

Contents

Preface: Of sculpins and model organisms 3

Introduction 4

An invasion of the Lower Rhine	4
Ecological genetics and phylogeographic inference	5
The study system: continuous bodies of water and leaky genepools	7
Aspects treated in this study.....	7
Literature:	8

Declaration of collaborators contributions 10

Chapter 1: An invasive lineage of sculpins, *Cottus* sp. (Pisces, Teleostei) in the Rhine with new habitat adaptations has originated from hybridization between old phylogeographic groups 11

Abstract	11
Introduction.....	11
Methods:.....	13
Results:.....	14
Discussion	21
Acknowledgements	24
Literature	25
Appendix – Chapter 1	27

Chapter 2: Direct cloning of microsatellite loci from *Cottus gobio* through a simplified enrichment procedure 28

Abstract:	28
Microsatellites from Sculpins	28
Acknowledgements:	37
Literature	38

Chapter 3: A Genetic Map of *Cottus gobio* (Pisces, Teleostei) based on microsatellites can be linked to the Physical Map of *Tetraodon nigroviridis* 39

Abstract:	39
Introduction.....	39
Methods.....	40
Results:.....	42
Discussion:	45
Acknowledgements	47
Literature	47

Chapter 4: Rapid moulding of nascent hybrid zones results from differential adaptation of two lineages of sculpins 50

Abstract:	50
Introduction:.....	50

Contents

Methods:.....	51
Results:.....	55
Discussion:	57
Acknowledgements:	60
Literature:	60
Appendix – Chapter 4.....	61

Chapter 5: Shape based assignment tests reveal transgressive phenotypes in natural sculpin hybrids (Teleostei, Scorpaeniformes, Cottidae) 62

Abstract	62
Introduction.....	62
Methods	64
Results.....	69
Discussion	73
Acknowledgements	76
Literature	76
Appendix – Chapter 5.....	78

Chapter 6: The distribution of genomic regions associated with habitat and divergent morphology across sculpin hybrid zones 79

Abstract:	79
Introduction:.....	79
Methods:.....	81
Results.....	86
Discussion	89
Acknowledgements:	92
Literature:	92
Appendix – Chapter 6.....	94

Abstract 95

Zusammenfassung 96

Erklärung 98
Teilpublikationen..... 98

Lebenslauf 99