



# Understanding Chemolithotrophic Reduction Mechanisms from the Dark Marine Biosphere

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**Research Objective:** To better understand natural carbonate reduction mechanisms by identifying carbonate-reducing members of a consortia to develop adaptive systems engineered around biofilms

## Motivation

- Since the beginning of the Industrial Revolution, levels of ocean acidity have increased by 26%<sup>1</sup>
- Current acidity today exceeds previously experienced natural variability<sup>1</sup>

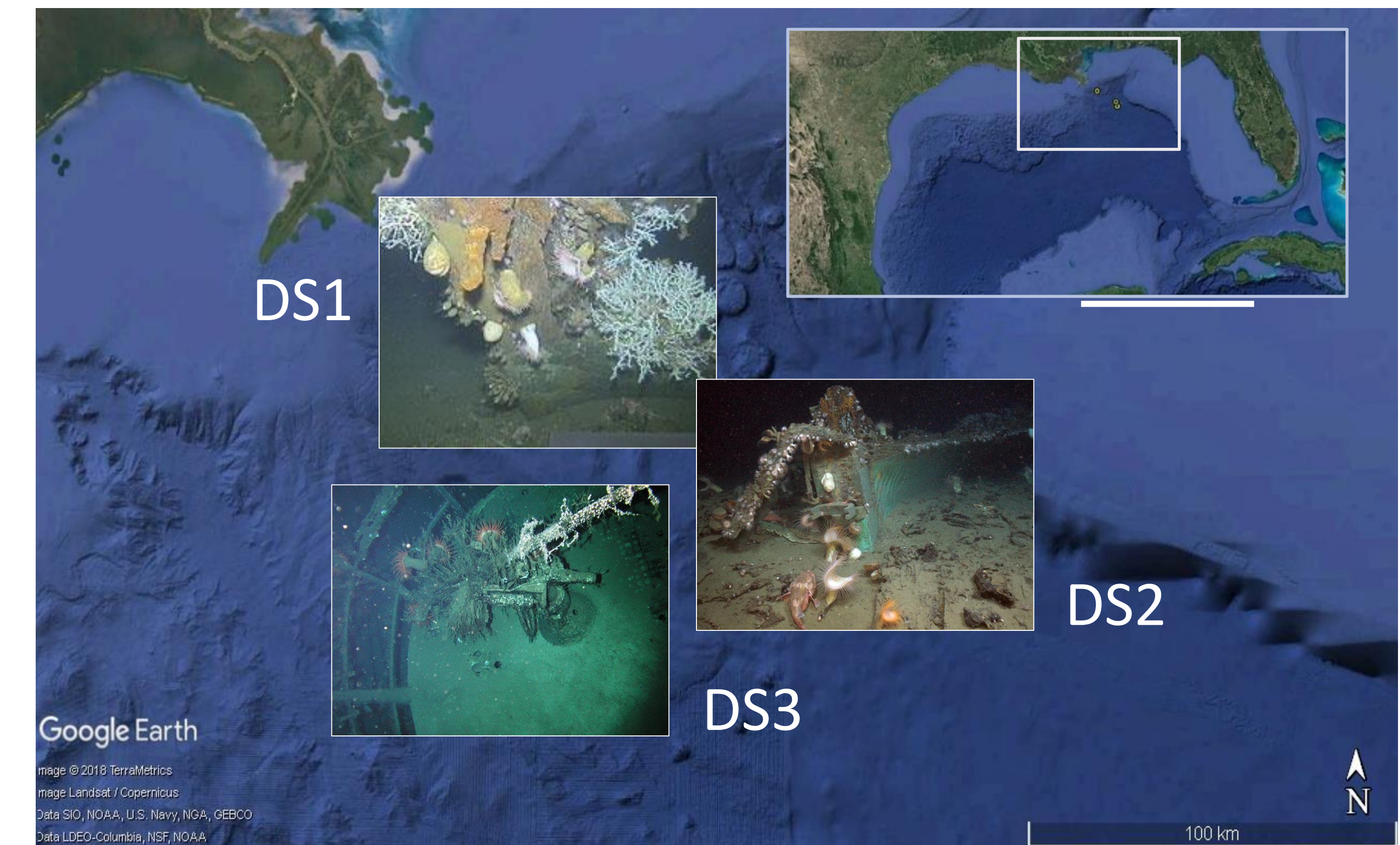
## Methodology

- Sediment samples taken from defined sites in the Gulf of Mexico
- Cultured anaerobically in selective media with defined N/C content
- DNA isolation and PCR used to identify isolates

## Conclusion

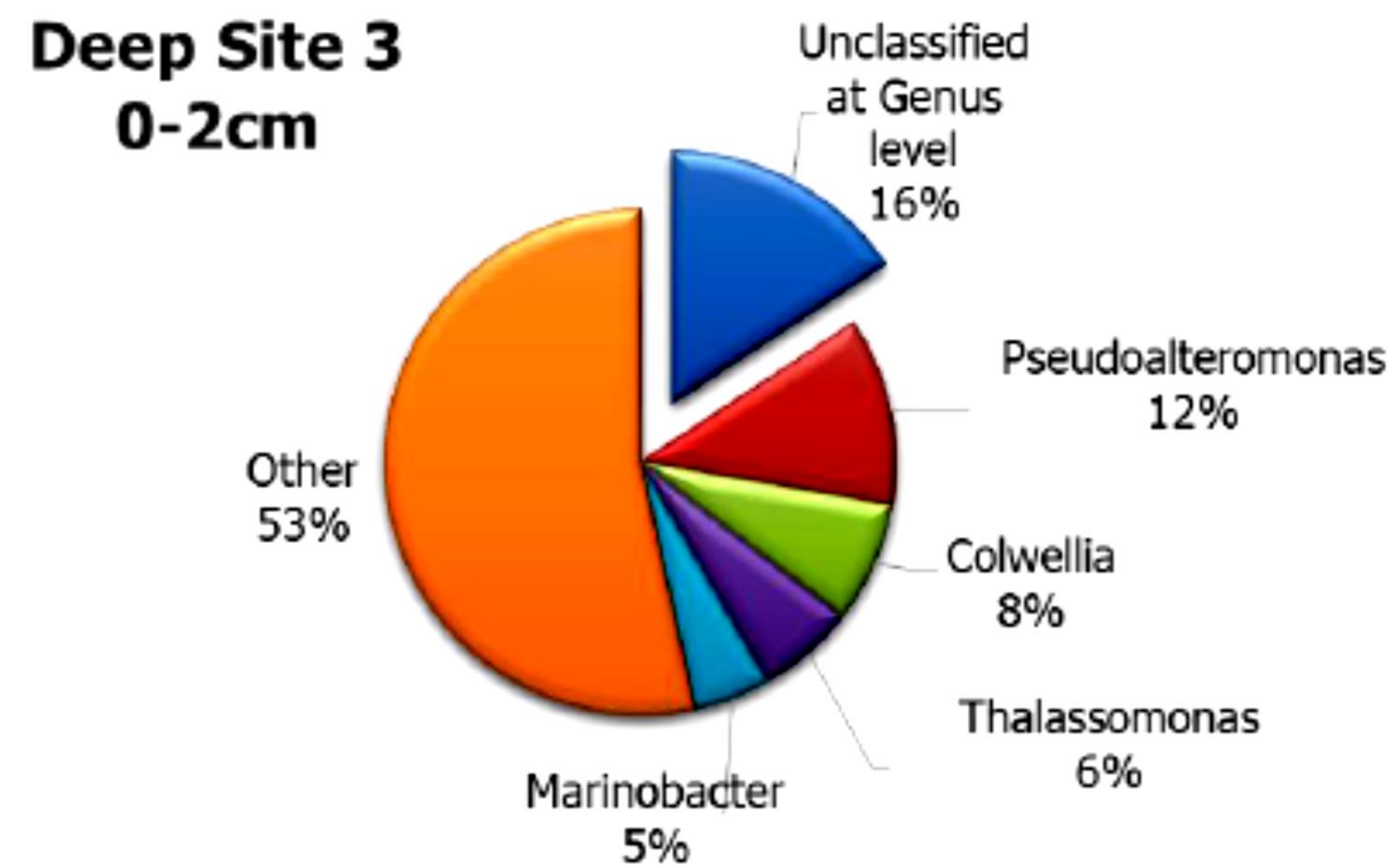
We have potentially isolated a new carbon fixing organism from the deep marine biosphere that fixes carbonate using a unique carbon fixation pathway compared to published pathways.

\* DS3-7 does not encode a full set of enzymes from any one carbon fixation pathway.



Map showing where sediment samples were taken. Inset photos show actual collection sites.

## Results



Microbial Diversity Determined by Metagenomic Sequencing of Sediment Samples

**16S rRNA matches 99.87% to *Marinobacter hydrocarbonoclasticus***

## Mapping this project onto the UN Sustainable Development Goals<sup>2</sup>

- **14.3** Minimize and address the impacts of ocean acidification
- **13.3** Improve human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

## References

- <sup>1</sup> Guterrez, A. (2018). The Sustainable Development Goals report 2018.
- <sup>2</sup> Inter-Agency and Expert Group on SDG Indicators. (2016, March). Global indicator framework for the Sustainable Development Goals and targets of the 2030 Agenda for Sustainable Development.

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DS3-7     ttcggggttgtaaagcactttcagcgcaggaggaaggctctgaagttaataccttcagggat 480
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