



Tapeworms (Cestoda: Proteocephalidea) of *Synodontis* spp. (Siluriformes) in Africa: survey of species and their redescriptions

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Abstract

Proteocephalidean tapeworms parasitic in *Synodontis* spp. (Siluriformes: Mochokidae) in Africa are critically reviewed based on examination of their type specimens and extensive new material from Kenya and Sudan. *Proteocephalus synodontis* Woodland, 1925 and *Proteocephalus membranacei* Troncy, 1978 are considered to be valid and both species are redescribed. *Proteocephalus synodontis* differs from congeners parasitic in other African freshwater fishes, including *P. membranacei*, in the possession of an extraordinarily developed inner longitudinal musculature formed by massive bundles of muscle fibres. A considerable variability was found in the size (35–140 × 30–75 µm) and shape (from elongate, tear-shaped to spherical) of the apical organ, which was present in all specimens from the Nile River basin in the Sudan, but absent in all but two juvenile specimens from Lake Turkana in Kenya. A congruent low molecular variability was also observed and these slight morphological and genetic differences may indicate ongoing allopatric speciation of tapeworms from the two previously connected basins. Nevertheless, all tapeworms were identical in all other morphological and molecular characteristics and are considered conspecific. *Proteocephalus largoproglottis* Troncy, 1978 from *Synodontis membranacea* from Lake Chad is synonymized with *P. membranacei* described from the same host and locality. *Proteocephalus synodontis* and *P. membranacei* differ from each other in the development of the inner longitudinal musculature, shape of the scolex and presence of weakly developed, almost indistinguishable ventral osmoregulatory canals in the latter species.

Key words: *Proteocephalus*, Proteocephalidae, *Synodontis* spp., freshwater fish, Africa, Nile, Turkana, taxonomy, allopatric speciation, 28S rDNA, 5.8S/ITS2

Introduction

African freshwater fishes have been reported to harbour 19 species of the order Proteocephalidea, ten of which belong to the genus *Proteocephalus* Weinland, 1858 (Khalil & Polling 1997; de Chambrier *et al.* 2009). To date, three species of *Proteocephalus* have been described from catfish of the genus *Synodontis* Cuvier, 1816 (Siluriformes: Mochokidae) from Africa, namely *Proteocephalus synodontis* Woodland, 1925 from *Synodontis schall* (Bloch and Schneider) from the Nile River in Khartoum, Sudan, and *Proteocephalus largoproglottis* Troncy, 1978 and *Proteocephalus membranacei* Troncy, 1978, both from *Synodontis membranacea* (Geoffroy Saint Hillaire) from Lake Chad in Ndjamena, Chad (Woodland 1925; Troncy 1978). A fourth species, *Proteocephalus beau-champi* Fuhrmann and Baer, 1925, has been reported by Khalil (1963) from *S. schall* from the Sudan. This species is known to be a parasite of *Chrysiichthys* spp. (Siluriformes: Bagridae) and no voucher exists for this material. This determination is thus dubious and cannot be confirmed.

Morphological descriptions of all these species were incomplete and lacked much information on taxonomically and phylogenetically important features. Recently, tapeworms apparently conspecific with *P. synodontis* were collected from the type host, *S. schall*, and other *Synodontis* spp. from several localities of the Nile River basin in