

The taxonomic status of *Distomum annulatum* DIESING, 1850: redescription of type specimens from the Natural History Museum, Vienna

M. Ostrowski de Núñez* & H. Sattmann**

Abstract

Distomum annulatum DIESING, 1850 is redescribed and placed into the genus *Caballerotrema*, as *Caballerotrema annulatum* comb.n. The type specimens are compared with paratypes of *C. piscicola* (STUNKARD, 1960), *C. arapaimense* THATCHER, 1980 and *C. aruanense* THATCHER, 1980. Comments on *C. brasiliense* PRUDHOE, 1960 and *C. piscicola* as described by KOHN & FERNANDES (1981) were included.

Key words: *Distomum annulatum*, redescription, *Caballerotrema annulatum* comb.n.

Zusammenfassung

Distomum annulatum DIESING, 1850 wird neu beschrieben und in die Gattung *Caballerotrema* als *Caballerotrema annulatum* comb.n. gestellt. Die Typusexemplare werden mit Paratypen von *C. piscicola* (STUNKARD, 1960), *C. arapaimense* THATCHER, 1980 und *C. aruanense* THATCHER, 1980 verglichen. Die Darstellung wird durch Anmerkungen über *C. brasiliense* PRUDHOE, 1960 und *C. piscicola* sensu KOHN & FERNANDES (1981), ergänzt.

Introduction

Karl Moritz Diesing described *Distomum annulatum* collected by Johann Natterer from the intestine of the electric eel *Gymnotus electricus* LINNAEUS, 1766 (= *Electrophorus electricus*), on 3. September 1827 in Mato Grosso, Brazil (DIESING 1850). The very brief description in Latin mentioned external characteristics, such as the length and width of worms (6" and 1/2", approximately 12 and 1 mm, respectively), the transverse annulation, the reniform "head" with a crown of spines and the apertures on oral and ventral suckers. The internal organisation and the number of collar spines were not described. Therefore, it was difficult for later authors to correctly classify this species. COBBOLD (1860) transferred the species to *Echinostoma*, DIETZ (1909) listed it under *species inquirenda*, MENDHEIM (1943) noted features which conform to the diagnosis of *Himasthla* and, finally, STUNKARD (1960) transferred it to this genus, as *Himasthla annulata* (DIESING).

In this study we redescribe *Distomum annulatum* based on the type specimens deposited in the Natural History Museum, Vienna, (NHMW ZOOEV) and place it in the genus *Caballerotrema* PRUDHOE, 1960.

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Original description

Distoma annulatum was first described in DIESING (1850: 386-87):

"*Corpus lineare depressiusculum, transverse annulato-plicatum. Collum conicum subtus excavatum. Caput reniforme, echinatum. Os terminale. Acetabulum ore multo majus ad colli basin, apertura circulari. Longit. 6''' : latit. ultra 1/2'''.*

Habitaculum. Gymnotus electricus: in intestinis, Septembri in Brasilia (Natterer). M.C.V."

The species was figured in DIESING (1856) (see Fig. 6) accompanied with a description identical with that above.

Material and Methods

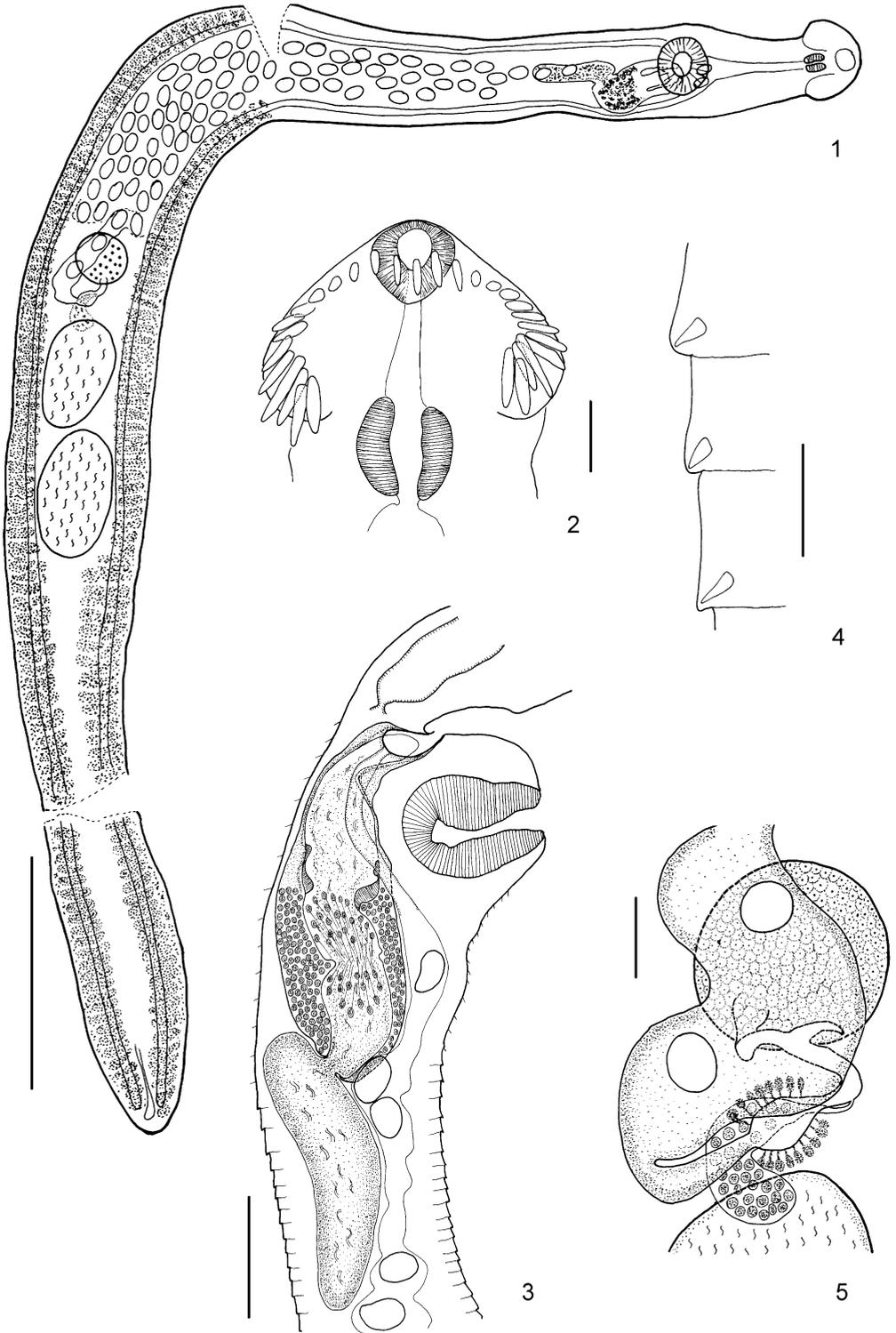
The vial No. 4572 contained 8 whole specimens and several fragments of *Distoma annulatum*. The specimens were in astonishingly good conditions, considering the time they had been stored in alcohol. Three whole specimens and two anterior fragments were dehydrated in 75%, 96% and 100% ethanol, cleared in xylene and mounted in Canada balsam. Staining was not undertaken, as this gives poor results in very old specimens (OSTROWSKI DE NÚÑEZ 1986). Studies were conducted using an Olympus interference contrast microscope and illustrations were made with the aid of a camera lucida. Measurements (given as the range in μm – unless otherwise stated – with the mean in parentheses) of total length and width and genitalia were taken from the 3 mounted specimens; for other organs the fragments were included. Only those collar spines in a straight position were measured (n = number of spines measured). For comparison, a paratype of *Himasthla piscicola* STUNKARD, 1960 (United States National Parasitic Collection, USNPC 39445), and paratypes of *Caballerotrema arapaimense* THATCHER, 1980 (No. 5745a and b) and *C. aruanense* THATCHER, 1980 (5744b) deposited in the Collection of the Museu de Zoologia da Universidade de São Paulo (MZUSP), were studied.

Caballotrema annulatum (DIESING, 1850) comb.n. (Figs 1-6)

Material: 3 mounted specimens and 2 anterior fragments of vial No. 4572; lectotype [selected herein], NHMW ZOOEV microslides 3969/a; paralectotypes, NHMW ZOOEV microslides 3969/b-e.

Description: Body elongate, dorso-ventrally flattened, 6.9-7.4 (7.1) mm long by 368-416 (392) wide at level of ventral sucker, and 560-480 (520) at level of testes. Annulations visible from level of seminal vesicle to beyond the testes, each annulation with a row of spines. Head collar 320-432 (395) wide, without pronounced ventral lobes. Collar spines conspicuous, 29 in single uninterrupted row, with 4 corner spines

Figs 1-5: *Distomum annulatum* DIESING: 1: habitus of lectotype, NHMW ZOOEV micro-slide 3969a; 2: spinous head collar of paralectotype NHMW ZOOEV micro-slide 3969d; 3: cirrus-sac of paralectotype NHMW ZOOEV micro-slide 3969c; annulations (4) and female genital system (5) of lectotype, NHMW ZOOEV micro-slide 3969a. Scale is 1 mm in 1, 0.1 mm in 2 and 5, 0.2 mm in 3, and 0.05 in 4.



arranged in pairs at each side, first pair 82-95 (89) long by 16-19(16) wide (n= 6), first spine being larger; second pair 76-107 (90) long by 13-19 (16) wide (n = 8), 4th spine being larger. First lateral spine on each side larger 79-85 (82) long by 13-16 (14) wide (n = 6), subsequent lateral spines diminishing gradually in size 41-85 (63) long by 9-16 (12) wide (n = 22), dorsal spines 63-69 (66) long by 9-13 (12) wide (n = 4). Forebody short, 560-720 (640) long, representing 9% of total body length (TBL). Tegumental spines, 12-19 long at forebody, 19-28 long at level of testes, decreasing in size until half the distance of post-testicular space. Oral sucker ventro-subterminal, 75-119 (97) long by 94-126 (107) wide; ventral sucker, 163-327 (245) long by 232-301 (268) wide. Sucker length ratio 1:1.7-3.3 (1:2.6), width ratio 1: 2.2-3.1 (1:2.5). Prepharynx short, 107-170 (132); pharynx muscular, 119-144 (129) long by 94-138 (121) wide. Oral sucker/pharynx width ratio 1:1-1.3. Oesophagus 251-377 (318) long; intestinal bifurcation dorsally 31-82 behind anterior border of ventral sucker. Intestinal caeca blind, reaching 138-195 (161) from posterior extremity. Testes 2, oval, tandem, intercaecal, located in middle third of body; anterior testis 458-534 (484) long by 270-333 (301) wide; posterior testis 534-628 (569) long by 251-283 (267) wide, at distance 1.7-2.7 (2.2) mm from posterior extremity, corresponding to 23-39% of TBL. Cirrus-sac large, 860-1,143 (948) long by 176-251 (209) wide at level of pars prostatica, 94-157 (118) wide at level of posterior part of seminal vesicle, situated dorsally to ventral sucker, contains seminal vesicle, well-developed pars prostatica and unspined cirrus. Genital pore situated in angle formed by anterior end of ventral sucker and body wall, posterior to intestinal bifurcation, visible only in lateral view. Ovary nearly spherical, 201-207 (205) long by 226-239 (232) wide, in mid-line of body, 2.3-3.2 (2.7) mm posterior to ventral sucker, distance representing 32-43% (37%) of TBL. Mehlis' gland posterior to ovary; Laurer's canal opens dorsally. Proximal part of uterus acts as uterine seminal receptacle. Uterus intercaecal, forms numerous transverse coils between ovary and ventral sucker, distally transformed in metraterm opens into genital atrium. Eggs numerous, 72-85 (78) long by 50-85 (61) wide. Vitellarium follicular, follicles small, distributed in lateral fields, overlap caeca in part, extend from posterior level of ventral sucker to posterior extremity; in post-testicular zone not confluent, leaving narrow area without follicles. Excretory vesicle not discernible.

Host: *Electrophorus electricus* (L.) (= *Gymnotus electricus* L.), collected on 3. September 1827.

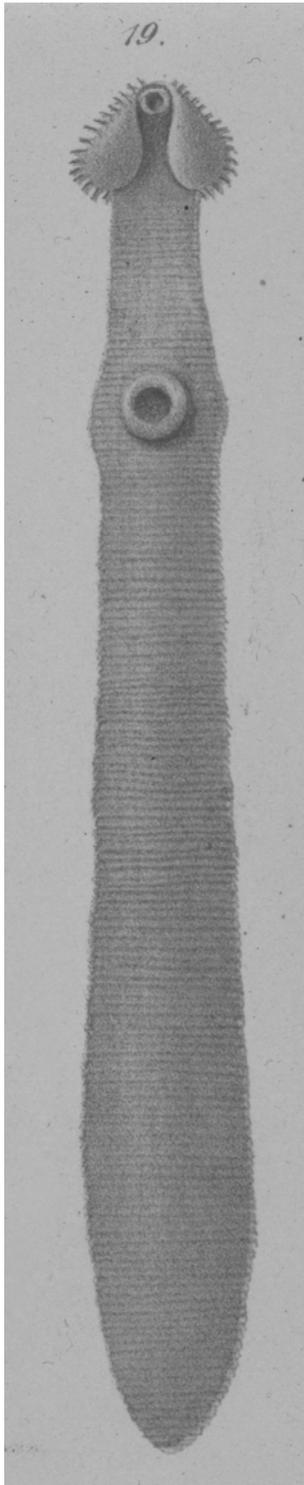
Location: Intestine.

Locality: Mato Grosso, Brazil.

Remarks: Lectotype designation has been made to ensure the names's proper and consistent application.

Discussion

The genus *Caballerotrema* PRUDHOE (1960) was established for *C. brasiliense* PRUDHOE, 1960 from the osteoglossid fish, *Arapaima gigas* (CUVIER, 1829) from Brazil. THATCHER (1980) added two more species, *C. arapaimense* from *A. gigas* and *C. aruanense* from *Osteoglossum bicirrhosum* (CUVIER, 1829), and redescribed *C. brasiliensis* based on newly collected specimens. KOSTADINOVA & GIBSON (2001) redescribed *C. brasiliense* upon



type material, considered *C. arapaimense* a *species inquirenda* and transferred *Himasthla piscicola* STUNKARD, 1960 to *Caballerotrema*. *Distoma annulatum* fits in the genus *Caballerotrema* based on its head collar with 29 collar spines and its voluminous cirrus-sac reaching far behind the ventral sucker.

THATCHER (1980) considered the posterior part of the seminal vesicle as lying free in the parenchyma, KOSTADINOVA & GIBSON (2001), however, reported a fine membranous sac, enveloping the seminal vesicle posteriorly to the prostatic region in the specimen of *C. aruanense* from *Zungaro zungaro* (HUMBOLDT). This feature could not be seen in the present old material, but may be possibly present.

Comparing *C. annulatum* with the other species of the genus, as described by THATCHER (1980) and our examination of paratypes, it differs from them by its smaller head collar and the absence of distinct ventral lobes; it also has a different definitive host. It further differs from *C. aruanense* in that the anterior limit of vitelline follicles is more posteriorly (compared with paratype MZUSP 5744b) and in smaller eggs. Moreover, it differs from *C. brasiliense*, *C. arapaimense* and *C. piscicola* in testes shape. In *C. piscicola* the 4. angle spine is the smallest while in *C. annulatum* it is the largest.

KOSTADINOVA & GIBSON (2001) considered that there are no significant differences between *C. brasiliense* and *C. arapaimense*, and that the size-range for the collar spines is the same. Additionally, they find two other specimens among the type series of *C. arapaimense* with considerable differences in the size and shape of the collar spines, probably belonging to different species of *Caballerotrema*. The examination of the paratypes of *C. arapaimense* and the published drawings of *C. brasiliense* by PRUDHOE (1960) and THATCHER (1980) show a more anterior limit of vitelline follicles in *C. arapaimense*, beginning at level of posterior border of ventral sucker or a short distance behind, while in *C. brasiliense* the vitelline follicles "extend anteriorly to about midway between the ovary and the ventral sucker, or a little beyond" (PRUDHOE, 1960). Our examination of the paratype of *C. piscicola* show measurements within the range given for *C. brasiliense* by THATCHER (1980), with a forebody 10%, and post-

Fig. 6: *Distomum annulatum* from DIESING (1856, Table III, Fig. 19).

testicular space 24.6% of TBL. The ventral sucker to ovary distance in *C. piscicola* is considerably larger (46%) than that given by KOSTADINOVA & GIBSON (2001) for *C. brasiliense* (29-33% TBL), and could not be estimated from the drawing or description by THATCHER (1980). Considering that the specimens of *C. piscicola* "are much extended, a result of their protracted immersion in water, and the uterine region between the cirrus sac and the ovary is especially narrow" (STUNKARD 1960: 546), and the type material of *C. brasiliense* is contracted, and the existence of misidentified specimens in the type series of *C. arapaimense* (KOSTADINOVA & GIBSON, 2001), a critical revision of all species of *Caballerotrema* from *Arapaima gigas* upon newly collected material is needed.

The only specimen obtained from *Osteoglossum bicirrhosum* and described as *Himasthla piscicola* by KOHN & FERNANDES (1981) belong to *Caballerotrema*, as noted by KOSTADINOVA & GIBSON (2001). This specimen shares with *C. aruanense* the shape of testes and the host. Additionally, it is similar in body size (11.7 mm vs 9.1 mm given by THATCHER (1980), and 10.3 mm by KOSTADINOVA & GIBSON (2001)), head collar (1.06 mm vs 0.88 mm in THATCHER (1980) and 0.99 mm in KOSTADINOVA & GIBSON (2001)), and post-testicular space (30% estimated in the drawing of KOHN & FERNANDES (1981), 28.7% in paratype of *C. aruanense*). Only the cirrus-sac is considerably larger in the specimen of KOHN & FERNANDES (1981), 2700 vs 1200 in *C. aruanense*, but it is also larger than that in the paratype of *C. piscicola* (1143, own data). It seems to us, that *C. piscicola* of KOHN & FERNANDES (1981) is more similar to *C. aruanense* than to *C. piscicola* of STUNKARD (1960).

After the discovery of a large amount of specimens of this genus by THATCHER (1980) in fishes of the family Osteoglossidae from Brazil, it is well established that they are true and not accidental parasites of fish.

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MIZZARO-WIMMER M. & SALVINI-PLAWEN L., 2001

Praktische Malakologie

Springer Wien New York: 188 pp. (Preis € 35,-)

Das im Springer-Verlag edierte Lehrbuch ist gerade rechtzeitig zum 14. World Congress of Malacology in Wien erschienen.

Schon seit längerer Zeit bestand ein grosser Bedarf an einem speziell anatomisch ausgerichteten Lehrbuch, das nicht nur Biologiestudenten oder Wissenschaftlern auf diesem Gebiet eine entsprechende Handhabe bietet, sondern vor allem auch die naturbedingt älteren Hand- und Hilfsbücher up to date bringt.

Was beim ersten Durchblättern sofort ins Auge fällt, ist die geradezu akribische Durchführung einer einmal gewählten Linie, die nicht nur das Zurechtfinden wesentlich erleichtert, sondern auch rein optisch einen besonders bestechenden Eindruck macht.

Durch die erfolgte identische Beibehaltung der dargestellten anatomischen Teile in allen systematischen Gruppen ist eine Orientierung und ein Vergleich von den Caudofoveata bis zu den Gastropoden leicht möglich und ermöglicht es daher vor allem den Studenten, diese so unterschiedlichen Gruppen, die natürlich ebenso die Solenogastres wie die Placophora und die Tryblidia umfassen, in ihrer Variabilität und entwicklungsgeschichtlichen Veränderung leicht unterscheiden und vergleichen zu können. Nachdem sowohl die Solenogastres wie auch die Caudofoveata zu den Spezialgebieten des Zweitautors gehören, ist die Gewähr gegeben, wirklich die neuesten Erkenntnisse und Forschungsergebnisse vorgesetzt zu bekommen. Und doch weist der Autor gerade für diese beiden Gruppen darauf hin, dass die Forschung und Organisationsbreite noch bei weitem nicht abgeschlossen ist und daher auch hier durchaus noch weitere Resultate zu erwarten sind.

Neben einer erstaunlich kurzen, aber sehr präzisen Beschreibung der anatomisch bearbeiteten Teile der Mollusken wird darüber hinaus auch auf die Biologie und die bei der Bearbeitung verwendeten Methoden eingegangen. Das mag vor allem für jene Leser interessant und wichtig sein, die selbst "Hand anlegen" wollen und denen diese Hinweise sicherlich viele Leerläufe bei der anatomischen Bearbeitung ihres Materials erspart. Besonders darf noch darauf hingewiesen werden, dass die Auswahl und Zusammenstellung der für die anatomische Darstellung gewählten Beispiele mit grosser praktischer Erfahrung von Luitfried Salvini-Plaen und Fachkollegen vorgenommen wurde und daher Gültigkeit für alle anderen zugehörigen Arten und Gattungen hat.

Und damit zum graphischen Teil dieses Werkes. Nicht nur, dass die präsentierten Zeichnungen von einer höchst beeindruckenden Exaktheit und in naturnaher Darstellung ausgeführt sind, wurde das Material von Maria Mizzaro-Wimmer in fast allen Fällen selbst präpariert und stellt daher nicht eine, wie leider in manchen Werken übliche Kopie bereits publizierter Abbildungen dar, sondern es handelt sich um aus sorgfältiger anatomischer Bearbeitung hervorgegangenen Erkenntnisse. Man kann daher in diesem Fall nicht nur die zeichnerischen Qualitäten, sondern auch die präparatorische Meisterschaft der Bildautorin bewundern.

Ein Kompliment auch noch dem Springer-Verlag, der durch die exakte Übernahme der fachlichen wie auch zeichnerischen Vorlagen dafür gesorgt hat, dass damit ein Lehrbuch geschaffen wurde, das durch seine klaren Konzeptionen und das beeindruckende optische Bild sicherlich ein "Muss" in jeder einschlägigen Bibliothek werden wird .

O.E. Paget