Journal of Helminthology

**First isolation and scanning electron microscopy of haptoral sclerites of *Macrogyrodactylus* (Monogenea).**

Mpho Maduenyane, Quinton Marco Dos Santos, Annemariè Avenant-Oldewage

**Supplementary Figure S1:**

**Supplementary Figure S1:** Phylogenetic topology based on maximum likelihood (ML) resulting from analysis of a fragment of 18S rDNA of *Macrogyrodactylus* *congolensis* (Prudhoe, 1957) from *Clarias* *gariepinus* (Burchell, 1822) in bold and other data available for the genus, including *Gyrodactylus* *carassii* (Malmberg, 1957) as outgroup. Only nodes with more than 50% bootstrap support (1000 replicates) annotated with ML support and Bayesian inference (BI) posterior probabilities (ML/BI).

**Supplementary Figure S2:**



**Supplementary Figure S2:** Phylogenetic topology based on Bayesian inference (BI) resulting from analysis of ITS (ITS1-5.8S-ITS2) rDNA of *Macrogyrodactylus* *congolensis* (Prudhoe, 1957) from *Clarias* *gariepinus* (Burchell, 1822) in bold and other data available for the genus based on 18S rDNA, including *Gyrdicotylus galliieni* Vercammen-Grandjean, 1960 as outgroup. Only nodes with more than 0.6 posterior probability annotated with maximum likelihood (ML) bootstrap support (1000 replicates) and BI probabilities (ML/BI).

**Supplementary Figure S3:**

**Supplementary Figure S3:** Phylogenetic topology based on Bayesian inference (BI) resulting from analysis of COI mtDNA of *Macrogyrodactylus* *congolensis* (Prudhoe, 1957) from *Clarias* *gariepinus* (Burchell, 1822) in bold and other data available for the genus, including *Gyrodactylus parvae* You, Easy & Cone, 2008as outgroup. Only nodes with more than 0.6 posterior probability annotated with maximum likelihood (ML) bootstrap support (1000 replicates) and BI probabilities (ML/BI).

**Supplementary Table S1**: Genetic distances between *Macrogyrodactylus congolensis* (Prudhoe, 1957) from *Clarias gariepinus* (Burchell, 1822) in bold and other data for the genus based on 18S rDNA, including *Gyrodactylus* *carassii* (Malmberg, 1957). Uncorrected *p*-distances (%) are below the diagonal and number of base pair differences above. Shaded data indicate intraspecific distances.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accession Number** | **Species** | **Specimen** |  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** |
| **OM424629** | ***Macrogyrodactylus congolensis*** | **MG1** | **1** | **-** | **0** | **0** | **0** | **0** | **0** | **0** | **6** | **18** | **21** | **20** | **98** |
| **OM424630** | ***Macrogyrodactylus congolensis*** | **MG2** | **2** | **0** | **-** | **0** | **0** | **0** | **0** | **0** | **6** | **18** | **21** | **20** | **98** |
| **OM424631** | ***Macrogyrodactylus congolensis*** | **MG3** | **3** | **0** | **0** | **-** | **0** | **0** | **1** | **1** | **7** | **19** | **22** | **21** | **98** |
| **OM424632** | ***Macrogyrodactylus congolensis*** | **MG4** | **4** | **0** | **0** | **0** | **-** | **0** | **0** | **0** | **6** | **18** | **21** | **20** | **98** |
| **OM424633** | ***Macrogyrodactylus congolensis*** | **MG5** | **5** | **0** | **0** | **0** | **0** | **-** | **0** | **0** | **6** | **18** | **21** | **20** | **98** |
| HF548680 | *Macrogyrodactylus congolensis* | - | **6** | **0** | **0** | **0.05** | **0** | **0** | - | 0 | 6 | 18 | 21 | 21 | 99 |
| MG973078 | *Macrogyrodactylus karibae* | M ka | **7** | **0** | **0** | **0.05** | **0** | **0** | 0 | - | 6 | 18 | 21 | 21 | 99 |
| HF548686 | *Macrogyrodactylus clarii x*  *Macrogyrodactylus heterobranchii* | B | **8** | **0.33** | **0.33** | **0.38** | **0.33** | **0.33** | 0.33 | 0.33 | - | 12 | 23 | 15 | 100 |
| HF548684 | *Macrogyrodactylus clarii x*  *Macrogyrodactylus heterobranchii* | A | **9** | **0.98** | **0.98** | **1.03** | **0.98** | **0.98** | 0.98 | 0.98 | 0.65 | - | 35 | 3 | 104 |
| AJ567671 | *Macrogyrodactylus polypteri* | - | **10** | **1.13** | **1.13** | **1.18** | **1.13** | **1.13** | 1.15 | 1.09 | 1.25 | 1.9 | - | 38 | 102 |
| HF548682 | *Macrogyrodactylus simentiensis* | - | **11** | **1.09** | **1.09** | **1.15** | **1.09** | **1.09** | 1.15 | 1.15 | 0.82 | 0.16 | 2.08 | - | 102 |
| AJ566377 | *Gyrodactylus carassii* | - | **12** | **5.28** | **5.28** | **5.28** | **5.28** | **5.28** | 5.41 | 5.15 | 5.47 | 5.67 | 5.31 | 5.59 | - |

**Supplementary Table S2:** Genetic distances between *Macrogyrodactylus congolensis* (Prudhoe, 1957) from *Clarias gariepinus* (Burchell, 1822) in bold and other data for the genus based on ITS (ITS1-5.8S-ITS2) rDNA, including *Gyrdicotylus gallieni* Vercammen-Grandjean, 1960. Uncorrected *p*-distances (%) are below the diagonal and number of base pair differences above. Shaded data indicate intraspecific distances.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accession Number** | **Species** | **Specimen** |  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** |
| **OM426797** | ***Macrogyrodactylus congolensis*** | **MG1** | **1** | **-** | **0** | **0** | **0** | **0** | **0** | **0** | **0** | **5** | **6** | **12** | **15** | **15** |
| **OM426798** | ***Macrogyrodactylus congolensis*** | **MG2** | **2** | **0** | **-** | **0** | **0** | **0** | **0** | **0** | **0** | **5** | **6** | **12** | **16** | **16** |
| **OM426799** | ***Macrogyrodactylus congolensis*** | **MG3** | **3** | **0** | **0** | **-** | **0** | **0** | **0** | **0** | **0** | **7** | **9** | **18** | **20** | **20** |
| **OM426800** | ***Macrogyrodactylus congolensis*** | **MG4** | **4** | **0** | **0** | **0** | **-** | **0** | **0** | **0** | **0** | **6** | **7** | **14** | **17** | **17** |
| **OM426801** | ***Macrogyrodactylus congolensis*** | **MG5** | **5** | **0** | **0** | **0** | **0** | **-** | **0** | **0** | **0** | **5** | **6** | **12** | **15** | **15** |
| **OM426802** | ***Macrogyrodactylus congolensis*** | **MG8** | **6** | **0** | **0** | **0** | **0** | **0** | **-** | **0** | **0** | **5** | **6** | **12** | **16** | **16** |
| **OM426803** | ***Macrogyrodactylus congolensis*** | **MG10** | **7** | **0** | **0** | **0** | **0** | **0** | **0** | **-** | **0** | **5** | **6** | **12** | **15** | **15** |
| MZ869848 | *Macrogyrodactylus congolensis* | 1 SA | 8 | **0** | **0** | **0** | **0** | **0** | **0** | **0** | - | 4 | 5 | 11 | 12 | 12 |
| GU252717 | *Macrogyrodactylus congolensis* | SenCL1 | 9 | **0.63** | **0.63** | **0.87** | **0.75** | **0.63** | **0.63** | **0.63** | 0.58 | - | 2 | 23 | 27 | 27 |
| GU252716 | *Macrogyrodactylus congolensis* | KenM1 | 10 | **0.75** | **0.75** | **1.11** | **0.87** | **0.75** | **0.75** | **0.75** | 0.73 | 0.24 | - | 23 | 29 | 29 |
| MZ869851 | *Macrogyrodactylus karibae* | 1 SA | 11 | **1.66** | **1.66** | **2.46** | **1.93** | **1.66** | **1.66** | **1.66** | 1.62 | 3.1 | 3.1 | - | 14 | 14 |
| MG973078 | *Macrogyrodactylus karibae* | M ka | 12 | **1.82** | **1.94** | **2.4** | **2.05** | **1.82** | **1.94** | **1.82** | 1.74 | 3.31 | 3.55 | 1.89 | - | 0 |
| GU252715 | *Macrogyrodactylus karibae* | ZimM2 | 13 | **1.98** | **2.11** | **2.61** | **2.24** | **1.98** | **2.11** | **1.98** | 1.82 | 3.53 | 3.79 | 1.95 | 0 | - |
| MZ869845 | *Macrogyrodactylus karibae* | 1 ZM | 14 | **2.29** | **2.43** | **2.97** | **2.57** | **2.29** | **2.43** | **2.29** | 1.93 | 3.78 | 3.92 | 1.68 | 0.14 | 0.14 |
| GU252714 | *Macrogyrodactylus heterobranchii* | SenCL3 | 15 | **8.3** | **8.42** | **8.82** | **8.52** | **8.3** | **8.42** | **8.3** | 8.15 | 9.45 | 9.57 | 10.8 | 9.09 | 9.42 |
| GU252712 | *Macrogyrodactylus clarii x*  *Macrogyrodactylus heterobranchii* | ZimM10 | 16 | **8.51** | **8.63** | **9.06** | **8.74** | **8.51** | **8.63** | **8.51** | 8.41 | 9.72 | 9.84 | 10.74 | 9.59 | 9.68 |
| GU252713 | *Macrogyrodactylus clarii x*  *Macrogyrodactylus heterobranchii* | KenM4 | 17 | **8.53** | **8.65** | **9.06** | **8.75** | **8.53** | **8.65** | **8.53** | 8.3 | 9.57 | 9.69 | 10.93 | 9.33 | 9.67 |
| HF548683 | *Macrogyrodactylus clarii x*  *Macrogyrodactylus heterobranchii* | A | 18 | **9.4** | **9.53** | **10** | **9.66** | **9.4** | **9.53** | **9.4** | 8.42 | 10.43 | 10.57 | 10.86 | 10.29 | 10.27 |
| GU252711 | *Macrogyrodactylus clarii* | ZimM1 | 19 | **8.77** | **8.89** | **9.31** | **9** | **8.77** | **8.89** | **8.77** | 8.71 | 9.97 | 10.1 | 10.61 | 9.59 | 9.68 |
| MZ869849 | *Macrogyrodactylus clarii* | 1 SA | 20 | **9.17** | **9.3** | **9.77** | **9.43** | **9.17** | **9.3** | **9.17** | 8.47 | 10.21 | 10.35 | 10.64 | 10.35 | 10.27 |
| MZ869847 | *Macrogyrodactylus clarii* | 3 ZM | 21 | **9.34** | **9.47** | **9.91** | **9.58** | **9.34** | **9.47** | **9.34** | 8.73 | 10.46 | 10.59 | 10.76 | 10.19 | 10.38 |
| MZ869850 | *Macrogyrodactylus clarii* | 2 ZM | 22 | **9.59** | **9.72** | **10.17** | **9.83** | **9.59** | **9.72** | **9.59** | 8.9 | 10.73 | 10.87 | 10.88 | 10.45 | 10.39 |
| MZ869846 | *Macrogyrodactylus clarii* | 1 ZM | 23 | **9.58** | **9.58** | **10.07** | **9.71** | **9.58** | **9.58** | **9.58** | 8.9 | 10.51 | 10.51 | 10.24 | 10.37 | 10.3 |
| AJ567672 | *Macrogyrodactylus polypteri* | - | 24 | **8.44** | **8.56** | **8.72** | **8.66** | **8.44** | **8.56** | **8.44** | 8.31 | 9.16 | 9.28 | 10.84 | 9.64 | 9.91 |
| HF548681 | *Macrogyrodactylus simentiensis* | - | 25 | **19.6** | **19.73** | **20.42** | **19.85** | **19.6** | **19.73** | **19.6** | 15.57 | 20.68 | 20.83 | 19.12 | 20.92 | 20.92 |
| AJ001843 | *Gyrdicotylus gallieni* | - | 26 | **24.15** | **24.15** | **24.59** | **24.24** | **24.15** | **24.15** | **24.15** | 24.96 | 24.97 | 24.97 | 26.37 | 25.37 | 25.3 |

**Supplementary Table S2:** Continued

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accession Number** | **Species** | **Specimen** |  | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** | **23** | **24** | **25** | **26** |
| **OM426797** | ***Macrogyrodactylus congolensis*** | **MG1** | **1** | **16** | **67** | **65** | **68** | **66** | **67** | **64** | **68** | **68** | **66** | **66** | **129** | **191** |
| **OM426798** | ***Macrogyrodactylus congolensis*** | **MG2** | **2** | **17** | **68** | **66** | **69** | **67** | **68** | **65** | **69** | **69** | **66** | **67** | **130** | **191** |
| **OM426799** | ***Macrogyrodactylus congolensis*** | **MG3** | **3** | **21** | **72** | **70** | **73** | **71** | **72** | **69** | **73** | **73** | **70** | **69** | **136** | **196** |
| **OM426800** | ***Macrogyrodactylus congolensis*** | **MG4** | **4** | **18** | **69** | **67** | **70** | **68** | **69** | **66** | **70** | **70** | **67** | **68** | **131** | **192** |
| **OM426801** | ***Macrogyrodactylus congolensis*** | **MG5** | **5** | **16** | **67** | **65** | **68** | **66** | **67** | **64** | **68** | **68** | **66** | **66** | **129** | **191** |
| **OM426802** | ***Macrogyrodactylus congolensis*** | **MG8** | **6** | **17** | **68** | **66** | **69** | **67** | **68** | **65** | **69** | **69** | **66** | **67** | **130** | **191** |
| **OM426803** | ***Macrogyrodactylus congolensis*** | **MG10** | **7** | **16** | **67** | **65** | **68** | **66** | **67** | **64** | **68** | **68** | **66** | **66** | **129** | **191** |
| MZ869848 | *Macrogyrodactylus congolensis* | 1 SA | **8** | 13 | 56 | 56 | 57 | 57 | 58 | 57 | 60 | 60 | 60 | 57 | 90 | 170 |
| GU252717 | *Macrogyrodactylus congolensis* | SenCL1 | **9** | 27 | 77 | 75 | 78 | 75 | 77 | 73 | 78 | 78 | 74 | 73 | 139 | 196 |
| GU252716 | *Macrogyrodactylus congolensis* | KenM1 | **10** | 28 | 78 | 76 | 79 | 76 | 78 | 74 | 79 | 79 | 74 | 74 | 140 | 196 |
| MZ869851 | *Macrogyrodactylus karibae* | 1 SA | **11** | 12 | 80 | 78 | 81 | 78 | 77 | 76 | 79 | 79 | 72 | 80 | 122 | 188 |
| MG973078 | *Macrogyrodactylus karibae* | M ka | **12** | 1 | 75 | 75 | 76 | 74 | 75 | 74 | 76 | 76 | 73 | 77 | 141 | 204 |
| GU252715 | *Macrogyrodactylus karibae* | ZimM2 | **13** | 1 | 73 | 75 | 74 | 72 | 75 | 72 | 74 | 74 | 71 | 74 | 141 | 187 |
| MZ869845 | *Macrogyrodactylus karibae* | 1 ZM | **14** | - | 72 | 72 | 73 | 73 | 72 | 73 | 74 | 74 | 72 | 74 | 113 | 184 |
| GU252714 | *Macrogyrodactylus heterobranchii* | SenCL3 | **15** | 10.07 | - | 7 | 4 | 4 | 9 | 6 | 9 | 9 | 8 | 88 | 156 | 212 |
| GU252712 | *Macrogyrodactylus clarii x*  *Macrogyrodactylus heterobranchii* | ZimM10 | **16** | 10.18 | 0.89 | - | 5 | 5 | 4 | 1 | 4 | 4 | 4 | 88 | 152 | 203 |
| GU252713 | *Macrogyrodactylus clarii x*  *Macrogyrodactylus heterobranchii* | KenM4 | **17** | 10.21 | 0.49 | 0.64 | - | 0 | 7 | 4 | 7 | 7 | 6 | 89 | 154 | 207 |
| HF548683 | *Macrogyrodactylus clarii x*  *Macrogyrodactylus heterobranchii* | A | **18** | 10.21 | 0.55 | 0.7 | 0 | - | 7 | 4 | 7 | 7 | 6 | 87 | 127 | 192 |
| GU252711 | *Macrogyrodactylus clarii* | ZimM1 | **19** | 10.18 | 1.14 | 0.51 | 0.9 | 0.98 | - | 3 | 0 | 0 | 0 | 90 | 154 | 203 |
| MZ869849 | *Macrogyrodactylus clarii* | 1 SA | **20** | 10.22 | 0.83 | 0.14 | 0.55 | 0.55 | 0.42 | - | 3 | 3 | 3 | 86 | 125 | 190 |
| MZ869847 | *Macrogyrodactylus clarii* | 3 ZM | **21** | 10.35 | 1.2 | 0.55 | 0.93 | 0.97 | 0 | 0.42 | - | 0 | 0 | 91 | 134 | 198 |
| MZ869850 | *Macrogyrodactylus clarii* | 2 ZM | **22** | 10.35 | 1.23 | 0.55 | 0.95 | 0.97 | 0 | 0.42 | 0 | - | 0 | 90 | 133 | 192 |
| MZ869846 | *Macrogyrodactylus clarii* | 1 ZM | **23** | 10.23 | 1.13 | 0.57 | 0.85 | 0.85 | 0 | 0.42 | 0 | 0 | - | 86 | 118 | 191 |
| AJ567672 | *Macrogyrodactylus polypteri* | - | **24** | 10.39 | 11.07 | 11.67 | 11.19 | 12.15 | 11.94 | 12.08 | 12.25 | 12.43 | 12.27 | - | 143 | 204 |
| HF548681 | *Macrogyrodactylus simentiensis* | - | **25** | 18.26 | 23.01 | 22.42 | 22.81 | 20.35 | 22.71 | 20.03 | 21.04 | 20.94 | 19.28 | 21 | - | 202 |
| AJ001843 | *Gyrdicotylus gallieni* | - | **26** | 26.4 | 26.94 | 27.21 | 26.44 | 27.39 | 27.21 | 27.3 | 27.58 | 27.43 | 27.4 | 26.53 | 31.17 | - |

**Supplementary Table S3**: Genetic distances between *Macrogyrodactylus congolensis* (Prudhoe, 1957) from *Clarias gariepinus* (Burchell, 1822) in bold and other data for the genus based on COI mtDNA, including *Gyrodactylus parvae* You, Easy & Cone, 2008. Uncorrected *p*-distances (%) are below the diagonal and number of base pair differences above. Shaded data indicate intraspecific distances.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Accession Number** | **Species** | **Specimen** |  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** |
| **OM456987** | ***Macrogyrodactylus congolensis*** | **MG1** | **1** | **-** | **0** | **0** | **0** | **0** | **0** | **0** | **1** | **1** | **1** | **72** | **79** | **80** | **83** | **80** | **102** |
| **OM456988** | ***Macrogyrodactylus congolensis*** | **MG2** | **2** | **0** | **-** | **0** | **0** | **0** | **0** | **0** | **1** | **1** | **1** | **72** | **79** | **80** | **83** | **80** | **102** |
| **OM456989** | ***Macrogyrodactylus congolensis*** | **MG3** | **3** | **0** | **0** | **-** | **0** | **0** | **0** | **0** | **1** | **1** | **1** | **72** | **79** | **80** | **83** | **80** | **102** |
| **OM456990** | ***Macrogyrodactylus congolensis*** | **MG4** | **4** | **0** | **0** | **0** | **-** | **0** | **0** | **0** | **1** | **1** | **1** | **72** | **79** | **80** | **83** | **80** | **102** |
| **OM456991** | ***Macrogyrodactylus congolensis*** | **MG5** | **5** | **0** | **0** | **0** | **0** | **-** | **0** | **0** | **1** | **1** | **1** | **72** | **79** | **80** | **83** | **80** | **102** |
| **OM456995** | ***Macrogyrodactylus congolensis*** | **MG8** | **6** | **0** | **0** | **0** | **0** | **0** | **-** | **0** | **1** | **1** | **1** | **72** | **79** | **80** | **83** | **80** | **102** |
| **OM456993** | ***Macrogyrodactylus congolensis*** | **MG9** | **7** | **0** | **0** | **0** | **0** | **0** | **0** | **-** | **1** | **1** | **1** | **72** | **79** | **80** | **83** | **80** | **102** |
| **OM456992** | ***Macrogyrodactylus congolensis*** | **MG6** | **8** | **0.23** | **0.23** | **0.23** | **0.23** | **0.23** | **0.23** | **0.23** | **-** | **0** | **0** | **73** | **80** | **81** | **84** | **81** | **103** |
| **OM456994** | ***Macrogyrodactylus congolensis*** | **MG7** | **9** | **0.23** | **0.23** | **0.23** | **0.23** | **0.23** | **0.23** | **0.23** | **0** | **-** | **0** | **73** | **80** | **81** | **84** | **81** | **103** |
| **OM456996** | ***Macrogyrodactylus congolensis*** | **MG10** | **10** | **0.23** | **0.23** | **0.23** | **0.23** | **0.23** | **0.23** | **0.23** | **0** | **0** | **-** | **73** | **80** | **81** | **84** | **81** | **103** |
| MG970258 | *Macrogyrodactylus karibae* | - | 11 | **16.82** | **16.82** | **16.82** | **16.82** | **16.82** | **16.82** | **16.82** | **17.06** | **17.06** | 17.06 | - | 62 | 63 | 68 | 62 | 104 |
| GU252718 | *Macrogyrodactylus clarii* | ZimM1 | 12 | **18.46** | **18.46** | **18.46** | **18.46** | **18.46** | **18.46** | **18.46** | **18.69** | **18.69** | 18.69 | 14.49 | - | 1 | 19 | 21 | 118 |
| GU252719 | *Macrogyrodactylus clarii x Macrogyrodactylus heterobranchii* | ZimM10 | 13 | **18.69** | **18.69** | **18.69** | **18.69** | **18.69** | **18.69** | **18.69** | **18.93** | **18.93** | 18.93 | 14.72 | 0.23 | - | 20 | 22 | 117 |
| GU252720 | *Macrogyrodactylus clarii x Macrogyrodactylus heterobranchii* | KenM4 | 14 | **19.39** | **19.39** | **19.39** | **19.39** | **19.39** | **19.39** | **19.39** | **19.63** | **19.63** | 19.63 | 15.89 | 4.44 | 4.67 | - | 9 | 118 |
| GU252721 | *Macrogyrodactylus heterobranchii* | SenCL3 | 15 | **18.69** | **18.69** | **18.69** | **18.69** | **18.69** | **18.69** | **18.69** | **18.93** | **18.93** | 18.93 | 14.49 | 4.91 | 5.14 | 2.1 | - | 114 |
| KP780992 | *Gyrodactylus parvae* | - | 16 | **23.83** | **23.83** | **23.83** | **23.83** | **23.83** | **23.83** | **23.83** | **24.07** | **24.07** | 24.07 | 24.3 | 27.57 | 27.34 | 27.57 | 26.64 | - |