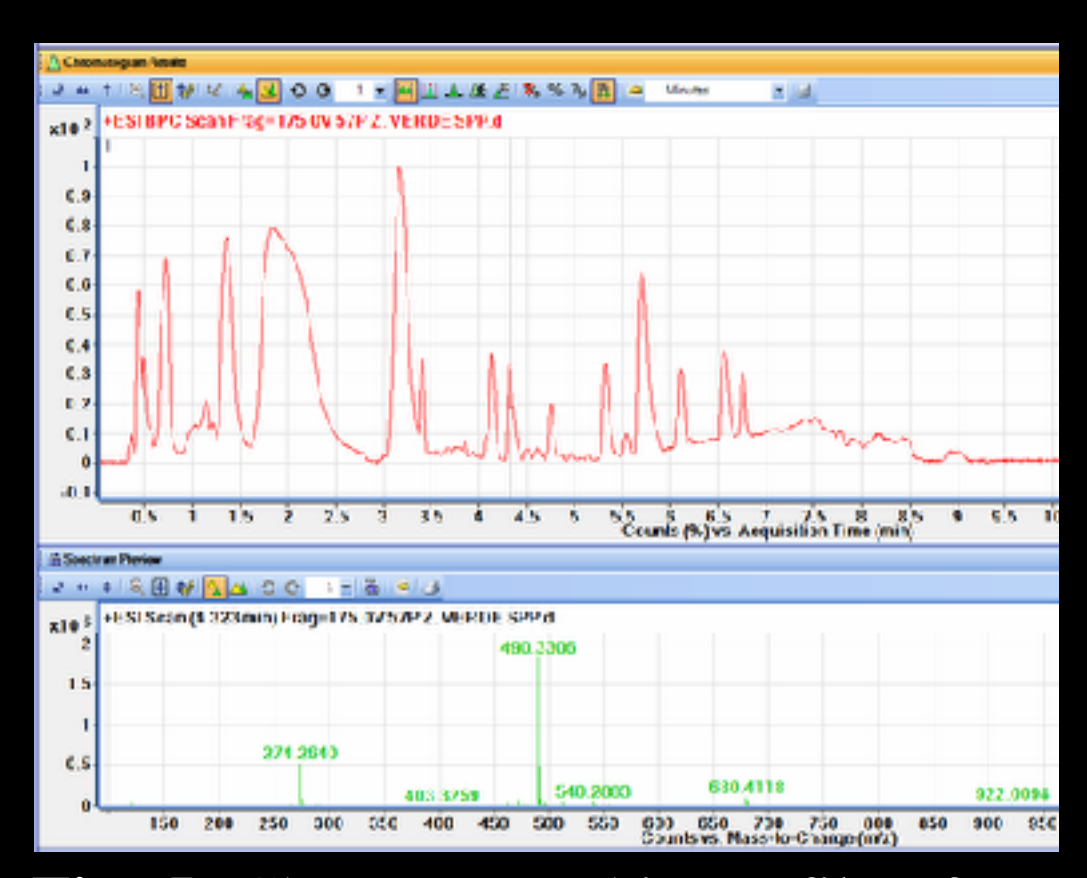


Fig 5. Chromatographic profile of one replicate of *Zoanthus cf. sociatus*

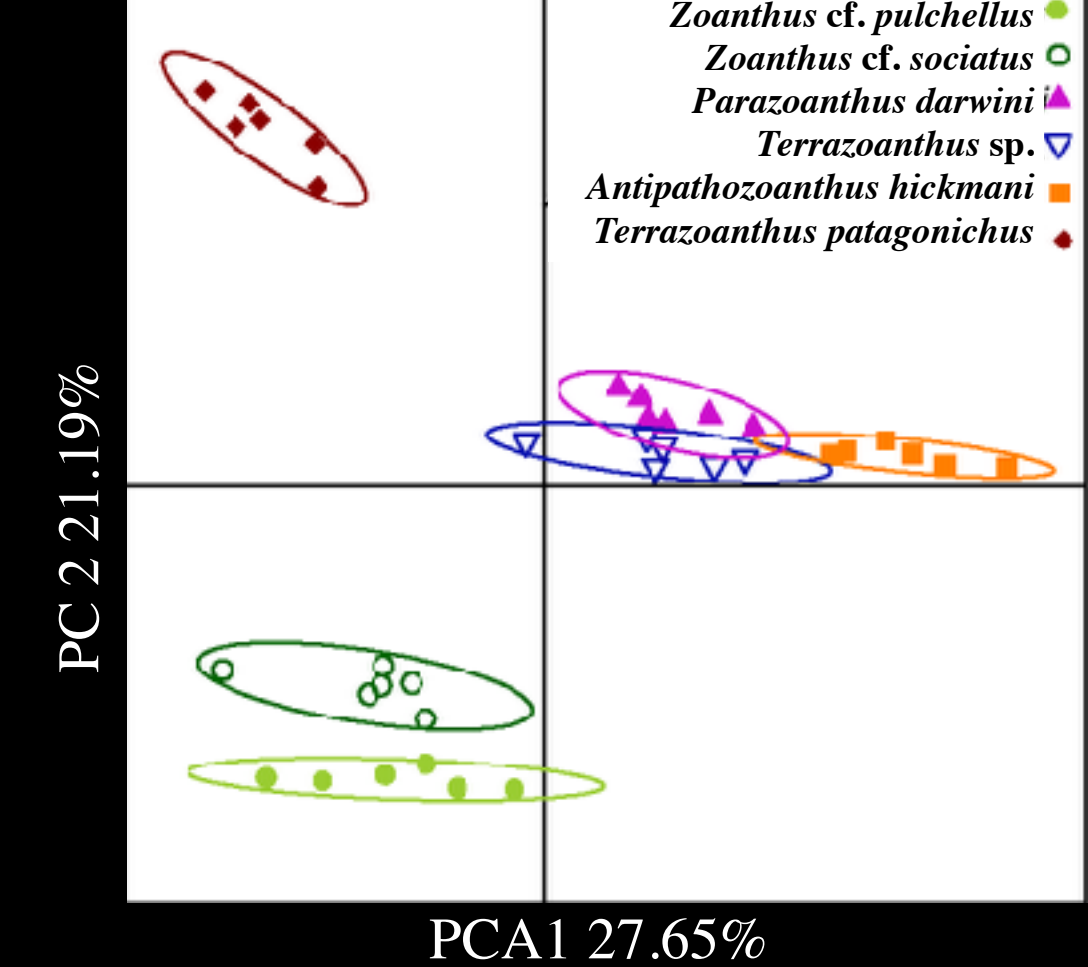


Fig 6. Untargeted Metabolomic. Scores plot between the most significant principal components. The explained variances are shown in brackets.

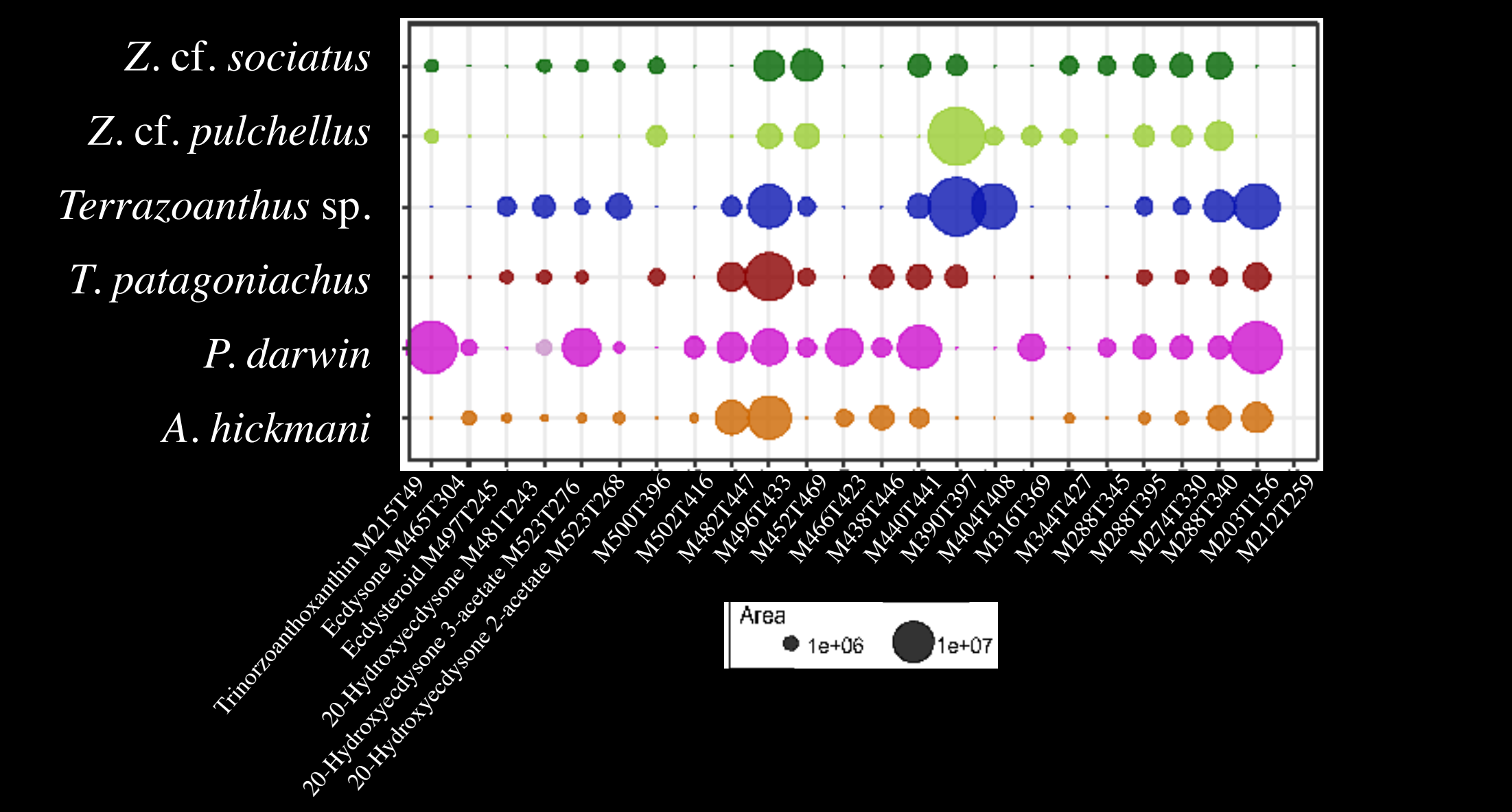


Fig 7. Main variables found in more than one species of zoantharians. For each variable M = molecular weight, T = retention time. Different colors represent the six different zoantharians species.

DISCUSSION

- Molecular data of some Eastern Pacific zoantharians showed similarities with the Caribbean species⁵. Systematics applied confirm the high level of conservatism in zoantharian DNA and illustrate well the challenge in zoantharians taxonomy.
- The results of metabolomics analyses performed on 6 species strongly support that this approach is useful as a complementary tool to morphological and molecular taxonomy of zoantharians.

PERSPECTIVES

- Expand our investigation to other Atlantic, Pacific and the Caribbean species to explore the range of this metabolic approach in the classification of zoantharians.
- Direct morphological comparisons with Atlantic specimens will be performed to confirm these preliminary identifications.

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References: 1. Ivanišević et al. 2011 Metabolomics 7 (2): 289-304; 2. Cachet et al. 2015 Sci. Rep 5:8282; 3. Reimer & Fujii. 2010 ZooKeys 42:1-36; 4. Reimer & Hickman. 2008 Coral Reefs 27: 641-654; 5. Reimer et al. 2012 J.Mar. Biol. (2012) -14.