



Allele specific expression on liver and head kidney of *Salmo salar* with differential susceptibility to the challenge with *Piscirickettsia salmonis*.



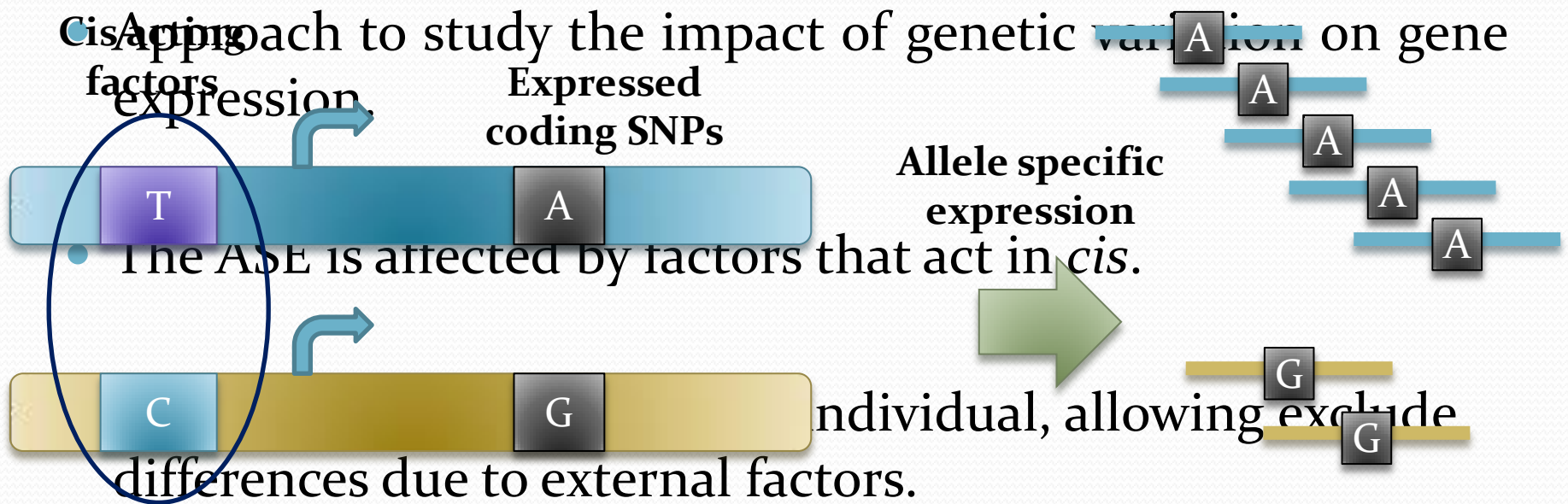
Dettleff, P. & Martínez, V.
Santiago de Compostela, 2015
ISGA XII

Cis and *Trans* regulation

- *Trans*-regulatory elements regulate the expression of distant genes (e.g. transcription factors).
- *Cis*-regulatory elements are regions of DNA which regulate the transcription in the same gene or nearby genes (e.g. enhancers and promoters).
- *Cis*-acting regulatory variation can play a role in phenotypic variation.

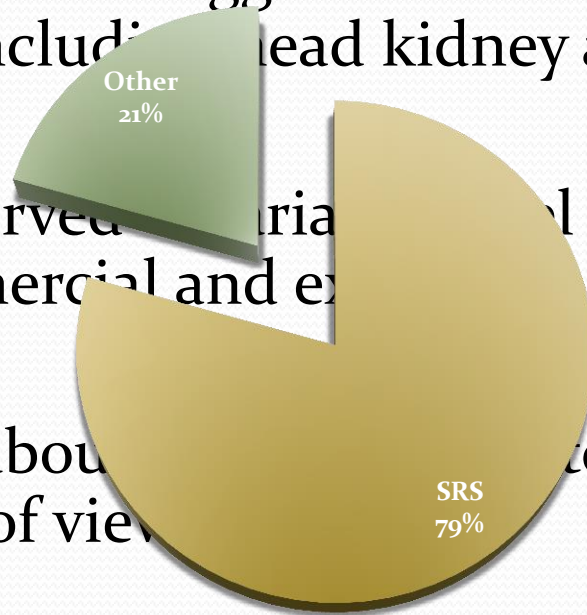
Allele specific expression

- The allele specific expression (ASE) determines the existence of imbalances in the expression of one allele relative to the other.

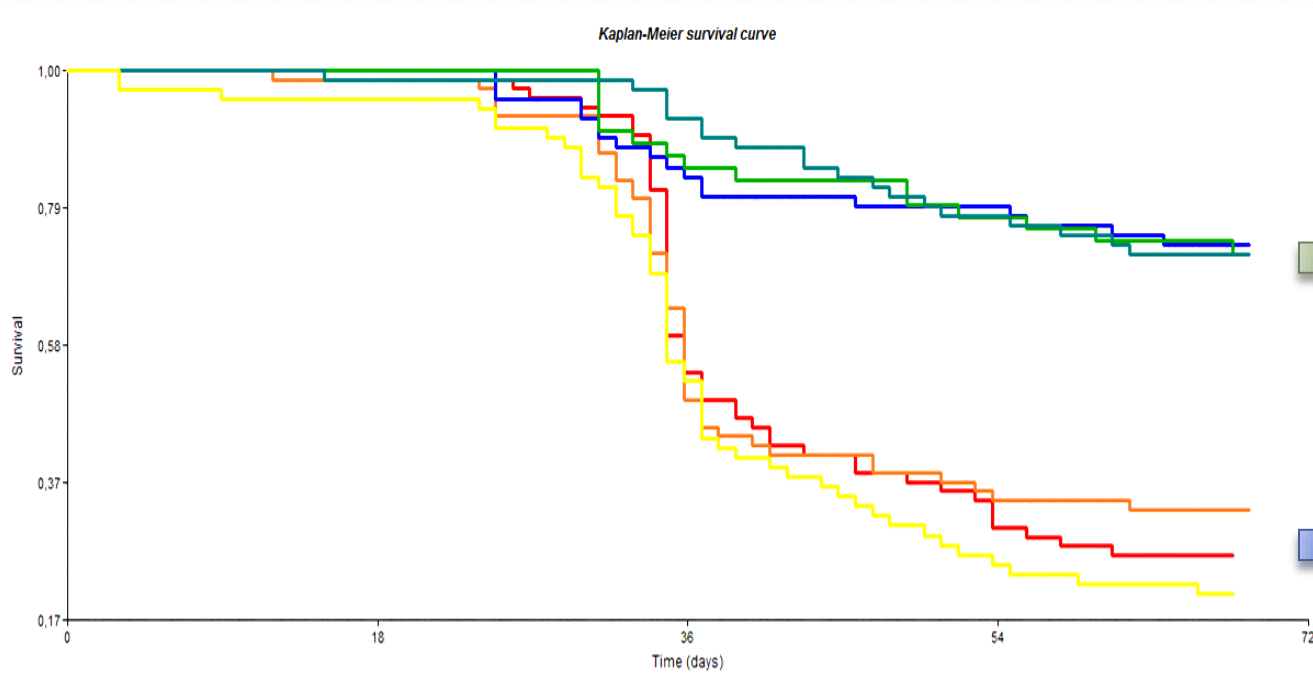


Piscirickettsia salmonis

- The principal bacterial agent that affect the Atlantic salmon Chilean production.
- Produces a systemic aggressive infection that involves several organs, including head kidney and liver.
- It has been observed a high level of resistance to this bacteria in commercial and experimental populations.
- Little is known about the pathogenesis of this disease from a molecular point of view.



SRS challenge



Resistant families

Susceptible families

Head kidney and liver samples

De novo assembly

Pair-end sequencing



de novo assembly



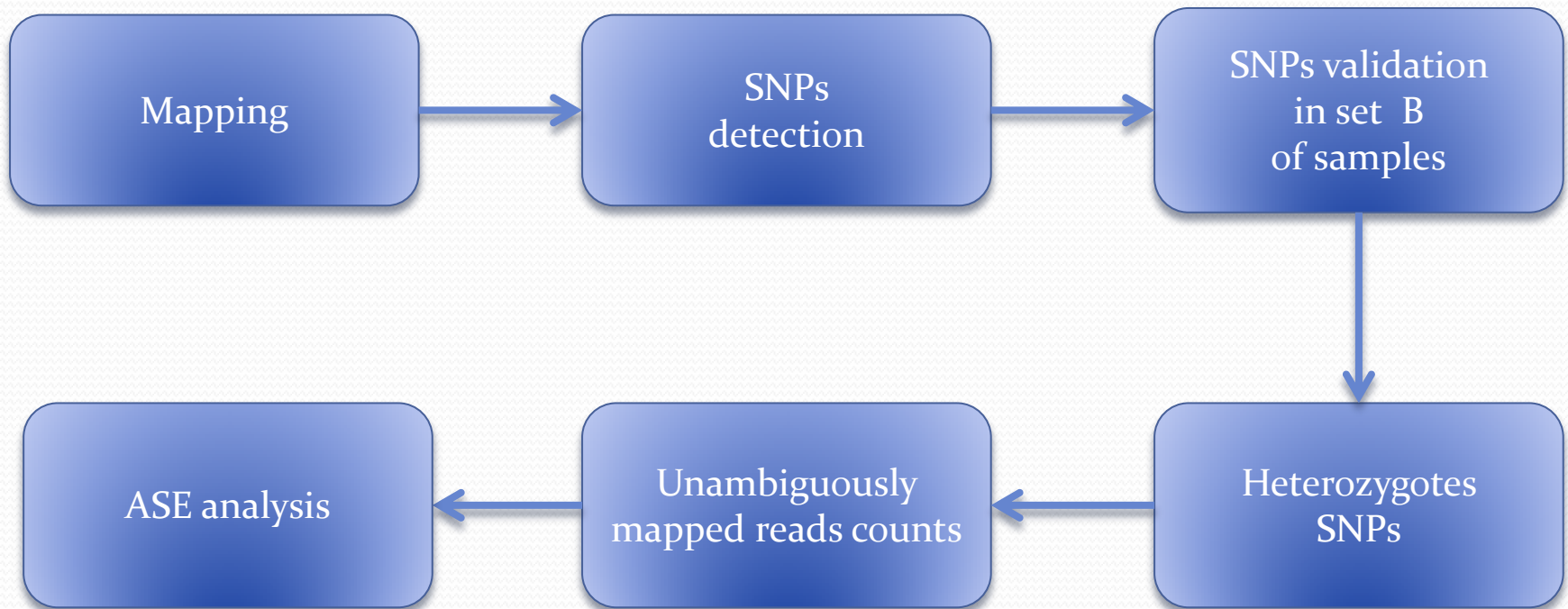
blastx



Annotation

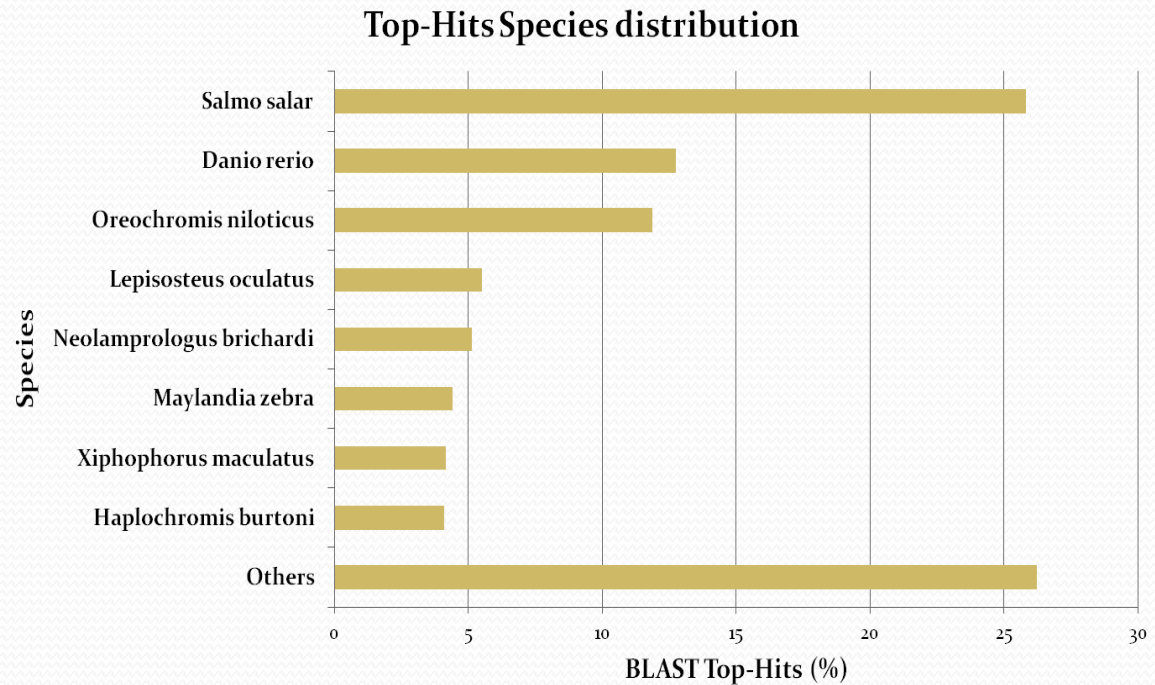


ASE detection



Assembly results

N₅₀	1,711
N° of nucleotides	50,867,482
Contigs > 1000 bp	17,294
N° of annotated contigs	16,614
GO terms	81,791



KEGG enzymatic annotation

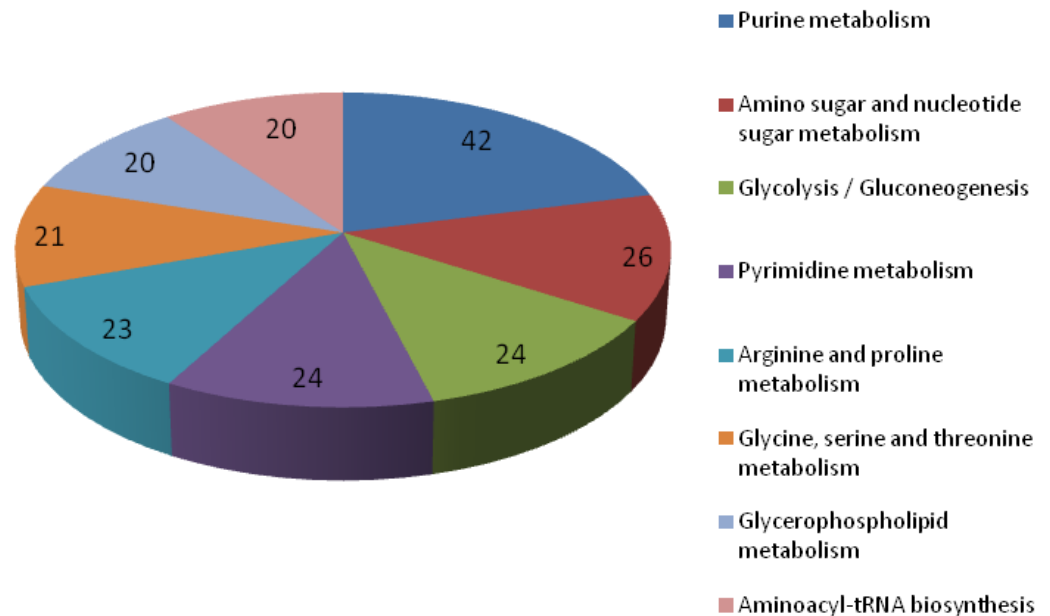
N° sequences
with enzymatic
annotation

4,173

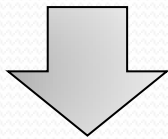
Metabolic
pathways

126

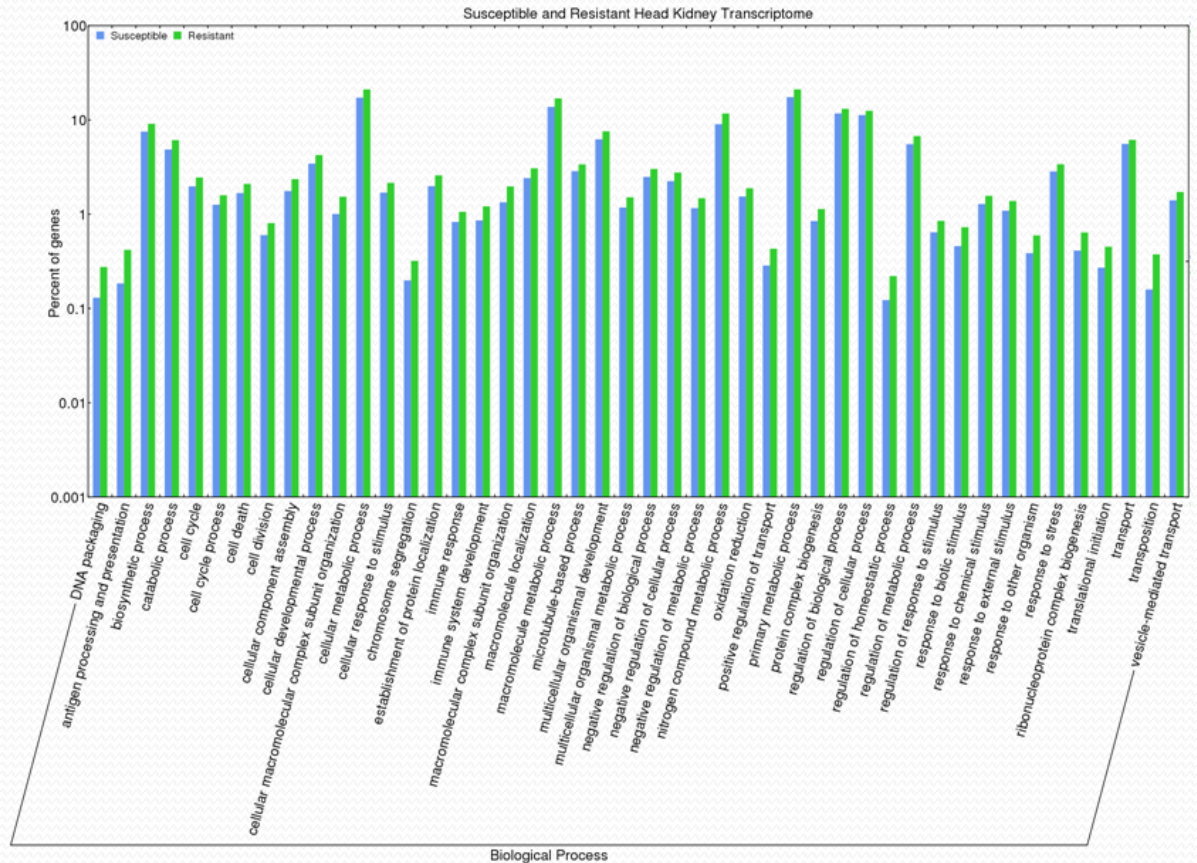
Pathways with greater number on enzymes



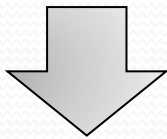
GO category	Terms with differences
Molecular Function	19
Biological Process	86
Cellular Component	34



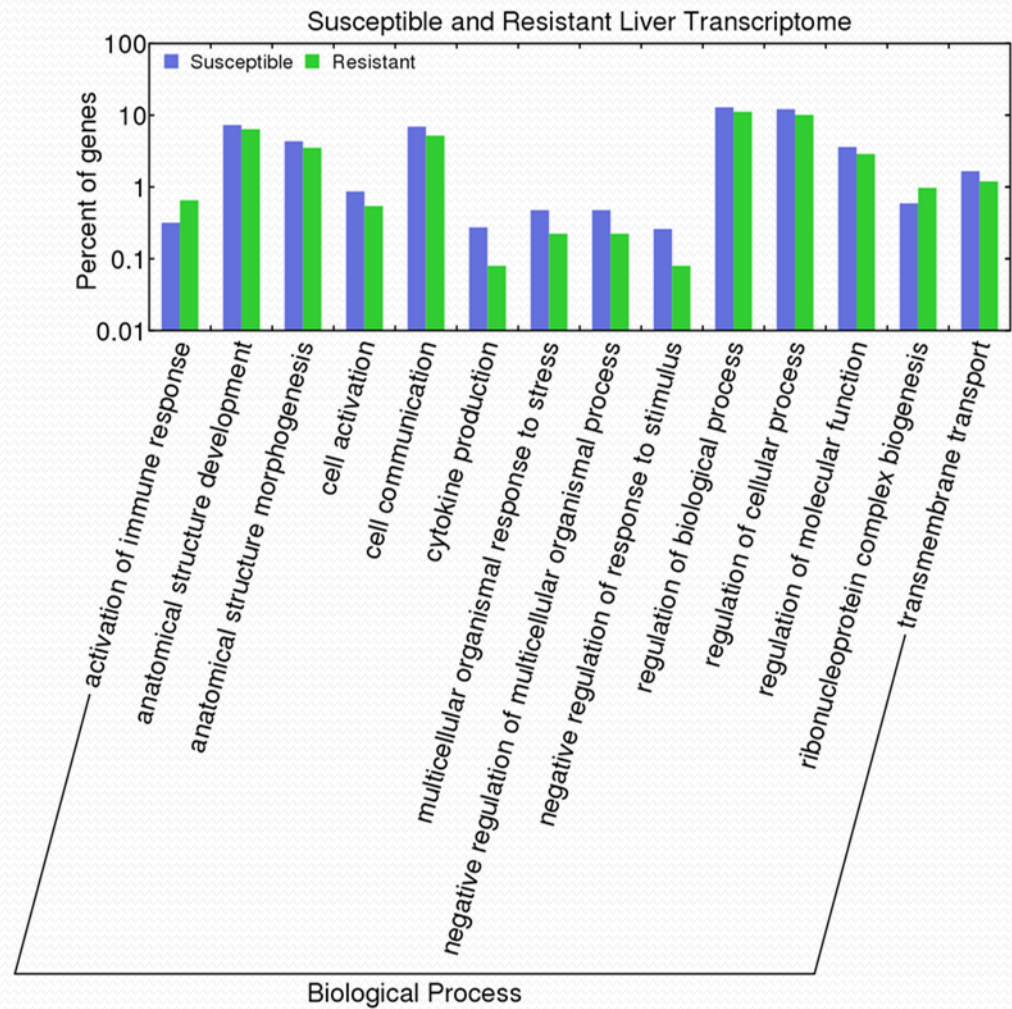
- Immune response
- Antigen processing and presentation
- Cell death
- Response to stress



GO category	Terms with differences
Molecular Function	12
Biological Process	19
Cellular Component	3



- Activation of immune response
- Cytokine production



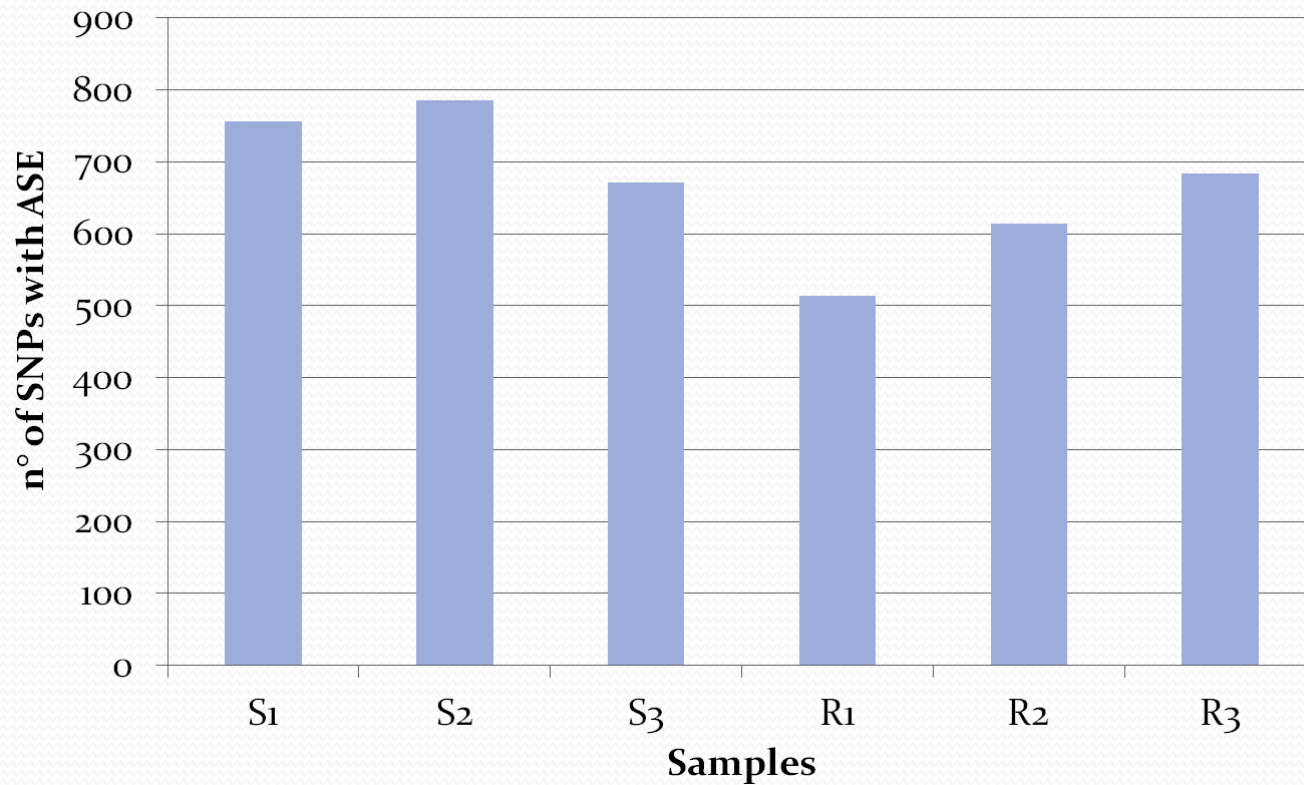
SNPs

		SNPs identified in head kidney and liver			
	Type	N° of SNPs	N° of SNPs	%	
Transition	A/G	969	1909	64	
	C/T	940			
Transversion	A/T	253	1067	36	
	C/G	218			
	A/C	305			
	G/T	291			

Validation of SNPs in set B of samples (n=20)

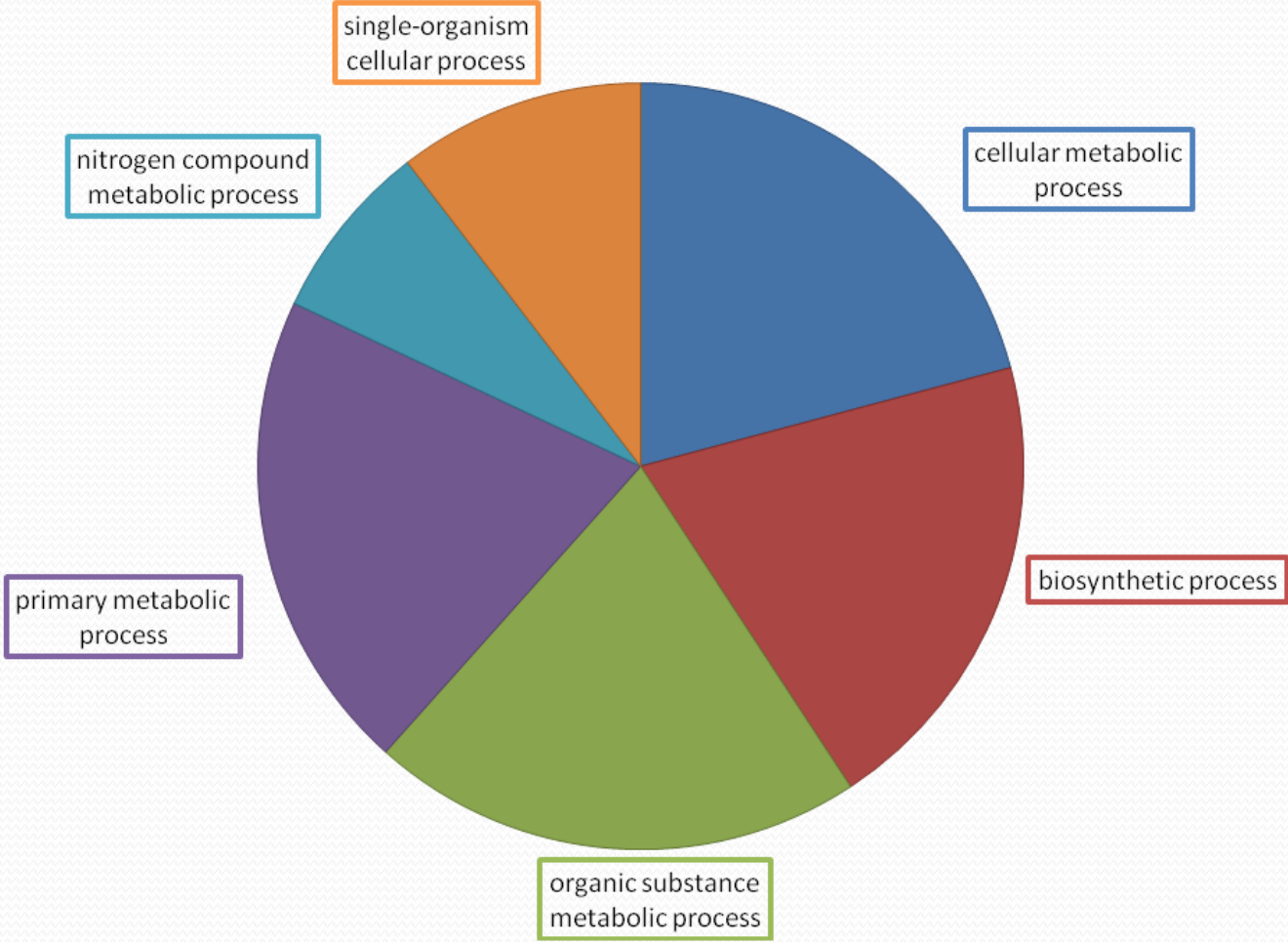
2,976 SNPs validated in set B

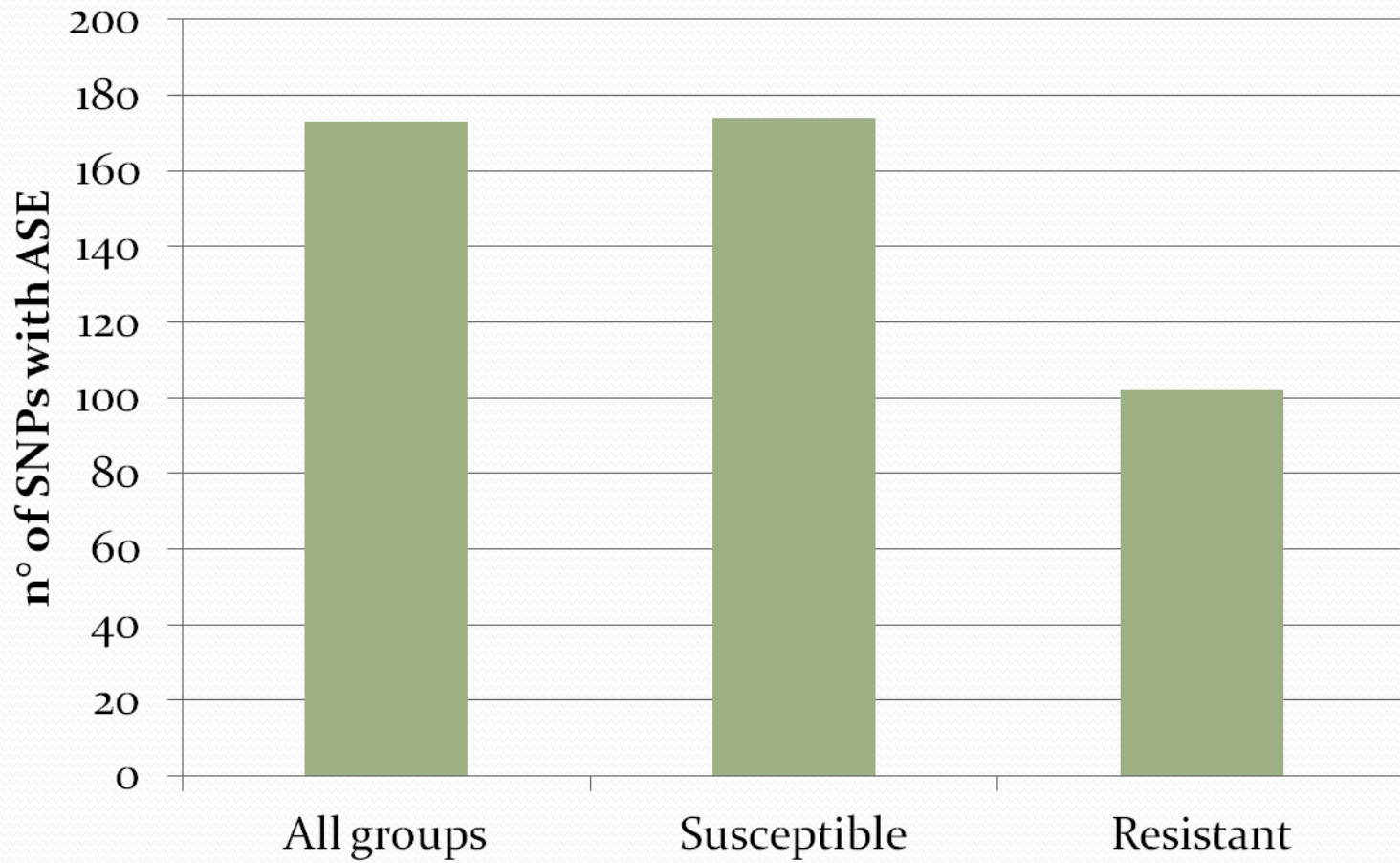
ASE



173 SNPs with ASE
in all samples

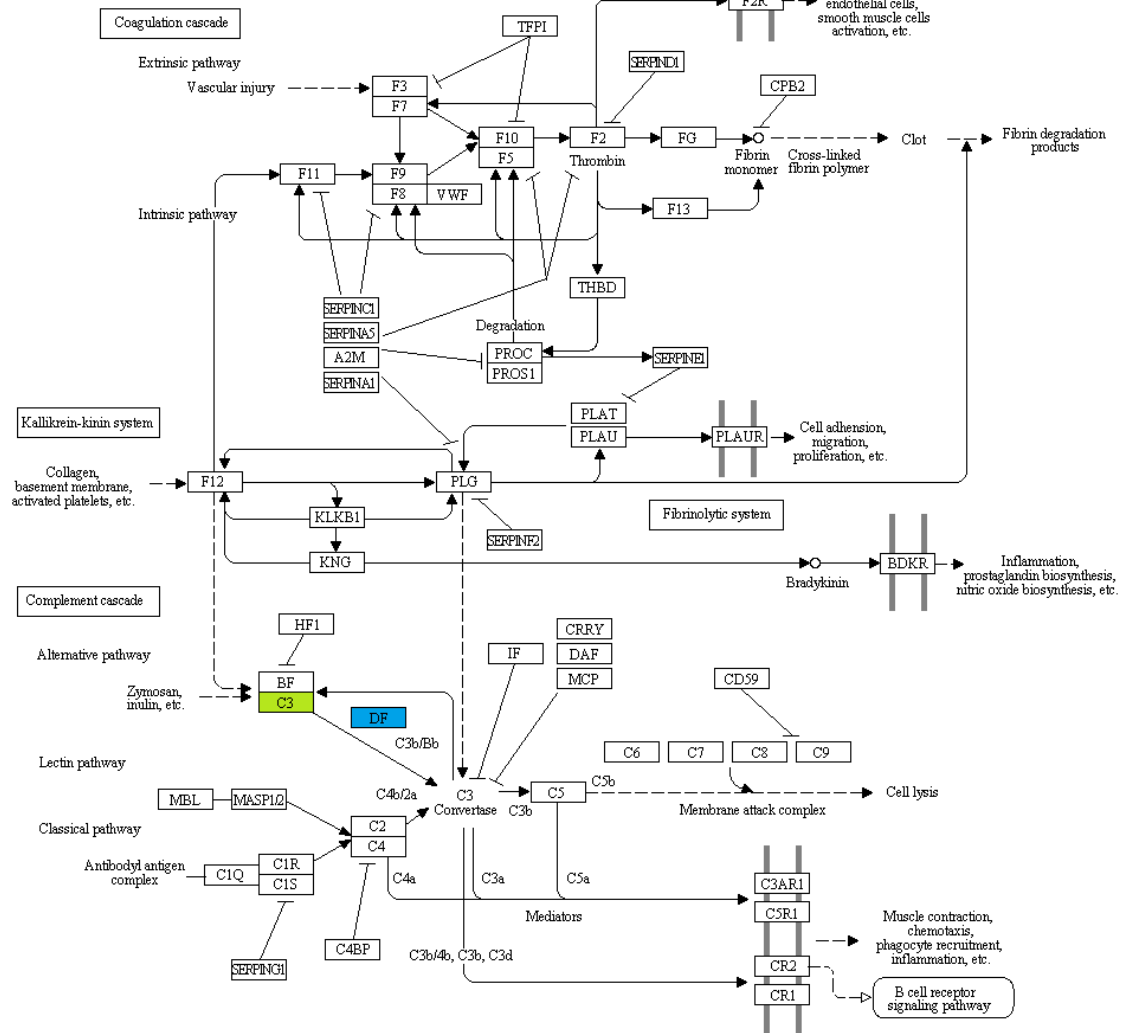
GO-distribution of genes with ASE in all samples (Biological process, level 3)





- Ribosomal proteins
- Complement factors
- Hemoglobin subunits

COMPLEMENT AND COAGULATION CASCADES



Conclusions

- The results showed that common ASE genes in all fish are mostly connected with different metabolic processes.
- The ASE genes by group include protein metabolic processes, with several ribosomal proteins and presenting a low number of immune genes.
- Complement factors and hemoglobin subunits could be interesting genes involved in survival to the disease.
- Further studies are required to understand if these *cis*-acting factors could affect disease resistance in practice.

Acknowledgments



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