

TABLE OF CONTENTS

1. Executive summary	1
2. General introduction	5
3. Species identification, taxonomy and notes on evolutionary and phylogenetic development.....	10
3.1. Taxonomic history of the Vaal River yellowfishes	10
3.1.1. Orange-Vaal smallmouth yellowfish	10
3.1.2. Orange-Vaal largemouth yellowfish	11
3.2. Species identification	11
3.3. Notes on evolutionary and phylogenetic development	20
4. Reproductive biology and early development	22
4.1. Introduction.....	22
4.2. Review of the known reproductive biology of the Vaal River yellowfishes	23
4.3. Artificial reproduction experiment.....	26
4.3.1. Introduction.....	26
4.3.2. Materials and methods.....	26
4.3.3. Results:.....	40
4.4. Early development of yellowfishes	42
4.4.1. Introduction.....	44
4.4.2. Materials and methods.....	45
4.4.3. Results and discussion	Error! Bookmark not defined.
Early development of the Smallmouth yellowfish	61
Early development of the Largemouth yellowfish.....	63
4.4.4. Conclusions	<u>63</u>
5. Age validation.....	Error! Bookmark not defined.
5.1. Introduction.....	67
5.2. Materials and methods	72
5.3. Results and discussion	73
5.3.1. Larval development and hatching	73
5.3.2. Age validation	76
5.4. Conclusions.....	79
6. Home ranges, habitat use, migrations and general behaviour	Error! Bookmark not defined.
6.1. Introduction.....	86
6.2. Materials and methods	88
6.2.1. The study area.....	89

6.2.2.	Biotelemetry monitoring methods.....	91
6.2.3.	Yellowfishes used in the study.....	86
6.2.4.	Environmental conditions monitored.....	88
6.2.5.	Data analyses methods.....	89
6.3.	General behavioural biology and ecology.....	91
6.3.1.	Consideration of individual behavioural patterns.....	92
6.3.2.	Home ranges.....	103
6.3.3.	Habitat use.....	105
6.3.4.	Coordinated migrations.....	110
	Spawning migrations.....	111
	Migrations of larvae and juvenile yellowfish.....	112
	Seasonal migrations of adult yellowfishes.....	113
6.3.5.	Comments on possible territoriality behaviour of Vaal River yellowfishes.....	114
7.	Aspects of the Conservation and management of Vaal River yellowfishes.....	116
7.1.	Review of the socio-economic value assessment of Yellowfish in the Vaal River	Error! Bookmark not defined. 116
7.2.	Review of the impact of angling on yellowfish of the Vaal River	Error! Bookmark not defined.
7.3.	Simplified Regional Scale Risk Assessment of the threats Largemouth Yellowfish in the Vaal River.....	120
7.3.1.	Introduction.....	120
7.3.2.	Materials and methods.....	121
	Problem formulation.....	121
	Study area.....	122
	Ecological assessment endpoints.....	124
	Habitat identification.....	124
	Source and associated stressor identification.....	125
	Conceptual site model.....	125
	Ranking system.....	126
	Risk characterisation.....	128
7.3.3.	Results and discussion.....	129
	Sum of the relative ranks per stressor.....	129
	Sum of relative ranks per habitat.....	130
	Sum of relative risk per endpoint.....	131
	The relative risks per risk region.....	131
	Scenario assessments.....	132
7.3.4.	Conclusions.....	137

8.	Closing remarks and recommendations	136
8.1.	Closing remarks.....	137
8.2.	Recommendations.....	137
9.	Acknowledgements	138
10.	References.....	143
11.	Appendices	160
ATTACHMENTS:		
	Appendix A 1: CD of raw data collected in the study.....	161
	Appendix B 1 : DVD of video clips obtained in the study.....	193

