



Research Article

New Species of the Genus *Contracaecum* (Railliet and Henry, 1912) from Catfish *Wallago attu* of Indus River, Sindh, Pakistan

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Abstract | A new species *Contracaecum malhi* collected from catfish *Wallago attu* Bloch and Schneider, 1801 of Indus river of Sindh, Pakistan. Totally, 41 specimens of host were collected. The host specimens were dissected longitudinally, viscera put into petri dishes for examination of nematodes and were process through standard method of temporary slide. A new species, *Contracaecum malhi*, were identified in having differential diagnostic characters such as body shape and size, shape of cephalic end and its structures, ventricular shape, spicule shape and size, numbers and arrangement of caudal papillae, posterior end with 3 rectal gland and large spine at tip, genital structure of female. The name of new species *Contracaecum malhi* refers to the name of host *wallago attu* from which the specimens of new species were collected.

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Introduction

The genus *Contracaecum* was first reported by Railliet and Henry, 1912. Parasitic nematodes were found in intestine, stomach and esophagus of fishes as intermediate host and piscivorous birds and mammals as definitive host. These parasitic nematodes affect fishes which will eventually affect humans. In the first case, some parasites affect only fishes making them unsuitable for human consumption as food or diminishing the size of the fish, being unattractive for commercial purpose. In the second case, parasites present in fishes can affect human cause provoking diseases even death. Parasites as host of fishes live internally as endoparasite or externally as ectoparasites exerts some harmful influence on the basic phenomena of life of their hosts, abundance, distribution, metabolic performance, nutritional

requirements, growth, reproduction, evolution as well as organism tolerances to natural and man-made environmental stress (Kinne, 1980). Fish as source of food, it is imported to control infections cause by nematodes by improve research in the field of parasitology. The study on helminths and especially parasitic nematodes of catfishes are limited Ahmad *et al.* (2014), Ayaz *et al.* (2013), Khanum *et al.* (2008), Kakar and Bilqees (2008), Shakir and Khan (2006), Soofi *et al.* (2015, 2016a, b, c, d, e, 2017). There are few species of *Contracaecum* reported from Pakistan. Type species of genus is *Contracaecum microcephalum* Rudolphi (1809). Species of *Contracaecum* reported from world are *C. andersoni* Vevers (1923), *C. bodenheimeri* Witenberg (1929), *C. haliaeti* Baylis and Daubney (1923), *C. matweijewi* Layman and Mudretsova (1926), *C. micropapillatum* Stossich (1890), *C. milviensis* Karokhin (1937), *C. ovale*

Linstow (1907), *C. paxdioni* Sobolev and Sudarikov (1939), *C. praestriatum* Monning (1923), *C. rudolphi* Amato *et al.* (2006), *C. septentrionale* Kreis, (1955), *C. travassansi* Gutierrez (1943), *C. variegatum* Rudolphi (1809), *C. yamaguti* Mawson (1956), *C. aduncum* Rud (1802) *C. engonium* Baylis and Daubney (1923), *C. pelagicum* Silva *et al.* (2005), *C. carliselei* Ortlepp (1938), Barson and Marshall (2004), *C. tricuspis* Barson and Marshall (2004).

The aims of present Study are to identify new species of parasites so prevent the fish loss and transmission of infection cause by those parasites.

Materials and Methods

Totally 41 host catfish *Wallago attu* of Indus river, Sindh, Pakistan collected and transferred to Parasitology Laboratory Department of Zoology, University of Sindh, Jamshoro, Pakistan. Hosts were dissected longitudinally, visceral organ separated into petri dishes contained distil water for examination of nematodes under stereo dissecting microscope. 78 (22 ♂ and 55 ♀) specimens collected from 41 hosts fishes. Live nematodes killed in hot 70% ethanol, cleared in lacto-phenol and glycerol solutions and preserved in alcohol-glycerol solution. Diagrams were made with the help of Camera Lucida. Photographs taken with Camera Olympus DP12. Measurements are given in millimeter (mm). Specimens are deposited in the Department of Zoology, University of Sindh, Jamshoro, Pakistan.

Result and Discussion

Taxonomic summary

Family: Anisakidae Skrjabin and Karokin (1945)

Genus: *Contracaecum* Railliet and Henry (1912)

Species: *Contracaecum malhi* n. sp.

Host: *Wallago attu*

Site of infection: Intestine

Locality: River Indus at Jamshoro, Sindh, Pakistan

Number of specimens: 78 (22 ♂ and 55 ♀) from 41 hosts

Etymology: The name of new species *Contracaecum malhi* refers to the common name of host fish *Wallago attu* from which specimens were collected.

Description: (Figures 1 and 2)

General: Body of worm thick, straight, brownish in color. Anterior end of body narrow in female and

wider in male, narrow pointed posteriorly. Widest at pre-equatorial region in male and post-equatorial region in female. Body is covered with thick and striated cuticle throughout the length. Cephalic end contains 3 lips of unequal size and triangular in shape, 3 interlabia wider at half level of lips, dorsal lip pointed triangular in shape well developed. Esophagus broad muscular in male and narrow in female, esophagus end with broad ventriculus followed by conical shape ventriculus appendix. Intestinal caecum start at just behind the esophagus and intestine reach at posterior end of body. Two elongate spicule tube in shape, unequal in size, large spicule wider anteriorly and narrow posteriorly, small spicule narrow posteriorly and wider anteriorly. Posterior end of male narrow and pointed tail along with thick spine at the tip, 3 rectal glands present at the base of spicules and 9-10 pairs of caudal papillae hardly visible. Anus at posterior region near the tail. Female posterior end narrow, thick along with spine at tip of tail. Genital opening at middle of body, both vulvar lips with rounded ends, uterus fill with different shape of eggs.

Female: Body of the female measures 19.49-28.9 X 0.19-0.87 in size. Esophagus measures 4.30-5.94. Ventriculus measures 0.7-0.23. Ventriculus appendix measures 2.17-2.38. Genital pore distance from anterior end measures 9.22-13.17. Eggs measures 0.04-0.09 X 0.03-0.07. Tail measures 1.42-1.98 mm in size.

Male: Body of the male measures 13.13-15.19 X 0.17-0.22 in size. Esophagus measures 3.16-3.36. Ventriculus measures 0.6-0.19. Ventriculus appendix measures 1.19-1.47. Large spicule 3.7-3.85 and small spicule measures 2.47-3.19. Cloaca from posterior end measures 1.19-1.75. Tail measures 1.62-1.89 mm in size.

Remarks: New species *Contracaecum malhi* compare (Table 1) with other species of genus *Contracaecum* shows morphometric differential diagnostic characteristics.

C. spiculigerum Rudolphi (1809) collected from intestine of *Pelecrocara* species differs from present species in having larger in length; esophagus with reduce ventriculus; male with caudal papillae including 3-4 pairs of post-anal and numerous pre-anal; spicules equal in size; vulva pre-equatorial.

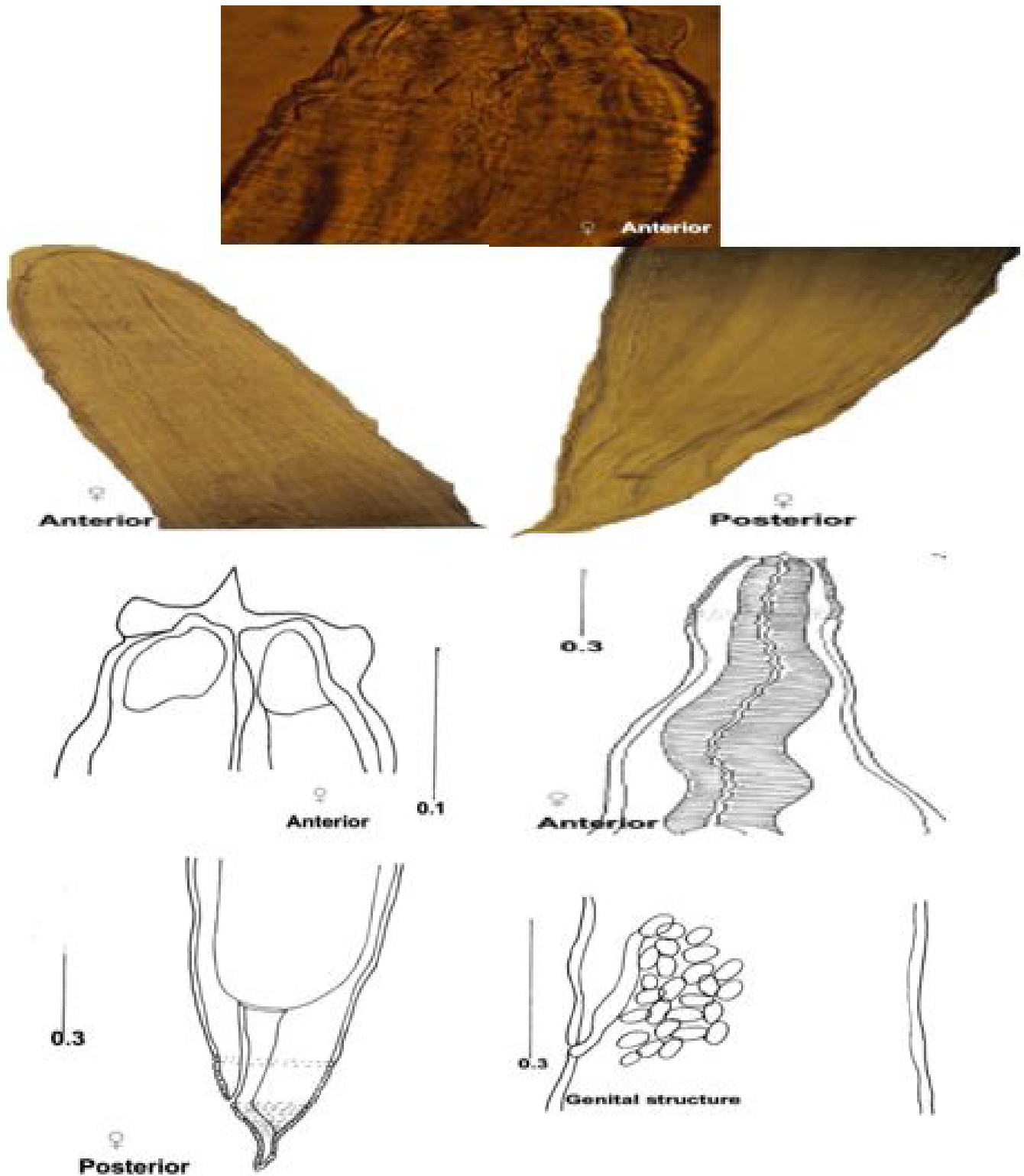


Figure 1: *Contracaecum malhi* n.sp. Female worm anterior, posterior and genital structure Photographs and Diagrams. Scale bar: Anterior 0.1 mm and 0.3 mm, Posterior and genital structure 0.3mm.

C. margolisi [Mattiucci et al. \(2003\)](#) collected from stomach of *Zalophus californianus* and *Arctocephalus pusillus* of New Zealand, Argentina, south Africa differs from present species in having only male specimens; larger in length; lips with antero-median rounded notch and antero-lateral auricles with lateral rounded knob, dentigerous ridges present; dorsal lip

with 2 pairs of lateral papillae and each sub-ventral lips with 1 large pair of papillae with 1 extero-lateral papilla; nerve ring, derides and amphids present; 8 pairs of caudal papillae; tail conical in shape.

C. pelagicum [Silva et al. \(2005\)](#) collected from intestine of *Sula leucogaster*, *Diamedea melanophris* and

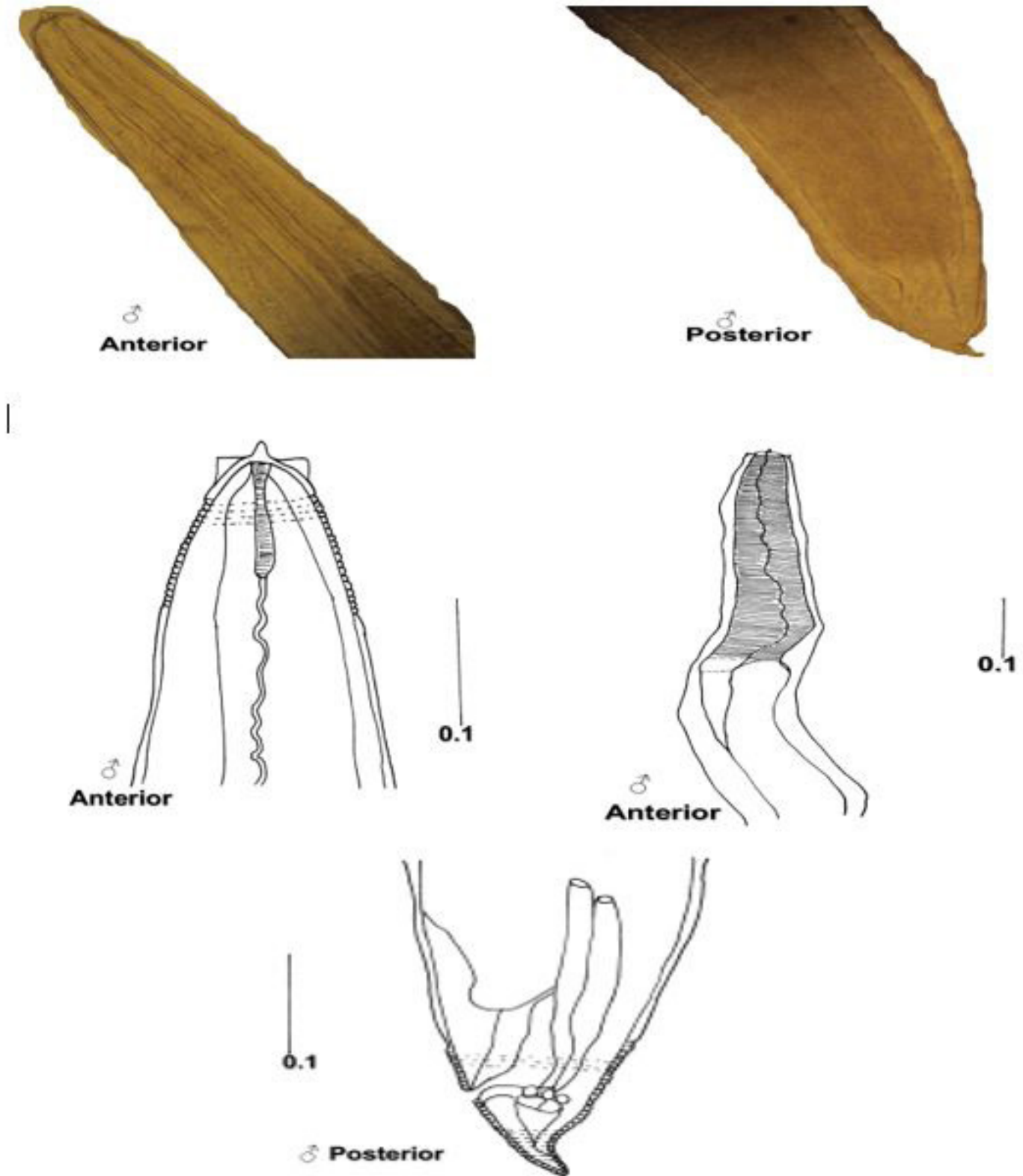


Figure 2: *Contracaecum malhi* n.sp. Male worm anterior and posterior Photographs and Diagrams. Scale bar: Anterior 0.1 mm and Posterior 0.1mm.

Spheniscus magellanicus of Brazil differs from present species in having male larger in length and female smaller in length; ventriculus reduce; nerve ring present; spicules equal in size; 7 pairs of postanal and numerous preanal papillae; tail conical in shape.

C. microcephalum Barson and Marshall (2004) collected from intestine and stomach of various fish eating birds of Europe, Asia, Africa, America and Zimbabwe differs from present species in having lips hexagonal to rounded in shape, lips form two lobes anteriorly which further divide into small lobules and

Table 1: Comparison of previously recorded species of genus *Contraaacuum* with *Contraaacuum malhi* n.sp.

Species	<i>Contraaacuum malhi</i> n.sp. <i>C. pelagicum</i> Silva et al. (2005)		<i>C. margarisi</i> Martucci, 2003		<i>C. rudolphi</i> Barson and Marshall (2004)		<i>C. microcephalum</i> Barson and Marshall (2004)		<i>C. septentrionale</i> Kreis (1955)	
Host	Wallago attu		Magellanic penguins		Zalophus californianus, Arctocephalus pusillus		various fish eating birds		Phalacrocorax aristotelis	
Locality	Pakistan		Brazil		New Zealand, Argentina, south Africa		Europe, and Asia		Iceland	
Gender	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Body length	13.13-15.19	19.49-28.9	18.8-32.7	11.3-23	12.10-33.90	10.10-57.60	13.10-36.92	12.37-37.20	31.6-38.0	39-45
Greatest width	0.17-0.22	0.19-0.87	0.7-1	0.3-0.7	0.24-0.95	0.29-1.51	0.27-0.70	0.27-0.85	0.88-1.24	1.30-1.89
Esophagus	3.16-3.36	4.30-5.94	2.4-3.6	1.6-2.8	2.03-4.26	1.62-5.48	1.69-4.10	1.85-4.33		
Ventriculus	0.6-0.19	0.7-0.23	0.7-0.9	0.5-0.7	0.58-1.37	0.62-1.58	0.66-1.18	0.70-1.24	0.168-0.210	0.189-0.378
Ventriculus appendix	1.19-1.47	2.17-2.38	0.7-0.9	0.5-0.7	1.49				0.75-1.02	1.00-1.13
Large spicule	3.7-3.85		3.3-4.9	6.30	4.46-9.98		1.41-3.65		12.57-15.16	
Small spicule	2.47-3.19		3.3-4.9	6.16	4.05-9.19		1.40-3.50		12.57-15.16	
Cloaca from Posterior end	1.19-1.75		0.1-0.2		0.14-0.24		0.17-0.30		12.57-15-16	
Genital pore distance from anterior end		9.22-13.17		3.9-8.5		5.12-17.70		5.26-12.10		
Egg		0.04-0.09 X 0.03-0.07				0.059-0.073 X 0.041-0.059		0.057-0.068 X 0.041-0.050		
Tail	1.62-1.89	1.42-1.98							1.21-1.66	0.9-0.95

finger like medial lobes; interlabia with bifurcated tip; posterior end of male conical with pointed tip; 20-30 pairs of caudal papillae; spicules with alae; eggs oval to spherical in shape.

C. rudolphi Barson and Marshall (2004) collected from intestine and stomach of various fish eating birds of Europe, and Asia differs from present species in having; lips wider than longer, lip pulp anteriorly form two lobes each divide into lateral lobules and medial lobules; interlabia with bifurcated tips; posterior end of male with rounded tip; 27-47 pairs of caudal papillae; spicules with alae; eggs oval to spherical in shape.

C. carlislei Barson and Marshall (2004) collected from intestine and stomach of fish eating birds of Zimbabwe differs from present species in having bilobed lips rectangular in shape; large curved interlabia; dorsal lip with pair of papillae, each sub-ventral lips with a pair and single papillae; 26-41 pairs of caudal papillae.

C. tricuspis Barson and Marshall (2004) collected from intestine and stomach of fish eating birds of Zimbabwe differs from present species in having lateral surface of lips notched with a point in which interlabia fit; dorsal lip with pair of papillae and each sub-ventral lips with a pair; 55-48 pairs of caudal papillae.

C. adersoni Vevers (1923) collected from intestine of *Podiceps ruficellis* and *Phalacrocorax pygmaeus* of Asia and America differs from present species in having larger in length; lips hexagonal, each bear a pair of papillae; interlabia triangular; nerve ring present at anterior end of body; 20-45 pairs of caudal papillae; spicules equal in size and with pointed distal end; female tail conical in shape; vulva pre-equatorial; eggs oval in shape.

C. bodenhemeri Witenberg (1929) collected from intestine of *Procellaria diomedea* of Africa differs from present species in having only female specimens; cuticle form collar consisting of narrow folding; mouth dome shape; dorsal lip bear oval pair of papillae and each lateroventral lip bear a papilla; two conical teeth at inner surface of each lip; interlabia conical in shape.

C. haiaeti Baylis and Daubney (1923) collected from intestine of *Haliaetus leucorhynchus* of Asia and north America differs from present species in having only

female specimens; larger in length; lips hexagonal with two very prominent ear like projections; tail conical covered with bosses.

C. matwejewi Layman and Mudretsova (1926) collected from stomach and intestine of *Sterna paradise* of the Burnets sea of Asia differs from present species in having larger in length; dorsal lip rounded with two papillae; lip pulp form four processes; tail with conical tip and armed with spines; spicules same size; eggs spherical in shape.

C. micropapillatum Stossich (1890) collected from intestine and stomach of various fish eating birds of Europe, Asia, Africa, Australia and north America differs from present species in having lip pulp form two parts, each further divided into lateral lobe and a finger like small lobules; interlabia with bifurcated tips; 29-50 pairs of caudal papillae; spicules with alae; female tail with phasmid.

C. milviensis Karokhin (1937) collected from intestine and stomach of *Haliaetus albicitta* of Asia differs from present species in having lips hexagonal with rounded tips; dorsal lip with two large papillae and each Lateroventral lips with a pair of papillae; interlabia with bifurcated tips; 45 pairs of caudal papillae; spicules with alae; female end with phasmid.

C. ovale Linstow (1907) collected from intestine and stomach of various fish eating birds of Europe, Asia, Africa, Australia, central and south America differs from present species in having larger in length; lip pulp with two rounded lobes; 27-44 pairs of caudal papillae; male posterior end with rounded tip; spicules with alae; female posterior end with phasmid; eggs oval in shape.

C. paxdioni Sobolev and Sudarikov (1939) collected from intestine and stomach of *Pandion haliaetus* of Europe and Asia differs from present species in having dorsal lip with straight anterior margin bear two rounded projections at inner side of lip, bear a pair of papillae; each lateroventral lips bear one large papillae; lip pulp divided into lobules; cervical papillae present; 49 pairs of caudal papillae; spicules with wider proximal end; eggs covered with bosses.

C. praestriatum Monning (1923) collected from *Podiceps nigricollis*, and *Podiceps cepensis* of Europe and Asia differs from present species in having lips thick,

wider, unequal in size; dorsal lip with a pair of papillae and each lateroventral lips with a pair of papillae; 22 pairs of caudal papillae; spicules equal in size with alae; small gubernaculum.

C. septentrionale Kreis (1955) collected from stomach of *Phalacrocorax aristotelis* of Iceland differs from present species in having larger in length; each sub-lateral lips bear a papilla; Lip pulp divide into narrow basal part; dorsal lip with conical processes; interlabia conical in male and elongate in female; spicules covered with fine striated membrane; 30-43 pairs of caudal papillae; vulva preequatorial, vagina bifurcating into two uterine branches.

C. travassnsi Gutierrez (1943) collected from intestine and stomach of *Phalacrocorax carbo* of Europe, south and north America differs from present species in having larger in length; spicules straight; 36 pairs of caudal papillae; nerve ring present in female; vulva with two branches of uterus.

C. variegatum Rudolphi (1809) collected from intestine and stomach of various fish eating birds of Europe, Asia, Australia, central America differs from present species in having hexagonal lips; lip pulp contain two small lobes, each bear a small finger like process; interlabia with bifurcated tips; 29-55 pairs of caudal papillae; spicules with alae.

Conclusions and Recommendations

New species *Contraecaecum malhi* differs from other congeners species of genus *Contraecaecum* Railliet and Henry (1912) in having body shape and large size, shape of cephalic end and its structure's, ventriculus shape, spicule shape and size, numbers and arrangement of caudal papillae, posterior end with 3 rectal gland and large spine at tip, genital structure of female. On the basis of differential characteristics new species proposed.

Our present study has great contribution to scientific world and this taxonomic method of study use to identify new parasitic species to prevent the fish loss and transmission of infection by those parasites.

Novelty Statement

This study has great contribution to scientific world. It is use to identify new parasitic species to prevent

the fish industry loss and transmission of infection by those parasitic species.

Author's Contribution

Hira Soofi: Main primary author who conduct the study by collection of host, perform practical research work, identification, writing of article.

Abdul Rasool Abbasi: Supervise in identification and collection of host.

Arifa Bhutto: Supervise in writing of article.

Conflict of interest

The authors have declared no conflict of interest.

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