



UNIVERSITY OF
HOHENHEIM



H O L M I R
Hohenheim Center for
Livestock Microbiome Research

Modulation of broiler gut microbiota by dietary particle size, exogenous phytase and calcium concentration

Ismael Rubio-Cervantes, Stephanie Wolfrum, Markus Rodehutschord, Amélia Camarinha-Silva

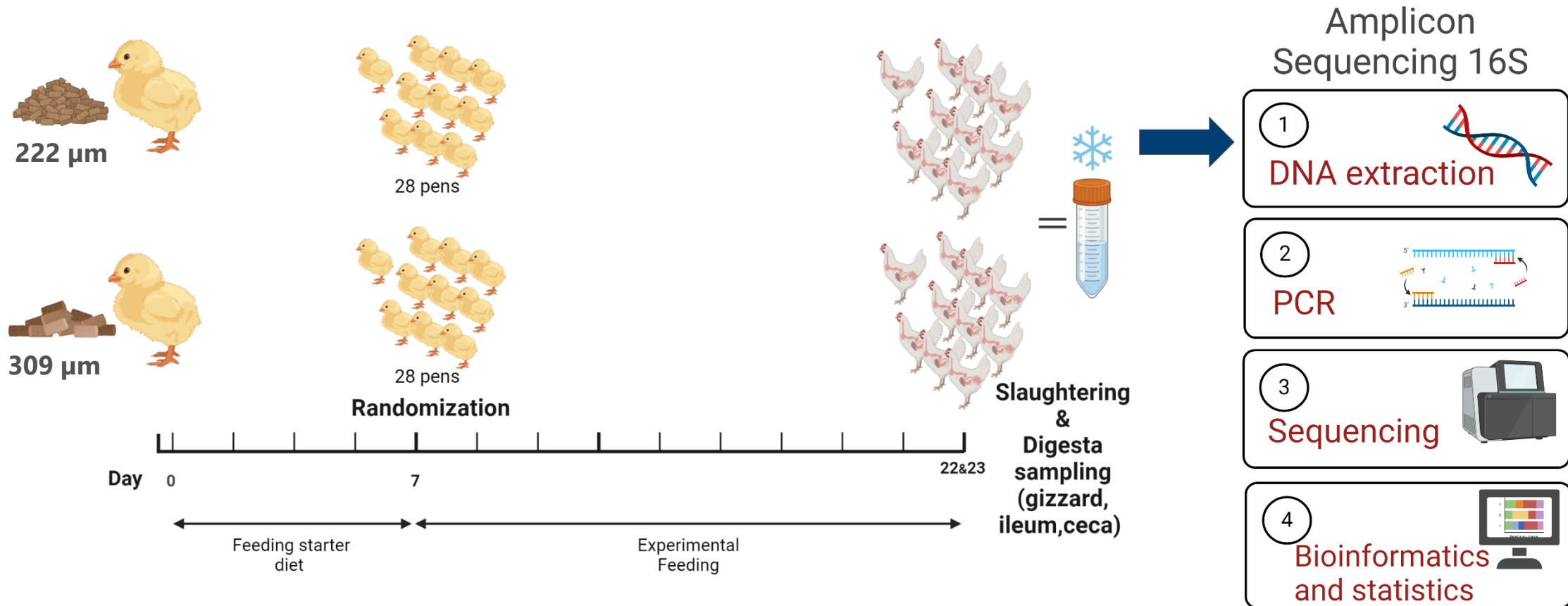
Background

- Energy spent on feed processing: Grinding (20%) and pelleting (60%)
- Coarser dietary particles can result in a lower pH in the GIT, which reduces InsP6 binding to other nutrients and increases P digestibility
- Calcium concentration influences the pH of the digestive tract and InsP6 degradation

To investigate how particle size, exogenous phytase and Ca concentration impact gut microbiota of broilers

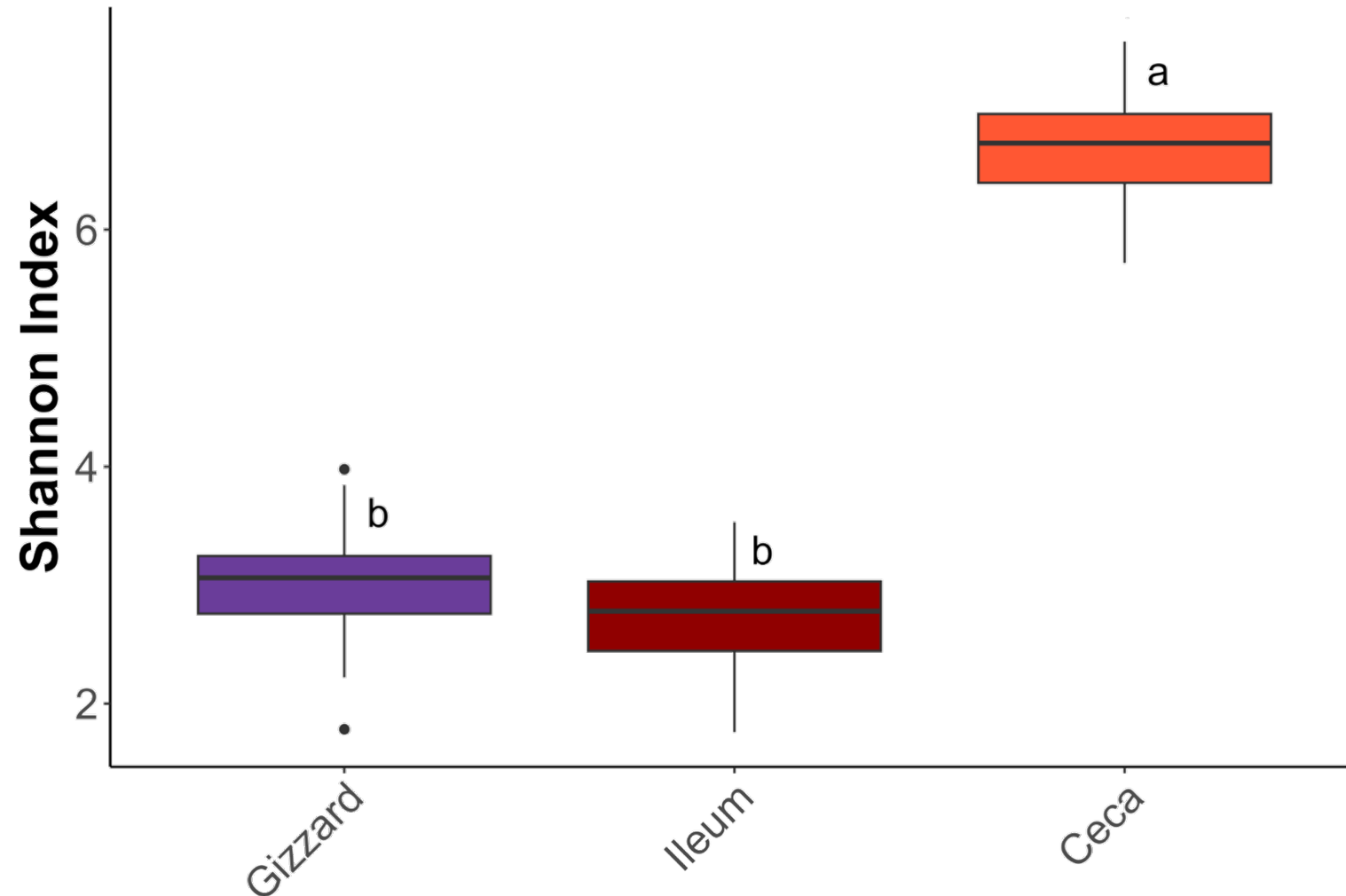
Materials and methods

- Particle size (2) × Ca concentration (2) × phytase (2) → 7 Replicates
- Corn, soybean meal, rapeseed meal, sunflower meal (According to GfE (1999))

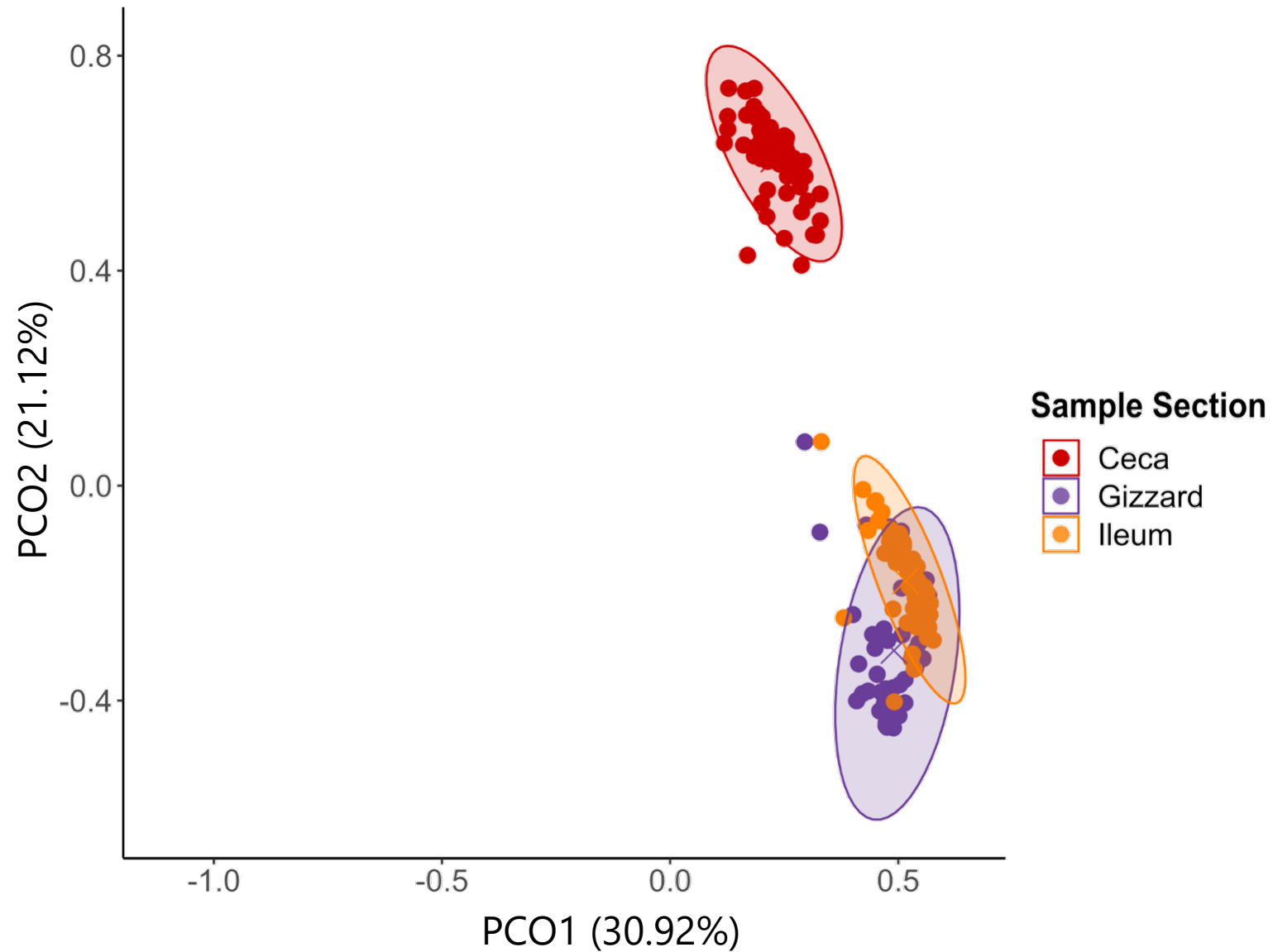


Alpha-diversity

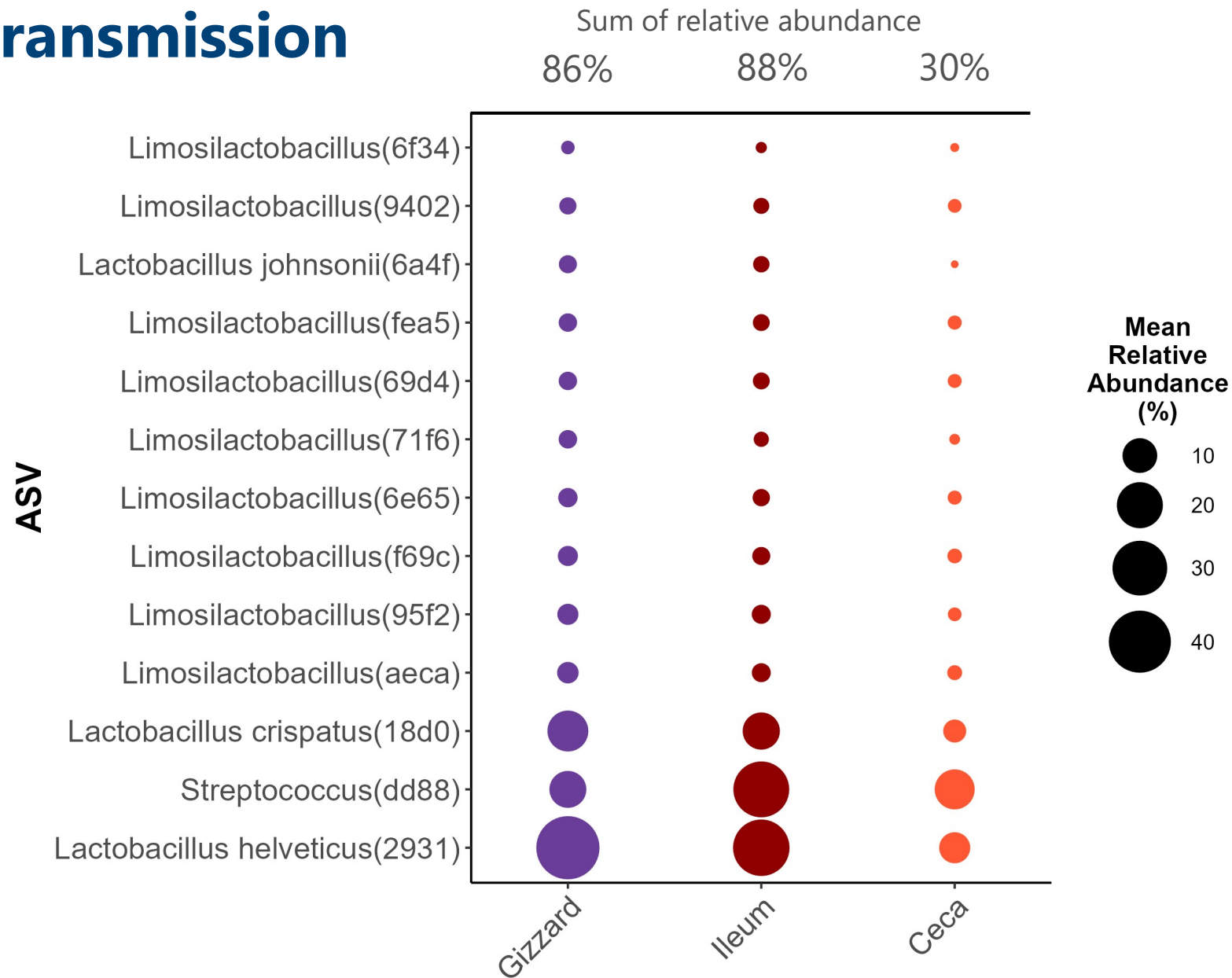
p-value < 0.05



Beta-diversity



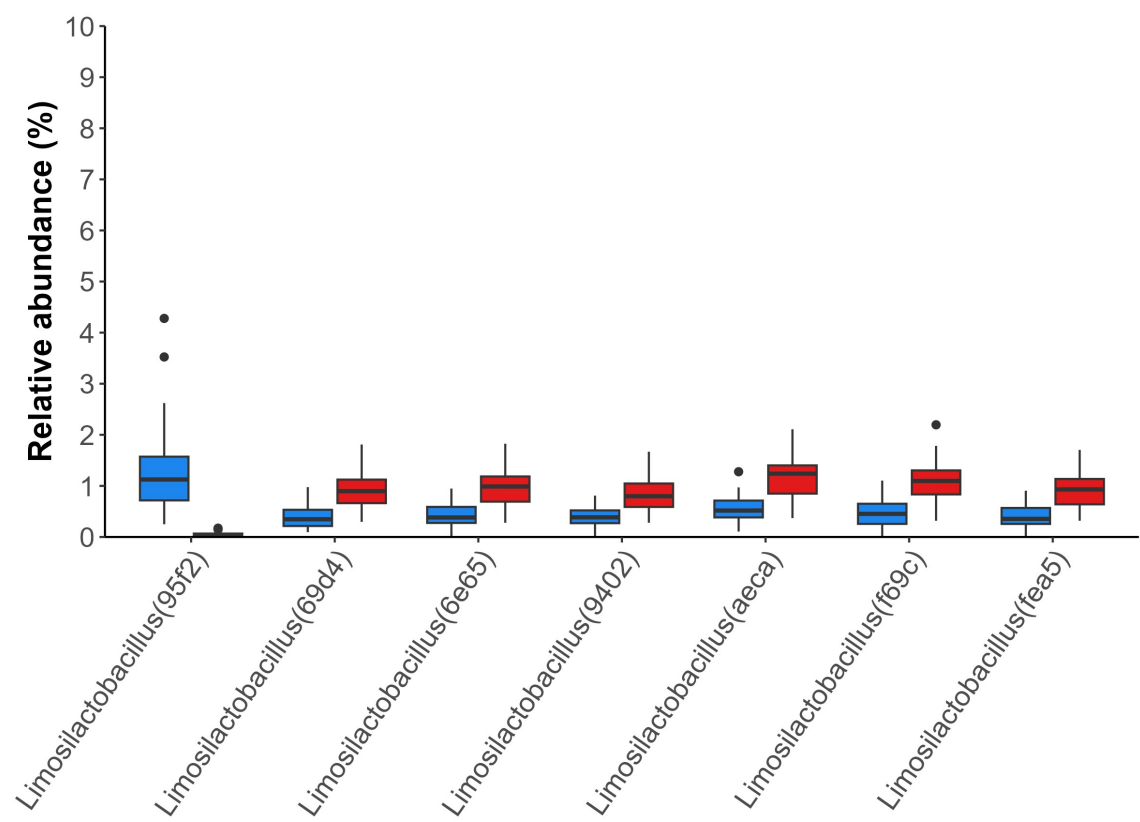
Vertical transmission



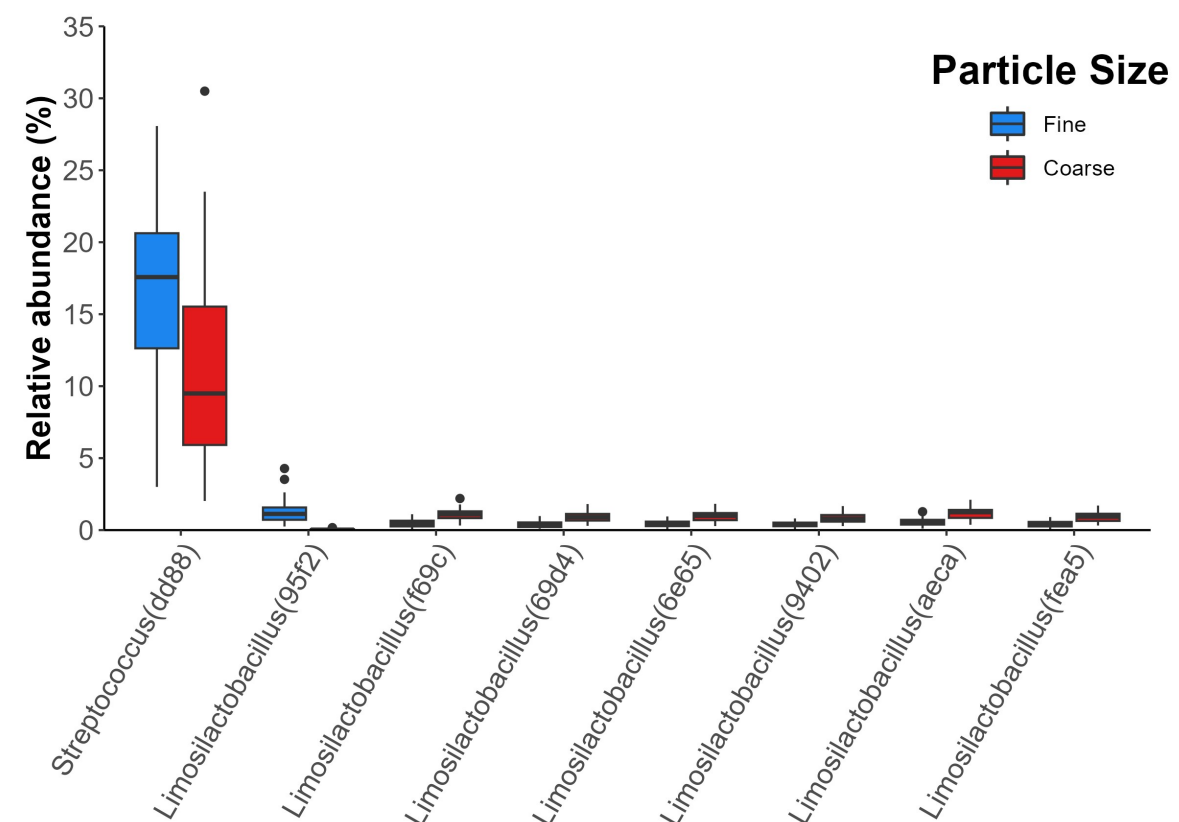
Particle size and vertical transmission

p-value < 0.05

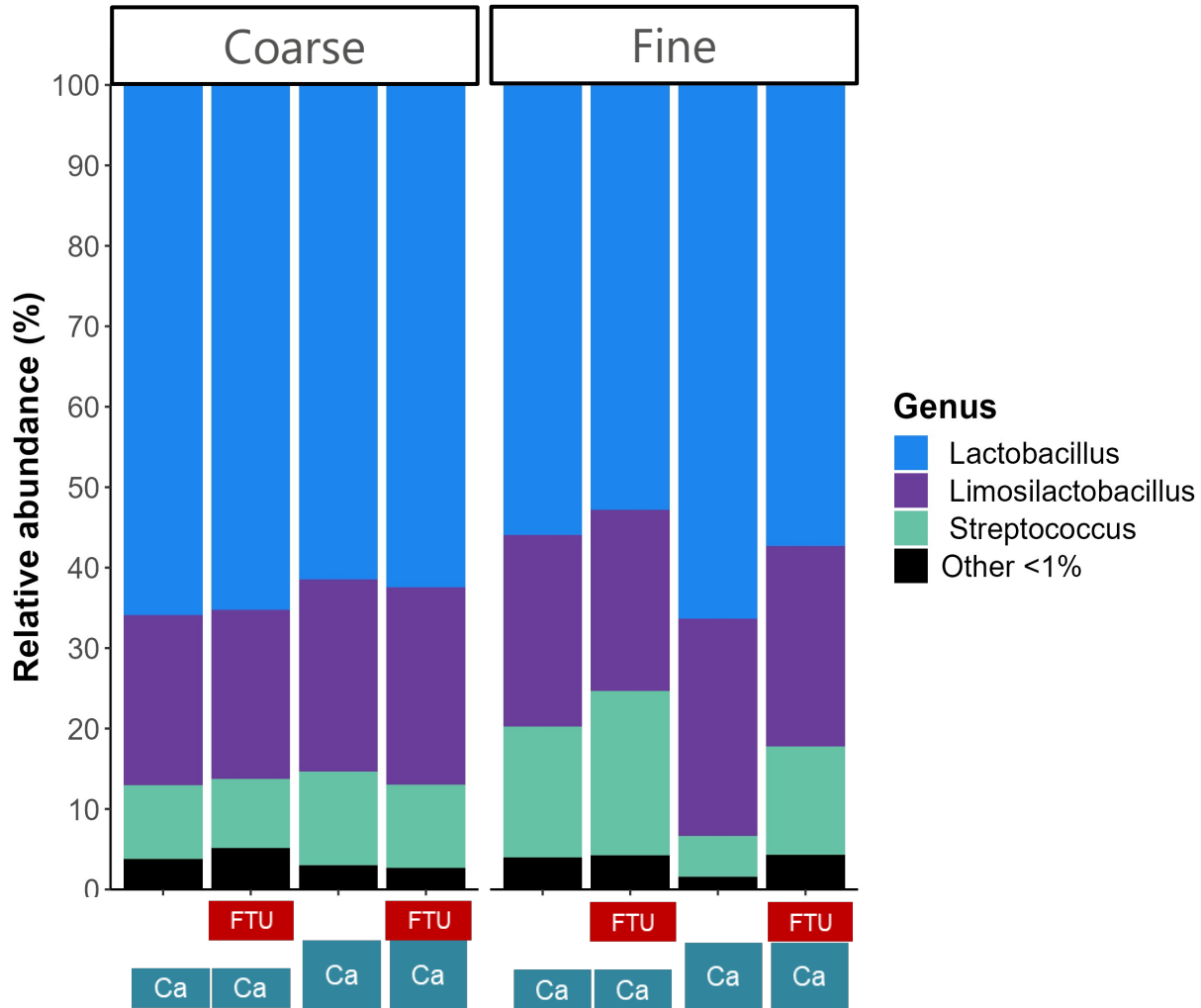
Ileum



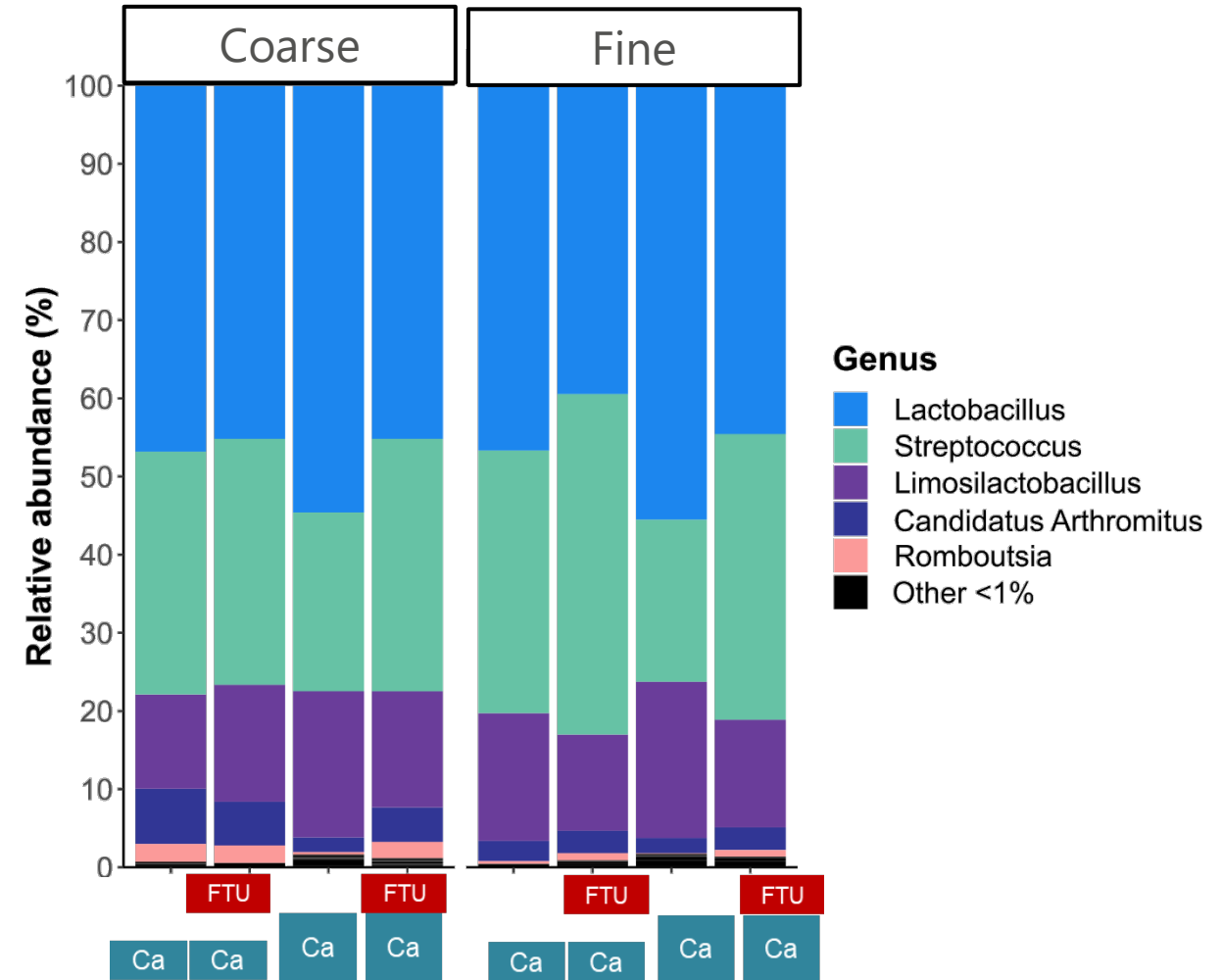
Ceca



Gizzard



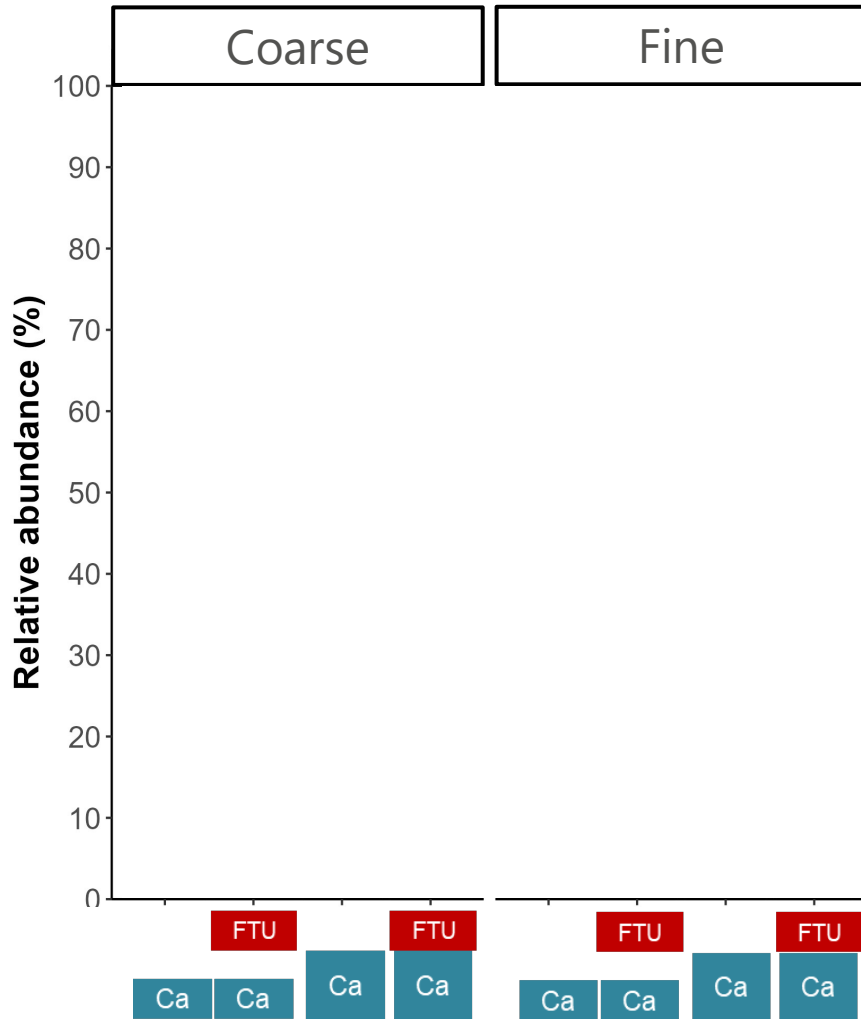
Ileum



FTU: Phytase units

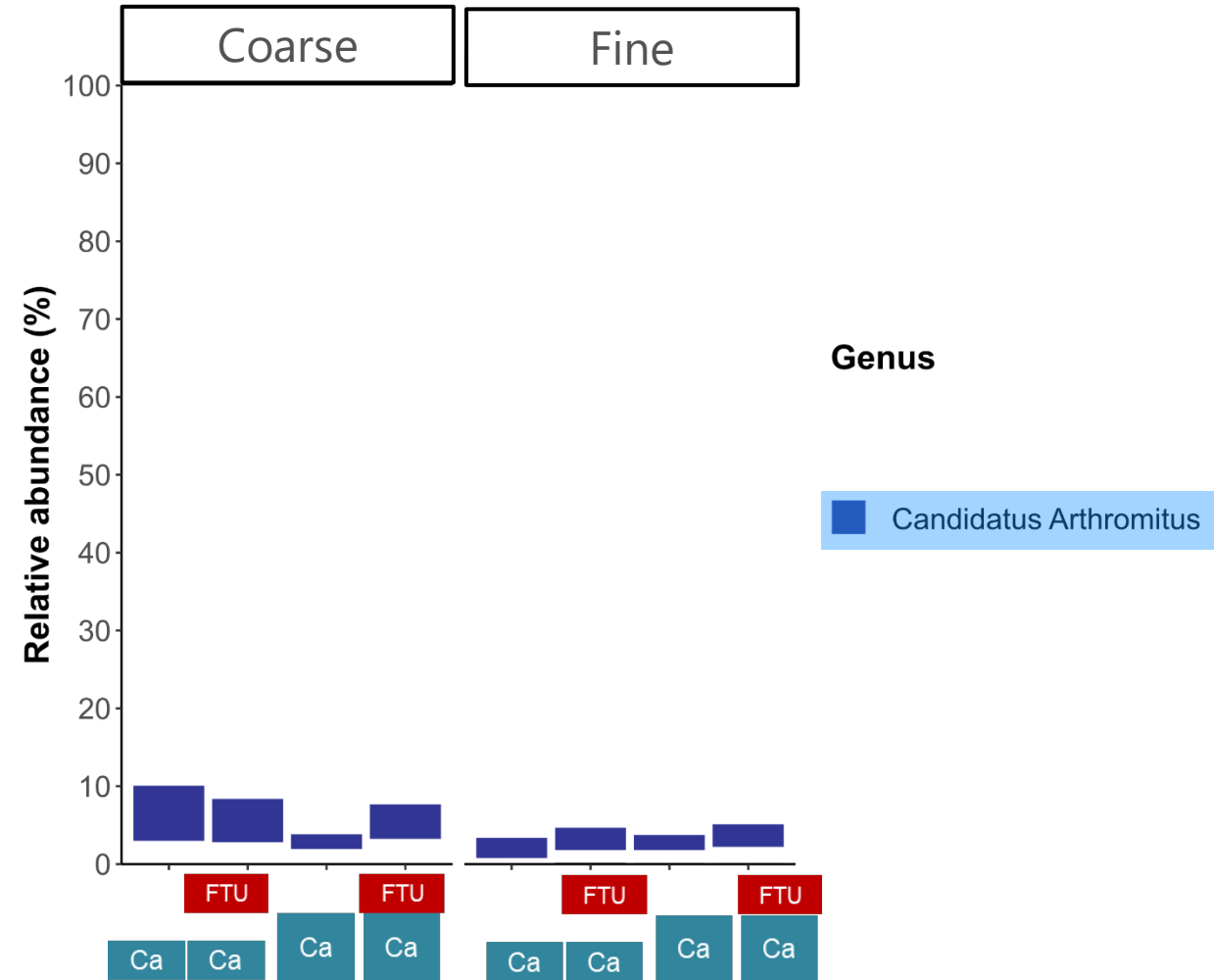
Ca: Calcium

Gizzard



FTU: Phytase units
Ca: Calcium

Ileum



Genus

Candidatus Arthromitus

Ileum: relative abundance as a result of factors

	Particle Fine	Particle Coarse	Phytase	Calcium
Candidatus arthromitus	7.01***	9.17***	0.000565	-0.698*

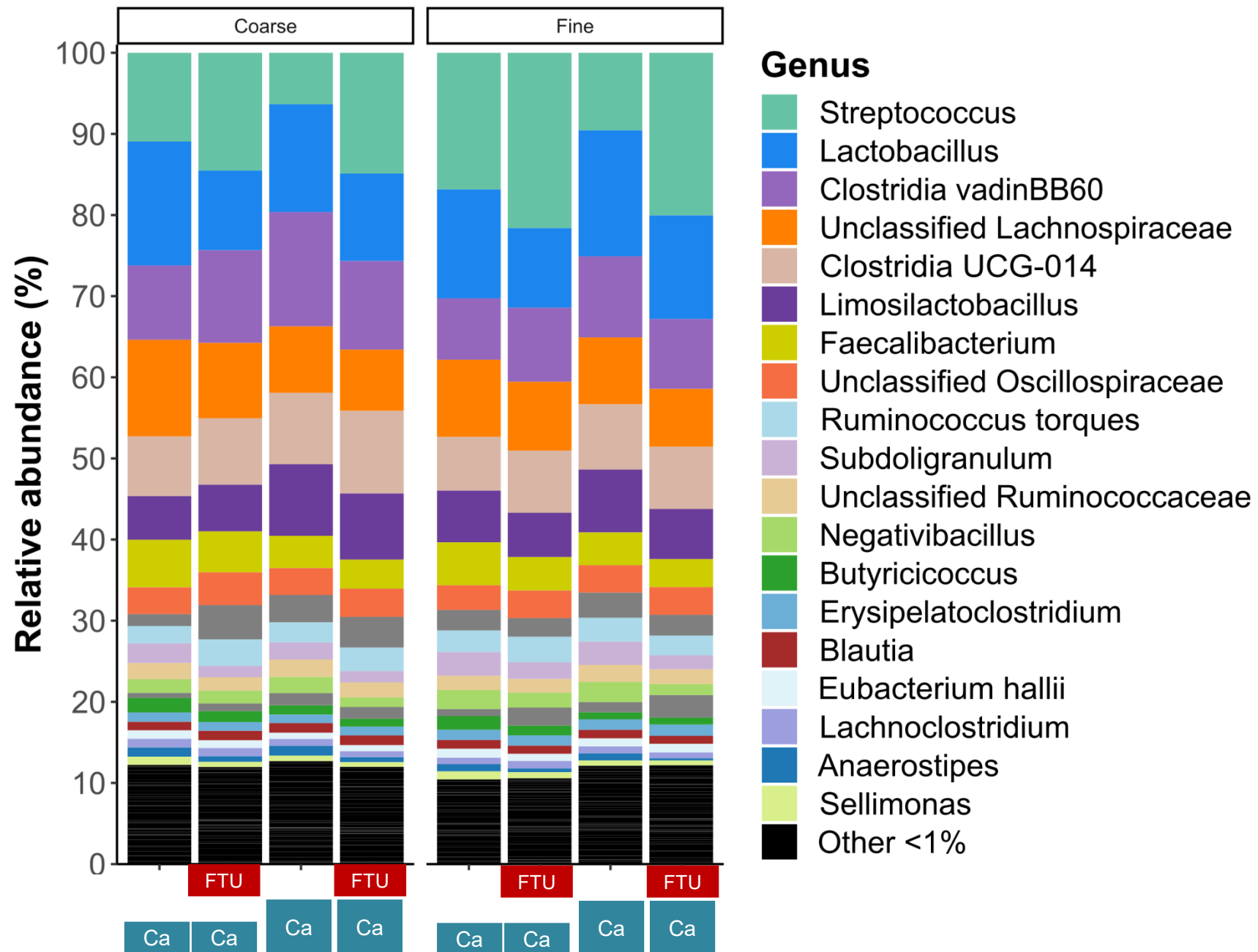
GLM Model: rel_abun ~ Particle + Phytase_FTU_kg + Calcium

* $P \leq 0.05$

** $P \leq 0.01$

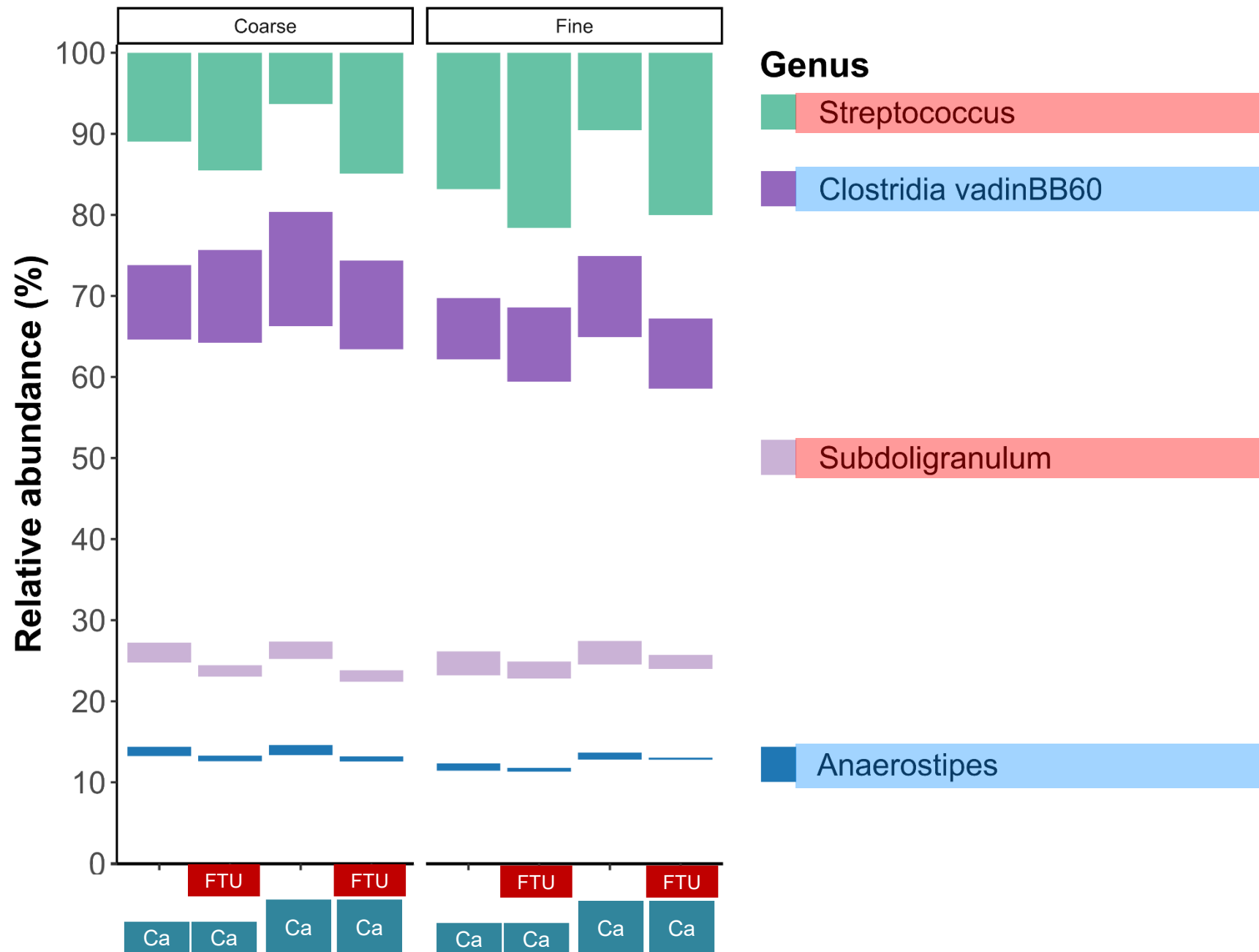
*** $P \leq 0.001$

Ceca



FTU: Phytase units
Ca: Calcium

Ceca



Ceca: relative abundance as a result of factors

	Particle Fine	Particle Coarse		Phytase	Calcium
Anaerostipes	1.04553604***	1.34309571***		-0.00051254***	-0.02575393
Clostridia vadinBB60	4.77119527*	7.30821016**		-0.00018426	0.5936968
Streptococcus	22.3610645***	17.1119097**		0.0066782***	-1.32880666*
Subdoligranulum	3.34818691***	2.79419354**		-0.0009288*	-0.0757

GLM Model: rel_abun ~ Particle Size + Phytase_FTU_kg + Calcium

* P<=0.05

** P<=0.01

*** P<=0.001

Conclusions

Significant variations in microbiome composition are attributed to changes in particle size. These variations impact pH levels and modify microbial interactions within the GIT.

Exogenous phytase influences the microbiome in the ceca, potentially, due to its role in modulating phosphorus and *myo*-inositol availability in the upper GIT.

Calcium is an agglutinant, an antimicrobial and affects pH which might explain its effects on relative abundance of different genera.



UNIVERSITY OF
HOHENHEIM



H o L M i R
Hohenheim Center for
Livestock Microbiome Research

TEAMWORK MAKES THE DREAM WORK

- Colleagues from Livestock Microbial Ecology (460m)
- Stephanie Wolfrum (460a)
- Bibiana Rios-Galicia (460c)
- Johan Sebastián Sáenz (460c)



Deutsche
Forschungsgemeinschaft



AMAIZE-P



UNIVERSITY OF
HOHENHEIM



H o L M i R
Hohenheim Center for
Livestock Microbiome Research

THANK YOU FOR YOUR ATTENTION

Looking forward to your questions!

DFG Deutsche
Forschungsgemeinschaft



AMAIZE-P



UNIVERSITY OF
HOHENHEIM



UNIVERSITÄT
HOHENHEIM