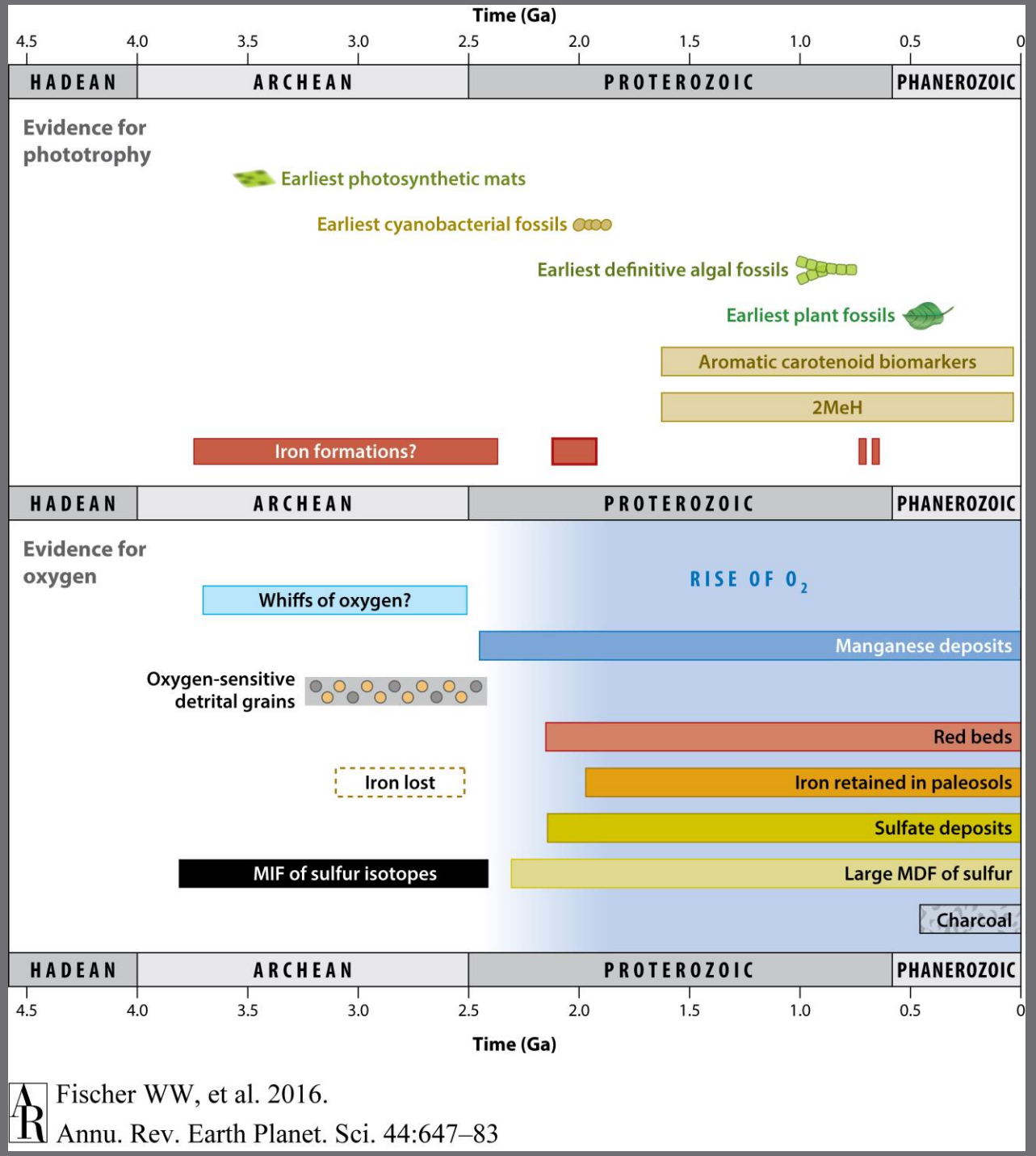
Colonization of the marine realm and the Great Oxidation Event: Experimentally assessing the plasticity and evolution of cyanobacterial salinity tolerance

Slides as PDF or PPTX available at: https://bit.ly/39Dk1Kc

Jennifer Reeve, Boswell Wing, Christopher Greidanus, Maxwell Pashayan, Anya Sukiennicki, Paige Campbell

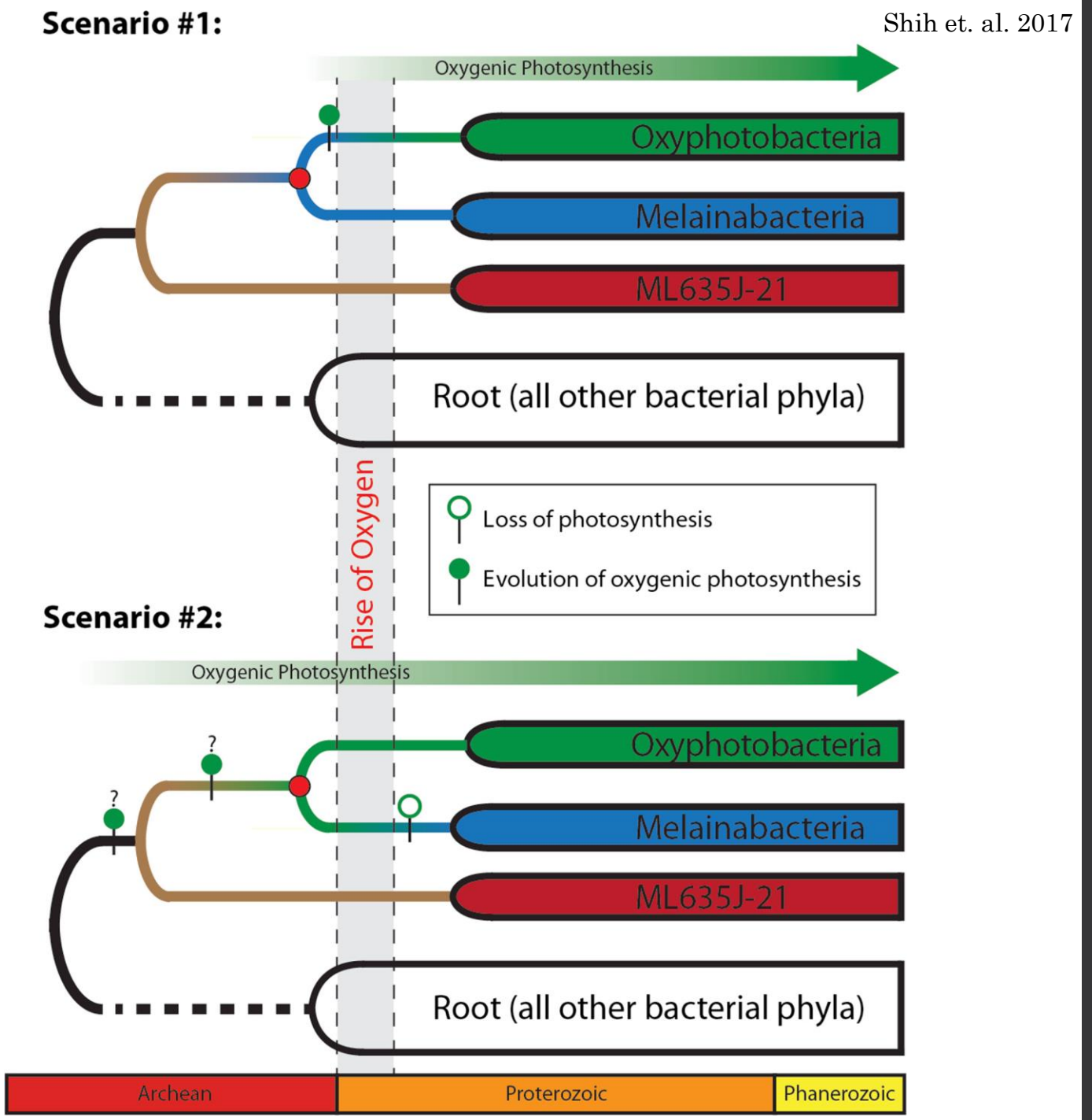
AbSciCon 2022 – Recent Advances, Development and New Challenges in Understanding Early Life

Cyanobacteria drove the oxidation of Earth's atmosphere



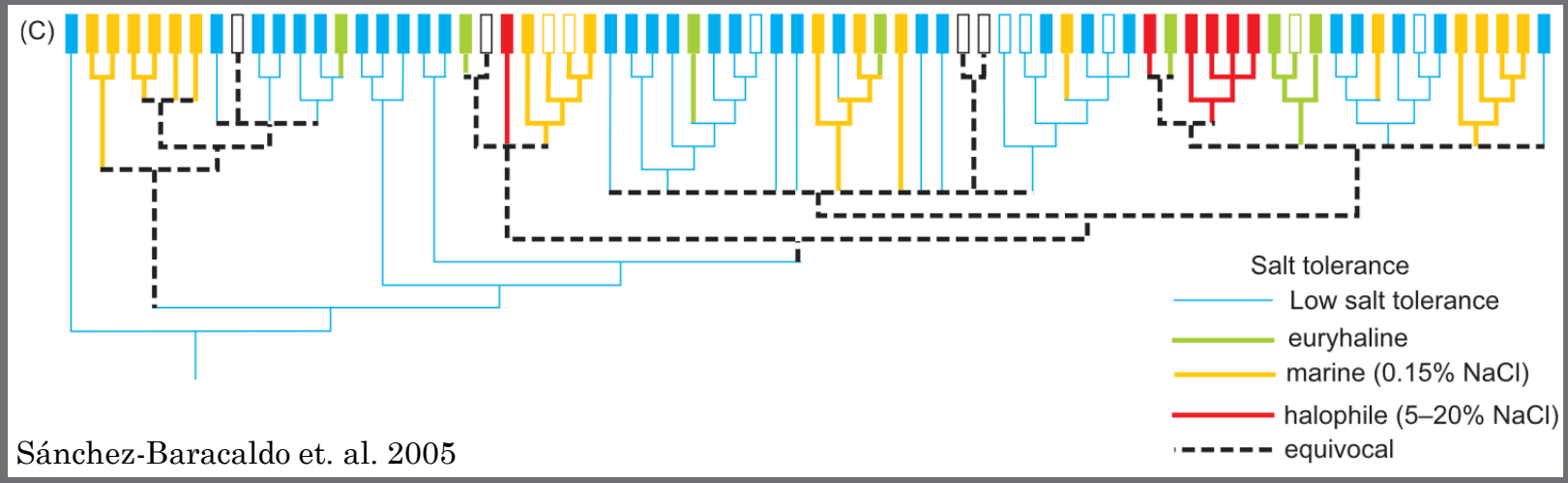
Fischer WW, et al. 2016.
Annu. Rev. Earth Planet. Sci. 44:647–83

Shih et. al. 2017

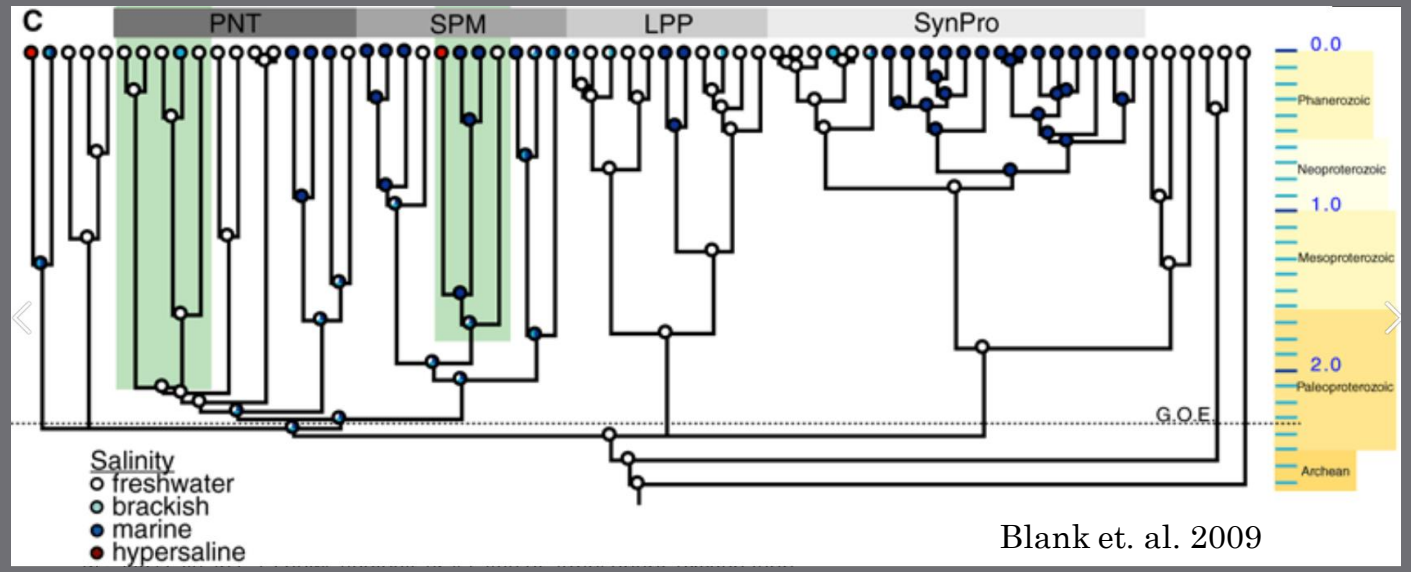


The timing of the origin of oxygenic photosynthesis is actively debated

Salinity may have played a key role in the early evolution of Cyanobacteria



Sánchez-Baracaldo et. al. 2005



Blank et. al. 2009

An investigation into the effects of increasing salinity on photosynthesis in freshwater unicellular cyanobacteria during the late Archaean

Achim J. Herrmann | Michelle M. Gehringer

Early photosynthetic eukaryotes inhabited low-salinity habitats

Patricia Sánchez-Baracaldo[a,1], John A. Raven[b,c], Davide Pisani[d,e], and Andrew H. Knoll[f]

Phylogenetic distribution of compatible solute synthesis genes support a freshwater origin for cyanobacteria

Carrine E. Blank

Using ancestral state reconstruction (ASR) on cyanobacterial salinity tolerance relies on assumptions about extant cyanobacteria

- Habitat predicts salinity tolerance
- Salinity tolerance is a discrete trait

We surveyed the literature to develop a database of cyanobacterial responses to changes in salinity

Aquaculture Research, 2010, **41**, 1348–1355 doi:10.1111/j.1365-2109.2009.02423.x

Effects of salinity on the growth and proximate composition of selected tropical marine periphytic diatoms and cyanobacteria

Helena Khatoon, Sanjoy Banerjee, Fatimah Md Yusoff & Mohamed Shariff

Osmotic adjustment and organic solute accumulation in cyanobacteria from freshwater and marine habitats

R. H. Reed and W. D. P. Stewart

Salt-Tolerant *Synechococcus elongatus* UTEX 2973 Obtained Engineering of Heterologous Synthesis of Compatible Solute Glucosylglycerol

Jinyu Cui[1,2,3†], Tao Sun[1,2,4†], Lei Chen[1,2,3] and Weiwen Zhang[1,2,3,4*]*

Responses of Cyanobacteria to Low Level Osmotic Stress: Implications for the Use of Buffers

By DEBORAH J. MOORE,[1]* ROBERT H. REED[1] AND WILLIAM D. P. STEWART[2]

Response of *Westiellopsis prolifica* and *Anabaena* sp. to salt stress

M. N. Jha, G. S. Venkataraman* and B. D. Kaushik

Effects of Water Stress on Cryptoendolithic Cyanobacteria from Hot Desert Rocks

Malcolm Potts* and E. Imre Friedmann

Photosynthetic pigment production and metabolic and lipidomic alterations in the marine cyanobacteria *Synechocystis* sp. PCC 7338 various salinity conditions

Hwanhui Lee[1] · YuJin Noh[1] · Seong-Joo Hong[2] · Hookeun Lee[3] · Dong-Myung Kim[4] · Byung-Kwan Cho[5] · Hyung-Kyoon Choi[1]

logeny and salt-tolerance of freshwater Nostocales strains: Contribution to their systematics and evolution

Charlotte Duval[a,1], Solène Thomazeau[a,1], Yannick Drelin[a], Claude Yéprémian[a], Marc Bouvy[b], Arnaud Couloux[c], Marc Troussellier[b], Florence Rousseau[d], Cécile Bernard[a,*]

Comparative Proteomics Study of Salt Tolerance between a Nonsequenced Extremely Halotolerant Cyanobacterium and Its Mildly Halotolerant Relative Using *in vivo* Metabolic Labeling and *in vitro* Isobaric Labeling

Jagroop Pandhal, Saw Yen Ow, Phillip C. Wright, and Catherine A. Biggs*

Growth Responses of Blue-green Algae to Sodium Chloride Concentration

JOHN C. BATTERTON, [illegible]

cellular growth and oduction of freshwater *Synechococcus* strain CCAP1405

SUCHANDAN BEMAL AND ARGA CHANDRASHEKAR ANIL*

Cell size changes as indicator of salt resistance of blue-green algae

By NORBERT ERDMANN and ULRICH SCHIEWER

Effect of Media and Salinity on Lipid Content of Cyanobacterium *Hapalosiphon* sp.

Suneerat Ruangsomboon*

The halophilic cyanobacterium *Synechocystis* DUN52 and its osmotic responses

F.A.A. Mohammad, R.H. Reed and W.D.P. Stewart

Salinity Effects on Growth, Photosynthetic Parameters, and Nitrogenase Activity in Estuarine Planktonic Cyanobacteria

sander,[1,2] E. McClinton III,[3] H.W. Paerl[1]

CHARACTERIZATION OF FIVE MARINE CYANOBACTERIAL SPECIES WITH RESPECT TO THEIR pH AND SALINITY REQUIREMENTS

AZRA BANO AND PIRZADA J. A. SIDDIQUI*

Response of two strains of *Nostoc muscorum* to metal stress and salinity

By U PANDEY* and C CHATTERJEE

Carbohydrate Accumulation and Osmotic Stress in Cyanobacteria

By ROBERT H. REED,* DOUGLAS L. RICHARDSON, STEPHEN R. C. WARR AND WILLIAM D. P. STEWART

Multiphasic osmotic adjustment in a euryhaline cyanobacterium

(Osmotic stress, *Synechocystis*; carbohydrate accumulation; ion transport)

Robert H. Reed, Stephen R.C. Warr, Douglas L. Richardson *, Deborah J. Moore and William D.P. Stewart

Influencia de la salinidad sobre crecimiento y composición bioquímica de la cianobacteria *Synechococcus* sp.

Influence of salinity on the growth and biochemical composition of the cyanobacterium *Synechococcus* sp.

Néstor Rosales
José Ortega
Roberta Mora
Ever Morales*

Growth and morphology of *Anabaena* strains (Cyanophyceae, Cyanobacteria) in cultures under different salinities

B.K. Stulp & W.T. Stam

Effect of salinity on some physiological and biochemical responses in the cyanobacterium *Synechococcus elongatus*

Maryam Rezayian[1,2], Vahid Niknam[2], and Mohammad Ali Faramarzi[1,*]

Effect of Carbon Content, Salinity and pH on *Spirulina platensis* for Phycocyanin, Allophycocyanin and Phycoerythrin Accumulation

Gaurav Sharma[1], Manoj Kumar[2], Mohammad Irfan Ali[1] and Nakuleshwar Dut Jasuja[1*]

Proteomic analyses of the cyanobacterium *Arthrospira* (*Spirulina*) *platensis* under iron and salinity stress

Mostafa M.S. Ismaiel[a,b,*], Michele D. Piercey-Normore[a], Christof Rampitsch[c]

Synthesis of glucosylglycerol in salt-stressed cells of the cyanobacterium *Microcystis firma**

M. Hagemann, N. Erdmann, and E. Wittenburg

Salt effects on 77K fluorescence and photosynthesis in the cyanobacterium *Synechocystis* sp. PCC 6803

Hendrik Schubert and Martin Hagemann

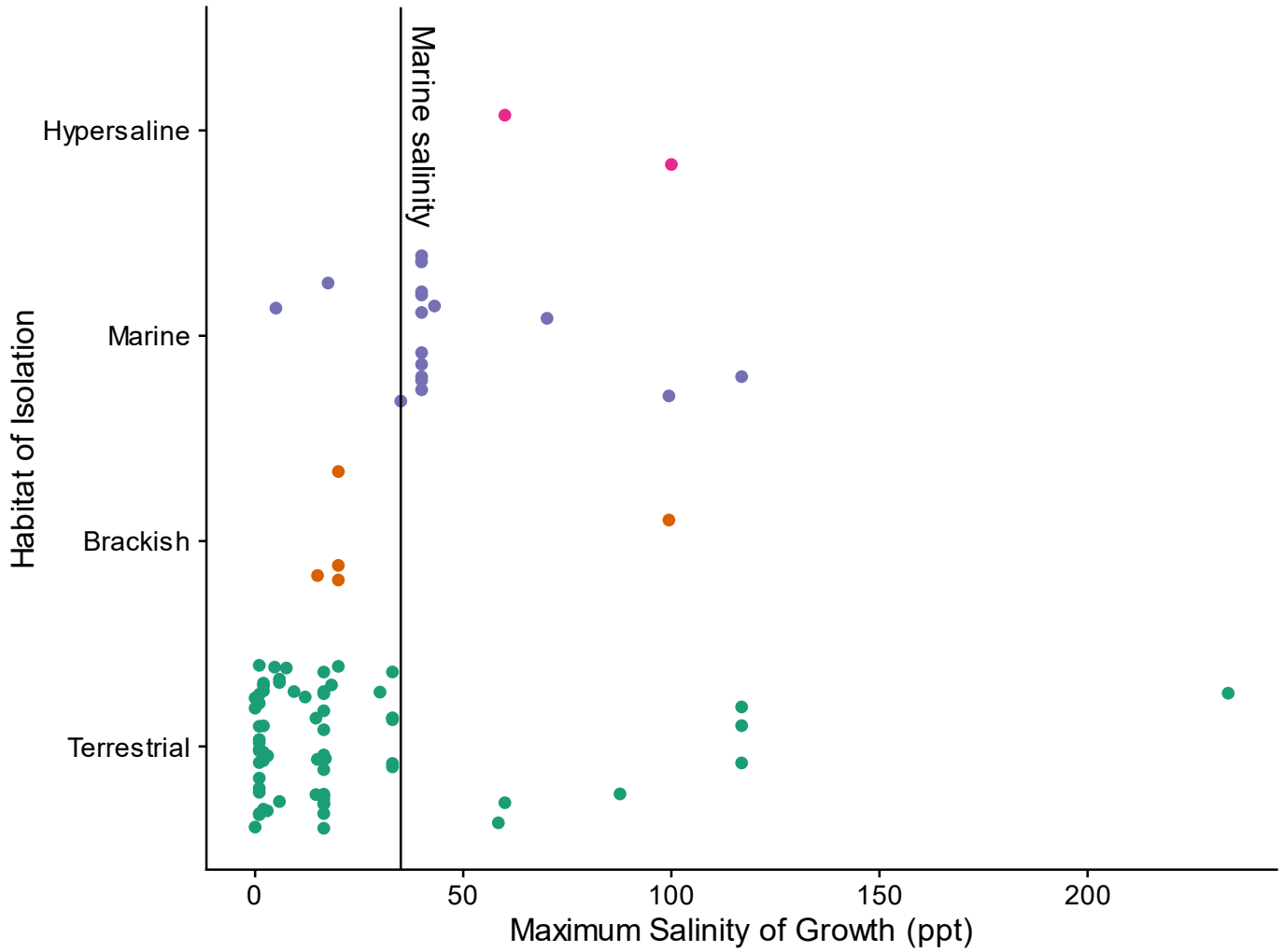
Antioxidative responses of *Nostoc ellipsosporum* and *Nostoc piscinale* to salt stress

Maryam Rezayian[1] · Vahid Niknam[1] · Mohammad Ali Faramarzi[2]

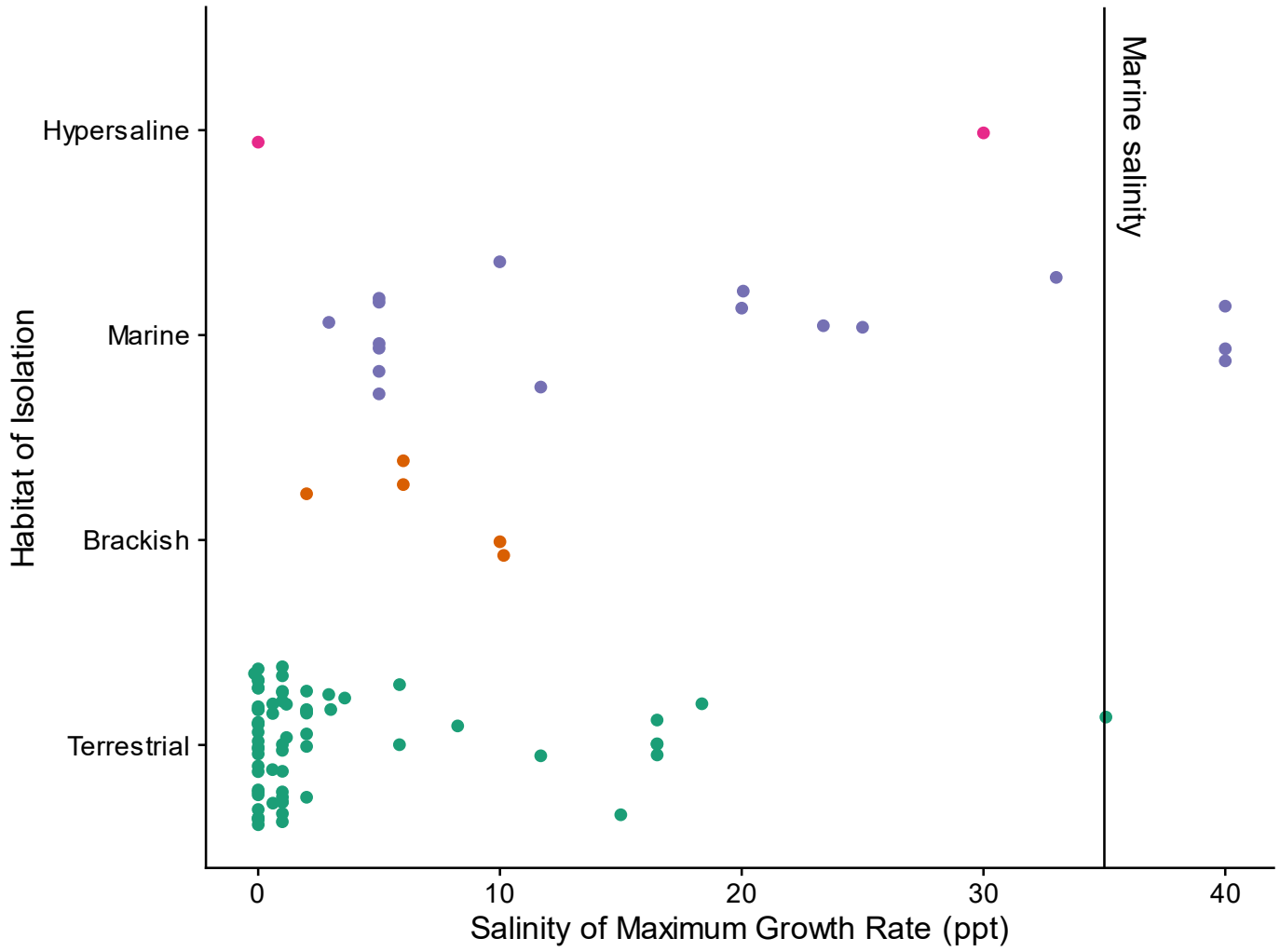
of salinity on growth, pigmentation, N_2 on and alkaline phosphatase activity of *stis* PCC6803: a euryhaline cyanobacterium cultured *Trichodesmium* sp.

Fei-Xue Fu*, P. R. F. Bell

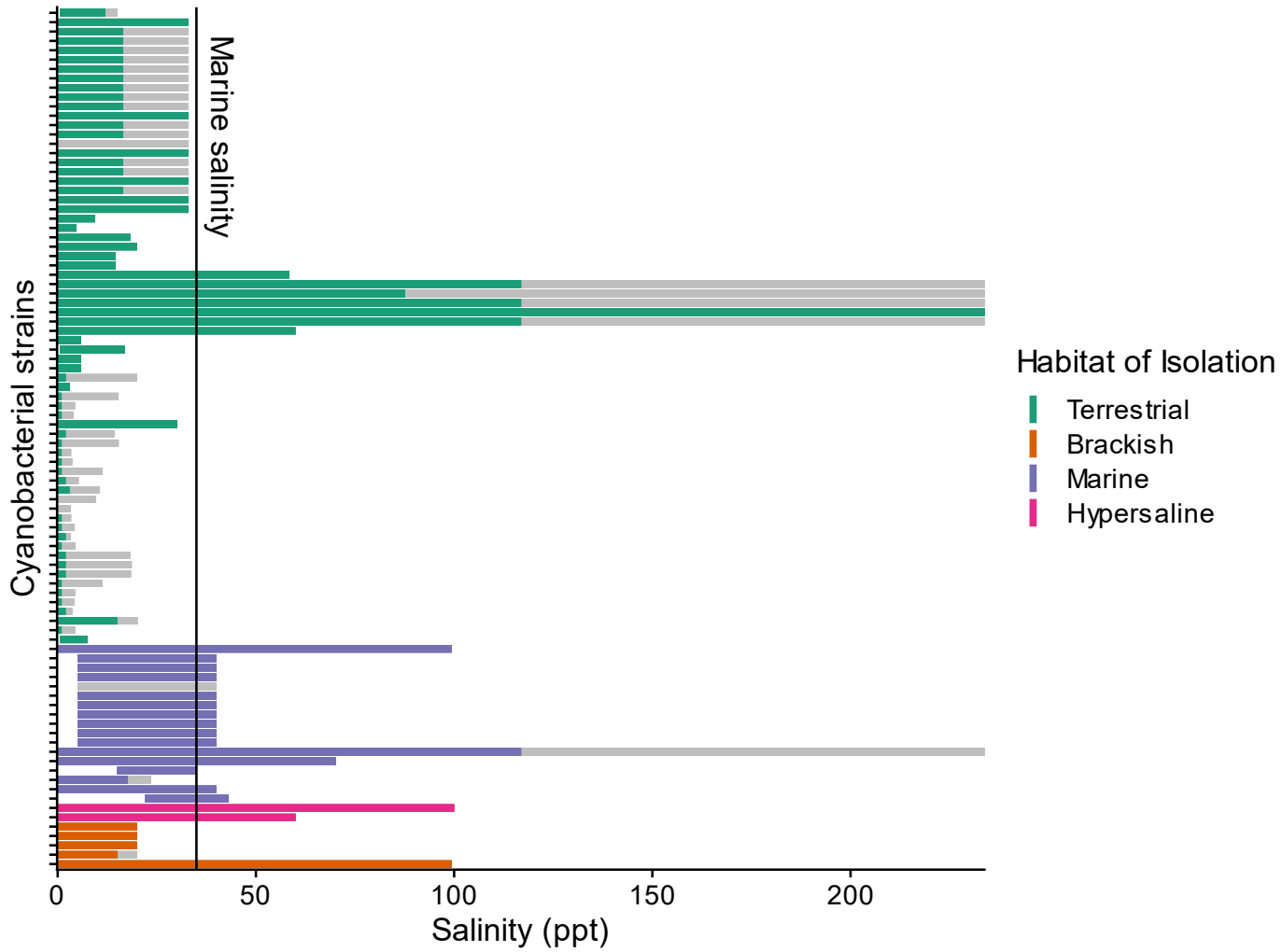
D.L. Richardson, R.H. Reed and W.D.P. Stewart



Maximum salinity of growth

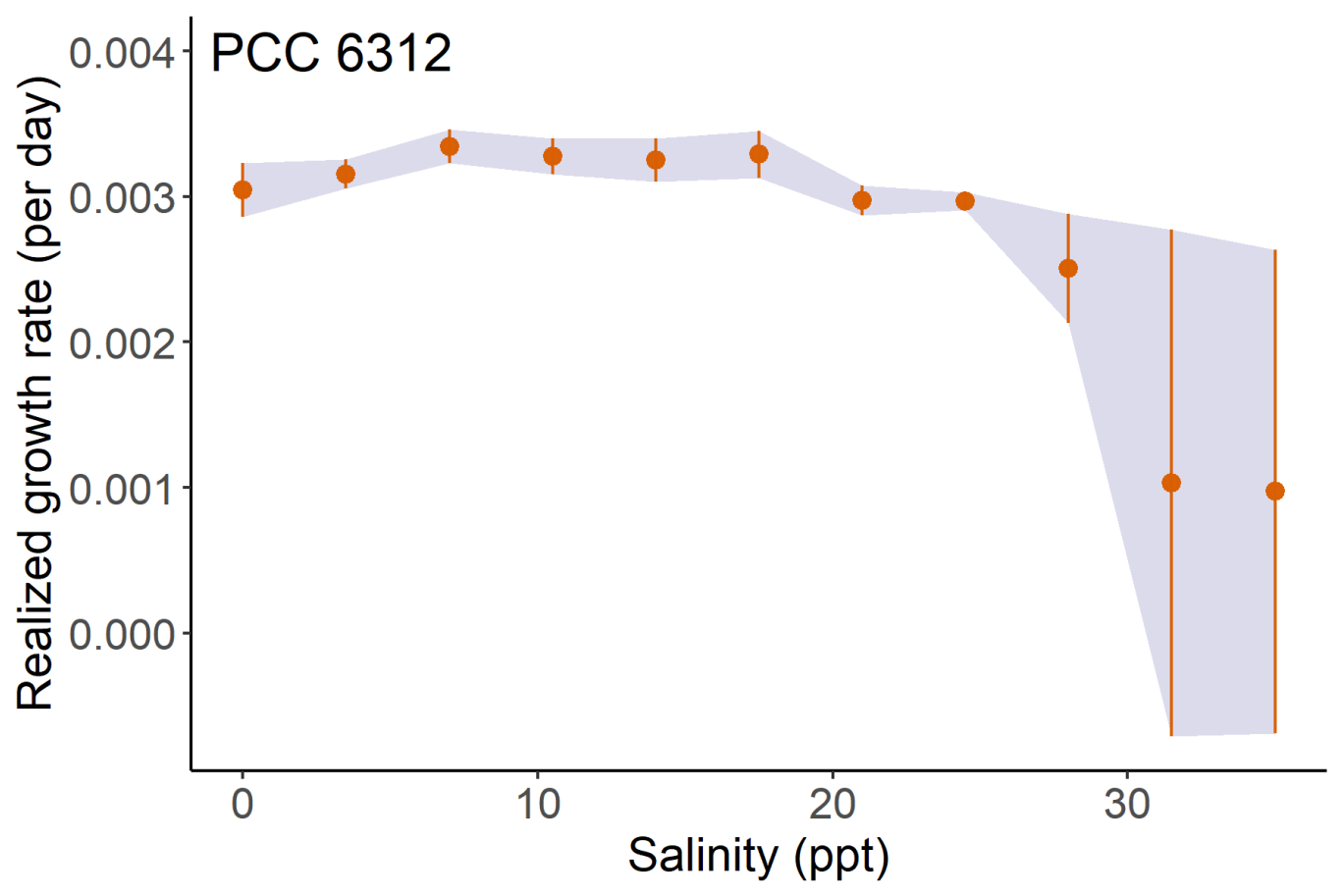


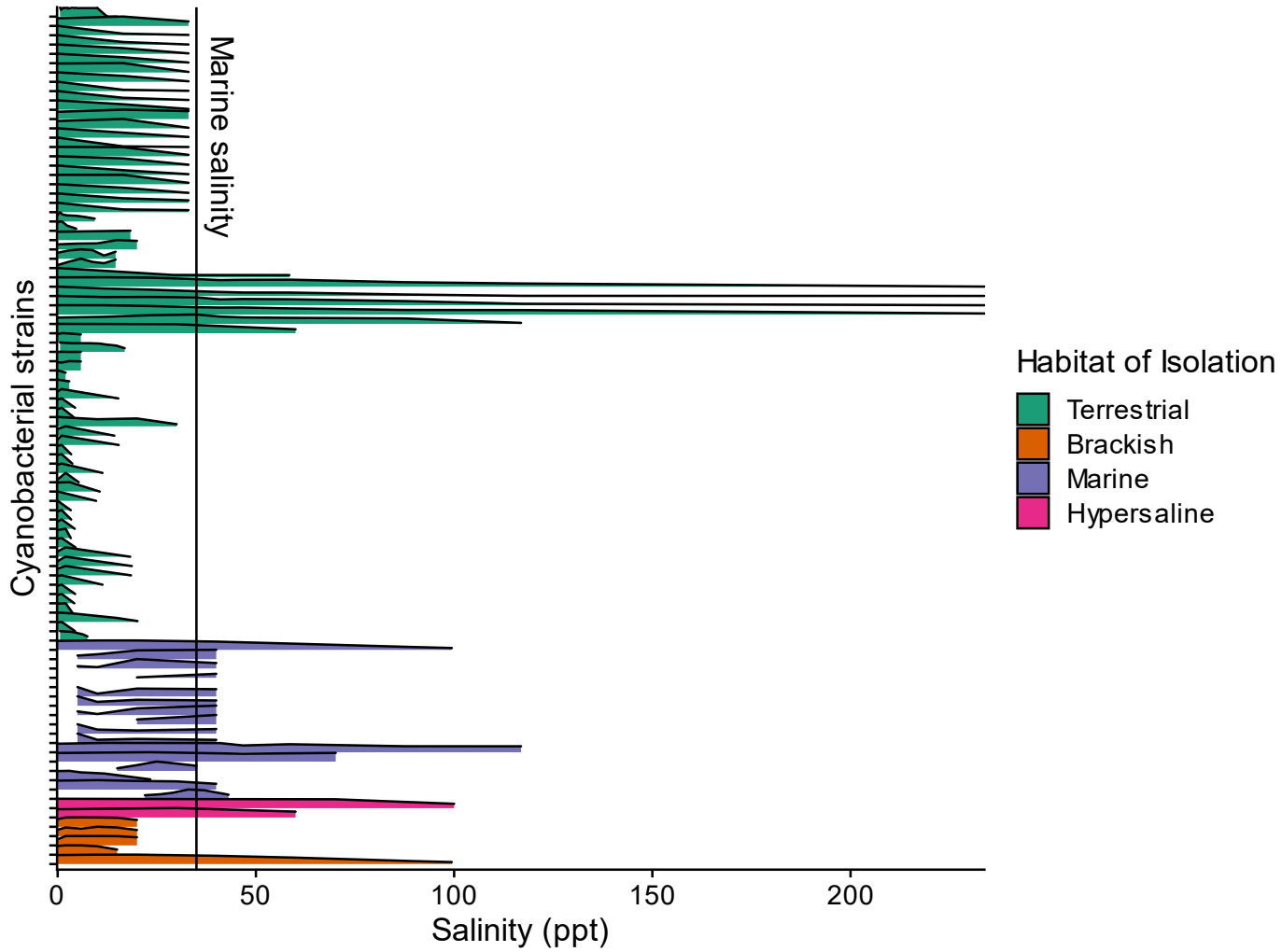
Salinity of maximum growth



Discrete growth

Reaction norms intro





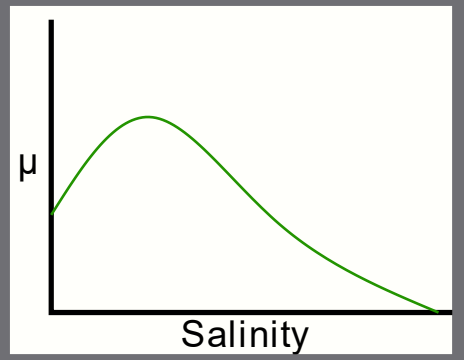
Reaction norms

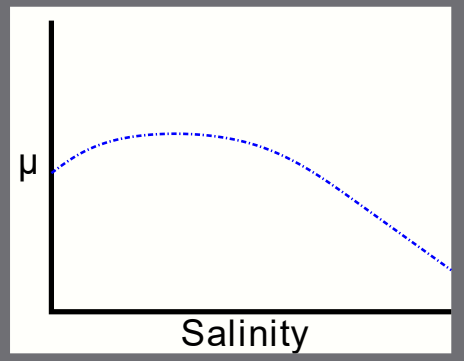
Salinity tolerance in extant Cyanobacteria

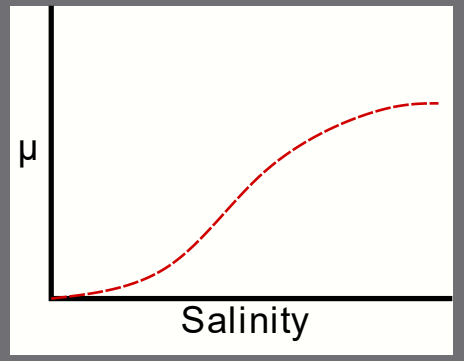
Habitat predicts salinity tolerance

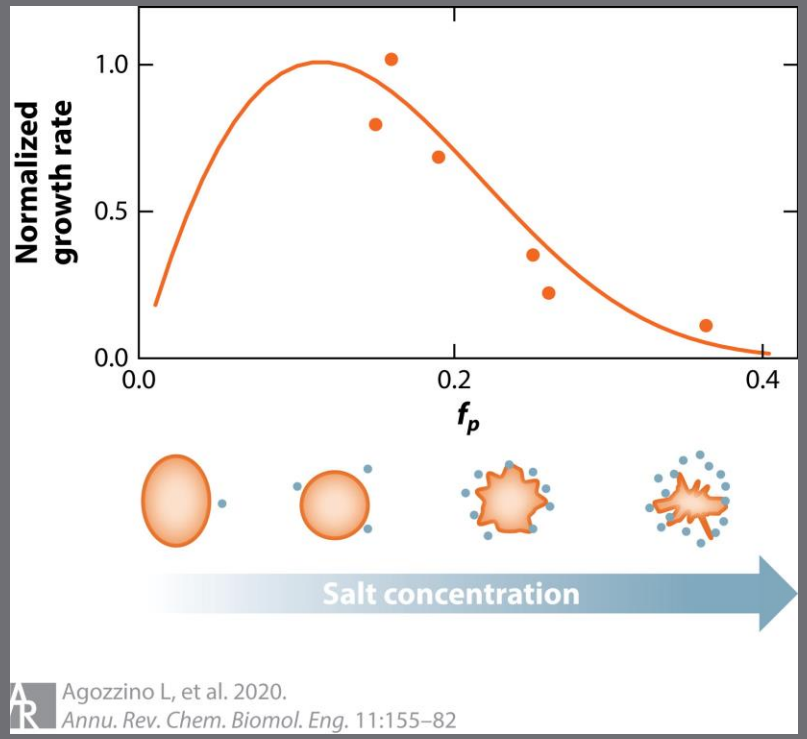
Salinity tolerance is a discrete trait

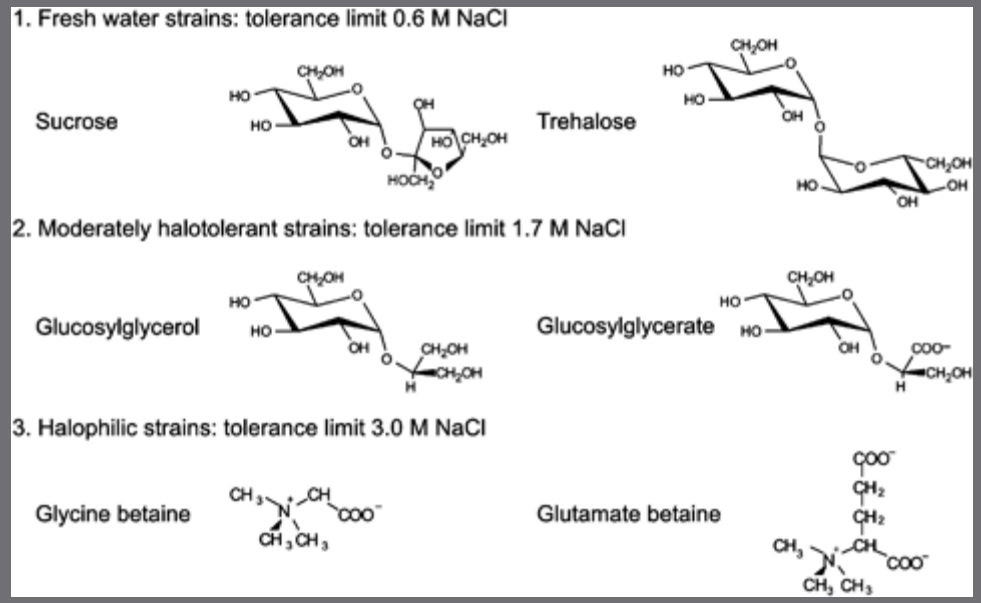
Future question: Can we identify molecular mechanisms behind the different response shapes?





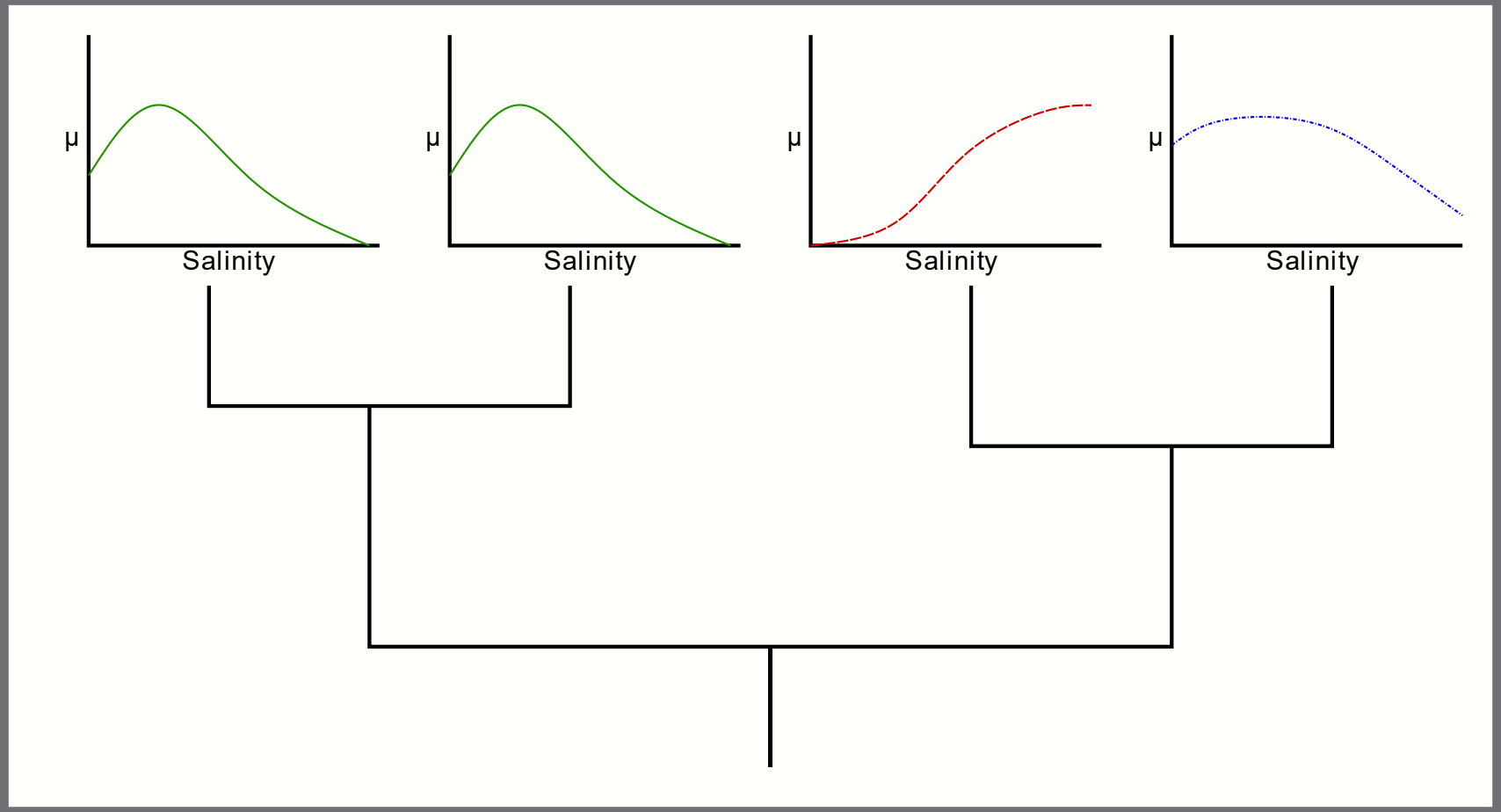






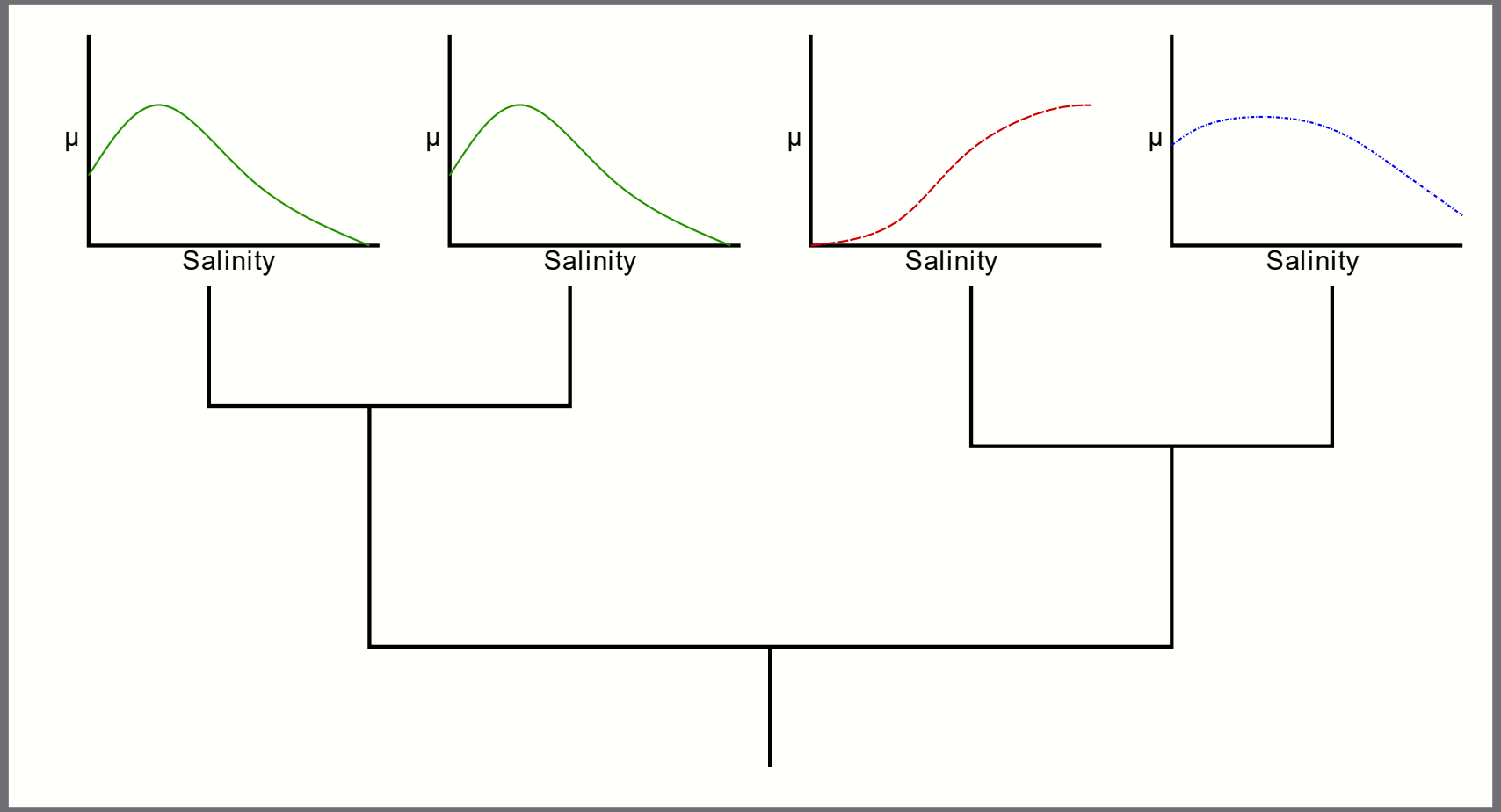
Future question: How do these reaction norms evolve?

Ancestral state reconstruction



Future question: How do these reaction norms evolve?

Experimental evolution



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- Friends and family

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Questions

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