
Contents

Foreword	ix
Introduction	xi
Chapter 1. Freshwater Environments and Fishes	1
1.1. Environments of freshwater ichthyofauna.	1
1.1.1. Areas and volumes of freshwater environments	1
1.1.2. Mesozoic and Cenozoic freshwater environments and their fish fauna.	3
1.1.3. Climates and sea levels	4
1.1.4. Biological crises	6
1.2. What is a freshwater fish?	7
1.2.1. Air breathing.	9
1.2.2. Weberian apparatus.	11
1.2.3. Pharyngeal dentition	13
1.2.4. Electric fishes	13
Chapter 2. Assemblages of Freshwater Fishes in the Mesozoic. . .	15
2.1. Triassic	15
2.1.1. Australia	15
2.1.2. Africa	16
2.1.3. South America	17
2.1.4. Europe	18
2.1.5. Asia	18
2.1.6. North America	19
2.2. Jurassic	20
2.2.1. South America	21
2.2.2. Australia	21

2.2.3. Antarctica	22
2.2.4. India	22
2.2.5. Africa	22
2.2.6. North America	23
2.2.7. Asia	23
2.3. Cretaceous	24
2.3.1. Europe	25
2.3.2. Australia	28
2.3.3. Asia	28
2.3.4. Africa	32
2.3.5. South America	34
2.3.6. North America	37
2.3.7. Madagascar	39
Chapter 3. Assemblages of Freshwater Fishes in the Cenozoic	41
3.1. Paleogene	41
3.1.1. North America	42
3.1.2. Europe	44
3.1.3. Asia	47
3.1.4. Africa and the Arabian Peninsula	48
3.1.5. South America	49
3.1.6. Australia	50
3.2. Neogene	51
Chapter 4. Evolutionary Histories of Freshwater Fishes	53
4.1. Coelacanth (Actinistia)	53
4.2. Lungfish (Dipnoi)	59
4.3. Polypterids (Cladistia)	63
4.4. Coccolepidids	66
4.5. Sturgeons and related fishes (Acipenseriformes)	66
4.6. "Paleopterygians" and "sub-holosteans"	69
4.7. Redfieldiiforms (Redfieldiiformes)	70
4.8. Scanilepiforms (Scanilepiformes)	71
4.9. Perleidiforms (Perleidiformes)	71
4.10. Holosteans (Holostei)	72
4.10.1. Ginglymodians (Ginglymodi)	73
4.10.2. Halecomorphs (Halecomorphi)	76
4.11. Basal teleostemorphs (Teleostemorpha) and <i>incertae sedis</i>	80
4.12. Ichthyodectiforms (Ichthyodectiformes)	82
4.13. Elopomorphs (Elopomorpha)	83

4.14. Osteoglossomorphs (Osteoglossomorpha)	84
4.15. Otomorphs (Otomorpha)	93
4.15.1. Clupeomorphs (Clupeomorpha)	93
4.15.2. Ostariophysans (Ostariophysi)	94
4.16. Euteleosteans (Euteleosteomorpha)	112
4.16.1. Protacanthopterygians (Protacanthopterygii)	112
4.16.2. Paracanthopterygians (Paracanthomorphacea)	115
4.16.3. Percomorphs (Percomorphacea)	116
Chapter 5. Evolutionary Patterns in Freshwater Fishes	127
5.1. Vicariances and dispersals	127
5.2. Evolutionary radiations	130
5.2.1. Causes of the diversification of freshwater fishes	130
5.2.2. Examples of evolutionary radiations	133
5.3. Lineage depletion, evolutionary stases and refuge zones	137
5.3.1. The "living fossils"	137
5.3.2. Resilience to biological crises	138
Conclusion	141
Bibliography	143
Index	191
