a **b**

Fig. 1. *Centromochlus meridionalis* photographed alive in aquarium. **a,** female, 60.2 mm SL; and **b,** male, 53.2 mm SL (ABAM I-00398). Arrow indicates modified anal fin forming the intromittent organ. (Photographs L. N. Carvalho and F. G. Cabeceira).

plant matter) and logs (4.4 %; wood with diameter greater than 10 cm).

Centromochlus meridionalis was found in 8 of 12 streams sampled in the Teles Pires River basin, and co-occurred with 30 other fish species (FGC, pers. obs.). In a survey performed with standardized sampling effort during the dry season of 2010–2011, *C. meridionalis* was the second most abundant fish species in the studied streams, outnumbered only by *Moenkhausia phaeonota* (Characiformes: Characidae). An average of 9 individuals (range: 1–32) of *C. meridionalis* were collected per 150-m long stream stretch. The catfish was primarily captured in loosely submersed leaf litter accumulations. On most of those occasions, two or three specimens were captured in a single leaf litter pack, with a maximum of five individuals (in that case, three adults and two juveniles). Individuals were also captured under submerged logs greater than 10 cm in diameter.

Behavior in aquarium. Behavioral observations revealed peak activity between 8:00 pm and 3:00 am, with individuals resting after dawn. Nine distinct behavioral acts were identified and divided into four categories: resting, moving,

Table 1. Characterization and frequency of behavioral acts performed by individuals of *Centromochlus meridionalis* in captivity. Total number of behavioral acts = 4190.

Behavioral category Behavioral act	Description	Frequency
Resting		
Resting over sand	Remains exposed over sand substrate	5.9 %
Resting among leaves and logs	Rests between submerged leaves and logs	13.3 %
Settled on the substrate	Undulating body movements while stationary, sometimes disrupting sand particles and dead leaves	1.6 %
Movement		
Swimming near the substrate	Swimming close to the substrate (maximum 5 cm above it)	45.6 %
Swimming in midwater	Swimming in middle layer of water column (5 cm above substrate and 5 cm below surface)	7.7 %
Swimming close to the surface	Swimming in top 5 cm of water column	6.9 %
Feeding		
Swimming rapidly toward food on the substrate	During swimming close to the substrate and after detecting food, the individual assumes a head-down position and swims forward rapidly, biting the food item	17.5 %
Picking food at the surface	The individual swims rapidly towards food floating at the surface, engulf it and returns rapidly to midwater	1.4 %
Interaction		
Agonistic interactions	When two individuals moving around the tank approach each other closely (less than 2 cm), both suddenly move away to avoid physical contact	0.1 %

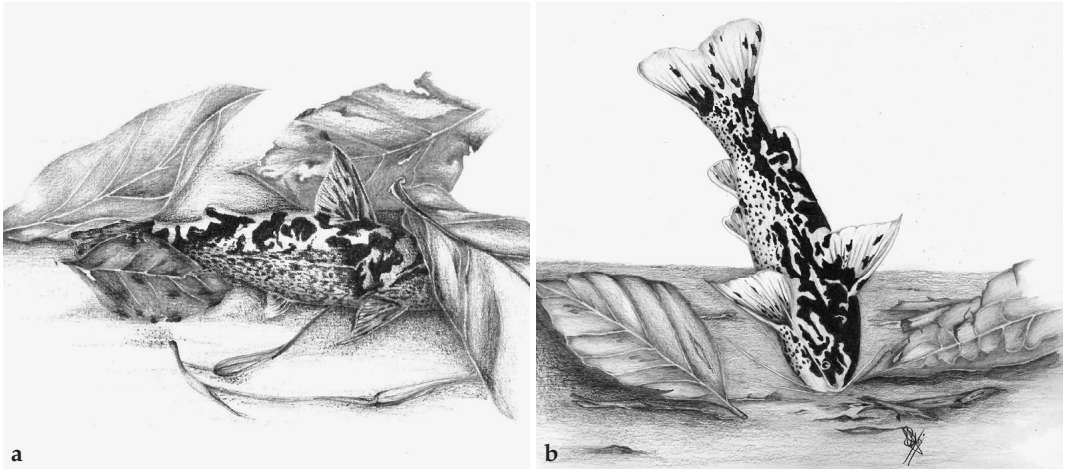

Fig. 2. Illustration of behavioral acts performed by *Centromochlus meridionalis*: **a,** resting between leaves; and **b,** feeding at the bottom in head-down posture. For a description of the behaviors see Table 1. (Illustrations by Cristiane C. de Freitas).

feeding and agonistic interactions (Table 1; Fig. 2). The most frequent behavior was swimming near the substrate (Frequency of Occurrence = 34 %), food searching in the substrate (17.5 %), resting among leaves and logs (13.3 %) and swimming among submerged leaves and logs (11.6 %).

Movements across the aquarium were performed by rapid swimming and sudden changes in direction. During swimming, the fish often remained close to the substrate but also explored the middle layer of the water column at times. Swimming near the surface was less frequent and always occurred for very short periods (a few seconds) before returning to lower layers. At times, the fish quickly swam to the surface and returned to the bottom. The greatest activity was observed during feeding. When food was offered, the fish swam frenetically close to the substrate throughout the tank, over open sand and between leaves and logs. After locating a food particle, the catfish quickly positioned head-down and bit the food, using rapid mouth movements (Fig. 2b). Only during the last observation sessions the fish began to search for food on the water surface, which was interpreted as conditioned feeding behavior.

Diet. The specimens analyzed for stomach content analysis measured 9.3–52 mm SL and weighed 0.1–4.2 g. Of the 38 stomachs analyzed, 8 (21.1 %) were empty, 8 (21.1 %) showed up to 10 % of fullness, 3 (7.9 %) were 25 % full, 5 (13.2 %) were 50 % full, 9 (23.7 %) were 75 % full, and 5 (13.2 %) were 100 % full. The food items were grouped in 13 categories (Table 2). In terms of volume, debris appear with R.V. = 25 %, Ephemeroptera with R.V. 16 %, Hymenoptera (ants) with R.V. 15 % and Trichoptera with R.V. = 15 %. The most frequent

Table 2. Values of Alimentary Index (A.I.%) for the items found in stomach contents of 30 specimens of *Centromochlus meridionalis*, with their respective Frequency of Occurrence (F.O.%) and Relative Volume (R.V.%).

Food item	F.O.%	R.V.%	A.I.%
Insect fragments	13	3	1.4
Terrestrial insects			
Hymenoptera (ants)	33	15	18.7
Terrestrial arthropods			
Spirostreptida (Diplopoda)	3	2	0.3
Aquatic insects (mostly larvae)			
Trichoptera	37	15	21.1
Ephemeroptera	10	16	6
Hemiptera	10	2	0.6
Plecoptera	3	2	0.2
Megaloptera	3	1	0.1
Diptera	3	0.2	0.02
Coleoptera	17	9	5.4
Fish			
Moenkhausia phaeonota	7	2	0.3
Crustaceans			
Decapoda (shrimps)	3	2	0.3
Debris	47	25	44

items were debris with F.O. = 47 %, Trichoptera with 37 %, and Hymenoptera (ants) with 33 %. In terms of Alimentary Index, the most important items were organic debris (A.I. = 40 %), Trichoptera larvae (A.I. = 21.1 %) and adult Hymenoptera (ants) (A.I. = 18.7 %).

Discussion

Centromochlus meridionalis was found in streams with structural and limnological features similar to those of the small Central Amazon streams (Espírito-Santo et al., 2009). However, the substrate of the studied streams was covered by a smaller amount of coarse litter than that present in Central Amazon streams (Mendonça et al., 2005; Carvalho, 2008). This apparent scarcity of coarse litter suggests that *C. meridionalis* present a strong selection for this type of substrate, which is used as shelter during the day (FGC, pers. obs.). Considering the distinctive mottled color pattern of *C. meridionalis*, we hypothesize that use of coarse litter packs as resting sites is part of its primary defense system, by providing cover and camouflage (Keenleyside, 1979), which could be an effective strategy against visually-oriented predators. Available data for other species of Centromochlinae indicate that most of them generally inhabit larger streams and rivers (e. g., Py-Daniel et al., 2007; our personal observations), where they use various types of substratum for resting, such as rubble, cracks and small cavities in boulders and logs (e. g., Barreto & Rocha, 2005; Sarmento-Soares & Buckup, 2005; Py-Daniel et al., 2007). Therefore, the use of litter packs for shelter and foraging by *C. meridionalis* appears to represent unusual features for a member of this subfamily, more common in fishes of the subfamily Auchenipterinae.

The behavioral observations recorded in aquaria showed that *C. meridionalis* has nocturnal habits similar to the majority of species of Auchenipteridae (Burgess, 1989; Akama & Ferraris, 2003). In captivity, however, the individuals of this species did not show the dusk activity peak known for other Centromochlinae (e. g., Ferraris, 2003; Sazima et al., 2005). During the day or under artificial light, the fish hid under leaves and logs at the bottom of the tank. Thus, the observed behaviors show that the species uses predominantly the lower layer of the water column both during resting and activity periods. This behavioral pattern contrasts to the typical behavior known for most species of Centromochlinae, which usually swim close to the surface during foraging, searching for insects that fall into the water (Ferraris, 2003). However, such behavior was not commonly observed for *C. meridionalis* in the aquarium. The relatively short and stout body of *C. meridionalis* is also indicative of its nektobenthic habits, a trait more commonly observed in species of Auchenipterinae.

Centromochlus meridionalis showed a distinctive feeding behavior, foraging on the bottom by biting at food items from a head-down position. This feeding tactic may be associated with the main types of food items ingested, which included both terrestrial and aquatic insects possibly dragged by the current close to the bottom. Siluriforms show a variety of predatory tactics depending on the environmental conditions and prey types (Pohlmann et al, 2004). *Centromochlus meridionalis* may be considered a generalized microcarnivore because its diet primarily includes items of animal origin, such as autochthonous and allochthonous insects, other terrestrial invertebrates, crustaceans and (occasionally) small fish. Other species of Centromochlinae, e. g., *Glanidium ribeiroi* (Ortêncio Filho et al., 2001) and *G. bockmanni* (Sarmento-Soares & Buckup, 2005) feed primarily on autochthonous and allochthonous insects (Ferraris, 2003). Adult *G. ribeiroi* may also feed on fish and plant matter (Ortêncio Filho, 2001), whereas *G. albescens* is considered an omnivorous species (Araújo et al., 2009). Nevertheless, there is no detailed information about the feeding behavior of those catfishes, which denotes the need for more behavioral and naturalistic studies focusing on species of Centromochlinae.

Although a considerable amount of organic debris was found in the stomach contents of *C. meridionalis*, this finding does not necessarily indicate that the species is a detritivore. Debris may have been accidentally ingested along with other food items collected at the stream bottom. Approximately 20 % of the substrate in the streams where the species was collected consisted of fine sediments similar to the debris found in the stomach contents. Fine sediment accumulates in slow-flowing stretches and near the margins of streams, where most of the leaf litter accumulations inhabited by *C. meridionalis* is found. Moreover, they ingested a considerable amount of trichopteran larvae of the family Leptoceridae,

which live buried in the mud (Mugnai et al., 2010), which may help explain the debris found in the stomach and also the unusual head-down posture employed during foraging.

The use of different layers of the water column by *C. meridionalis* during foraging, as well as the diversity of food items ingested, indicate a generalized microcarnivore diet. The food items ingested by *C. meridionalis* included the characid *Moenkhausia phaeonota* and small shrimps. Although those items are not particularly representative of the diet of *C. meridionalis*, they suggest the use of varied foraging tactics. *Moenkhausia phaeonota* is a diurnal fish that is abundant in the studied streams. It swims rapidly in small midwater schools (sensu Casatti et al., 2001; Padial et al., 2009; FGC, pers. obs.). This characid species rests close to the bottom and along the stream margins at night, where it remains stationary or moves very slowly (FGC, pers. obs.). Due to those differences in activity time and microhabitat use, *C. meridionalis* most likely captures small fish while the prey rests at night.

Finally, it is necessary to remark that the streams inhabited by *C. meridionalis* are located in an area that is strongly threatened by human-induced disturbances, mainly resulting from the deforestation for agricultural use. In this sense, the restricted geographic distribution of *C. meridionalis* emphasizes the extinction risk to the species and reinforces the need to establish conservation measures to protect the headwaters of the Teles Pires River in the upper Tapajós River Basin, a region known for its high number of endemic fish species.

Acknowledgments

Fieldwork was funded by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (processes 569382/2008-4 and 556858/2009-3). We thank Edivaldo Barbosa for help during the field work. We are also grateful to Continental Farm for allowing access to the streams. Permission for collecting specimens was granted by ICMBio to FGC. JZ receives a productivity grant from CNPq (307464/2014-1). FGC thanks Coordenação de Aperfeiçoamento de Pessoal de Nivel Superior for a scholarship grant. This is publication number 47 of the Technical Series of the Núcleo de Estudos da Amazônia Meridional (NEBAM), and number 38 of Projeto Igarapés.

Literature cited

Altman, J. 1974. Observational study of behavior: sampling methods. Behaviour, 49: 227–267.

Araújo, F. G., B. C. T. Pinto & T. P. Teixeira. 2009. Longitudinal patterns of fish assemblages in a large tropical river in southeastern Brazil: evaluating environmental influences and some concepts in river ecology. Hydrobiologia, 618: 89–107.

Akama, A. & C. J. Ferraris. 2003. *Entomocorus melaphareus*, a new species of auchenipterid catfish (Osteichthyes: Siluriformes) from the lower and middle reaches of the rio Amazonas. Neotropical Ichthyology, 1: 77–82.

Barreto A. P. & J. M. Rocha. 2005. Assembleia de peixes de um riacho da Floresta Atlântica: composição e distribuição espacial (Guaraqueçaba, Paraná, Brasil). Acta Scientiarum Biological Science, 27: 153–160.

Birindelli, J. L. O. 2010. Relações filogenéticas da superfamilia Doradoidea (Ostariophysi, Siluriformes). Unpublished Doctoral Tesis, Universidade de São Paulo, São Paulo, 376 pp.

Birindelli, J. L. O., L. M. Sarmento-Soares & F. C. T. Lima. 2015. A new species of Centromochlus (Siluriformes, Auchenipteridae, Centromochlinae) from the middle Rio Tocantins basin, Brazil. Journal of Fish Biology, 87: 860–875.

Burgess, W. E. 1989. An atlas of freshwater and marine catfishes: a preliminary survey of the Siluriformes. TFH Publications, Neptune, 784 pp.

Cabalzar, A., F. C. T. Lima & M. C. Lopes. 2005. Peixe e Gente no Alto Rio Tiquié: conhecimento tukano e tuyuka, ictiologia, etnologia. São Paulo, Instituto Socioambiental, 339 pp.

Casatti, L., F. Langeani & R. M. C. Castro. 2001. Peixes de Riacho do Parque Estadual Morro do Diabo, Bacia do Alto Rio Paraná, SP. Biota Neotropica, 1: 1–15.

Cassemiro, F. A. S., N. S. Hahn & R. L. Delariva 2005. Estrutura trófica da ictiofauna, ao longo do gradiente longitudinal do reservatório de Salto Caxias (rio Iguaçu, Paraná, Brasil), no terceiro ano após o represamento. Maringá, 27: 63–71.

Carvalho, L. N. 2008. História natural de peixes de igarapés amazônicos: utilizando a abordagem do Conceito do Rio Contínuo. Unpublished Doctoral Tesis, Instituto Nacional de Pesquisas da Amazônia, Manaus, 142 pp.

Downing Meisner, A. D., J. R. Burns, S. H. Weitzman & L. R. Malabarba. 2000. Morphology and histology of the male reproductive system in two species of internally inseminating South American catfishes, *Trachelyopterus lucenai* and *T. galeatus* (Teleostei: Auchenipteridae). Journal of Morphology, 246: 131–141.

Espírito-Santo, H. M. V., W. E. Magnusson, J. Zuanon, F. P. Mendonça & V. L. Landeiro. 2009. Reproductive strategies of Amazonian stream fishes and their

fine-scale use of habitat are ordered along a hydrological gradient. Freshwater Biology, 54: 536–548.
Ferraris, C. J. 2003. Auchenipteridae (driftwood catfishes). Pp. 470–482 in: R. E. Reis, S. O. Kullander & C. J. Ferraris (eds), Checklist of the freshwater fishes of South and Central America. Editora Universitária da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre.
— 2007. Checklist of catfishes, recent and fossil (Osteichthyes: Siluriformes), and catalogue of siluriform primary types. Zootaxa, 1418: 1–628.
Ferreira, L. V., R. L. Sá, R. Buschbacher, G. Batmanian, J. M. C. Silva & E. Moretti. 1999. Identificação de áreas prioritárias para a Conservação da Biodiversidade através da Representatividade das Unidades de Conservação e Tipos de Vegetação nas Ecorregiões da Amazônia Brasileira. Ações Prioritárias para a Conservação da Biodiversidade da Amazônia. Programa Nacional da Diversidade Biológica, PROBIO, Ministério do Meio Ambiente.
Goulding, M., M. L. Carvalho & E. J. G. Ferreira. 1988. Rio Negro: rich life in poor water. SPB Academic Publishing, The Hague, 200 pp.
Hyslop, E. J. 1980. Stomach contents analysis: a review of methods and their application. Journal of Fish Biology, 17: 411–429.
Kawakami, E. & G. Vazzoler. 1980. Método gráfico e estimativa de índice alimentar aplicado no estudo de alimentação de peixes. Boletim do instituto Oceanográfico, 29: 205–207.
Keenleyside, M. H. 1979. Diversity and adaptation in fish behaviour. Springer, Berlin, 208 pp.
Loir, M., C. Cauty, P. Planquette & P. Y. Bail. 1989. Comparative study of the male reproductive tract in seven families of South-American catfishes. Aquatic Living Resource, 2: 45–56.
Mees, G. F. 1974. The Auchenipteridae and Pimelodidae of Suriname (Pisces, Nematognathi). Zoologische Verhandelingen, 132: 1–256, 15 pls.
Mendonça, F. P., W. E. Magnusson & J. Zuanon. 2005. Relationships between habitat characteristics and fish assemblages in small streams of Central Amazonia. Copeia, 2005: 750–763.
Mugnai, R., J. L. Nessimian & D. F. Baptista. 2010. Manual de identificação de macro invertebrados aquáticos do Estado do Rio de janeiro. Technical Books, Rio de Janeiro, 176 pp.
Ortêncio Filho, H., N. S. Hahn, R. Fugi, & M. R. Russo. 2001. Aspectos da alimentação de *Glanidium ribeiroi* (Haseman, 1911) (Teleostei, Auchenipteridae), espécie endêmica do rio Iguaçu, PR. Acta Limnologica, 13: 85–92.
Padial, A. A., S. M. Thomaz & A. A. Agostinho. 2009. Effects of structural heterogeneity provided by the floating macrophyte *Eichhornia azurea* on the predation efficiency and habitat use of the small Neotropical fish *Moenkhausia sanctaefilomenae*. Hydrobiologia, 624: 161–170.
Py-Daniel, L. H. R., C. P. Deus, O. M. Ribeiro & L. M. Sousa. 2007. Peixes. Pp. 89–125. In: L. H. Rapp Py-Daniel et al. (eds.), Biodiversidade do Médio Madeira: bases científicas para proposta de conservação. Ed 1. Ministério do Meio Ambiente: Ministério da Ciência e Tecnologia, Manaus.
Pohlmann, K. J., J. Atema & T. Breithaupt. 2004. The importance of the lateral line in nocturnal predation of piscivorous catfish. Journal of Experimental Biology, 207: 2971–2978.
Rodriguez, M. A., S. E. Richardson & W. M. Lewis. 1990. Nocturnal behavior and aspects of the ecology of a driftwood catfish, *Entomocorus gameroi* (Auchenipteridae). Biotropica, 22: 435–438.
Santos, G. M., B. Mérona, A. Afonso & M. Jégu. 2004. Peixes do Baixo Rio Tocantins: 20 anos depois da Usina Hidrelétrica Tucuruí. Eletronorte, Brasília, 216 pp.
Sarmento-Soares, L. M. & R. F. Martins-Pinheiro. 2008. A systematic revision of *Tatia* (Siluriformes: Auchenipteridae: Centromochlinae). Neotropical Ichthyology, 6: 495–542.
Sarmento-Soares, L. M. & P. Buckup. 2005. A New *Glanidium* from the Rio São Francisco Basin, Brazil (Siluriformes: Auchenipteridae: Centromochlinae). Copeia, 2005: 846–853.
Sarmento-Soares, L. M., F. Cabeceira, L. N. Carvalho, A. Akama & J. Zuanon. 2013. *Centromochlus meridionalis*, a new catfish species from the southern Amazonian limits, Mato Grosso, Brazil (Siluriformes, Auchenipteridae). Neotropical Ichthyology, 11: 797–808.
Sazima, I., J. Zuanon & V. Haddad. 2005. Puncture wounds by driftwood catfish during bucket baths: local habits of riverside people and fish natural history in the Amazon. Wilderness and Environmental Medicine, 16: 204–208.
Soares, M. G. M. 1979. Aspectos ecológicos (alimentação e reprodução) dos peixes do igarapé do Porto, Aripuanã, MT. Acta Amazonica, 9: 325–352.
Soares-Porto, L. M. 1998. Monophyly and interrelationships of the Centromochlinae (Siluriformes, Auchenipteridae). Pp. 331–350 in: L. R. Malabarba et al. (eds.), Phylogeny and classification of neotropical fishes. Editora Universitária da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, 603 pp.
Souza, L. S., J. W. Armbruster & D. C. Wemeke. 2012. The influence of the Rupununi portal on distribution of freshwater fish in the Rupununi district, Guyana. Cybium, 36: 31–43.
Strahler, A. N. 1957. Quantitative analysis of watershed geomorphology. American Geophysical Union Transactions, 38: 913–920.

Received 21 October 2014
Revised 29 May 2015
Accepted 12 August 2015

Ichthyological Exploration of Freshwaters

An international journal for field-orientated ichthyology

INSTRUCTIONS TO CONTRIBUTORS

Warning
Prospective authors should read carefully the following instructions and follow them when submitting a manuscript. Doing so significantly hastens publication and saves money and efforts. Manuscripts which do not satisfy the instructions below may be rejected at the Editor's discretion and will not be returned.

Submission of manuscripts
The original manuscript should be sent to the Editor, Maurice Kottelat, by e-mail (mkottelat@dplanet.ch). Additional information is requested:
1) the name, postal and e-mail addresses, telephone and fax numbers of the corresponding author;
2) the names, postal and e-mail addresses of up to four persons outside the authors' institutions who are qualified to review the paper; and
3) a statement that the material has not been published and is not considered for publication elsewhere and that it will not be submitted elsewhere unless it is rejected or withdrawn. In submitting a manuscript, the author(s) accept(s) transfer of the copyright to the Publisher.

Co-authors, corresponding author
Authors are those who have played a significant role in designing and conducting the research and in writing the manuscript. Individuals who have only collected data, provided material or financial support, or reviewed the manuscript should be listed in acknowledgments. Honorary authorship is not accepted.

Co-authors should designate a single corresponding author to whom correspondence and proofs will be sent. All correspondence regarding the paper should go through the corresponding author. Correspondence will not be sent to other co-authors and correspondence from other co-authors regarding the manuscript will neither be answered nor taken into consideration.

Format
Files. The manuscript should be submitted in DOC or RTF format only. The text, captions, tables etc. must all be included in the same file. It the manuscript includes only a few illustrations, include them in low resolution in the word file. If the manuscript includes numerous illustrations they must be submitted in a separate PDF file; send all figures in low resolution and with caption in a single file. The files should be less than 8 MB.

Text. All manuscripts are subject to editorial revision before final acceptance for publication. Nothing in the manuscript should be underlined. Titles with numerical series designations are not permitted. Titles should be brief, fewer than 20 words and should indicate clearly the field of study and the group of fishes investigated. All abbreviations should be explained in the Method section (or figure caption when appropriate) or a reference to published explanations should be provided; exceptions are very common abbreviations, such as mm, km, kg, sec, min, yr, vs., SL. Footnotes are not permitted. All measurements must be in metric units. The first page should include: title of the paper, author(s), addresses and abstract, all left justified. The text should be followed by Material Examined (if appropriate), Acknowledgments (if any), Appendix (if any) and Literature Cited, in that order. Keys are desirable in taxonomic papers. They should be dichotomous and not serially indented.

Nomenclature. Names of living organisms should follow the appropriate and current International Codes of Nomenclature. Only formal names of genera and species should be written in italics. Names of authors and publication dates of scientific names should be mentioned once, in introduction or discussion, depending where most convenient, exceptionally as a table; bibliographical references must be included in the Literature cited section. Very old and classical works can be omitted if not absolutely justified.

Language. Manuscripts should be written in English. All papers must have a concise but informative abstract in English. In taxonomic papers, the abstract must include at least clear diagnosis of the new taxa. This maybe omitted for papers including the descriptions of many new taxa; consult the editor first. A second abstract, provided by the author(s), in the language of the country or area concerned by the text is acceptable. A maximum of two abstracts is permitted.

Acknowledgments. Identify individuals by first name(s) and surname. Do not list titles, position or institution. Acknowledge individuals, not positions. Idiosyncrasy and private jokes are not permitted.

Literature cited. Format for Literature Cited is that of the most recent issue. Do not abbreviate the names of journals. For books, give full name of publishing company or institution, and city. Manuscripts in preparation, abstracts, in-house reports and other literature not obtainable through normal library channels cannot be cited. In-press manuscripts can be cited only if they have been formally accepted.

Tables. Tables should be included in the text file, at the end. Use Word format and do not anchor them. Tables must be numbered sequentially with Arabic numerals; they should have concise but self-explanatory headings. Do not insert frames, vertical rules, dotted lines or footnotes. The location of first citation of each table should be clearly indicated in the text.

Figures. Detailed instructions for the preparation of digital images are here: http://pfeil-verlag.de/div/eimag.php

For the submission of new manuscript only low resolution copies are needed. Do not send large files at this stage. Case by case, if needed, we may ask you to send the original files at the time of submission.

All maps, graphs, charts, drawings and photographs are regarded as figures and are to be numbered consecutively and in the sequence of their first citation in the text. When several charts or photographs are grouped as one figure, they must be trimmed and spaced as intended for final reproduction. Each part of such a group figure should be lettered with a lower case block letter in the lower left corner. Where needed, scale should be indicated on the figure by a scale bar.

All illustrations should be designed to fit a width of 68 or 140 mm and a depth no greater than 200 mm. Lettering should be large enough to be easily seen when reduced onto a journal column (68 mm).

If a vector-graphics program is used, the original files saved by this program and all linked files must be submitted. Do not export or save the figure in a different format (for more details see the informations on http://pfeil-verlag.de/div/eimag.php
If line drawings are scanned, the resolution must be 1200 dpi or more and the format must be bitmap (1 pixel = 1 bit).
If halftones are scanned, the resolution should never be lower than 400 dpi, applied to a width of 14 cm, even for photographs designed for column width.

Photographic prints and slides and original drawings must be scanned for submission. We will ask to send the original after acceptance of the manuscript.

Colour illustrations should preferably be submitted as slides (photographic slides, not slides prepared by a printer). Digital images should be only unmodified (raw) data files as originally saved by the camera or the scanner. If the data files are modified, a copy of the original, unmodified file should be submitted too.

The decision to print in colour or in black and white any figure originally submitted in colour remains with the editor and publisher. This decision will be based on scientific justification, quality of the original, layout and other editorial, financial and production constraints. By submitting colour originals, the authors know and accept that they may be published in black and white.

Review
Each manuscript will be sent to two reviewers for confidential evaluation. When justified, the reviewer's comments will be forwarded to the corresponding author. When submitting a revised manuscript, authors should briefly indicate the reasons for disregarding any suggestion they consider unacceptable. Remember that if a reviewer had questions or did not understand you, other readers may make the same experience and the answers should be in the manuscript and not in a letter to the editor. Changes in style, format and layout requested by the Editor are non-negotiable and non-observance will result in rejection of the manuscript.

Revised manuscripts received more than 6 months after the reviewers' comments had been sent will not be considered or will be treated as new submissions.

Proofs, Reprints and Page Charges
A PDF proof file will be sent to the corresponding author; it should be checked and returned to the Editor within one week. If corrections are not received within this delay, they may be done by the Editor, at the author's risks. Authors may be charged for any changes other than printer's error. Reprint orders must be forwarded with the corrections. The corresponding author is responsible for contacting the co-authors and forwarding their reprint orders.

The authors will receive a PDF file for personal use free of charge; high-resolution PDF files for unlimited use may be ordered. There will be no page charges and no charges for justified colour illustrations.

Ichthyological Exploration of Freshwaters

An international journal for field-orientated ichthyology

Volume 26 · Number 3 · November 2015

CONTENTS

Cover photograph
Geophagus diamantinensis (photograph by José L. O. Mattos)
José L. O. Mattos, Wilson J. E. M. Costa and Alexandre C. A. Santos
(this volume pp. 209–220)

Articles appearing in this journal are indexed in:

AQUATIC SCIENCES and FISHERIES ABSTRACTS
BIOLIS – BIOLOGISCHE LITERATUR INFORMATION SENCKENBERG
CAMBRIDGE SCIENTIFIC ABSTRACTS
CURRENT CONTENTS/AGRICULTURE, BIOLOGY & ENVIRONMENTAL SCIENCES and SCIE
FISHLIT
ZOOLOGICAL RECORD