Neotrop. Helminthol., 7(2), 2013

ISSN: 2218-6425 impreso / ISSN: 1995-1043 on line

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ASOCIACIÓN PERUANA DE HELMINTOLOGÍA E INVERTEBRADOS AFINES

ORIGINAL ARTICLE / ARTÍCULO ORIGINAL

A KEY TO THE SPECIES OF *RHABDOCHONA (FILOCHONA*) SAIDOV, 1953, (NEMATODA: RHABDOCHONIDAE) PARASITIZING CYPRINID FISHES

UNA CLAVE PARA LAS ESPECIES DE *RHABDOCHONA (FILOCHONA*) SAIDOV, (1953) (NEMATODA: RHABDOCHONIDAE) PARÁSITOS DE PECES CIPRINIDOS

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Suggested citation: Kalia, DC, Dolma, Y & Kumari, S. 2013. A key to the species of *Rhabdochona (Filochona*) Saidov, 1953, (Nematoda: Rhabdochonidae) parasitizing cyprinid fishes. Neotropical Helminthology, vol. 7, n°2, jul-dec, pp. 283 - 288.

Abstract

To facilitate the identification of the species of *Rhabdochona (Filochona)* Saidov, 1953, parasitizing carp fishes, a bipartite key for 12 species of the subgenus is provided. A large number of worms, *Rhabdochona (Filochona) hellichi turkestanica* (Skrjabin, 1917) Moravec *et al.* 2010, were recovered from *Schizothorax plagiostomus* Heckel in river Ravi at Chamba, a district of Himachal Pradesh (India).

Keywords: Bipartite key - Cyprinid fish – Identification - *Rhabdochona (Filochona)* - *Schizothorax* - species.

Resumen

Para comprender la identificación de las especies de *Rhabdochona (Filochona)* Saidov, 1953, parasitando a peces carpa, una clave bipartita para 12 especies del subgénero es provista. Un gran número de helmintos, *Rhabdochona (Filochona) hellichi turkestanica* (Skrjabin, 1917) Moravec *et al.*, 2010, fueron registrados de *Schizothorax plagiostomus* Heckel en el río Ravi en Chamba, un distrito de Himachal Pradesh (India).

Palabras clave: Clave bipartita - especie - identificación - pez ciprinido - *Rhabdochona (Filochona) – Schizothorax.*

INTRODUCTION

The widely accepted diagnosis of genus *Rhabdochona* Railliet, 1916, as provided by Chabaud (1975) and Pinto *et al.* (2010), on the basis of egg surface (smooth/with filaments/with floats), into *Rhabdochona (Rhabdochona)* Railliet, 1916; *Rhabdochona* (*Filochona*) Saidov, 1953 and *Rhabdochona* (*Globochona*). Moravec, 1972, has a phylogenetic value, but useful for the separation of numerous species in the genus has been followed, notwithstanding Saidov's (1953) bifurcation of genus *Rhabdochona* Railliet, 1916 (Railliet, 1916), into *Rhabdochona (Rhabdochona)* Railliet, 1916 and *Rhobdochona (Filochona)* Saidov, 1953 and Moravec (1975) observation's on species of *Rhabdochona* Railliet, 1916, parasitic in fishes of Europe and Asia, for reconstructing his earlier hypothesis of 1972 on general characterization of the genus, into four subgenera namely, *Rhabdochona (Rhabdochona)* Railliet, 1916; *Rhabdochona (Globochona)* Moravec, 1972;

Rhabdchona (Globochonoides) Moravec, 1975 and *Rhabdochona (Sinonema)* Moravec, 1975, including additional features, for diagnosis rather than the egg characteristic only, such as number and arrangement of teeth in the prostome, presence of cervical alae, shape of female tail tip and shape of deirids and which was accepted by Bilquees (1979); Soota & Sarkar (1981) and Soota (1983).

Rhabdochona (Filochona) hellichi (Sramek, 1901) Chitwood, 1933, is distributed over western, central and southern Europe, Transcaucasia and Soviet central Asia reaching up to Kashmir, India (Moravec, 1975). However some small morphological differences observable between European and Asian specimen of *R. hellichi* especially in the shape of distal end of the left spicule, a character used for bifurcating the species, was considered to be within the intraspecific variations (Moravec, 1975; Moravec & Amin, 1978).

The recent molecular studies on *R. hellichi* from *Barbus barbus* (Linnaeus) in Czeeh Republic and those of the *Schizochorax* sp. from West Bengal and Sikkim in India by Cernotikova (2010), suggest these forms to be genetically distant. Hence the two subspecies, *Rhabdochona (Filochona) hellichi turkestanica* (Skrjabin, 1917) Moravec *et al.*, 2010 (an Asian representative of *Schizothorax* Heckel and related genera, having ventral process of the distal tip of left spicule distinctly longer than the dorsal process) and *Rhabdochona (Filochona) hellichi hellichi* (Sramek, 1901) Moravec *et al.*, 2010 (parasitizing European species of *Barbus* having both processes of the distal tip of the life spicule approximately equally long), have been accepted in the present study. Hence a bipartite key to the species of *Rhabdochona (Filochona)* Saidov, 1953, parasitizing cyprinid fishes is given.

The bipartite key yields quick segregation of the genera (Sramek, 1901; Skrjabin, 1917; Dinnik, 1933; Yamaguti, 1935; Thapar, 1950; Osmanor, 1964; Roytmann & Troffmenko, 1964; Skrjabin, 1964; Moravec, 1972; Siddiqi & Khattak, 1984; Moravec *et al.*, 1991), a scheme very well documented in "CIH keys to the Nematode Parasites of Vertebrates" by Chabaud (1975). Furthermore, a single characteristic feature e.g. bursa (Chitwood & Jordan, 1965; Gupta & Kalia, 1981; Kalia & Gupta, 1983) works well for the preparation of a useful pictoral key, in the backdrop of the availability of the detailed morphological descriptions for all the known spp. of a genus,

MATERIALS AND METHODS

During the survey of parasitic nematodes in Himachal Pradesh, a total number of 277 (83♂ & 194 ♀) specimens of *Rhabdochona (Filochona) hellichi turkestanica* (Skrjabin, 1917) Moravec *et al.*, 2010, were recovered from 105 (21♂ & 84♀)fish hosts (*Schizothorax plagiostomus* Heckel, 1838) in river Ravi at Chamba in the months of April, May and August, 2011. The distinct numbers and distinguishable arrangement of caudal papillae (Moravec, 1975); the characteristic distal terminations of the left spicule (Moravec *et al.*, 2010) and also the position of vulva (Rahemo, 1978) have been considered for the separation of the species.

RESULTS

KEYS:

1 (6) Cloacal papillae 12-14 pairs.

2 (5) Postcloacal papillae 4-5 pairs.

3 (4) Left spicule with blunt distal tip.
Anterior end of both sexes with a typical annular structure; cloacal papillae 12-13 (7-8+5) pairs; left spicule 0.422-0.451 mm long (with blunt distal tip), right spicule 0.08- 0.09 mm long.
(from *Varicorhinus hereatensis steindachneri* in USSR)
R. varicorhini Osmanov,1964

4(3) Left spicule with bifurcated distal tip.
Cloacal papillae 14 (9+5) pairs; left spicule 0.688-0.71mm long (with

bifurcated distal tip), right spicule 0.11-0.129 mm long.
(from *Varicorhinus capoeta sevangi* in Azebaidzhan)
R. macrostoma Moravec & Mikailov,1970

5(2) Post cloacal papillae 6 pairs.
Cloacal papillae 13-14 (7-8+6) pairs; left spicule 0.522 mm long, right spicule 0.108 mm long.
(from *Barbus luteus* in Iraq)
R.similis Moravec, Ali & Abul-Eis, 1991

6 (1) Cloacal papillae 14 pairs or more.

7 (20) Cloacal papillae up to 17 pairs.

8 (13) Minimum number of cloacal papillae 14 pairs.

9 (10) Right spicule without dorsal barb.
Cloacal papillae 14-15(8-9+6) pairs; left spicule 0.693-0.723mm long, right spicule 0.159- 0.171 mm long (without dorsal barb at distal tip) ; egg with distinct protuberances on either pole provided with a broad filament of fibrous structure (filaments often frayed into more parts).
(from *Tor* sp. in Sikkim, India)
R.hospeti Thapar, 1950.

10 (9) Right spicule with dorsal barb.

11(12) Cloacal papillae 14-16 (8-10+6) pairs.
Left spicule 0.435- 0.510 mm long, right spicule 0.108-0.120 mm long, boat shaped (with dorsal barb at distal tip) ; tail of both sexes conical , ending in sharp cuticular point; each pole of mature egg provided with one, less frequently with two narrow filaments attaining as much as 0.57 mm length.
(from *Zaco platypus*, *Tribolodon hakuensis* and *Leuciscus brandti* from Japan)
R. zacconis Yamaguti, 1935

12 (11) Cloacal papillae 14-17 (8-11+6) pairs.
Left spicule 0.576-0.750 mm long, with its distal tip in lateral view blunt, not extended and provided with fine cuticular membrane, whereas in ventral view distal tip appears cone shaped, right spicule 0.11-0.147mm long (with wide lateral keels and dorsal barb).
(from *Barbus brachycephalus*, *Schizothorax intermedius* from the River Kyzlu, USSR)
R.gnedini Skrjabin, 1946

13 (8) Minimum number of cloacal papillae 15 pairs.

14 (15) Distal processes of left spicule contiguous.
Prostome with 10-12 anterior teeth; cloacal papillae 15-17 (10-11+5-6) pairs; left spicule 0.54-0.58 mm long (with contiguous distal processes), right spicule 0.09-0.103 mm long with dorsal barb at distal tip.
(from *Barilius* sp., *Puntius* sp. and *Noemacheilus* sp. in Pakistan)
R. charsaddiensis Siddiqi and Khattak, 1984

15 (14) Distal processes of left spicule distinctly separate.

16 (19) Vulva postequatorial.

17(18) Left spicule with its distal processes of almost equal lengths.
Prostome funnel- shaped with 14 fairly big anterior teeth (3 dorsal, 3 ventral, laterl teeth arranged in couples 2 pairs on each side); cloacal papillae 15-17 (9-11+6) pairs; left spicule 0.501- 0.509 mm long (with distal processes of almost equal length), right spicule 0.126-0.144 mm long, with distinct dorsal barb.
(from *Barbus barbus* and *Schizothorax intermedius* in Europe and Central Asia)
R.hellichi hellichi (Sramek,1901) Chitwood, 1933

18 (17) Left spicule with its unequal distal processes.
Cloacal papillae 16 (10+6) pairs, left

spicule 0.570-0.576 mm long, with 0.318-0.33 mm long shaft,representing 56-59% of entire spicule length (with unequal distal processes), right spicule 0.135-0.138 mm long, with distinct dorsal barb at the distal tip.
(from *Schizothorax* sp. in India)
R. hellichi turkestanica (Skrjabin,1917) Moravec *et al.*, 2010

19 (16) Vulva equatorial.
Cloacal papillae 16-17(10-11+6) pairs, left spicule 0.420 mm long, shaft 0.228 mm long representing 53% of entire spicule length, distal tip of extuded spicule moderately expanded, somewhat bifurcate, provided with narrow cuticular membrane, right spicule 0.093 mm long, with small dorsal barb on distal tip.
(from *Capoeta trutta* and *Cyprinion macrostoma* in Iraq)
R. tigridis Rahemo, 1978 (emend.)

20 (7) Cloacal papillae more than 17 pairs.

21(22) Cloacal papillae not variable in numbers.
Cephlic papillae in two rows of 4 each,cloacal papillae 18(12+6) pairs; left spicule 0.42 mm long with its distal end split and spoon shaped, right spicule 0.118mm long bearing an anchor like dorsal process distally; vulva almost equatorial (1:1.1); immature eggs devoid of filaments, mature eggs 0.435 mm × 0.203 mm with two filaments (one at each pole).
(from *Oreoleuciscus humilis* in USSR)
R. humili Roytman and Trofimenko, 1964

22 (21) Cloacal papillae variable in numbers.
Cloacal papillae18-20(12-14+6) pairs; left spicule 0.405 mm long with bifurcated distal tip, shaft of its spicule representing approximately its anterior half, right spicule 0.084 mm; vulva equatorial.
(from *Vricorhinus capoeta sevangi* and *V. capoeta heratensis* from Basins of the Caspian and Aral seas)
R. fortunatowi Dinnik, 1933.

DISCUSSION

Moravec *et al.* (2010) observed during the study on the morphology and taxonomy of three spp. of *Rhabdochona* parasitizing fishes in India, that the European and Asian representatives of *Rhabdochona (Filochona) hellichi* (Sramek, 1901) Chitwood, 1933 (Chitwood, 1933), exhibit some small morphological differences, especially in the shape of distal end of the left spicule and considered it to be within the intrsaspecific variability of the species. Therefore, *R. (F.) hellichi turkestanica* (Skrjabin, 1917) was differentiated from the nominotypical subspecies *R. (F.) hellichi hellichi* (Sramek, 1901) mainly in having the ventral process of the distal tip of the left spicule distinctly longer than the dorsal process (versus both processes approximately equally long). This categorization has also been supported by the molecular studies (Cernotikova, 2010) of *R. hellichi* specimens from *Barbus barbus* (Linnaeus) in Czech Republic and also those from *Schizothorax* in West Bengal and Sikkim (India). Needless to add that *R. (F.) hellichi hellichi* parasitizes barbels (*Barbus spp.*) in Europe and *R. (F.) hellichi turkestanica* found as parasitic mainly in species of *Schizothorax* and some related fish genera in Central and South Asia (Moravec *et al.*, 2012).

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Received November 26, 2012.
Accepted October 8, 2013.

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