BROMOTYROSINE DIVERSITY IN A COMMON APLYSINIDAE SPONGE PRESENT OFF THE COAST OF ECUADOR

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INTRODUCTION

Marine biodiversity through their genetic resources offers a wide spectrum of biotechnological applications, such as small molecules with bioactivity against cancer or pathogenic bacteria. Ecuador is considered one of the megadiverse countries in terms of biodiversity, nevertheless, its associated chemodiversity is hardly known and described, especially regarding the marine environment. Its coast has an extension of 2.859 km at the continent and a vast marine territory under the equatorial front influence, which is characterized for a strong thermohaline gradient caused by the confluence of several currents and the upwelling of deep waters rich in nutrients. This region is considered a new hotspot of functional biodiversity.[1]

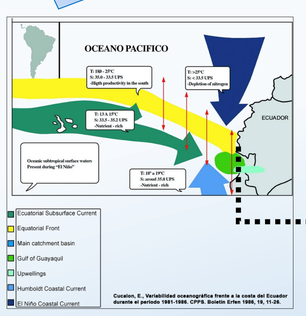
OBJECTIVE

Description of the specialized metabolome of marine invertebrates from El Pelado marine reserve in Ecuador and therefore the construction of a marine chemical library. The first group selected were sponges from Aplysinidae family.

METHOD

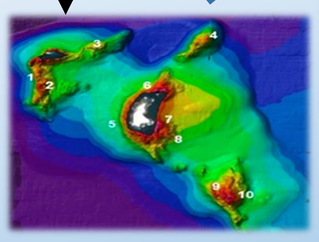
Samples were processed following the chart bellow. Sponge identification was made comparing external morphology and skeletal characteristics[2]. To screen their pharmacological potential, antitumor activity of the isolated compounds was assessed by cytotoxicity and anti-proliferative assays using an *in vitro* model of human breast cancer (MCF-7 cells).[3]

Where?



El Pelado Marine Reserve, created in 2012, is one of the newest locations in the System of Protected Areas in Ecuador. It was chosen considering its location at the equatorial front.

Sampling



Extraction

Freeze drying, then mix 1:1 MeOH:DCM

Fractionation by VLC

H_2O /MeOH /DCM through C18 and sample residue.

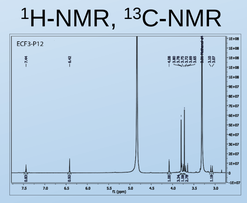
Isolation

UHPLC profiling 2.6µ Phenyl-hexyl 100x2.10 mm gradient 30-90-30% ACN

55%ACN + 1%TFA Preparative Phenyl-hexyl 5µ 19x250mm

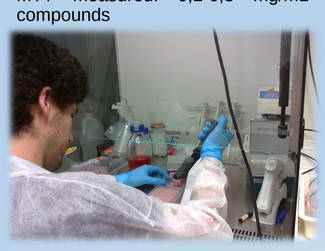
Structure elucidation

^{1}H-NMR, ^{13}C-NMR



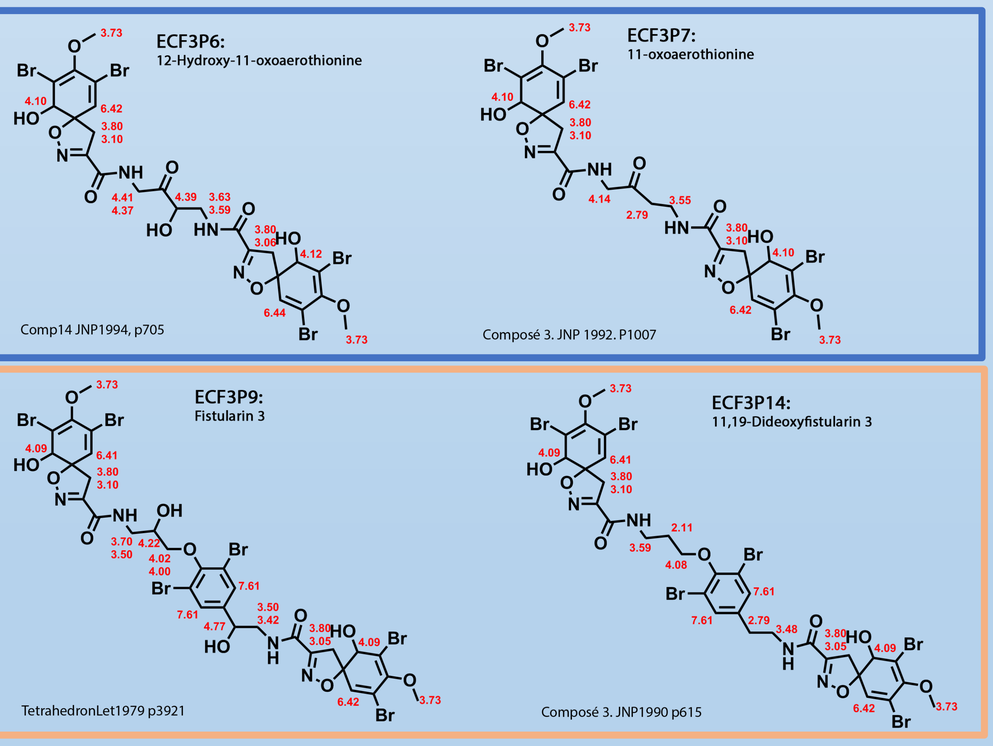
Bioassay

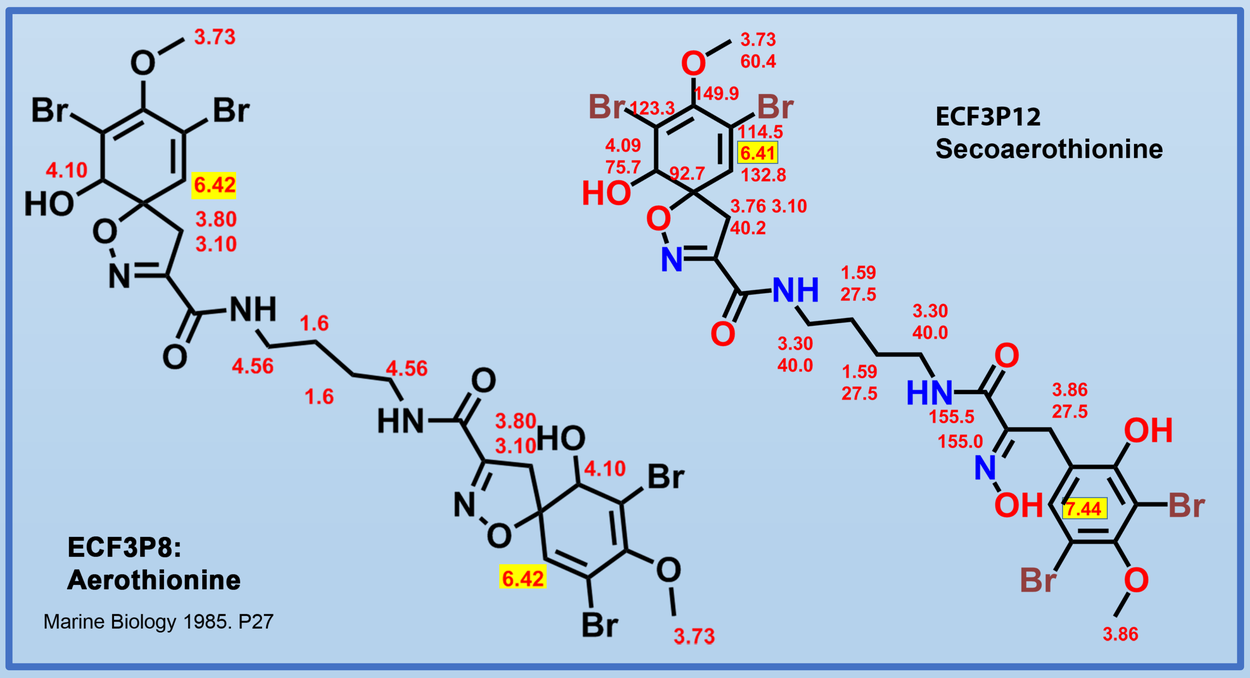
MTT measured. 0,1-0,3 mg/mL compounds



RESULTS

Sponge was identified as *Aplysina revillagigedi.* The novel compound secoaerothionine was isolated along with other eight known compounds. Two groups of brominated metabolites, fistularines and aerothionines (bromotyrosine family) have been found. In the group of aerothionines two very similar compounds were identified and ^{1}H-NMR evidenced differences: **secoaerothionine compared to aerothionine has lost its symmetry**[4]. Compound fistularin 3 showed antiproliferative activity in levels around 0.1 mg/mL without cytotoxicity.

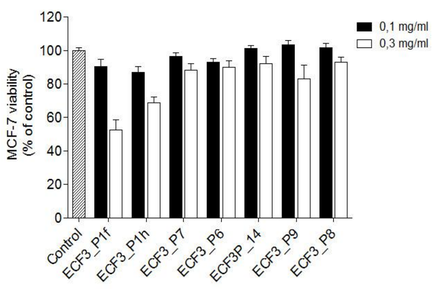




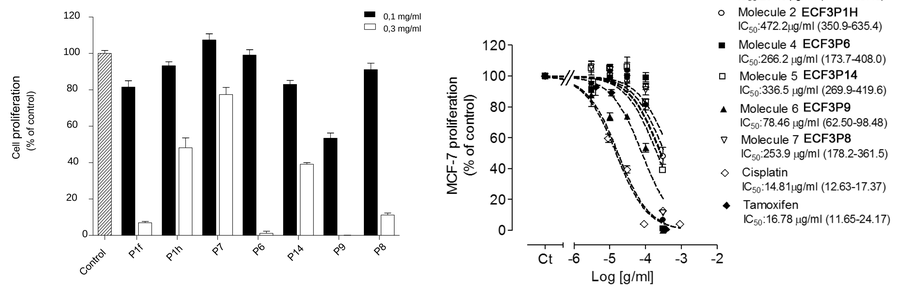
Aerothionines

Fistularines

Cytotoxicity assay



Antiproliferative assay



Conclusion

To our knowledge, this is the first report of marine natural products from a sponge collected off the coast of Ecuador. These results are highly encouraging and they show good promise for the chemical study of other marine species. Future research will entail identifying novel high-value chemical compounds from other abundant invertebrate species in El Pelado Marine Reserve.

Acknowledgements

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References

1. Stuart-Smith, R. D.; Bates, A. E.; Lefcheck, J. S.; Duffy, J. E.; Baker, S. C.; Thomson, R. J.; Stuart-Smith, J. F.; Hill, N. A.; Kininmonth, S. J.; Airoldi, L.; Becerro, M. A.; Campbell, S. J.; Dawson, T. P.; Navarrete, S. A.; Soler, G. A.; Strain, E. M.; Willis, T. J.; Edgar, G. J., Integrating abundance and functional traits reveals new global hotspots of fish diversity. *Nature* **2013,** *501* (7468), 539-42.
2. Cruz-Barraza, J. A.; Carballo, J. L.; Rocha-Olivares, A.; Ehrlich, H.; Hog, M., Integrative taxonomy and molecular phylogeny of genus Aplysina (Demospongiae: Verongida) from Mexican Pacific. *PLoS One* **2012,** *7* (8), e42049.
3. Rodrigues, D.; Alves, C.; Horta, A.; Pinteus, S.; Silva, J.; Culioli, G.; Thomas, O. P.; Pedrosa, R., Antitumor and antimicrobial potential of bromoditerpenes isolated from the red alga, Sphaerococcus coronopifolius. *Marine drugs* **2015,** *13* (2), 713-726.
4. Mani, L.; Jullian, V.; Mourkazel, B.; Valentin, A.; Dubois, J.; Cresteil, T.; Folcher, E.; Hooper, J. N. A.; Erpenbeck, D.; Aalbersberg, W.; Debitus, C., New Antiplasmodial Bromotyrosine Derivatives from Suberea ianthelliformisLendenfeld, 1888. *Chemistry & Biodiversity* **2012,** *9* (8), 1436-1451.