

TABLE S4- Algae detected on limestone cultural heritage by molecular methods

Name of the Cultural Heritage	Phylum	Class	Order	Family	Genus	Specie	Culture	Molecular biology	Indoors/ Outdoors	Country	Color	Reference
Qingxing palace and Lingyin and Kaihua temple	Chlorophyta	Trebouxiophyceae	incertae sedis	Coccomyxaceae	Coccomyxa	not identified	none	NGS	Outdoors	China	/	Li et al., 2016 [31]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	Trebouxiales	Trebouxiaceae	Trebouxia	aggregata	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	Prasiolales	Stichococcaceae	Diplosphaera	not identified	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	Watanabeales	Watanabeaceae	Chloroidium	angustoellipsoideum	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	Watanabeales	Watanabeaceae	Chloroidium	ellipsoideum	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	Watanabeales	Watanabeaceae	Chloroidium	saccharophilum	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	Trebouxiales	Trebouxiaceae	Dictyochloropsis	splendida	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	Chlorellales	Chlorellaceae	Graesiella	emersonii	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	incertae sedis	incertae sedis	Leptosira	erumpens	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	Watanabeales	Watanabeaceae	Phyllosiphon	arisari	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	Prasiolales	Prasiolaceae	Edaphochlorella	mirabilis	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	Chlorellales	Chlorellaceae	Muriella	terrestris	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	Sphaeropleales	Radiococcaceae	Neocystis	brevis	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	Sphaeropleales	Radiococcaceae	Neocystis	mucosa	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Trebouxiophyceae	incertae sedis	incertae sedis	Xylochloris	not identified	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Chlorophyceae	Sphaeropleales	Bracteacoccaceae	Bracteacoccus	not identified	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]

Saaleck Castle/Bad Kösen	Chlorophyta	Chlorophyceae	Chlamydomonadales	Chlamydomonada ceae	Chamyomonas	monadina	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Ulvophyceae	Trentepohliales	Trentepohliaceae	Trentepohlia	aurea	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
Saaleck Castle/Bad Kösen	Chlorophyta	Ulvophyceae	Klebsormidiales	Klebsormidiaceae	Interfilum	not identified	3N BBM+V medium and Z Medium	CDM (PCR)	Outdoors	Germany	/	Kirchhof et al., 2018 [22]
The West Lake area statues	Chlorophyta	Ulvophyceae	Trentepohliales	Trentepohliaceae	Trentepohlia	not identified	none	NGS	Outdoors	China	yellow	Zhu et al., 2023 [6]
The Old Cathedral of Coimbra	Chlorophyta	Trebouxiophyceae	incertae sedis	incertae sedis	Pseudostichococcus	monallantoides	liquid BG11 and BG11(-N) culture media	CDM (PCR)	Indoors	Portugal	green	Soares et al., 2021 [60]
The Old Cathedral of Coimbra	Chlorophyta	Chlorophyceae	Sphaeropleales	Bracteacoccaceae	Bracteacoccus	not identified	liquid BG11 and BG11(-N) culture media	CDM (PCR)	Indoors	Portugal	green	Soares et al., 2021 [60]
The Old Cathedral of Coimbra	Chlorophyta	Chlorophyceae	Sphaeropleales	Scenedesmaceae	Acutodesmus	bajacalifornicus	liquid BG11 and BG11(-N) culture media	CDM (PCR)	Indoors	Portugal	green	Soares et al., 2021 [60]
The Old Cathedral of Coimbra	Bacillariophyt a	Fragilariophyceae	Fragilariales	Fragilariaceae	Asterionella	not identified	liquid BG11 and BG11(-N) culture media	CDM (PCR)	Indoors	Portugal	green	Soares et al., 2021 [60]
The Old Cathedral of Coimbra	Chlorophyta	Trebouxiophyceae	Prasiolales	Prasiolaceae	Prasiococcus	calcarius	liquid BG11 culture medium	CDM (PCR)	Outdoors	Portugal	green/ dark- green	Soares et al., 2019 [72]
The Old Cathedral of Coimbra	Chlorophyta	Trebouxiophyceae	incertae sedis	incertae sedis	Pseudostichococcus	monallantoides	liquid BG11 culture medium	CDM (PCR)	Outdoors	Portugal	green/ dark- green	Soares et al., 2019 [72]
The Old Cathedral of Coimbra	Chlorophyta	Trebouxiophyceae	Prasiolales	Stichococcaceae	Stichococcus	mirabilis	liquid BG11 culture medium	CDM (PCR)	Outdoors	Portugal	green/ dark- green	Soares et al., 2019 [72]
The Old Cathedral of Coimbra	Chlorophyta	Trebouxiophyceae	Prasiolales	Stichococcaceae	Stichococcus	minutus	liquid BG11 culture medium	CDM (PCR)	Outdoors	Portugal	green/ dark- green	Soares et al., 2019 [72]
The Old Cathedral of Coimbra	Chlorophyta	Trebouxiophyceae	Chlorellales	Chlorellaceae	Pseudochloris	wilhelmii	liquid BG11 culture medium	CDM (PCR)	Outdoors	Portugal	green/ dark- green	Soares et al., 2019 [72]
The Old Cathedral of Coimbra	Chlorophyta	Trebouxiophyceae	Chlorellales	Chlorellaceae	Pseudochloris	henanensis	liquid BG11 culture medium	CDM (PCR)	Outdoors	Portugal	green/ dark- green	Soares et al., 2019 [72]
The Old Cathedral of Coimbra	Chlorophyta	Chylorophyceae	Chlamydomonadales	Chlamydomonada ceae	Heterochlamydomona s	inaequalis	liquid BG11 culture medium	CDM (PCR)	Outdoors	Portugal	green/ dark- green	Soares et al., 2019 [72]
The Old Cathedral of Coimbra	Chlorophyta	Chylorophyceae	incertae sedis	incertae sedis	Jenufa	aeroterrestica	liquid BG11 culture medium	CDM (PCR)	Outdoors	Portugal	green/ dark- green	Soares et al., 2019 [72]
The Old Cathedral of Coimbra	Chlorophyta	Chylorophyceae	Sphaeropleales	Bracteacoccaceae	Bracteacoccus	not identified	liquid BG11 culture medium	CDM (PCR)	Outdoors	Portugal	green/ dark- green	Soares et al., 2019 [72]
The Old Cathedral of Coimbra	Chlorophyta	Chylorophyceae	Sphaeropleales	Bracteacoccaceae	Bracteacoccus	aerius	liquid BG11 culture medium	CDM (PCR)	Outdoors	Portugal	green/ dark- green	Soares et al., 2019 [72]
The Old Cathedral of Coimbra	Chlorophyta	Chylorophyceae	Sphaeropleales	Scenedesmaceae	Acutodesmus	bajacalifornicus	liquid BG11 culture medium	CDM (PCR)	Outdoors	Portugal	green/ dark- green	Soares et al., 2019 [72]
Santa Clara-a-Velha Monastery	Chlorophyta	Trebouxiophyceae	Chlorellales	Chlorellaceae	Chlorella	not identified	liquid medium BG11	CDM (PCR)	Outdoors	Portugal	green	Miller et al., 2008 [63]
Santa Clara-a-Velha Monastery	Chlorophyta	Trebouxiophyceae	Chlorellales	Chlorellaceae	Chlorella	vulgaris	liquid medium BG11	CDM (PCR)	Outdoors	Portugal	green	Miller et al., 2008 [63]

Santa Clara-a-Velha Monastery	Chlorophyta	Trebouxiophyceae	Trebouxiales	Trebouxiaceae	Myrmecia	bisecta	liquid medium BG11	CDM (PCR)	Outdoors	Portugal	green	Miller et al., 2008 [63]
Santa Clara-a-Velha Monastery	Chlorophyta	Trebouxiophyceae	Prasiolales	Stichococcaceae	Stichococcus	not identified	liquid medium BG11	CDM (PCR)	Outdoors	Portugal	green	Miller et al., 2008 [63]
Santa Clara-a-Velha Monastery	Chlorophyta	Trebouxiophyceae	Prasiolales	Stichococcaceae	Stichococcus	bacillaris	liquid medium BG11	CDM (PCR)	Outdoors	Portugal	green	Miller et al., 2008 [63]
Santa Clara-a-Velha Monastery	Chlorophyta	Trebouxiophyceae	Trebouxiales	Trebouxiaceae	Trebouxia	not identified	liquid medium BG11	CDM (PCR)	Outdoors	Portugal	green	Miller et al., 2008 [63]
Lingyan Temple	Chlorophyta	Trebouxiophyceae	not identified	not identified	not identified	not identified	none	NGS	Outdoors	China	/	Li et al., 2023 [67]
Lingyan Temple	Chlorophyta	Trebouxiophyceae	not identified	Watanabeales	Jaagichlorella	africana	none	NGS	Outdoors	China	/	Li et al., 2023 [67]
Lingyan Temple	Chlorophyta	Ulvophyceae	Trentepohliales	Trentepohliaceae	Trentepohlia	not identified	none	NGS	Outdoors	China	/	Li et al., 2023 [67]
Lingyan Temple	Chlorophyta	Trebouxiophyceae	Trebouxiales	Trebouxiaceae	Trebouxia	anticipata	none	NGS	Outdoors	China	/	Li et al., 2023 [67]
Lingyan Temple	Chlorophyta	Trebouxiophyceae	Trebouxiales	Trebouxiaceae	Trebouxia	not identified	none	NGS	Outdoors	China	/	Li et al., 2023 [67]
Austrian petroglyphs from Hallstatt-Dachstein/Salzkammergut	incertae sedis	Cryptophyceae	Cryptomonadales	not identified	not identified	not identified	none	Nanopore sequencing	Outdoors	Austria	green	Rabbachin et al., 2023 [15]
Austrian petroglyphs from Hallstatt-Dachstein/Salzkammergut	Chlorophyta	Ulvophyceae	Trentepohliales	Trentepohliaceae	Trentepohlia	not identified	none	Nanopore sequencing	Outdoors	Austria	orange	Rabbachin et al., 2023 [15]
Austrian petroglyphs from Hallstatt-Dachstein/Salzkammergut	incertae sedis	Cryptophyceae	Pyrenomonadales	not identified	not identified	not identified	none	Nanopore sequencing	Outdoors	Austria	dark green	Rabbachin et al., 2023 [15]
Church of San Leonardo di Siponto	Chlorophyta	Trebouxiophyceae	Trebouxiales	Trebouxiaceae	not identified	not identified	none	NGS	Outdoors	Italy	gray-brownish and white	Chimienti et al., 2016 [62]
Church of San Leonardo di Siponto	Chlorophyta	Trebouxiophyceae	Chlorellales	Oocystaceae	not identified	not identified	none	NGS	Outdoors	Italy	gray-brownish and white	Chimienti et al., 2016 [62]