First record of monogeneans from Schilbe intermedius in South Africa

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Short Report

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Abstract

The present study deals with the survey of monogeneans from *Schilbe intermedius* Rüppell, 1832 (silver catfish). Surveys were carried out at six localities in the northern region of South Africa where fish were collected and examined for monogenean gill parasites. There are presently no records of monogeneans from this fish species from South Africa. Fourteen monogenean species of *Schilbetrema* Paperna and Thurston, 1968 and two species of *Schilbetrematoides* Kritsky and Kulo, 1992 have been recorded from African schilbeids. Three species of the *Schilbetrema* were recorded during this study with variation in infestation: *Schilbetrema quadricornis* Paperna and Thurston, 1968 from all localities; *Schilbetrema acornis* Paperna and Thurston, 1968 from four localities; *Schilbetrema undinula* Kritsky and Kulo, 1992 recorded from one locality.

Introduction

Schilbe intermedius Rüppell, 1832 belongs to the butter catfish family, Schilbeidae (Osteichthyes: Siluriformes) and is endemic to South Africa. This fish species was previously grouped with other fishes assigned to the African Schilbeidae, however recently *Schilbe depressirostris* (Peters, 1832) was reinstated from *S. intermedius* based on morphological and molecular data (van der Bank et al. 2012, 2017). Schilbeids host a number of gill-parasite species from the African Dactylogyridae. The dactylogyrid genus, *Schilbetrema* Paperna and Thurston, 1968 was proposed by Paperna and Thurston (1968) for some species from the host *Schilbe mystus* (Linnaeus, 1758) in Uganda. Thereafter, a number of authors described and recorded *Schilbetrema* spp. from Ghana (Paperna 1969, 1979), Tanzania (Paperna 1979), Egypt (El-Naggar 1985), Togo (Kritsky & Kulo 1992a), Zimbabwe (Douellou & Chishawa 1995) and Ivory Coast (N'Douba et al. 1997). This genus now includes 14 species, all from schilbeid hosts. A second genus, *Schilbetrematoides* Kritsky and Kulo, 1992, proposed for a species from *S. intermedius* (now *S. depressirostris*) in Togo by Kritsky and Kulo (1992b), where after N'douba et al. (2000) added a second species to this genus from *Schilbe mandibularis* (Guenther, 1867) in the Ivory Coast.

Materials And Methods

Schilbe intermedius was collected seasonally (Autumn = May; Winter = July; Spring = September; Summer = December) between 2009 and 2015 from six different localities in the northern region of South Africa using gill nets. The Nwanedi-Luphephe and Nandoni dams form part of the Limpopo River System and Flag Boshielo, Loskop, and Tzaneen dams as well as the Phalaborwa Barrage are found in the Olifants River System. The hosts (Nwanedi-Luphephe Dam, n = 60; Nandoni Dam, n = 89; Loskop Dam, n = 60; Flag Boshielo Dam, n = 65; Tzaneen Dam, n = 92; Phalaborwa Barrage, n = 60) were examined for monogeneans with the aid of a stereo microscope (Model: LEICA EZ4). Monogeneans were removed and mounted on slides using glycerine jelly or ammonium picrate-glycerine (GAP) and identified according to Kritsky and Kulo (1992a) using a compound microscope (Model: LEICA DM500). Species were identified primarily on the morphological features of the haptoral parts. These sclerotised parts were photographed

and measured using the above-mentioned microscope with Axiovision 4.7.2 software. Measurements were taken as proposed by Gussev (1962) and given in µm (mean and range). Drawings of specimens were made freehand with the aid of a drawing tube connected to the same microscope. The prevalence, mean abundance and mean intensity of the different species were calculated according to Bush et al. 1997. Seasonal variation of infection was calculated to determine if any significant differences occur.

Results And Discussion

During this study three monogenean species of *Schilbetrema* were recorded from the gills (Table 1). A notable difference was observed in the distribution of *Schilbetrema* spp. among localities, with variation in intensity of infection among the three species also recorded (Table 1). Measurements of the whole worm and that of selected sclerotised parts are presented in Tables 3.5–3.7 and compared to available morphometric data for these species by Paperna and Thurston (1968), Kritsky and Kulo (1992a) and Douëllou and Chishawa (1995). *Schilbetrema quadricornis* Paperna and Thurston, 1968 (Figs. 1a & 2) was the dominant species and recorded at all six localities. The prevalence of this parasite was high (> 83.3%) at most localities, except at Tzaneen Dam where the prevalence was notably lower (46.0%). The prevalence of *Schilbetrema acornis* Paperna and Thurston, 1968 (Figs. 1b & 3) varied between the localities (25.0% – 70.0%), and was not recorded from Nandoni and Tzaneen dams. *Schilbetrema undinula* Kritsky and Kulo, 1992 (Figs. 1c & 4) was only recorded from Phalaborwa Barrage (prevalence = 13.3%). Some of the hosts were highly infected with *Schilbetrema* spp. (e.g. 339, 346 and 480 from individual host specimens at Nandoni Dam) and might have a negative effect on the condition of those specific hosts. Although seasonal fluctuations of *Schilbetrema* spp. infections were observed, no significant differences were observed (significance at $P \leq 0.05$).

Table 1
The prevalence, mean abundance and mean intensity of monogeneans from *Schilbe intermedius* recorded from six localities in South Africa.

	Schilbetrema quadricornis	***Schilbetrema acornis***	***Schilbetrema undinula***
Nwanedi-Luphephe Dam	83.3%; 20.3; 21.3	25.0%; 1.5; 6	–
Nandoni Dam	94.4%; 45.9; 48.6	–	–
Loskop Dam	96.7%; 39.7; 41.0	28.3%; 4.8; 16.8	–
Flag Boshielo Dam	90.8%; 11.2; 12.3	69.2%; 4.1; 5.9	–
Tzaneen Dam	46.0%; 46.0; 100	–	–
Phalaborwa Barrage	85.0%;10.6; 12.5	70.0%; 8.3; 11.9	13.3%; 0.5; 3.8
prevalence; mean abundance; mean intensity			

Table 2
Measurements of the body and sclerotised haptoral features (mean, minimum and maximum values given in µm) of *Schilbetrema quadricornis* from the current study compared to available data for this species.

Measurements from *Schilbetrema quadricornis*	Paperna &Thurston, 1968 (Type specimens)	Kritsky & Kulo, 1992a (Redescription)	Douëllou & Chishawa, 1995	Current study (n = 10)
Body length	439 (364–514)	401 (309–513)	500 (340–590)	436,0 (316,0–530,0)
Body width	146 (138–153)	74 (56–89)	68 (40–88)	80,3 (69,0–105,0)
Haptor length	85 (78–93)	82 (71–102)	–	82,5 (72,0–100,0)
Haptor width	82 (81–83)	73 (61–85)	–	76,3 (68,0–83,0)
Dorsal anchors length	54 (52–55)	59 (52–65)	61,1 (55,0–64,6)	58,2 (53,0–63,0)
Dorsal anchors base width	23 (20–26)	22 (17–26)	–	22,0 (19,2–25,0)
Dorsal bar length	39 (38–40)	(36–45)	38,4 (35–41)	40,0 (37,4–43,0)
Ventral anchors length	23 (22–25)	25 (21–28)	20,8 (19,9–22,5)	23,1 (20,0–25,9)
Ventral bar length	40 (40)	40 (36–47)	41 (36,4–45,9)	41,7 (37,0–45,3)
Marginal hooks length	15–16	17 (16–18)	13,2–17,4	15,9 (14,0–17,5)

Table 3
Measurements of the body and sclerotised haptoral features (mean, minimum and maximum values given in µm) of *Schilbetrema acornis* from the current study compared to available data for this species.

Measurements from *Schilbetrema acornis*	**Paperna &Thurston, 1968 (Syntype specimens)**	**Kritsky & Kulo, 1992a (Redescription)**	**Current study (n = 10)**
Body length	577	430 (333–568)	434,0 (380,0–540,0)
Body width	149	94 (68–118)	96,4 (75,0–121,0)
Haptor length	87	61 (56–66)	62,8 (58,0–67,0)
Haptor width	99	(62–63)	62,8 (62,1–64,0)
Dorsal anchors length	37–38	35 (34–37)	36,0 (35,0–38,0)
Dorsal anchors base width	15 (13–17)	15–16	15,1 (14,8–16,5)
Dorsal bar length	23	27 (23–31)	27,8 (24,0–31,2)
Ventral anchors length	26–27	28 (26–30)	28,2 (26,5–30,1)
Ventral bar length	20	19 (18–22)	19,8 (18,3–22,6)
Marginal hooks length	23	20–22 and 23–27	24,1 (20,0–27,2)

Table 4
Measurements of the body and haptoral features (mean, minimum and maximum values given in µm) of *Schilbetrema undinula* from the current study compared to available data for this species.

Measurements from *Schilbetrema undinula*	Kritsky & Kulo, 1992a (Species description)	Douëllou & Chishawa, 1995	Current study (n = 6)
Body length	281 (233–314)	590 (400–840)	575,0 (465,0–655,0)
Body width	77 (50–102)	90 (70–120)	87,0 (79,0–96,0)
Haptor length	53 (52–55)	–	53,4 (52,2–54,2)
Haptor width	58 (50–65)	–	58,0 (53,0–62,0)
Dorsal anchors length	33 (29–36)	31,8 (27,2–34,8)	31,9 (28,5–35,0)
Dorsal anchors base width	15 (13–17)	–	15,7 (15,1–16,2)
Dorsal bar length	26 (23–29)	24,5 (23,2–25,7)	25,6 (24,2–28,3)
Ventral anchors length	23 (21–26)	21,5 (18,2–24,8)	22,1 (20,5–24,0)
Ventral bar length	29 (26–35)	22,9 (21,5–24,0)	23,0 (22,4–23,8)
Marginal hooks length	18–19 and 20–21	21,5 (18,0–24,0)	20,1 (18,0–23,1)

The ventral bar was the most profound feature used to differentiate among the *Schilbetrema* spp. collected during this study. The ventral bar of *S. quadricornis* is long, with two bilateral horns and a delicate submedial projection lacking terminal ornamentation (Fig. 2d). In *S. acornis* this structure is shorter and stumpy, lacking terminal horns and having a submedial projection appearing to be flabby and bilaterally flattened (Fig. 3d). The ventral bar of *S. undinula* has short terminal horns and a simple anteromedial process (Fig. 4d). It can thus be difficult to differentiate between *Schilbetrema acornis*, *S. undinula* and even *S. aegyptica*. However, the ventral bar of *S. acornis* are short and stumpy whereas this structure is comparatively slender in *S. undinula* and broad and flattened in *S. aegyptica*.

Conclusion And Recommendations

This study is the first report of monogeneans from *S. intermedius* (after van der Bank et al. 2012, 2017) as well as the first report of *Schilbetrema* spp. for South Africa and contributes to the distribution of African dactylogyrids. Although these new records are valuable, it is suggested that molecular data

should be obtained as only one sequence for *Schilbetrema* spp. from Africa is available (Mendoza-Palmero et al. 2015).

Declarations

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Ethical approval: All applicable international, national, and/or institutional guidelines for the care and use of animals were followed. Ethical clearance was obtained from the Animal Research Ethics Committee (AREC) at the University of Limpopo (AREC/04/2019: PG).

Conflict of interest: On behalf of all authors, the corresponding author states that there is no conflict of interest.

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Figures

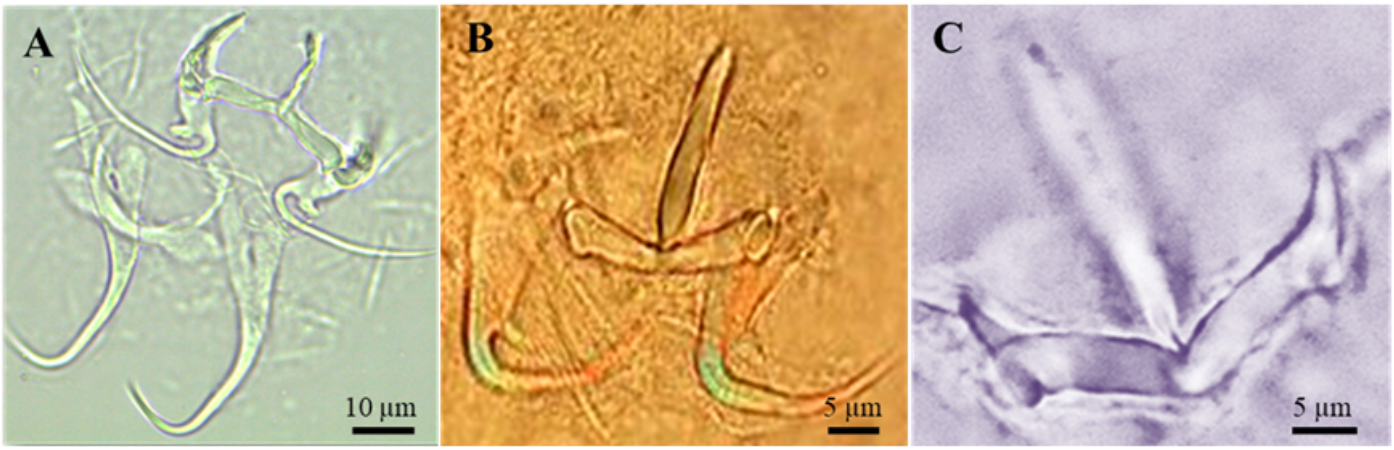

Figure 1

Sclerotised haptoral parts of A, *Schilbetrema quadricornis* B, *Schilbetrema acornis* C, *Schilbetrema undinula*, indicating variation in size and structure of the ventral bar

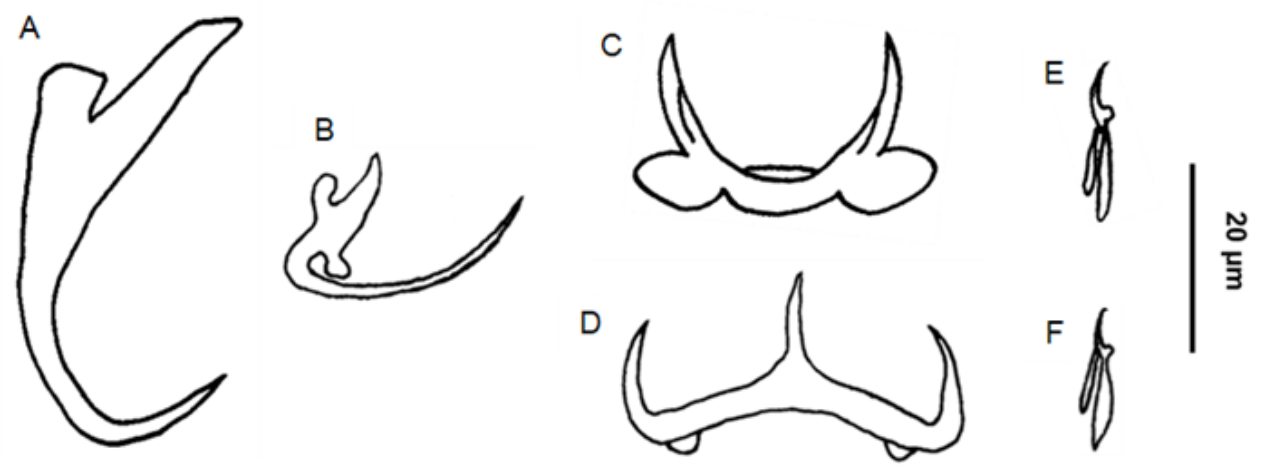

Figure 2

Sclerotised haptoral parts of *Schilbetrema quadricornis*. A = dorsal anchor; B = ventral anchor; C = dorsal bar; D = ventral bar; E = hook (pairs 1,5,6,7); F = hook (pairs 2,3,4)

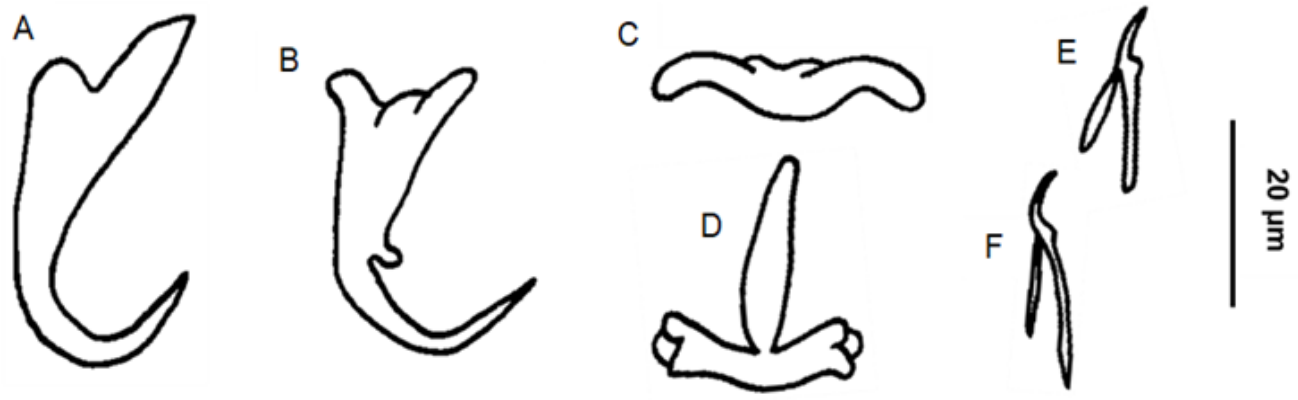

Figure 3

Sclerotised haptoral parts of *Schilbetrema acornis*. A = dorsal anchor; B = ventral anchor; C = dorsal bar; D = ventral bar; E = hook (pairs 1,5); F = hook (pairs 2,3,4,6,7)

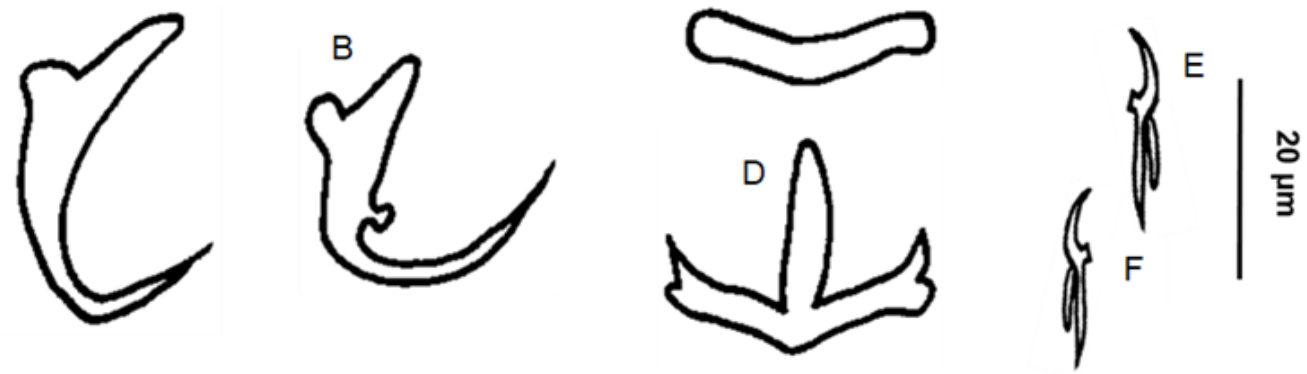

Figure 4

Sclerotised haptoral parts of *Schilbetrema undinula*. A = dorsal anchor; B = ventral anchor; C = dorsal bar; D = ventral bar; E = hook (pairs 1,2,3,4,6,7); F = hook (pair 5)