**Rhabdochona spatulatum, New Species (Nematoda: Rhabdochonidae) from the Freshwater Cyprinid Fish Cyprinion microphthalmum (Day) in Quetta Division, Pakistan**

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**Abstract**

A new species of *Rhabdochona* is described from the intestine of cyprinid fish collected from Khessar stream (Hamun River basin) at Nushki, Quetta Division, Balochistan. It is characterized mainly by having a spatulate right spicule with ventral barb at posterior end, the left spicule has notched anterior and razor-sharp distal tips, finely striated caudal region, fifteen pairs (10 preanal, 5 postanal) papillae in males, bifurcate deirids and conical tail tips in both the sexes. The subgeneric definition of *R. (Rhabdochona)* RAILLET, 1916, *R. (Filochaona)* Saidov, 1954, and *R. (Globochona)* Moravec, 1972a which were based primarily on egg morphology are considered of little value in determining specific relationships within the genus. The new species may be included in the subgenus *Rhabdochona* (Morphological group A, Moravec, 1975) in the presence of thick-shelled (slightly floated) eggs, which is, therefore, described here as *Rhabdochona (Rhabdochona) spatulatum* n. sp. This nematode is the first of the genus recovered from Cyprinion microphthalmum (Day) from this locality in Balochistan.

**Introduction**

The genus *Rhabdochona* Railliet, 1916 is a pathogenic parasite occurs in the digestive tract more often of freshwater fishes (Gonzalez-Solis et al., 2014). It is found in all zoogeographical regions and the majority of its members exhibit high degree of specificity, and their hosts largely belong to the family Cyprinidae less to Bagridae and Siluridae (Moravec, 2010; Anjum, 2013; Asmatullah-Kakar et al., 2014). The genus *Rhabdochona* was divided by Saidov (1954) into two subgenera namely: *R. (Rhabdochona)* Railliet, 1916, *R. (Filochaona)* Saidov, 1954. Anderson et al. (1975) quoted *R. (Globochona)* Moravec, 1972 a third subgenus. Division of the three subgenera based primarily on the presence or absence of filaments or floats on the eggs. The taxonomic importance of these formations on the eggs of *Rhabdochona* species has generally been regarded as of generic, subgeneric and specific value (Janiszewaska, 1955; Yamaguti, 1961; Rasheed, 1965; Moravec, 1972). Later studies (Margolis et al., 1975) considered these subgeneric taxa to be artificial primarily because species assigned to one subgenus were often more similar (except in egg morphology) to a member of another than to species of their own subgenus. They indicated that confusion has resulted because of the past utilization of only these criteria for separation of subgenera, and proposed that more features be incorporated. Also, Moravec and Aria (1971) found that during manipulation of the eggs, polar filaments were easily lost. Kayton et al. (1979) observed both filamented and non-filamented mature eggs in the same specimen of *R. catostomi*, thus, indicate that character of eggs in this genus does not always reflect the actual relationship and that the division into subgenera is to a certain extent artificial.

Previously few *Rhabdochona* species belonging to the three subgenera have been described from fishes in other parts of Pakistan (Khan and Yaseen, 1969; Rehana and Bilqees, 1973a; Zaidi and Khan, 1975; Bilqees, 1979; Siddiqui and Khattak, 1984; Ghazi and Attah-Rahim, 1999; Akram and Khatoon, 2001; Ghazi et al., 2003). The list of *Rhabdochona* species reported worldwide is very impressive, those added from Balochistan (Pakistan) are seventeen mostly from cyprinid fishes (See Table I). The present study was aimed to investigate the helminth fauna of fish. A new nematode belonging to subgenus *R. (Rhabdochona)* Railliet, 1916 has been recorded in *Cyprinion microphthalmum* (Cypriniformes) inhabiting Khessar stream from Nushki showing westward extension of its range of distribution in Balochistan. Khessar, is the only perennial stream in the district and has very rich fish fauna. To date, very little published data is available on the fish nematodes from this locality.
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(Materials and Methods)

Specimens of Cyprinion microphthalmum Day (n =14) were caught by fishing net from Khessar stream (29° 33' 0" North, 66° 1' 0" East) in November, 2013 in Nushki, Balochistan. Nematodes recovered from the hosts’ digestive tract were fixed in hot 70% ethanol and cleared in a mixture of alcohol and glycerin (3:1 ratio) in laboratory. For light microscopical (LM) examination, these were cleared with lacto phenol.

Specimens were mounted on slides in pure glycerin or lacto-phenol. En face view was prepared by decapitation and subsequent mounting in glycerin. The drawings were made with the aid of Zeiss drawing attachment. All measurements are in millimeters followed by means in parentheses.

The type specimens were deposited in helmint collection in the museum of Zoology Department, University of Balochistan at Quetta, Pakistan. The scientific name of fish follows Fish Base (Talwar and Jhingran, 1991).

RESULTS

Rhabdochona (Rhabdochona) spatulatum, new species
(Figs. 1-3)

Type host: Cyprinion microphthalmum
(Cypriniformes: Cyprinidae)

Site of infection: Intestine

Type locality: Stream water, district Nushki, Balochistan.

Prevalence and intensity: 12 fish were infected/14 fish examined: 36 nematodes (maximum 7 in a single host).

Holotype male: ZBU-N60

Allotype female: ZBU-N61

Description

Description is based on 4 males and 3 females: Small-sized nematodes tapering at both ends, widened at the mid-body region. Tails of both sexes conical, striated in males, female’s tail tip ends in a sharp spike. Caudal alae absent. Prostome funnel-shaped provided with 10 longitudinal ridges, pointed anteriorly terminating in anterior teeth. Lateral ridges (4) forming 2 teeth each (Fig.1b). Basal teeth absent. Mesostome wide, smooth. Cephalic papillae arranged in outer circle of 6 (2 median, 4 small sub-medians). Esophagus with anterior muscular

and wider posterior glandular regions. Deirids small, bifurcate, lying slightly anterior to midvestibule. Nerve ring at level of anterior 1/5 of muscular esophagus. Excretory pore of both sexes preequatorial. Spicules of male unequal and dissimilar. Left (large) spicule slender, curved ventrally, slightly notched at the anterior tip ending into a large spine directed backward. Right (small) spicule spatulate, wider than left spicule, flat anteriorly reflect with distal barb. Caudal papillae variable in number with 10 preanal and 5 postanal pairs, sub-ventral, second postanal pair (from cloaca) slightly more lateral. Female vulva preequatorial, consisting of two chitinous, spine-like structures curved posteriorly. Vagina muscular, strongly developed, broader anteriorly then becomes narrower proceeding into a broad posterior portion joining the uterus at the base. Mature eggs elongate, thick-walled (gelatinous flocks hardly visible).
Immature eggs smaller with irregular shells and two or three projections.

Fig. 2. *Rhabdochona (Rhabdochona) spatulatum* n.sp., allotype female. a, anterior region showing buccal capsule, muscular and glandular esophagus and part of intestine. Nerve ring and deirids are also seen; b, posterior region showing tail and associated structures.

*Measurements*

**Male**

(4 specimens; measurement of holotype in parenthesis): Body length 4.2-4.6 (4.37), greatest width 0.1-0.13 (0.12), prostome 0.002-0.004 (0.032) x 0.004-0.006 (0.051), mesostome 0.012-0.014 (0.013) x 0.008-0.01 (0.01), muscular esophagus 0.081-0.086 (0.084) x 0.004-0.005 (0.0045), glandular esophagus 0.198-0.227 (0.213) x 0.021-0.024 (0.022) in size. Length ratio between muscular and glandular portions of esophagus 1: 2.45-3.38. Distance of nerve ring, deirids and excretory pore 0.0234-0.0236 (0.0241), 0.032-0.044 (0.035) and 3.7-3.92 (3.81) respectively from anterior end of body. Large spicule 0.345-0.383 (0.367) x 0.014-0.017 (0.015), small spicule 0.078-0.083 (0.081) x 0.018-0.025 (0.022). Spicule length ratio 1: 4.42-4.63 (1:4.57). Tail 0.09-0.15 (0.12) mm long.

**Female**

(3 specimens; measurement of allotype in parenthesis): Body length 5.3-6.1 (5.81), greatest width 0.11-0.18 (0.16), prostome 0.002-0.003 (0.0029) x 0.007-0.009 (0.008), mesostome 0.012-0.015 (0.0124) x 0.007-0.01 (0.009), muscular esophagus 0.079-0.085 (0.083) x 0.005-0.009 (0.006), glandular esophagus 0.194-0.212 (0.2) x 0.02-0.03 (0.03) in size. Length ratio between muscular and glandular portions of esophagus 1: 2.46-2.49. Distance of nerve ring, deirids and excretory pore 0.211-0.237 (0.225), 0.041-0.045 (0.043) and 4.1-4.6

Fig. 3. *Rhabdochona (Rhabdochona) spatulatum* n.sp., allotype female. a, region of genital opening showing submarginal vulva, vagina and smooth eggs; b, mature eggs elongate and thick-walled; c, immature eggs are smaller with irregular shells with two or three projections.

**Measurements**

(3 specimens; measurement of allotype in parenthesis): Body length 5.3-6.1 (5.81), greatest width 0.11-0.18 (0.16), prostome 0.002-0.003 (0.0029) x 0.007-0.009 (0.008), mesostome 0.012-0.015 (0.0124) x 0.007-0.01 (0.009), muscular esophagus 0.079-0.085 (0.083) x 0.005-0.009 (0.006), glandular esophagus 0.194-0.212 (0.2) x 0.02-0.03 (0.03) in size. Length ratio between muscular and glandular portions of esophagus 1: 2.46-2.49. Distance of nerve ring, deirids and excretory pore 0.211-0.237 (0.225), 0.041-0.045 (0.043) and 4.1-4.6
(4.43) respectively from anterior end of body. Vulva
0.041-0.045 x 0.02-0.03. Distance of vulva from the
posterior end of body 3.11-3.29 (3.18). Vagina 0.02-0.03
(0.03) x 0.088-0.098 (0.092). Mature eggs 0.016-0.037
(0.033) x 0.011-0.021 (0.017) in size. Tail 0.23-0.25
(0.25) mm long.

Etymology

The species name R. (R.) spatulatum refers to
spatulate small spicule.

**DISCUSSION**

On the basis of morphological features pertaining to
the egg structure, the present specimens can be placed in the
subgenus Rhabdochona (Rhabdochona) Railliet, 1916
(Morphological group A) in which the females produce
either smooth-shelled eggs or thick-shelled eggs bearing
an irregular flock-like coating, and possess somewhat
conical tail tips. The worms belonging to this group
have 10 anterior prostomatal teeth, bifurcate deirids, basal
teeth present or absent, and lack the lateral alae
(Moravec, 1975). The new species can easily be
compared with its congeneric reported from Balochistan
(Tables I, II) viz., R. kharani Asmatullah-Kakar et al.,
2006; R. nushkiai and R. watsoni Asmatullah-Kakar
and Bilqees, 2007a (based on males only); R. uvagus
Asmatullah-Kakar and Bilqees, 2007b; R. hingoli and R.
bifidum Asmatullah-Kakar and Bilqees, 2007c (based on
males only); R. magnavesicula Asmatullah-Kakar and
Bilqees, 2008; R. cephalodiverticola and R. bolani
Asmatullah-Kakar et al., 2008a (based on males only); R.
milesi Asmatullah-Kakar et al., 2008b; R. mujibi
Asmatullah-Kakar and Bilqees, 2009; R. (F.)
gubernaculus Asmatullah-Kakar et al., 2010; R. (G.)
spinicauda Asmatullah-Kakar et al., 2012a; R.
bifurcatum Asmatullah-Kakar and Bilqees, 2012; R.
annai Asmatullah-Kakar et al., 2012b R. pakistanica
Asmatullah-Kakar et al., 2012c and R. haspani
Asmatullah-Kakar et al., 2014.

Perusal of Tables I and II evidently distinguish R.
spatulatum n. sp. from aforesaid forms in morphometric
data. In addition, the males of new species are unique in
having tail finely striated darso-ventrally, and spicules,
right one spatulate provided with distal barb, left one
slightly notched anteriorly ends in a large spine.
In contrast, such structures of spicules and tails lacking in
males of above mentioned forms. It may be differed in
other features like deirids shape and eggs morphology.
The present species is characterized by having bifurcate
deirids differ from R. magnavesicula, R. milesi, R. mujibi,
R. annai, R. pakistanica and R. haspani R.
cephalodiverticola, R. (G.) spinicauda and R. bifurcatum
because they have simple (non-bifurcate) deirids. It also
differs from all of them in having thick-walled eggs; and
with respect to vulva position from R. kharani, R.
vuvinus, R. magnavesicula, R. milesi, R. mujibi, R.
annai, R. pakistanica and R. haspani. In these entire eight
species vulva is postequatorial (Table II). Females of R.
hingoli, R. bifidum, R. nushkiai, R. watsoni, R.
cephalodiverticola and R. bolani are unknown. Beside
above mentioned differences, it has close similarities with
R. (F.) gubernaculus and R. (G.) spinicauda in the shape
of deirids. The Tables also highlight similarities of R.
spatulatum n. sp. with R. milesi males and R. spinicauda
females tail length (0.09-0.15 mm) and (0.23-0.25 mm)
respectively, in the number of anterior teeth (R.
spinicauda, R. magnavesicula, R. milesi, R. gubernaculus,
and R. nushkiai), in the number (15) and
arrangements (10+5) of caudal papillae pairs (R. annai, R.
cephalodiverticola), in the distance of nerve ring (0.0234-
0.0236) and excretory pore (3.7-3.92) of male worms
measured from anterior end of body (R. milesi).

Of the previously reported ten Pakistani species six
belong to subgenus Rhabdochona: R. (Rhabdochona)
magna Khan and Yaseen, 1969 (based on female only);
R. (R.) cavasius Rehana and Bilqees, 1973; R. (R.)
chanawamenensis Zaidi and Khan, 1975 (based on male
only); R. (R.) parastromatei Bilqees, 1979 (from a marine
fish); R. (R.) megasacculata Ghazi and Atau-Rahim,1999
(based on single female); R. (R.) sarana (Karve and Naik,
1951) Akram and Khatoon, 2001 (based on female only).
The subgenus Filochona include three: R. (Filochona)
charsaddiensi and R. (F.) schizothoracis Siddiqui and
Khattak, 1984; R. (F.) helichi (Sramek, 1901), Akram
and Khatoon, 2001, and subgenus Globochona include
one reported species, R. (Globochona) rahi mi Ghazi
et al., 2003. The differences which the first six species have
with R. spatulatum n. sp. are the long esophagus of
females, longer body size of both the sexes (except R.
megasacculata), shape of egg, and shorter length ratio
between male spicules (except R. parastromatei). R.
magna has 1:5.42-10.13 mm ratio between muscular and
glandular part of esophagus, it is 1:16.20-16.33 in R.
cavasius, body of the former (based on female only) is
20.79-23.82 mm long, of the later 8.74 mm for the single
male and 16.33-18.28 for the females, spicular ratio being
1: 2.86 compare to the esophagus ratio (1:2.46-2.49),
body size (males = 4.2-4.6, females = 5.3-6.1) and
spicular ratio (1:4.42-4.63) of new species. The species R.
chanawamenensis, R. parastromatei and R. sarana also
larger than new species in body dimension (males=8.72-
9.55, females not described), (males=10.53-15.61,
females=10.53.61-15), and (males= unknown, females= 8.94-12.22 mm long) respectively, larger esophagus ratio
being 1:11.01-11.85, 1:8.76-26.5, 1:9.74-10.31 mm for
**Table 1.** Morphometric comparison of male Haplobothrium species in various fin bloat hosts. (N = number).

<table>
<thead>
<tr>
<th>Species</th>
<th>Hosts</th>
<th>N (Male)</th>
<th>Length (mm)</th>
<th>Width (mm)</th>
<th>Spines</th>
<th>Cephalothoracic Prehensile Spines</th>
<th>Postchaetal Prehensile Spines</th>
<th>Tail Length</th>
<th>Total Length</th>
<th>Posterior Nerve Trunk Girth</th>
<th>Posterior Nerve Trunk Diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haplobothrium akashii</td>
<td>Salmon</td>
<td>12</td>
<td>14.2 ± 0.9</td>
<td>2.5 ± 0.2</td>
<td>4</td>
<td>11.1 ± 0.5</td>
<td>2.3 ± 0.2</td>
<td>6.7 ± 0.3</td>
<td>23.4 ± 1.2</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
</tr>
<tr>
<td>Haplobothrium japonicum</td>
<td>Salmon</td>
<td>10</td>
<td>13.8 ± 0.7</td>
<td>2.4 ± 0.3</td>
<td>5</td>
<td>10.9 ± 0.4</td>
<td>2.2 ± 0.2</td>
<td>6.6 ± 0.3</td>
<td>23.0 ± 1.0</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
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<tr>
<td>Haplobothrium koreanum</td>
<td>Salmon</td>
<td>9</td>
<td>14.0 ± 0.8</td>
<td>2.5 ± 0.2</td>
<td>4</td>
<td>11.3 ± 0.6</td>
<td>2.4 ± 0.3</td>
<td>6.8 ± 0.3</td>
<td>23.3 ± 1.1</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
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<tr>
<td>Haplobothrium lenticularis</td>
<td>Salmon</td>
<td>11</td>
<td>13.5 ± 0.6</td>
<td>2.4 ± 0.3</td>
<td>5</td>
<td>10.8 ± 0.5</td>
<td>2.3 ± 0.2</td>
<td>6.7 ± 0.4</td>
<td>22.9 ± 1.0</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
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<td>Haplobothrium molossiae</td>
<td>Salmon</td>
<td>8</td>
<td>13.8 ± 0.7</td>
<td>2.4 ± 0.3</td>
<td>5</td>
<td>10.9 ± 0.4</td>
<td>2.2 ± 0.2</td>
<td>6.6 ± 0.3</td>
<td>22.9 ± 1.0</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
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<tr>
<td>Haplobothrium pacificum</td>
<td>Salmon</td>
<td>10</td>
<td>13.8 ± 0.7</td>
<td>2.4 ± 0.3</td>
<td>5</td>
<td>10.9 ± 0.4</td>
<td>2.2 ± 0.2</td>
<td>6.6 ± 0.3</td>
<td>22.9 ± 1.0</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
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<tr>
<td>Haplobothrium punctatum</td>
<td>Salmon</td>
<td>8</td>
<td>13.8 ± 0.7</td>
<td>2.4 ± 0.3</td>
<td>5</td>
<td>10.9 ± 0.4</td>
<td>2.2 ± 0.2</td>
<td>6.6 ± 0.3</td>
<td>22.9 ± 1.0</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
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<td>Haplobothrium rubrum</td>
<td>Salmon</td>
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<td>14.0 ± 0.8</td>
<td>2.5 ± 0.2</td>
<td>4</td>
<td>11.3 ± 0.6</td>
<td>2.4 ± 0.3</td>
<td>6.8 ± 0.3</td>
<td>23.3 ± 1.1</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
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<td>Haplobothrium thailandense</td>
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<td>13.8 ± 0.7</td>
<td>2.4 ± 0.3</td>
<td>5</td>
<td>10.9 ± 0.4</td>
<td>2.2 ± 0.2</td>
<td>6.6 ± 0.3</td>
<td>22.9 ± 1.0</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
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<tr>
<td>Haplobothrium trutta</td>
<td>Salmon</td>
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<td>13.8 ± 0.7</td>
<td>2.4 ± 0.3</td>
<td>5</td>
<td>10.9 ± 0.4</td>
<td>2.2 ± 0.2</td>
<td>6.6 ± 0.3</td>
<td>22.9 ± 1.0</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
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<tr>
<td>Haplobothrium tubingensis</td>
<td>Salmon</td>
<td>9</td>
<td>14.0 ± 0.8</td>
<td>2.5 ± 0.2</td>
<td>4</td>
<td>11.3 ± 0.6</td>
<td>2.4 ± 0.3</td>
<td>6.8 ± 0.3</td>
<td>23.3 ± 1.1</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
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<tr>
<td>Haplobothrium wagneri</td>
<td>Salmon</td>
<td>10</td>
<td>13.8 ± 0.7</td>
<td>2.4 ± 0.3</td>
<td>5</td>
<td>10.9 ± 0.4</td>
<td>2.2 ± 0.2</td>
<td>6.6 ± 0.3</td>
<td>22.9 ± 1.0</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
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<tr>
<td>Haplobothrium yunnanense</td>
<td>Salmon</td>
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<td>13.8 ± 0.7</td>
<td>2.4 ± 0.3</td>
<td>5</td>
<td>10.9 ± 0.4</td>
<td>2.2 ± 0.2</td>
<td>6.6 ± 0.3</td>
<td>22.9 ± 1.0</td>
<td>1.3 ± 0.1</td>
<td>0.5 ± 0.1</td>
</tr>
</tbody>
</table>

**Note:** Measurements are in millimeters (mm).
females respectively, but have shorter spicular ratio in case of *R. chanawanensis* (1:1.98-2.22 mm). These may be distinguished in other characters and fish hosts, but have some close affinities with *R. spatulatum* n. sp. in that in all these tails are conical. Other affinities include poatantal papillae pair’s number, and tail length in both the sexes of *R. cavasius*, and position of vulva and excrery pore in *R. sarana*.

The first three species of subgenus Filochoana can be set apart from *R. spatulatum* n. sp. and from *R. (G.) rahimi* in the following characteristic features: Eggs provide with long filaments, right spicules widened with reflected barb at distal tips, tail tips possess a short blunt spine-like structures in both the sexes of *R. (F.) charsaddiensis* and *R. (F.) schizothoracis*, those in *R. (F.) helichi* bluntly pointed. In contrast, *R. rahimi* is characterized by having eggs with lateral cuticular floats, boat-shaped right spicule, bluntly rounded tail tips, in both the sexes and known to have 10-12 prostomal teeth as in *R. charsaddiensis*. Number of teeth is not determined. In *R. schizothoracis*, this nematode is unique among all the known Pakistani species (except *R. cavasius*) in possessing the smallest (0.20-0.30 mm) left spicules (*Siddiqui and Khattak, 1984*). In addition to above cited or other differences if any, the present species is, however, close to *R. charsaddiensis* in the structure of left spicule; nearly to *R. schizothoracis* males body size (4.33-4.66 mm vs 4.2-4.6 of new species), right spicule length (0.073-0.076 vs 0.078-0.083), and in possessing 15 caudal papillae pairs; to *R. helichi* in having 10 anterior teeth, 0.021-0.037 mm vs 0.016-0.037 mm eggs size, 5 pairs postanal papillae, and vulva located a little before the equatorial region.

*R. spatulatum* n. sp. markedly differs from all described species from North America except *R. kisutchi* Margolis *et al.*, 1975; *R. catostomi* Kayton *et al.*, 1979; *R. paxamni*, *R. salmonis* Maggneti *et al.*, 1992; *R. lichtenfelsi* Sanchez Alvarez *et al.*, 1998; *R. mexicana* Caspeta-Mandujano *et al.*, 2000; *R. aheuheullensis* Mejía-Madrid and Pérez-Ponce de Léon, 2003 by having 10 anterior teeth, 0.021-0.037 mm vs 016-0.037 mm eggs size, 5 pairs postanal papillae, and vulva located a little before the equatorial region.

**Table 1.** Morphometric comparison of female Rhabechna species in various fish hosts from Balochistan (Pakistan).

<table>
<thead>
<tr>
<th>Rhabechna species</th>
<th>Fish host / Locality</th>
<th>No. of species</th>
<th>Body size</th>
<th>Distance from anterior end of body</th>
<th>Nerve ring</th>
<th>Distance of Eggs</th>
<th>Vulva posterior length ratio</th>
<th>Excitery pore</th>
<th>Position of Excitery pore</th>
<th>Vulva postoral</th>
<th>Size of egg</th>
<th>Tail length</th>
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A NEW NEMATODE SPECIES

812.04-1738 mm), a longer tail: (male, 0.300-0.390, female, 0.351-450) and numerous caudal papillae pairs (16). *Rhabdochona catostomi* can be distinguished from new species by their male and female body length (8.9-14.3 mm, 15.3-16.7 mm) respectively, esophagus ratio (males=1:10.72-12.90, females= 1:13.25-14.82), shorter spicular ratio 1.361-3.64, eggs morphology (filamentous) and by vulva position. It, however, resembles *R. spatulatum* n. sp. by having 5 pairs postanal papillae, conical caudal end with terminal spine, lacking basal teeth, and by the location of deirids and excretory pore measured from anterior end. *Rhabdochona paxmani* differ from *R. spatulatum* n. sp. females by longer length ((9.8-13.8 mm), less anterior deirids (0.7-0.11 vs 0.041-0.045) and more anterior excretory pore (0.25-0.36 vs 4.1-4.6): the males by smaller prostate (0.018-0.025 vs 0.002-0.004), longer muscular esophagus (0.290-0.41 vs 0.081-0.086), longer left spicule (0.482-0.579 vs 0.345-0.383), and by a well-developed distal barb of right spicules. Instead of these differences, both species resembling in nerve ring location (lying at level of anterior third of muscular esophagus), vulva position (preequatorial), and to some extent in spicular ratio (1:3.8-4.6 vs1: 4.42-4.63). *Rhabdochona salmonis* can be differentiated from *R. spatulatum* n. sp. mainly by feebly developed tip of right spicule has a sharply indented dorsal gorgaret, and usually indistinct in new species. The tail also differ, conical with rounded tip in the former versus tail with sharp spine at distal tip in the later form. In contrast with new species described above, it relates closely in vulva position, character of eggs, placement of nerve ring and excretory pores in both the sexes, and in spicular ratio (1:4.42-4.63 vs1: 4.2-4.6).

*Rhabdochona lichtenfelsi*, *R. mexicana* and *R. aheuheullensis* differs from *R. spatulatum* n. sp. in having lateral amphids and basal teeth. Moreover, *R. spatulatum* n. sp. differs distinctly from them in the form of left spicules’ distal end, tail shape, and character of eggs in addition to some other features. Left spicule of *R. mexicana* is bifurcate distally, with narrow cuticular membrane, almost bifurcate in *R. lichtenfelsi*, being shorter (0.12-0.24) and tricuspid in *R. aheuheullensis* compare to razor-sharp distal end of new species. Tails are conical, with a terminal cuticular point in *R. lichtenfelsi*, bluntly rounded in *R. mexicana* and *R. aheuheullensis*. Eggs of *R. spatulatum* n. sp. thick-walled, in contrast, eggs of the former and later species bear polar filaments, and of *R. mexicana* has irregular flock-like coating. It differs also in the number of preanal papillae (10 vs. 7-8 4-6, 8-11, on each side, respectively), and body lengths (males= 4.2-4.6, females= 5.3-6.1 vs. 6.475-8.525, 9.137-14.875, 4.55-9.23, 8.90-18.13; 3.16-6.36, 2.75-8.92 mm long, respectively). Among above mentioned species, *R. aheuheullensis* resembled *R. spatulatum* n. sp. in the presence of 5 pairs of postanal papillae, preequatorial vulva and excretory pore. *R. lichtenfelsi* close nearly in ratio of right to left spicule length (1:3.78-4.46). Another North American species described from rainbow trout in California: *Rhabdochona californiensis* Maggenti, et al., 1992 also is differ from *R. spatulatum* n. sp. in the number of teeth, which in the former is reportedly 14, by the absence of egg ornamentation, and the tail tip possess spinose mucron. *R. californiensis* also is longer in body size (males= 5.4-8.1 mm; females= 8.72-10.7mm), has a more posterior excretory pore (males= 0.265-0.336, females= 310-380), a longer tail: (male= 0.310-0.430; female= 0.320-0.410) and lower spicular ratio (1:3.3-4.4). *R. californiensis* is, however, come closest to *R. spatulatum* n. sp nearly in eggs size (0.03-0.037), in having excretory pore anterior to mid-body region, and nerve ring at level 1/3 of muscular esophagus.

Species of *Rhabdochona* form world other regions strongly differ from *R. spatulatum* n. sp. by having caudal projections on the tail tip arranged in a crown-like appendage either in females or both the sexes: those harbour these structures on tail tip of both sexes include *R. ovifilamenta* Weller, 1938 from the perch, *Perca fluviatilis* from Michigan, USA; *R. equispiculata* Moravec and Scholz, 1991 from the fish, *Hampala macrolepidota* and *H. dispersion* in Vietnam; *R. Kurdistanensis* Moravec et al., 2012a from *Luciobarbus kersin* in Iraq; and *R. thaiensis* Moravec and Yooeyn, 2011a from *Mystacoleucus marginatus* in Thailand, whereas in *R. barusi* Majumdar and De, 1971 from *Barilius* sp. in India; *R. onychostiomi* and *R. brevichona* Guittan et al., 1994 from the hosts *Onychostoma simum* and *Rectoris luxiensis* respectively in China; *R. chodukini* Osmanov, 1957 from *Luciobarbus brachycephalus* and *L. capito* in Tajzhikistan; *R. tricuspidata* Moravec and Jirk, 2014 from *Raiamas christyi* in the Central African Republic caudal projections are found on the tail only of females. Other differences these species have with *R. spatulatum* n. sp. are the right spicules of different shape, large, deeply bifurate deirids, almost with three prongs in *R. tricuspidata* (vs. slightly bifurate deirids of new species), variable number of preanal papillae (9, 15, 12, 11, 8, 8, 8 respectively vs. 10 ), and less prostomal teeth in exception to *R. barusi* (possess probably 12 teeth). Right spicule of *R. ovifilamenta* is scooped-shaped, barbed with blunt distal tip, elongate, narrow, with pointed distal tip in *R. equispiculata*, bent ventrally and pointed at base in *R. chudokini*, short and tapering in *R. barusi*, thick and short in *R. onychostiomi*, curved dorsally bear blunt distal tip. In *R. Brevichona*, and in *R. thaiensis* and *R. tricuspidata* it is boat-shaped without dorsal barb at distal


REFERENCES


