**Supplementary information**

**Table 1 SI** Physico-chemical parameters of make-up and recirculating waters



**Table 2 SI.** List of lectins used for the glycoconjugate staining in biofilm communities sampled in autumn. Lectins highlighted in grey are also used to detect glycoconjugates in biofilm samples collected in summer, winter and spring.

|  |  |
| --- | --- |
| **Lectin (Conjugate)** | **Specificity** |
| **AAA**\_*Anguilla anguilla* (FITC)1 | α-L-Fucose  |
| **ABA**\_*Agaricus bisporus* (FITC)1 | Galactose (β1-3) N-Acetylgalactosamine  |
| **AIA**\_*Artocarpus integrifolia* (FITC)1 | α-Galactose  |
| **AAL**\_*Aleuria aurantia* (FITC)1,2 | Fucose (α1-6) N-Acetylglucosamine, Fucose (α1-3) N-Acetyllactosamine structures, Fucose attached to nucleic acids |
| **AMA**\_*Arum maculatum* (FITC)1 | Mannose  |
| **ASA**\_*Allium sativum* (FITC)1 | Mannose  |
| **Ban**\_*Musa paradisiaca* (FITC)2 | (α1-3) Glucose and Mannose, (β1-3) and (β1-6) Glucosyl-structures |
| **BDA**\_*Bryonia dioica* (FITC)1 | N-Acetylgalactosamine |
| **BPA**\_*Bauhinia purpurea* (FITC)1 | N-acetyl-D-Galactosamine |
| **CA**\_*Colchicum autumnale* (FITC)1 | N/A |
| **CAA**\_*Caragana aborescens* (FITC)1 | N-Acetylgalactosamine  |
| **Calsepa**\_*Calystega sepiem* (FITC)1 | Maltose = Mannose >> Glucose |
| **ConA**\_*Canavalia ensiformis* (FITC)1 | α-D-Mannose, α-D-Glucose, branched Mannose |
| **CPA**\_*Cicer arietinum* (FITC)1 | N/A |
| **CSA**\_*Cytisus sessilifolius* (FITC)1 | N-Acetylgalactosamine  |
| **DBA**\_*Dolichos biflorus* (FITC)3 | Methyl-2-Acetamido-2-Deoxy-D-Galactose  |
| **DGL**\_*Dioclea grandiflora* (FITC)1 | Mannose, Glucose, Mannose trimers  |
| **DSA**\_*Datura* *stramonium* (FITC)1 | (β1-4) N-Acetylglucosamine oligomers |
| **ECA**\_*Erythrina cristagalli* (FITC)1 | Galactose (β1-4) N-Acetylglucosamine  |
| **EEA**\_*Euonymus europaeus* (FITC)1 | D-Galactose (α1-3) L-Fucose (α1-2) D-Galactose |
| **GHA**\_*Glechoma hederacea* (FITC)1 | D-Galactose, Methyl α-D-Galactopyranoside, N-Acetylgalactosamine |
| **GNA**\_*Galanthus nivalis* (FITC)1 | Mannose  |
| **GS-I**\_*Griffonia simplicifolia* (FITC)3 | Melibiose, α-D-Galactose  |
| **HAA**\_*Helix aspersa* (FITC)1 | N-Acetylgalactosamine  |
| **HHA**\_*Hippeastrum hybrid* (Amaryllis) (FITC)1 | Mannose (internal and terminal Mannose residues)  |
| **HMA**\_*Homarus americanus* (FITC)1 | Sialic acid (derivatives of N-Acetylneuraminic acid and N-Glycolylneuraminic acid) |
| **HPA**\_*Helix pomatia* (FITC)3 | N-Acetylgalactosamine  |
| **IRA**\_*Iris hybrid* (FITC)1 | N-Acetyl- D-Galactosamine |
| **LAA**\_*Laburnum alpinum* (FITC)1 | N-Acetylglucosamine (β1-4) N-Acetylglucosamine |
| **LAL**\_*Laburnum anagyroides* (FITC)1 | α-Methyl-L-Fucose  |
| **LBA**\_*Phaseolus lunatus* (FITC)1 | N-Acetylgalactosamine (α1-3) L-Fucose (α1-2) D-Galactose  |
| **LcH**\_*Lens culinaris* (FITC)1 | N/A |
| **LEA**\_*Lycopersicon esculentum* (FITC)3 | (β1-4) N-Acetylglucosamine |
| **LFA**\_*Limax flavus* (FITC)1 | Sialic acid (derivatives of N-Acetylneuraminic acid and N-Glycolylneuraminic acid) |
| **Lotus**\_*Tetragonolobus purpurea* (FITC)3 | L-Fucose  |
| **LPA**\_*Limulus polyphemus* (FITC)1 | N-Acetylneuraminic acid  |
| **MAA**\_*Maackia amurensis* (FITC)1 | N-Acetylneuraminic acid (α2-3) Galactose  |
| **MNA-G**\_*Morniga G* (FITC)1 | Galactose |
| **MOA**\_*Marasmium* *oreades agglutinin* (FITC)1 | D-Galactose (α1-3) D-Galactose, D-Galactose (α1-3) D-Galactose (β1-4) N-Acetylglucosamine  |
| **MPA**\_*Maclura pomifera* (FITC)1 | N-Acetylgalactosamine > Galactose  |
| **NPA**\_*Narcissus pseudonarcissus* (FITC)1 | Mannose  |
| **PHA-E**\_*Phaseolus vulgaris* (FITC)1 | PHA-E recognizes a complex branched chain oligosaccharide structure  |
| **PHA-L**\_*Phaseolus vulgaris* (FITC)1 | PHA-L recognizes a complex branched chain oligosaccharide structure  |
| **PMA**\_*Polygonatum multiflorum* (FITC)1 | Asialofetuin and Asialomucin >> native Fetuin and Mucin |
| **PNA**\_*Arachis hypogaea* (FITC)1 | Terminal β-Galactose  |
| **PSA**\_*Pisum sativum* (FITC)3 | α-Mannose > α-Glucose  |
| **PSL**\_*Polyporus squamosus* (FITC)1 | N-Acetylneuraminic acid (α2-6) D-Galactose, (β1-4) N-Acetylglucosamine  |
| **PTA**\_*Psophocarpus tetragonolobus* (FITC)3 | N-Acetylgalactosamine, D-Galactose |
| **PWA**\_*Phytolacca americana* (FITC)1 | N-Acetylglucosamine (β1-4) N-Acetylglucosamine oligomers, [D-Galactose (β1-4) N-Acetylglucosamine]2 |
| **RCA** *Ricinus Communis Agglutinin I (FITC)* | Galactose, Lactose |
| **RPA**\_*Robinia pseudoaccacia* (FITC)1 | N/A |
| **SBA**\_*Glycine max* (FITC)1 | α and β- N-Acetylgalactosamine > α and β-Galactose  |
| **SJA**\_*Sophora japonica* (FITC)1 | N-Acetylgalactosamine  |
| **SNA**\_*Sambucus nigra* (FITC)1 | N-Acetylneuraminic acid (α2-6) D-Galactose/ N-Acetylgalactosamine |
| **SSA**\_*Salvia Sclarea* (FITC)1 | N-Acetylgalactosamine. Terminal N-Acetylgalactosamine linked to Serine (or Threonine)  |
| **STA**\_*Solanum tuberosum* (FITC)1 | N-Acetylglucosamine (β1-4) N- Acetylglucosamine oligomers |
| **TKA**\_*Trichosanthes kirilowii* (FITC)1 | Galactose  |
| **TL**\_*Tulipa sp.* (FITC)1 | N-Acetylgalactosamine, Galactose, Fucose  |
| **UDA**\_*Urtica dioica* (FITC)1 | N-Acetylglucosamine  |
| **UEA-I**\_*Ulex europaeus* (FITC)3 | α-L-Fucose  |
| **VFA**\_*Vicia faba* (FITC)1 | Mannose  |
| **VGA**\_*Vicia graminea* (FITC)1 | O-linked D-Galactose (β1-3) N-Acetylgalactosamine adjacent to an N-terminal Leucine residue |
| **VRA**\_*Vigna radiata* (FITC)1 | α-Galactose  |
| **VVA\_***Vicia villosa* (FITC)1 | N-Acetylgalactosamine  |
| **WFA**\_*Wisteria floribunda* (FITC)1 | N-Acetylgalactosamine  |
| **WGA**\_*Triticum vulgaris* (FITC)3 | (N-Acetylglucosamine)2, N-Acetylneuraminic acid |
| **CCA**\_*Cancer antennarius crude* (Alexa Fluor® 488)1 | N/A |
| **Co**\_*Codium fragile* (Alexa Fluor® 488)3 | N/A |
| **IAA**\_*Iberis amara* (Alexa Fluor® 488)1 | N/A |
| **MIA**\_*Mangifera indica crude* (Alexa Fluor® 488)1 | N/A |
| **PAA**\_*Perseau americana crude* (Alexa Fluor® 488)1 | N/A |
| **PA-I**\_*Pseudomonas aeruginosa* (Alexa Fluor® 488)3 | N/A |
| **PPA**\_*Ptilota plumosa* (Alexa Fluor® 488)3 | N/A |
| **RTA**\_*Trifolia repens crude* (Alexa Fluor® 488)1 | N/A |
| **SHA**\_*Salvia hormonium crude* (Alexa Fluor® 488)1 | N-Acetylgalactosamine  |
| **SSC**\_*Sarothamnus scoparius crude* (Alexa Fluor® 488)1 | N/A |

**Table 3 SI** Student’s t-test applied for physico-chemical parameters analysed



**Figure 1 SI** Rarefaction curves based on NGS data

