Electronic Supplementary Material (ESI) for Green Chemistry.


*Supplementary Information*

# Progresses and future prospects in biodegradation of marine biopolymers and emerging biopolymer-based materials for sustainable marine ecosystems

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Table S1: list of enzymes, organisms degrading biopolymers and their location.

| Enzymes | Kingdom | Organism | Location | Source | Polymer degraded | References |
|---|---|---|---|---|---|---|
| chitinase | Bacteria | *Stenotrophomonas maltophilia* | Las Escolleras-Puerto Madero in Chiapas, Mexico | sea water from the sediment-free surface | Chitin | *Salas-Ovilla et al. 2019* [1] |
| | Eukaryota | *Clonostachys rosea* | East Sector of the Tyrrhenian Sea | unknown | | *Pasqualetti et al. 2019* [2] |
| chitinase/chitobiase | Bacteria | *Vibrio fluvialis* | Tokushima, Japan | sea water | | *Osawa et Koga 1995* [3] |
| | | *Vibrio parahaemolyticus* | | | | |
| | | *Vibrio alginolyticus* | | | | |
| | | *Aeromonas hydrophila* | | | | |
| | | *Vibrio mimicus* | | | | |
| | | *Listonella anguillarum* | | | | |
| chitosanase | | *Basillus sp. Q1098* | Yellow sea, China | Marine sediment | chitosan | *Ma et al. 2020* [4] |
| alginate lyase | | *Cobetia sp. NAP1* | Tottori, Japan | brown algae | Alginatee | *Yagi et al. 2016* [5] |
| | | *Microbulbifer sp. ALW1* | Xiamen, China | | | *Zhu et al. 2017* [6] |
| Collagenase | Fish | *Cynoscion leiarchus* | Maceió, Alagoas, Brazil | Viscera wastes of smooth weakfish | Collagen | *Oliveira et al. 2017* [7] |
| | Bacteria | *Pseudomonas* | Shimla, Himachal Pradesh, India | Sewage of fish marked | | *Gautam1 et Azmi 2017* [8] |
| | | *Pseudomonas marinoglutinosa* | Indian Ocean | Sea water | | *Hanada et al. 1971* [9] |
| agarase | | *Vibrio sp. JT0107* | Sagami Bay in Kanagawa Prefecture in Japan | | Agar | *Sugano et al. 1993* [10] |
| | | *Cytophaga sp.* | North Wales in UK | | | *Duckworth et Turvey 1969* [11] |
| | | *Alteromonas agarlyticus GJ1B* | Mediterranean Sea in France | | | *Potin et al. 1993* [12] |
| | | *Vibrio sp. PO-303* | Ise Bay in Japan | Marine sediment | | *Araki et al. 1998* [13] |

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| | | *Thalassomonas sp. JAMB-A33* | Noma Point in Japan at a depth of 230 m | | | *Ohta et al. 2005* [14] |
| | | *Agarivorans sp. HZ105* | Xiamen coast in the East China Sea | | | *Hu et al. 2009* [15] |
| | | *Alteromonas sp. SY37-12* | South China Sea coast in Hainan Island | Marine red algae | | *Wang et al. 2006* [16] |
| | | *Pseudoalteromonas antarctica N-1* | Niebla in Chile | Marine algae | | *Vera et al. 1998* [17] |
| | | *Pseudomonas atlantica* | Halifax in Canada | | | *Morrice et al. 1983* [18] |
| | | *Vibrio sp. AP-2* | Japan | | | *Aoki et al. 1990* [19] |
| | | *Agarivorans albusYKW-34* | Kangnung coast in the East Sea of Korea | Marine mollusks | | *Fu et al. 2008* [20] |
| | | *Cytophaga flevensis* | IJsselmeer Lake in Netherlands | Fresh water | | *Van der Meulen et Harder. 1975* [21] |
| amylase | | *Streptomyces sp. D1* | Goa, Alibagh and Mumbai coastal region of India | Marine Sediment | Starch | *Chakraborty et al. 2009* [22] |
| | Eukaryota | *Aureobasidium pullulans N13d* | Pacific Ocean | deep sea sediments | | *Li et al. 2007* [23] |
| α-amylase | Bacteria | *Pseudoalteromonas haloplanktis* | Antarctica | seawater | | *Srimathi et al. 2007* [24] |
| | | *Halothermothrix orenii* | Tunisian salt lake | salt lake | | *Bhattarcharya et Pletschke. 2014* [25] |
| | Archaea | *Haloferax mediterranei* | Saltern, Spain | seawater | | *Pérez-Pomares et al. 2003* [26] |
| | Bacteria | *Pseudoalteromonas sp. M175* | Antarctic | ice | | *Wang et al. 2018* [27] |
| | Eukaryota | *Glaciozyma antarctica PI12* | | ice | | *Ramli et al. 2013* [28] |
| | Bacteria | Unknown | Midtre Lovènbreen Arctic glacier | Sediment | | *Vardhan Reddy et al. 2009* [29] |
| | | *Alteromonas sp. TAC 240B* | Antarctic | seawater | | *Chessa et al. 1999* [30] |
| Xylanase | Eukaryota | *Cladosporium sp.* | | marine sponges | Xylan | *Del-Cid et al. 2014* [31] |
| | Bacteria | *Flavobacterium frigidarium sp.* | | shallow-water marine sediment | | *Humphry et al. 2001* [32] |
| pullulanase | | *Shewanella arctica* | Spitsbergen, Norway | Seawater | Pullulan | *Elleuche et al. 2015* [33] |

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| pullulanase type I | | *Fervidobacterium pennavorans* | Hot springs, Azores islands | | | *Bertoldo et al. 1999* [34] |
| cellulase | | *Pseudoalteromonas haloplanktis* | Antarctic | | cellulose | *Violot et al. 2005* [35] |
| hyaluronidase | | *Vibrio sp. FC509* | unknown | unknown | hyaluronic acid | *Han et al. 2014* [36] |
| LPMO AA10 | | *Teredinibacter turnerae* | | shipworm | cellulose | *Fowler et al. 2019* [37] |

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