



## Exploring the diversity of brominated alkaloids naturally released by the sponge *Aplysina cavernicola*

Morgane Mauduit, Stephane Greff, Thierry Pérez, Charlotte Simmler

### ► To cite this version:

Morgane Mauduit, Stephane Greff, Thierry Pérez, Charlotte Simmler. Exploring the diversity of brominated alkaloids naturally released by the sponge *Aplysina cavernicola*. XII European Conference on Marine Natural Products, Aug 2021, Galway, Ireland. , 10.5281/zenodo.5654969 . hal-03857528

**HAL Id: hal-03857528**

**<https://hal.science/hal-03857528>**

Submitted on 17 Nov 2022

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License



# Exploring the diversity of brominated alkaloids naturally released by the sponge *Aplysina cavernicola*



Morgane MAUDUIT<sup>1</sup>, Stéphane GREFF<sup>1</sup>, Thierry PEREZ<sup>1</sup>, Charlotte SIMMLER<sup>1</sup>

<sup>1</sup> Institut Méditerranéen de Biodiversité et d'Écologie Marine et Continentale, UMR 7263

Endoume Marine Station, Rue de la batterie des lions, 13007 Marseille (e-mail: [morgane.mauduit@imbe.fr](mailto:morgane.mauduit@imbe.fr))

## Context

- Aplysina* species are marine sponges known to produce **spiro-isoxazoline bromotyrosine** alkaloids (e.g. aerothionin).
- It has been reported that the Caribbean sponge *A. fistularis* releases aerothionin in seawater with/without intentional stress.<sup>1</sup>
- Such released compounds, herein called **exo-metabolites (EM)**, could possibly exert their biological effects as marine chemical cues.<sup>2</sup>

The present study aims at determining (1) whether the Mediterranean sponge *Aplysina cavernicola* (Vacelet, 1959) naturally releases brominated alkaloids other than aerothionin, (2) what are their identity and, (3) in what proportions are they released.



## General Experimental Workflow



### 1 Untargeted Metabolomic Comparison

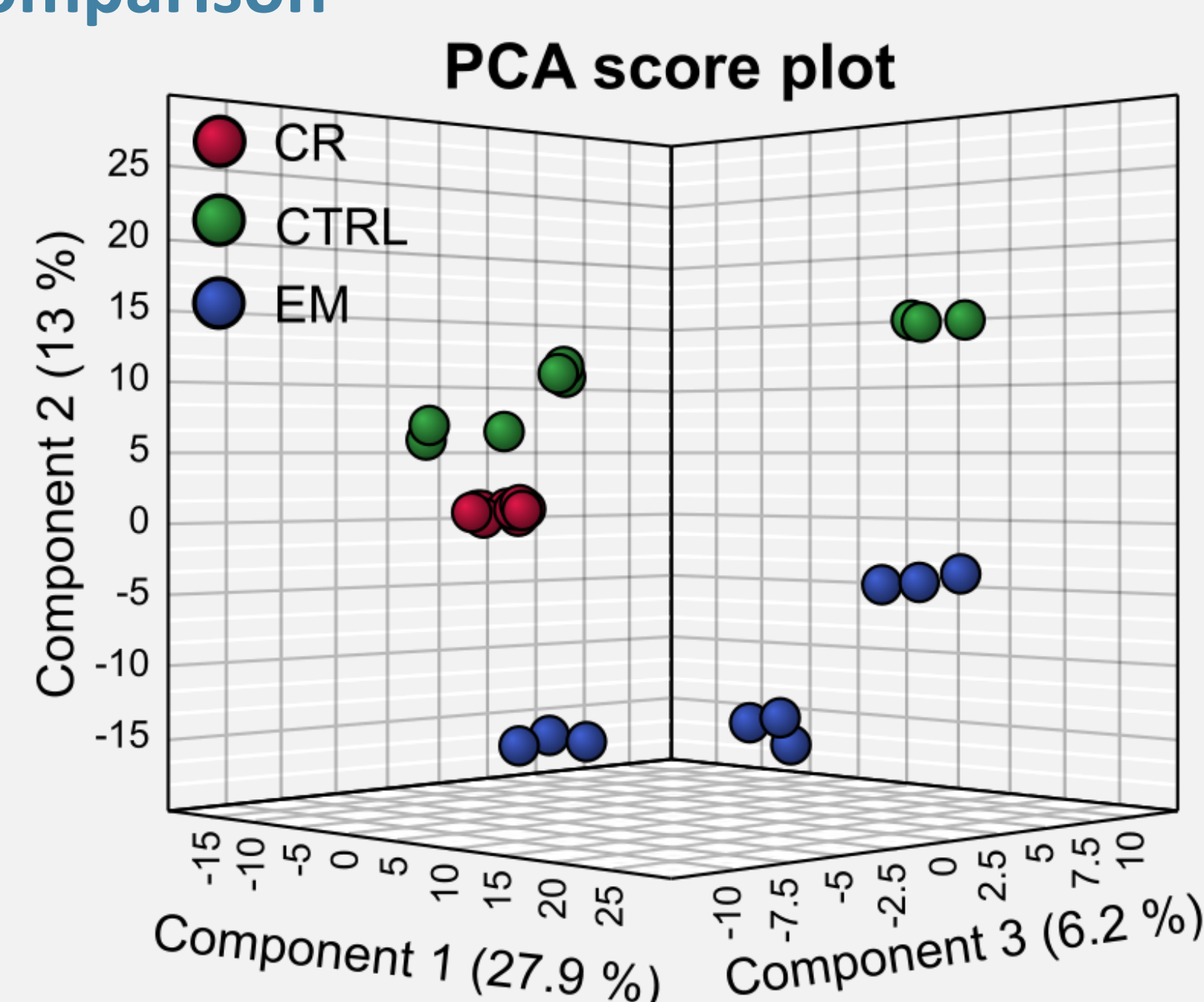
**CTRL:** Aquarium capture setting without sponges

**Mass recovered**

**EM:** 50.4 mg

**CTRL:** 17.4 mg

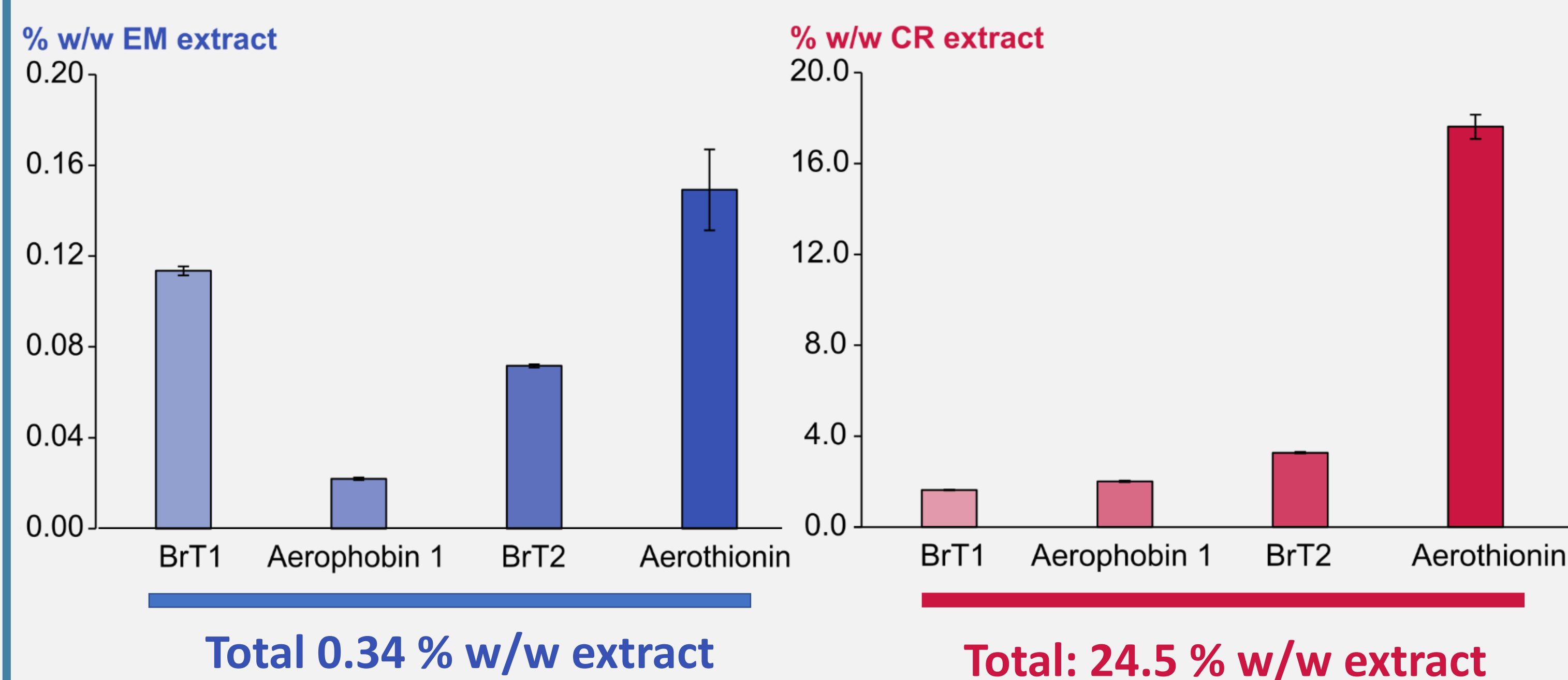
**CR:** 13.1 % w/w of sponge



- The EM extracts were found to be statistically different from the CTRL and from the CR.
- The amount of collected EM corresponds collectively to a concentration of 1 ppm in the aquarium (traces).

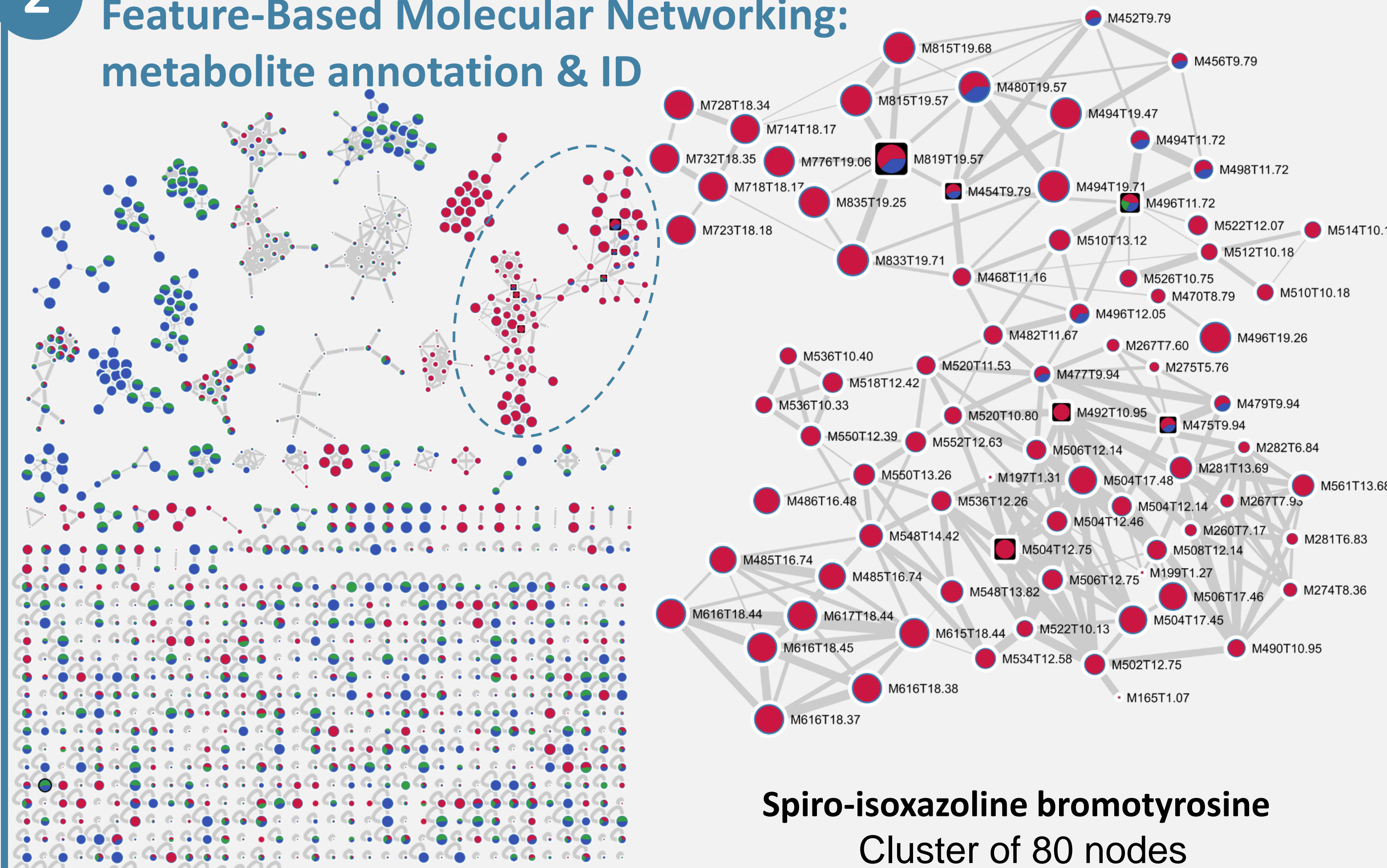
### 3 Quantification

The 4 brominated metabolites were isolated and used as calibration standards for comparative quantitative MS-based analysis.

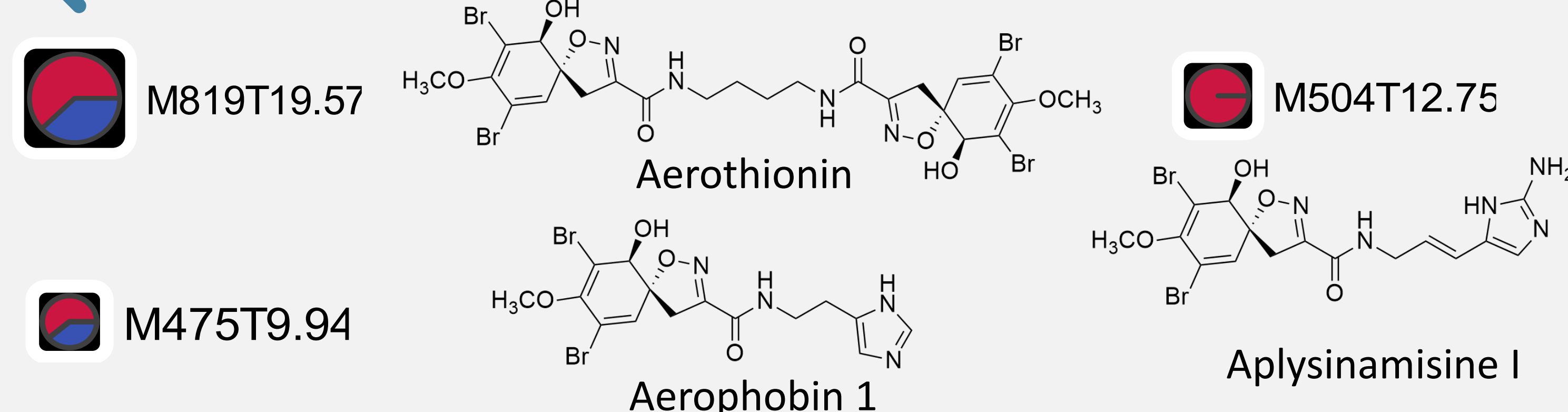


- The proportion of bromotyrosine alkaloids are different in **EM extract** than in the **sponge crude extract (CR)**.
- Aerothionin remains the major metabolite in both cases.
- Collectively, the identified bromotyrosine alkaloids released in seawater are ~100 times more diluted compared to their concentration in the CR.

### 2 Feature-Based Molecular Networking: metabolite annotation & ID



### Isolation & structure elucidation by NMR and MS<sup>2</sup>



- Up to now, a total of 4 brominated metabolites including aerothionin were identified as being released by *A. cavernicola*.
- Other major bromotyrosine alkaloids such as Aplysinamisine I were not recovered as EM.

## Conclusions

- Aerothionin together with other bromotyrosine alkaloids were found to be naturally released in the sea water by *A. cavernicola* in aquarium.
- Those metabolites were found to be released in trace quantities.
- Their relative proportions were found to be different from those characterizing the sponge crude extract.

→ Such results will help to develop experiments evaluating the roles of sponge exo-metabolites in ecosystem functioning.

### References:

<sup>1</sup> Walker, R. P. et al. Mar Biol 88, 27-32 (1985), <sup>2</sup> Santonja, M., et al. Mar Biol 165, 121 (2018)



This work is funded by ANR-20-CE-43-0003 (program SESAM)

MM Ph.D. is funded by a CNRS fellowship

MM participation to the XII ECMNP is funded by the GDR n°3658 MediatEC

