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DESCRIPTION OF A NEW SPECIES OF THE LEECH FAMILY SALIFIDAE (*ODONTOBDELLA KRISHNA* SP. NOV.) FROM THE RIVER GANGA AT PATNA, BIHAR (INDIA)

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INTRODUCTION

The first discovery of large-sized erpobdelliform leeches in the River Ganga in May 2010 has filled a gap within the South-Asian diversity and lead to the following description of a species new to science.

Leeches of the Family Salifidae are benthic predators in freshwaters of Africa, Asia and Australia in tropical, subtropical to warm-temperate zones. Salifidae are forming together with the Holarctic family Erpobdellidae the suborder Erpobdelliformes, having asymmetrically so-called "strepsilaemat" pharynx without true jaws; three pseudognatha are present as small fleshy folds. Salifidae are formally characterized by the presence of three pairs of needle shaped stylets, which distinguish them from their sister group Erpobdellidae (Johansson, 1918). Both families are generally occupying similar ecological niches. The larger species usually reach a body length of > 10-15 cm or more with full extension and they feed on other earthworm-like annelids, insect larvae and even other leeches. Recent works of the Indian Hirudinologists are including all hitherto known aquatic and terrestrial species (Chandra 1983, Mandal 2004a-d, 2009, Bandyopadhyay & Mandal 2004). Till yet any large Erpobdelliformes were unknown from India, but already described from Eastern China (Yang, 1996).

Brief Review of the Family Salifidae

The family Salifidae is comparatively poorly known, generic subdivision appears to be provisional as in Erpobdellidae (Sket & Trontelj, 2008). Although the numerous taxa have been formally described, many of them are insufficiently known only from the type locality or a few records (Moore 1927, Chandra 1983). At present seven genera with 31 described species and one subspecies (Tab. 1) are worldwide regarded as members of Salifidae (Soós 1966, Sawyer 1986). The uncertain systematic position of two genera *Scaptobdella* and *Dineta* still awaits clarification, since no stylets have been reported by their discovery (Blanchard 1897, Goddard 1908, Oka 1926). Salifidae of the Oriental Region are listed by Sket & Trontelj (2008) with three genera and nine species.

The anatomy of the pharynx and the arrangement of stylets is an important character to distinguish different genera, which have similar external morphology (Hussein, Kinzelbach & El-Shimy 1988). The pharynx, external annulation and genital system of East and South Asian Salifidae were studied (Nesemann 1995, Nesemann, Sharma & Sinha 2004, Nesemann *et al.*, 2007). revealing higher diversity than previously known.

Thorough fieldwork was conducted in Nepal, Japan and India to discover and investigate living leeches and to characterize their habitat specification. Thus Salifidae appear to be as highly diversified as Palearctic Erpobdellidae. Numerous regional species within the large territory of the family still await their discovery and scientific description.

MATERIAL AND METHODS

The leech fauna of the River Ganga was investigated frequently along the right bank in the city of Patna.

Keywords : Odontobdella, Salifidae, Hirudinea, India, first description, morphology, taxonomy.

Samples were collected qualitatively by hand or using a hand net. Stones, bricks, shells of living molluscs and valves of empty freshwater mussels were investigated; especially the subsurface near the bottom. During lean season many predatory leeches were found in shallow water in aquatic habitats or amphibious in the littoral zone of riverbank directly above the water's edge. Three specimens were usually relaxed in 15% ethanol and then transferred into 70% ethanol for preservation. One specimen was directly preserved into 96% ethanol for biochemical analysis.

STUDY AREA

The study area is the right (erosion-) bank of River Ganga along the city of Patna. It is located from Mahendrughat in the West (25° 37′ 19′′ N, 85° 09′ 18′′ E) downstream to the Ruins of the Old Royal palace in the East (25° 37′ 07′′ N, 85° 11 18′′ E. The research was conducted from May 30th to 22nd August 2011 including frequent field observations.

SYSTEMATIC ACCOUNTS

Phylum ANNELIDA

Class HIRUDINEA

Order ARHYNCHOBDELLIDA

Suborder ERPOBDELLIFORMES

Family SALIFIDAE

Genus ***Odontobdella*** Oka, 1926

Species ***krishna*** sp. nov.

Results :

Odontobdella krishna sp. nov.
(Figs. 1-13)

Material Examined : *Holotype* (Figs. 9, 11) : India, Bihar, Patna, River Ganga, between Krishnaghat and Gandhighat, 1-vi-2010, leg. Gopal Sharma and Hasko Nesemann (Reg. no. ZSI, GPRC IV-3018, 1 ex.).

Paratypes (Fig. 10) : India, Bihar, Patna, River Ganga, between Krishnaghat and Gandhighat, 1-vi-2010, leg. Gopal Sharma and Hasko Nesemann, (Reg. no. ZSI, GPRC IV-3019, 3exs.).

Additional material : River Gandak flooplain, monsoon pond at the right bank Shanti Bagicha, west of Hajipur (25° 42′ 7.56′′ N, 85° 11′ 12.07′′ E), 22-viii-2011, leg. Gopal Sharma and Hasko Nesemann, (Reg. no. ZSI, GPRC IV-3020, 1 ex.).

Type locality (Fig. 14) : India, Bihar, River Ganga at Patna, right bank, between Krishnaghat and Gandhighat, alt.-53 m. (25° 37′ 19′′ N, 85° 09′ 18" E).

Etymology : *Krishna* for occurrence from Krishnaghat which is famous place for bathing and other religious activities. It refers to the name of Lord Krishna.

Diagnosis : Large, much elongate Salifidae with very firm body consistence. Leech cylindrical interiorly; blunt lateral fringes located in posterior region. Eyes are lacking. The pharynx is strepsilaemat and triangular in cross-section, bearing three small (? probably reduced) stylets-pockets with each one pair of rudimentary styli present in pharynx, arranged in tandem.

Body length of holotype : 77 mm length and 6 mm width; diameter of caudal sucker 5 mm. Three Paratypes : 76 mm length, 7 mm width; diameter of the caudal sucker 4.5 mm, 67 mm length, 7 mm width; diameter of the caudal sucker 5 mm, 53.0 mm length, 9.0 mm width; diameter of the caudal sucker 5.0 mm. Annulation of the mid-body somites is heteronomous with six annuli, five of similar width, one ring is narrower than others: b1 H" b2 H" a2 = b5 = c11 > c12. Thus there are five wide rings, followed by one narrow ring on the anterior part of the body. The total number of annuli per segment increases by subdivision of all wider rings in the posterior region of the body. There are eleven annuli present on the dorsal side: [c1 H" c2] = [c3 H" c4] = [b3 H" b4] = [c9 H" c10] = [d21 H" d22] > c12. The clitellum's is not well marked in mature specimens, extending from × b5 – XIII a2. The male genital pore is very large and prominently swollen, situated median on the first annulus of XII b1; female pore in XII c12/ XIII b1. The distance between the genital pores is five and one half annuli (1/2 b1, b2, a2, b5, c11, c12).

The body surface is rough by numerous small papillae arranged in one row per annulus. Colour of dorsum yellow-brown, with numerous irregular dark brown spots on the anterior body. Colour of ventral surface.

Habitat and distribution : The adults of *Odontobdella krishna* sp.n. were found in the semi-aquatic zones of the riverbank very closed to the waterline outside the water.

Morphological observations : The living extended leeches reach a total length of 12-14 cm. The half-grown specimen from the River Gandak North of Patna has 46.0 mm length, 4.5 mm width and the diameter of caudal sucker is 3.5 mm. It was found in a shallow monsoon pond, swimming between submerged macrophytes.

The cocoons are rather flattened and rounded ovate in shape, length 13 mm, width 6.7 mm. They are fixed on stony substrate during the pre-monsoon period together with the leeches. They have been already

found, being erroneously added to *Salifa biharensis* by Nesemann *et al.* (2004 : 180, Figs. 162, 163).

Prey : *Odontobdella krishna* sp. nov. was observed while feeding on half-grown specimens of *Glyphidrilus gangeticus* in the natural habitat.

Differential diagnosis : The described new Indian leeches are more similar to *Odontobdella* species from Japan than to *Sinodontobdella* from China. Thus their generic position into *Odontobdella* is confirmed by their pharynx. *Odontobdella krishna* sp. nov. is distinguished from *Odontobdella blanchardi* and *Odontobdella polaneci* by their reduced and rudimentary stylets of minute size. Although the stylet-pockets are well visible, the function of styli in holding the prey is questionable due to their reduced size. *Odontobdella krishna* sp. nov. differs from other species by the lower degree of annulations in subdividing each segment into only six rings. It differs from other pigmented *Odontobdella* species by the absence of eyes. It shows some similarities to *Odontobdella quadrioculata* Oka, 1921 from Myanmar.

Discussion :

Classification of the species within Salifidae

Among the heteronomous annulated members two similar genera with five described species are named :

Odontobdella Oka 1926, Annotationes Zoologicae Japonenses, Vol. X, Article 24 : 248, Figs 8-13, 15.

Type species : *Scaptobdella blanchardi* Oka 1910

Congenitors : *Trocheta quadrioculata* Oka 1922

Odontobdella polaneci Nesemann 1995

Odontobdella krishna sp. nov.

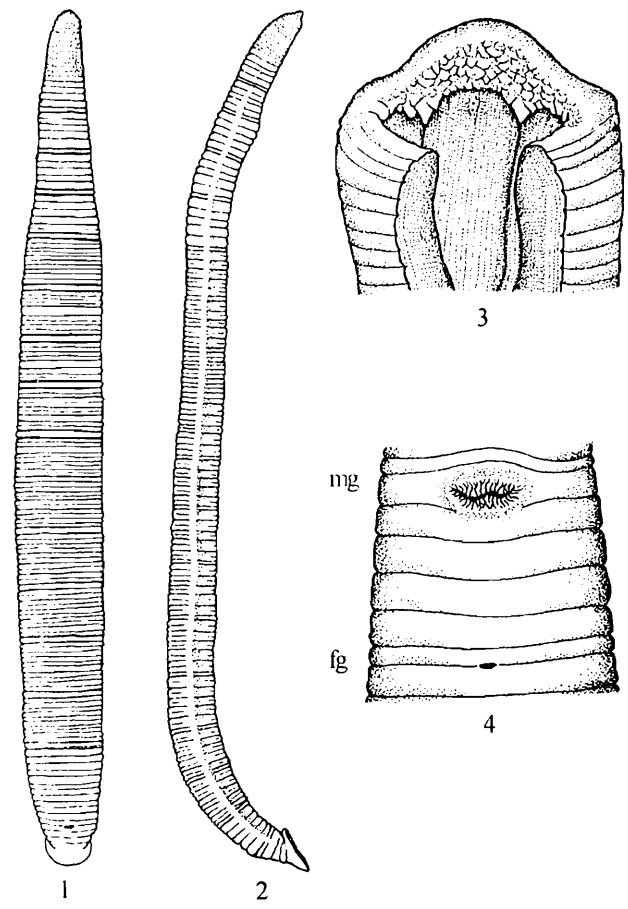
Odontobdella spec.

1995. *Sinobdella* Nesemann, *Acta Zoologica Academiae Scientarum Hungaricae*, **41** : 180, Figs 52-58, 62.

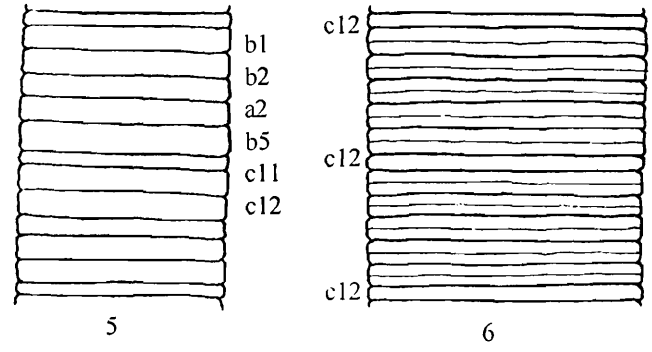
2007. *Sinodontobdella* Nesemann, *Aquatic Invertebrates of the Ganga River System*, Vol. **1** : 196, 5 Figures.

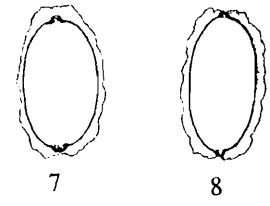
Type species : *Sinobdella kinzelbachi* Nesemann 1995.

Odontobdella was originally described for *Scaptobdella blanchardi* from Japan by Oka (1926) to differentiate leeches with stylets-bearing pharynx from *Mimobdella japonica* which stylets are lacking. The genus *Odontobdella* has been regarded for long times as monotypic by Soós (1966) and Sawyer (1986) unless one further species *Odontobdella polaneci* could be discovered and described. The re-examination of *Odontobdella blanchardi* was based on author's collections of topotypic material from the 'terra typica'



Figs. 1-4. *Odontobdella krishna* nov. sp. Fig. 1 : Habitus dorsal, Fig. 2 : lateral, Fig. 3 : Pharynx with pseudognaths and stylets, Fig. 4 : ventral position of male genital pore (mg) and female pore (fg).





Figs. 5-8. *Odontobdella krishna* nov. sp. Fig. 5 : annulation type of the anterior body, Fig. 6 : annulation type of posterior body, Fig. 7, 8 : Cocoons.

(Nesemann 1995). Although four Japanese islands are mentioned in the original description, Hondô (= Honshu) is the type locality as per subsequent designation because of its first position (Oka 1910).

The Chinese leeches differ markedly in the arrangement and position of stylets from their Japanese allies, that they were removed from *Odontobdella* and placed into a separate genus *Sinodontobdella* Nesemann (2007). This new leech name was given to replace the *Sinobdella* Nesemann, 1995, which has been found pre-occupied by *Sinobdella* Kottelat & Lim, 1994, for a fish (Teleostei : Chaudhuriidae).

Beside the nomenclatural history of the East-Asian Salifidae, the papers of Oka (1910, 1922, 1926) arises several questions about the systematic unity of the Japanese leeches studied by himself. In the original description of *Scaptobdella blanchardi* Oka 1910, the leeches were distinguished by their annulations scheme from *Mimobdella japonica* Blanchard, 1897. Oka (1910) has included four different coloured forms into *blanchardi*, namely white bluish, brownish, dark reddish to nearly black dorsal side from a wide geographical range including Honshu, Shikoku, Kyushu and Okinawa. Later Oka (1926 : 231, Fig. 15) described the presence of 'three to six' large stylets in the pharynx. In the figure one single stylet is shown and arranged in caudal direction. Thus the number of stylets might be incompletely counted since three pairs are generally found in Salifidae. The stylet-position in Oka's figure shows great affinities with findings of Nesemann (1995 : 182, Fig. 62) and Yang (1996: 201, Fig. 115d). It is most likely that Oka's first observations were based on an assemblage of *Odontobdella* and probably *Sinodontobdella*, which have been distinguished later by paying attention to the position and arrangement of the pharyngeal stylets.

New generic position of two East-Asian Salifidae

The presence of two accessory copulatory pores is an external feature of genus *Barbronia* Johansson (1918) or family Barbronidae according to few author's view (El-Shimy, 1998). Therefore two species of the Chinese fauna are being preliminary transferred into genus *Salifa* Blanchard (1897) because the authors (Yang 1996, Yang, Wang & Zhang 1997) do not mention any accessory pores (Table-1).

SUMMARY

A new predatory leech *Odontobdella krishna* sp. nov. is described from the River Ganga and Gandak at Patna. It differs from other hitherto known Salifidae in South-Asia by the large size. The amphibious species has no eyes in adults; the segments are subdivided into six to eleven unequal annuli. Five rings separate the genital pores. The pharynx bears three pairs of minute stylets. The new leech shares many characters with the Japanese *Odontobdella* species and differs markedly from the Chinese allies, e.g. *Sinodontobdella kinzelbachi*. The discovery of *Odontobdella krishna* sp. nov. fills a gap within the radiation of Salifidae.

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REFERENCES

Bandyopadhyay, P.K. & C.K. Mandal 2005. The occurrence of five leeches *Barbronia weberi*, *Glossiphonia annandalei*, *Glossiphonia heteroclita*, *Glossiphonia reticulata* and *Placobdella undulata* in West Bengal, India. *Rec. zool. Surv. India,* **105** (Part 3-4) : 93-101.

Blanchard, R. 1897a. Hirudinées des Indes Néederlandaises. *Zoologische Ergebnisse der Reise in Niederländisch-Ostindien*, **4** : 332-355.

Blanchard, R. 1897b. Hirudineen Ost-Afrikas. Berlin, *Die Thierwelt Ost Afrikas*, **4** : 1-8, pl. I.

Chandra, M. 1983. A check-list of leeches of India. *Rec. zool. Surv. India,* **80** : 265-290.

El-Shimy, N.A. 1996. Revision of the genus *Barbronia* Johansson, 1918 (Hirudinea : Erpobdelliformes : Barbronidae) in Egypt.–Zoology in the Middle East, **12** : 99-104.

Grosser, C. and P. Trontelj 2008. On the taxonomic status of *Barbronia wuttkei* (Kutschera, 2004) n. comb.–a leech species (Hirudinea : Salifidae) from a German aquarium. *Lauterbornia,* **65** : 69-75.

Table-1 : List of leech species of Erpobdelliformes (former Erpobdellidae sensu Soós, 1966), which are preliminary added to Salifidae (Sawyer, 1986) with three new combinations. Taxa of uncertain position are marked with asterisk. The Number of pairs of eyes is indicating : 1 labial pair + number of the buccal pairs + number of the lateral pairs).

Sl. No.	Taxon	Author(s) and Year of Description	Description	Measurements of Asian Species (L. × W. in mm)	Number of pair of eyes
1.	*Salifa perspicax*	Blanchard, 1897	Africa	48 × 4	1 + 6
2.	**Salifa cambouei*	Blanchard, 1897	Madagascar, Reunion	–	–
3.	*Salifa lateroculata*	(Kaburaki, 1921)	Asia, SE to Bali	14 × 3	1 + 4 (–5)
4.	*Salifa indica*	(Kaburaki, 1921)	NW-India	45 × 4	1 + 5
5.	*Salifa heptamerata*	(Kaburaki, 1921)	South-India	40 × 5	1
6.	*Salifa africana*	(Moore, 1939)	Africa, Central to South	33.3 × 6.8	1 (minute)
7.	*Salifa elongata*	Moore, 1939	Africa, Central to North	75 × 2.9	Not visible
8.	*Salifa delicata*	(Moore, 1939)	Africa, Tanganyika Lake	14.3 × 1.6	1
9.	*Salifa johanssonia*	Sawyer, 1986	Africa, White Nile	18 × 3.5	1 + 8
10.	*Salifa hainana*	Yang, 1996	China	24 × 3.5	1 + 3 (-5)
11.	*Salifa zhejiangica* nov. comb.	(Yang, 1996)	China	45 × 5	1 + 2 (small)
12.	*Salifa yunnanensis* nov. comb.	(Yang, Wang & Zhang, 1997)	China	42 × 5.5	1 + 2 (small)
13.	*Salifa biharensis*	Nesemann, Sharma & Sinha, 2004	North-India: Bihar	50 × 5	1 + 2
14.	*Linta be*	Westergren & Siddall, 2004	Madagascar	35	1 + 4
15.	*Barbronia weberi*	(Blanchard, 1897)	Asia to New Zealand	31 × 1.9	1 + 2
16.	*Barbronia rouxi*	Johansson, 1918	New Caledonia, New Guinea	–	1 + 2
17.	*Barbronia weberi formosana*	(Oka, 1929)	Japan, Taiwan	33	1 + (1-2)
18.	*Barbronia arcana*	(Richardson, 1970)	Australia	–	1 + 2
19.	*Barbronia assiuti*	Hussein & El-Shimy, 1982	Africa, Nile basin	40	1 + 2
20.	*Barbronia gwalagwalensis*	Westergren & Siddall, 2004	South-Africa	25	1 + 2
21.	*Barbronia wuttkei*	(Kutschera, 2004)	Germany (aquarium)	19 × 2.5	1 + 2
22.	*Barbronia nepalensis*	Nesemann & Sharma, 2007	Central Himalaya, Nepal	34 × 5	1 (+ 2)
23.	*Barbronia shillongensis*	Nesemann, 2007	Kashi Hills, NE-India	30 × 4	1 (+ 2)
24.	*Odontobdella blanchardi*	(Oka, 1910)	East-Asia	110 × 8	1 (+ 4)
25.	**Odontobdella quadrioculata*	(Oka, 1922)	Inle Lake, Myanmar	24	1 + 1
26.	*Odontobdella polaneci*	Nesemann, 1995	Japan	36	(1 minute)
27.	*Odontobdella krishna*	nov. spec.	Bihar, North-India	77 × 6	Not visible
28.	*Sinodontobdella kinzelbachi*	Nesemann, 1995	China	45	1 + 4
29.	**Scaptobdella horsti*	Blanchard, 1897	Java, Sumatra, Borneo, China	30 × 3	–
30.	**Scaptobdella sumatrensis*	Harding, 1931	Sumatra	–	–
31.	**Dineta cylindrica*	Goddard, 1908	Australia	–	1 + 2

Harding, W.A. & Moore, J.P. 1927. *Hirudinea. The fauna of British India, including Ceylon and Burma.*–London, Taylor & Francis, 302 pp.

Hussein, M.A., Kinzelbach, R. & El-Shimy, N.A. 1988. A key for freshwater Hirudinea of Egypt.–*Bulletin of the Faculty of Science, Assiut University*, **17** : 29-43.

Johansson, L. 1913. Hirudineen aus dem Sudan.–*Results of the Swedish Expedition to Egypt and the White Nile,* 1907, No. **24** : 42 pp., pl. I.

Johansson, L. 1918. *Hirudineen aus Neu-Caledonien und den Neuen Hebriden.*–In Sarasin & Roux : Nova Caledonia, A, Zoologie, 2, Lief. 4, p. 373-396.

Kaburaki, T. 1921. Notes on some Leeches in the Collection of the Indian Museum.–*Records of the Indian Museum,* **22** (5) : 689-719.

Kottelat, M. and Lim, K.K.P. 1994. Diagnoses of two new genera and three new species of earthworm eels from the Malay Peninsula and Borneo (Teleostei : Chaudhuriidae).–*Ichthyological Exploration of Freshwaters* 5(1) : 181-190.

Mandal, C.K. 2004a. Check-List of the Hirudinea (Leeches) of India.–*Rec. zool. Surv. India,* **102** (Part 1-2) : 41-46.

Mandal, C.K. 2004b. *Placobdella harasundarai* (Hirudinea : Glossiphoniidae) a new species of leech from West Bengal, India.–*Rec. zool. Surv. India,* **103** (Part 1-2) : 99-102.

Mandal, C.K. 2004c. Endemic Leech Fauna of India.–*Rec. zool. Surv. India,* **103** (Part 1-2) : 103-110.

Mandal, C.K. 2004d. *Paraclepsis gardensi* (Hirudinea : Glossiphoniidae) a new species of leech from West Bengal, India.–*Rec. zool. Surv. India*, **103** (Part 1-2) : 111-114.

Mandal, C.K. 2009. *Haemadipsa Anaigundensis* sp. nov. (Hirudinea : Haemadipsidae) a new species of Leech from Tamil Nadu, India.–*Rec. zool. Surv. India*, **109** (Part 3).

Moore, J.P. 1939. Additions to our Knowledge of African Leeches (Hirudinea).–*Proceedings of the Academy of Natural Sciences of Philadelphia,* **90** : 297-360.

Nesemann, H. 1995. On the morphology and taxonomy of the Asian leeches (Hirudinea : Erpobdellidae, Salifidae).–Acta Zoologica Academiae Scientarum Hungaricae, **41** (3) : 165-182, Budapest.

Nesemann, H., Sharma, G. & Sinha, R. K. 2004. Aquatic Annelida (Polychaeta, Oligochaeta, Hirudinea) of the Ganga River and adjacent water bodies in Patna (India : Bihar), with description of a new leech species (Family Salifidae).–*Annalen des Naturhistorischen Museums in Wien,* **105** B : 139-187.

Nesemann, H., Sharma, S., Sharma, G., Khanal, S.N., Pradhan, B., Shah, D.N. & Tachamo, R.D. 2007. *Aquatic Invertebrates of the Ganga River System: Volume 1–Mollusca, Annelida, Crustacea (in part)*, 263 pp., published by Hasko Nesemann, Chandi Press, Kathmandu.

Oka, A. 1910. Synopsis der Japanischen Hirudineen, mit Diagnosen der Neuen Species.–*Annotationes Zoologicae Japonenses,* **7** : 165-183.

Oka, A. 1926. Sur les deux genre *Mimobdella* Blanchard et *Odontobdella* nov. gen.–*Annotationes Zoologicae Japonenses,* **10** : 243-253.

Sawyer, R.T. 1986. *Leech biology and behaviour, Vol. II. Feeding biology, ecology, and systematics.* Oxford University Press, : 419-793.

Sket, B. & Trontelj, P. 2008. Global diversity of leeches (Hirudinea) in freshwater.–*Hydrobiologia,* **595** : 129-137.

Soós, Á. (1966) Identification Key to the Leech (Hirudinoidea) Genera of the World, with a Catalogue of the Species. III. Family Erpobdellidae.–*Acta Zoologica Academiae Scientarum Hungaricae,* **12** (3-4) : 371-407.

Westergren, S. & Siddall, M. E. 2004. Two New Species of Salifid Leeches (Arhynchobdellida: Erpobdelliformes: Salifidae) from South Africa and Madagascar.–*American Museum Novitates,* 3456 : 1-6.

Yang, T. 1996. *Annelida Hirudinea.*–In : Editorial Committee of Fauna Sinica, Academia Sinica Vol. 92, 252 pp, ISBN 7-03-004560-2, Science Press Beijing, China.

Yang, T.; Wang, D. & Zhang, Y. 1997. A New Species and New Record of Freshwater Leeches from China (Arhynchobdellidae: Salifidae).–*Zoological Research,* **18** (4) : 383-388.

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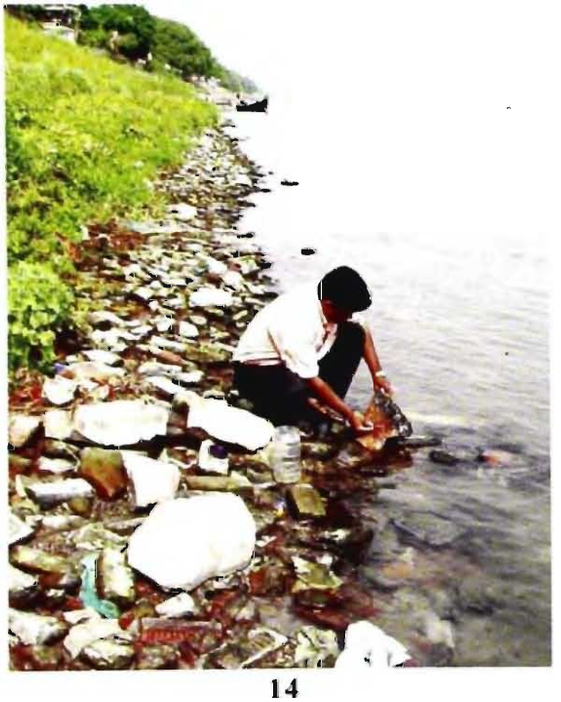
Obonotobdella krishna nov. sp. Fig. 9 : lateral view, Fig. 10 : ventral view, Fig. 11 : dorsal view of type specimens.



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Obonotobdella krishna nov. sp. Fig. 12 : Dorsal View of fully extended specimen with two cocoons, Fig. 13 : contracted specimen, Fig. 14 : Habit type, specimen.