



International Journal of Fauna and Biological Studies

Available online at www.faunajournal.com

I
J
F
B
S
International
Journal of
Fauna And
Biological
Studies

ISSN 2347-2677
IJFBS 2016; 3(2): 65-70
Received: 06-01-2016
Accepted: 09-02-2016

L Arunkumar
Department of Zoology,
Mayai Lambi College,
Yumnam Huidrom-09,
Manipur, India.

W Alphonsa Moyon
Department of Zoology,
South East Manipur College,
Komlathabi, Manipur, India.

Schizothorax chivae, a new schizothoracid fish from Chindwin basin, Manipur, India (Teleostei: Cyprinidae)

L Arunkumar, W Alphonsa Moyon

Abstract

Schizothorax chivae, a new schizothoracid species is described from the Chindwin basin of Manipur. It is distinguished from congeners by the combination of characters: 83 – 90 lateral line scales, 33 – 35 predorsal scales, 17 rows of scales between the lateral line and base of dorsal fin, 11 rows of scales between the lateral line and base of ventral fin, eye before the middle of head, interorbital space convex and 37.0 – 43.0% HL, barbels longer than half of eye diameter, height of head at occiput 77.1 – 81.2% HL, snout length 34.4-38.5% HL, dorsal spine longer than head length excluding snout length, depth of anal tile scales less than eye diameter and dorsal fin not midway between the snout and base of caudal fin.

Keywords: New Species, Schizothoracinae, Northeastern India

1. Introduction

The genus *Schizothorax* Heckel 1838 of the subfamily Schizothoracinae possess elongate body, subcylindrical, slightly compress, inferior mouth, labial plate on chin forming a sucker like structure, two pair of barbels (rostral and maxillary), fleshy lips and continuous, three rows of pharyngeal teeth, a tile like two rows of enlarged scales enclosing vent and anal fin base and small scales (Day [7], Tilak [25], Jayaram [10] and Talwar and Jhingran [23]).

The schizothoracine fishes are endemic to the central plateau of Asia (Chen and Chin [5]). The genus *Schizothorax* are allocated into two genera viz., *Schizothorax* and *Racoma* based on the presence and absence of a horny sheath covering the lower jaw respectively (Chen and Cao [4]). Yang *et al* [30] described *Schizothorax nudiventris*, *S. heterophysallidos* and *S. beipanensis* from Lancan Jiang, Nanpan Jiang and the upper Beipan Jiang of China respectively. Yang *et al* [30] described *Schizothorax heteri* and *S. leukus* and recorded eight valid species of this genus from the Irrawady drainage area in China.

Chaudhuri [3] described *Schizothorax molesworthi* from the Abor hills in Arunachal Pradesh and synonymised to *S. richardsonii* (Menon [14], Talwar and Jhingran [23]). *S. molesworthi* is a valid species, definitively known from the Brahmaputra river drainage and its native occurrence are China (Tibet or Xizang), India (Arunachal Pradesh) (Ng. [17]) Menon [14] described *Schizothorax kumaonensis* from Kumaon Himalayas.

Terashima [24] described *Schizothorax raraensis*, *S. macrophthalmus* and *S. nepalensis* from Lake Rara, Northwestern Nepal. They are placed to the genus *Schizothorax* (Jayaram [10]). Jayaram [10] and Talwar and Jhingran [23] listed four species viz., *Schizothorax kumaonensis*, *S. richardsonii*, *S. sinuatus* and *S. skarduensis* and two species viz., *S. kumaonensis* and *S. richardsonii* respectively.

Datta and Laishram [6] firstly listed the occurrence of *Schizothorax richardsonii* from Manipur. Sharma [20] firstly worked out the eco-biology of *Schizothorax richardsonii* and collected from the torrential abode of Sanahal Lokchao Stream, Leimakhong, Senapati District of Manipur. Singh [21] and Selim [19] reported the occurrence of this species in the northern and the southern parts of Ukhrul District of Manipur. Vishwanath [28] simply mentioned its extended distribution in Chakpi stream and rivers drained to Yu River in Ukhrul district of Manipur without descriptions.

A recent collection of fishes from the Chiva River, Chindwin basin, Manipur, India included a *Schizothorax* species which is herein described as *S. chivae*.

Correspondence:
W Alphonsa Moyon
Department of Zoology,
South East Manipur College,
Komlathabi, Manipur, India.

2. Materials and Methods

Measurements were made point to point with dial calipers and data recorded to the nearest 0.1 mm. Counts and measurements were made on the left side of the specimens whenever possible. Subunits of the head are presented as proportions of head length (HL). Head length and measurement of the body parts are given as proportions of standard length (SL). Measurements followed Jayaram [10]. The specimens are deposited in the Manipur University Museum.

3. Results



(a)



(b)



(b)



(b)



(c)

Fig 1: (a) *Schizothorax chivae* sp. nov. 50/NH/MUM, holotype, 184.1 mm SL, female, Chiva River at Khongjon Village, Chandel District, Manipur India (Lateral view)
(b) Lateral, ventral and dorsal views of head of *Schizothorax chivae* (50/NH/MUM, HL 40 mm, HW 26.5 mm)
(c) The last unbranched dorsal find ray of *Schizothorax chivae*.

3.1 *Schizothorax chivae* sp. Nov. [Fig. 1 (a) (b) (c)]

3.2 Holotype: 50/NH/MUM, 184.1 mm SL, female, from Chiva River at Khongjon Village, Chandel District, Manipur, India (Chindwin Basin), 24° 15'3'' N, 94° 17'59'' E, 236 m above sea level (asl), coll. W. Alphonsa Moyon and Party, 4 April, 2015.

3.3 Paratypes: 6 specimens, 75-159.4 mmSL, same data as holotype; 3 specimens, 76.5-80.0 mm SL, from Chiikuk Stream, same datas as holotype, coll. L. A and Moyon, 4 April, 2014.

3.4 Diagnosis: A species of *Schizothorax* with 83 – 90 lateral line scales, 33 – 35 predorsal scales, interorbital space convex, long barbels 12.1 – 16.6% HL and 60.8 – 79.5% ED, dorsal fin not midway between the snout and base of the caudal for commencing and with 8 – 13 denticles on its posterior side of spine, eye before the middle of head length and close to tip of snout.

3.5 Description: Morphometric measurements of holotypes and 9 paratypes are presented in Table 1. Data of the holotype are presented first, followed by the data of paratypes in parentheses. Body moderately elongate, somewhat compressed; greatest depth at the origin of dorsal fin; caudal peduncle compressed. Dorsal profile slightly arched in between dorsal fin and snout; ventral profiles less curved, rounded. Head moderately long. Snout bluntly pointed, conical with pores Mouth almost horizontally transverse and inferior. Upper and lower lips well developed, papillate. Lower jaw with a hard horny covering inside. First gill arch with 14-18 gill rakers. Barbels two pairs (rostral and maxillary). Rostral barbels slightly longer than maxillary barbell. Both the barbels are shorter than eye diameter. Nostrils nearer to eye than tip of snout. Eye moderate; not visible from ventral; interorbital convex. Thoracic regions (breast and belly) before pectoral fin tip scaleless. Thick epidermis covers on breast. Scales small. Lateral line complete with 83 – 90 scales, running in the mid flank and caudal peduncle. Transverse scales 17 and 11 between lateral line and dorsal fin origin and ventral fin origin respectively. Vertebrae 47.

Dorsal fin osseous, concave distal margin, three simple and seven to eight branched rays. Longest unbranched dorsal fin serrated with 8 -13 denticles along its hind margin, commencing slightly before ventral fin origin. Origin of dorsal fin close to tip of snout. Pectoral fin shorter than head length, not reaching ventral fin origin, and one unbranched with fourteen branched rays. Ventral fin short, with one unbranched and nine branched rays, not reaching vent. Anal fin with two soft rays and six branched rays, short but just reach the anterior base of caudal fin base when adpressed. Anal tile scales commencing from anterior tip end of ventral fin and extended upto the end base of last branched anal fin rays, its depth less than eye diameter. Caudal fin forked, each lobe obtusely pointed with four unbranched and eight branched rays (iv+8+8+iv). Posterior chamber of air bladder is longer than anterior chamber but less than twice the anterior chamber.

3.6 Reproductive behavior: Nupital organ remarkable in snout of male, not present in snout part of female but rudimentary tubercles are present. Males are generally smaller than females. Rudimentary tubercles present in the specimens of 95 TL., mm; 75 SL; mm. Mature male lighter colour than mature female and have a straight ventral profile and small. June to August is the peak breeding seasons for this fish.

3.7 Colour: Body dark grey above indistinctly speckled with black, silvery below sides often shot with gold. Fins pale yellowish or reddish. In 10% formalin, dorso-lateral above the lateral line is dark grey and latero-ventral below the lateral line is light golden yellow. Flank of the lateral line scale are more dark grey and distinct in the advance fingerling stages ranging 75 – 100 TL mm. Fins with black minute dots. More black dark at the base of caudal fin and forming like a large triangular structure. Anterior base of pectoral fin more blackish.

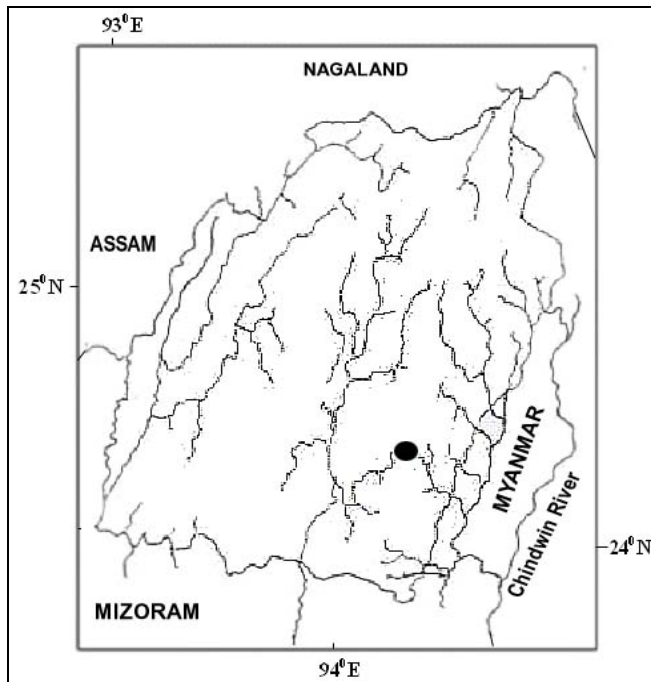


Fig 2: Map showing type locality (●) of *Schizothorax chivae*



Fig 3: Chiva River, Type locality and habitat of *Schizothorax chivae*.

3.8 Habitat: Rhithron type of stream. The type locality of *Schizothorax chivae* is fully dominated by hard rocks with a substrate of boulders, cobbles, pebbles and sand (Fig. 3). Other species of fishes collected from the type locality include species of *Schistura*, *Pethia*, *Glyptothorax*, *Mastacembelus*, *Poropuntius*, *Botia* etc.

3.9 Distribution: Known only from the Chiva River, Chiikuk stream at Khongjon village, Chandel District (Chindwin basin), Manipur, India (Fig.2).

3.10 Etymology: The species is named after Chiva River, Manipur, India its type locality.

3.11 Local names of *Schizothorax* in Manipur: Sana-Nga (Meitei at Imphal District), Ngarii (Moyon at Chandel District), Nali (Maring at Tengnoupal District, Chandel District) and Majong/Vansu (Tangkhum at Ukhrul District).

Table 1: Morphometric data of holotype and 9 paratypes of *Schizothorax chivae* sp. nov.

Characters	Holotype	Paratypes (Range)	Mean	± SD
Standard length (mm)	184.1	75.0 – 148.9		
% SL				
Body depth	21.7	23.9 – 25.4	23.9	± 1.6
Head length at occiput	17.6	17.2 – 19.3	17.9	± 4.2
Head depth at occiput	16.6	15.7 – 17.3	16.6	± 1.4
Lateral head length	21.7	22.3 – 25.0	22.9	± 1.6
Snout length	8.4	7.8 – 8.6	8.1	± 0.9
Dorsal spine length	19.9	18.0 – 20.1	19.5	± 1.5
Predorsal length	48.5	47.4 – 50.9	49.0	± 2.3
Caudal peduncle length	17.4	18.0 – 18.3	18.0	± 1.4
Caudal peduncle depth	10.7	9.5 – 10.9	10.4	± 1.1
Pectoral fin length	15.4	15.4 – 18.7	16.5	± 1.3
Ventral fin length	13.6	14.1 – 15.6	14.5	± 1.2
Anal fin length	20.0	16.9 – 20.7	19.4	± 1.5
Caudal fin length	21.7	23.9 – 25.4	23.9	± 1.6
Body width at dorsal fin origin	14.5	14.3 – 15.1	14.6	± 1.8
Body width at anal fin origin	11.2	9.5 – 11.3	10.5	± 1.0
Preanal anal fin length	73.0	71.4 – 77.4	73.4	± 2.9
Pre vent length	71.8	70.4 – 75.6	72.0	± 2.8
Pre ventral fin length	49.5	50.2 – 51.1	30.3	± 2.4
% HL				
Body depth	101.55	89.4 – 98.9	95.8	± 3.3
Dorsal spine length	91.6	80.6 – 88.7	85.4	± 3.1
Head depth	76.6	69.4 – 74.6	72.7	± 2.8
Head width	66.2	62.8 – 70.1	65.8	± 2.7

Snout length	38.5	34.4 – 35.5	35.9	± 2.0
Eye diameter	18.3	19.7 – 21.4	20.0	± 1.5
Interorbital space	43.0	37.1 – 40.8	39.6	± 2.0
Rostral barbel length	13.8	14.0 – 16.6	15.0	± 1.3
Maxillary barbel length	13.1	12.1 – 15.2	13.3	± 1.2
Mouth width	37.5	37.5 – 40.6	39.0	± 2.1
Head height at occiput	81.2	77.1 – 78.5	78.5	± 2.9
Pectoral fin length	71.0	69.1 – 74.7	72.2	± 2.8
% ED				
Maxillary barbel length	71.6	58.4 – 71.2	65.5	± 2.7
Rostral barbel length	75.3	67.6 – 77.6	74.1	± 2.9
% CPL				
Caudal peduncle depth	61.6	53.0 – 59.6	57.5	± 2.5
% PVL				
Predorsal length	98.1	94.4 – 99.6	95.5	± 3.3
% GBP – VFO				
Pectoral fin length	55.5	55.5 – 71.5	62.0	± 2.6

Abbreviations for Table 1: SL = Standard length, HL = Lateral head length, CPL = Caudal Peduncle length, PVL = Pre ventral fin length, GBP-VFO = Gape between Pectoral and Ventral fin length.

4. Discussions

Schizothorax chivae possess a distinct horny sheath covering of lower jaw and a suctorial mouth. Therefore, it belongs to the subgenus *Schizothorax* according to Chen & Cao [4], to the group A (Jayaram [10]) and to the specialized grade due to degenerate scales (Cao *et al* [1]).

Schizothorax chivae is also distinguished from *S. nudiventris*, *S. heterophysallidos* and *S. beipanensis* by having (absent vs. present) of trilobed lower lips. *Schizothorax chivae* is distinguished from *S. heteri* in having anterior dorsal fin origin to pelvic fin origin vs. posterior, lesser scales between dorsal fin origin to lateral line (17 vs. 24-33), lesser scales between ventral fin origin to lateral line (11 vs. 19-29) lesser lateral line scales (83-90 vs. 89-104). It is also easily distinguishable from *S. leukus* in having short barbel vs. equal to eye diameter, lesser lateral line scales (83-90 vs. 94-105), lesser scales between dorsal fin origin to lateral line (17 vs. 26-34), lesser scales between pelvic fin origin to lateral line (11 vs. 21-27), lesser head depth (15.7-17.3% SL vs. 21.5-23.4), larger eye diameter (18.3 – 21.4% HL vs. 11.0-17.4), more interorbital width (37.1-43.0% HL vs. 16.8-20.7), more caudal peduncle depth (53.0-61.6 vs. 39.4-47.2) in% of its length. It is further distinguished from *S. kumaonensis* in having less number of lateral line scales (83-90 vs 97-98) and longer head (21.7-25.0 % SL vs. 17.3-20.6).

Schizothorax chivae is distinguished from *S. molesworthi* by less number of lateral line scales (83-90 vs. 113), less number of scales between origin of dorsal fin base between lateral line (17 vs. 21), less number of lateral line and base of ventral fin origin (11 vs. 14), less predorsal scales (33-35 vs. 64), less denticles of dorsal spine (8-13 vs. 30), less number of unbranched dorsal fin rays (III vs. V), more branched anal fin rays (6 vs. 5), shorter interorbital space (below half of head length vs. half of head length), absent of narrow groove in front of the paired nostril vs. present. The upper edge of the dorsal fin is concave vs. straight. Greater body depth (above 5 times vs. 4 times) and longer head (above 5 times vs. 4.5 times) in total length. Broader head (above 1 vs. 0.6) in head length. Caudal peduncle is (1.6-1.8 vs. 1.3 times) as long as deep. Distribution (Manipur, Chindwin river drainage vs. Arunachal Pradesh, Brahmaputra river drainage).

Lateral line complete with 94-110 scales is one of the diagnostic characters of the genus *Schizothorax* (Jayaram [10]). Lateral line scales of *S. richardsonii* are 98-100, 98-100, 98-

102, 98-102, 92-93, 95-100 and 140-145 according to Day [7], Sen [22], Sharma [20], Singh [21], Selim [19], Uniyal and Arunkumar [27] and Gunther [8] respectively.

Schizothorax chivae is easily distinguished from its congeners by the combination of characters mentioned in diagnosis. The new species is easily distinguished from *S. richardsonii* in having less number of lateral line scales (83 – 90), less branched rays of caudal fin (8+8 vs. 10+9), interorbital space (convex vs. flat) commencing of dorsal fin (not midway between snout tip and caudal fin base vs. midway), eye (before the middle of head length vs. middle), less number of branched pectoral fin rays (14 vs. 15-17), more number of branched anal fin rays (6 vs. 5), less number of branched caudal fin rays (8+8 vs. 10+9), less number of scale rows between the lateral line and base of dorsal fin (17 vs. 24), and 11 vs. 19 between the lateral line and the base of ventral fin, dorsal spine longer than head length excluding snout length and shorter snout (34.4-38.5% HL vs. 41.7-49.7).

Schizothorax richardsonii is distributed in all the streams ranging about 700-3500 (or 4000), 300-2810 and 521.95-2183.23 metres above the mean sea levels (Tilak [26], Vishwanath [18] and Limatemjen [13] respectively). It is a high altitudinal fish. *S. chivae* is distributed at an elevation of 236 m above the mean sea level.

5. Conclusion

Sharma [20] and Singh [21] described that the commencing of dorsal fin and structure of interorbital space were midway between snout tip and caudal fin base and broad and flat respectively for *Schizothorax richardsonii* which collected from the Sanahal Lokchao, Leimakhong, Senapati District and different streams and rivers of northern parts of Ukhrul District Manipur. After vivid examination, their specimens are belongs to *S. chivae* due to position of dorsal fin close to tip of snout and convex interorbital space. Specimens of Sharma [20], Singh [21] and Selim [19] are the fishes of Chindwin basin, Manipur. Vishwanath [18] reported that *S. richardsonii* is widely distributed in the Himalayan foothills of Indus, Ganga and Brahmaputra basins. The freshwater fishes are distributed in a particular river basin and their congeners in an entirely separated different basin are proved to different species (Vishwanath and Linthoingambi [29], Kottelat and Lim [12], Ng [16], and Chakrabarty and Ng [2]). Thus, all the specimens collected from the Chindwin basin of Manipur by the above mentioned workers will be *Schizothorax chivae*.

6. Comparative materials and sources

Schizothorax richardsonii: Data from Sharma (1989), Singh (1998), Selim (1998). MUMF 2213 1ex, 118.0 mm SL, Wanze Stream, Khamsom, Manipur, Nov. 21, 1994. MUMF 2274 – 2276, 3 exs; 89.2 – 91.1 mm SL, a stream near Tolloi, Manipur, Nov. 12, 1997. MUMF 2300 – 2301, 2exs, 143.2 – 177.5 mm SL, Wanze stream, Khamsom Feb. 5 1997. Challou River, Chingai, Manipur, April 30, 1995. Unregistered 2 exs, 65.2 – 94.7 mm SL, Momo stream, Tusam CV, March 2, 1998. Collected by L. Kosygin Singh unregistered 2 exs, 61.6 mm SL, Maklang river, April 18, 1995, 63.0 mm SL, Chatrickong River at Khayang, May 12, 1997. Collected by Keishing Selim. *S. kumaoensis*: Data from Jhingran (1988) & Tilak (1990), *S. heteri*: Data from Yang *et al* (2013), *S. leukus*: Data from Yang *et al* (2013), *S. nudiventris*: Data from Yang *et al* (2009), *S. heterophysallidos*: Data from Yang *et al* (2009), *S. beipanensis*: Data from Yang *et al* (2009), *S. molesworthi*: Data from Chaudhuri (1913).

7. Acknowledgements

We are thankful to W. Tharshing, W. Agnes, Ng. Paalen, Ng. Beningkham, Ng. Dearson, L. Mosha, N. Beveershing, Ng. Dilip, & Ng. Ashani for their help for bringing the collection of fishes and special acknowledges to Mowar Nungchim Moyon for excellent computer typing. We are also pleased to Ratna Mutum, Assistant Curator, Manipur University Museum, Canchipur-03, for hospitality and accession of the specimens.

8. References

- Cao WX, Chen YY, Wu YF, Zhu SQ. Origin and evolution of Schizothoracine fishes in relation to the upheaval of the Qinghai-Xizang Plateau. In: the Comprehensive Scientific expedition to the Qinghai-Xizang Plateau. Chinese Academy of Sciences. Ed. Studies on the period, amplitude and type of the uplift of the Qinghai-Xizang Plateau. Beijing Science Press. 1981; 118-130.
- Chakrabarty P, Ng. HH. The Identity of Catfishes identified as *Mystus cavasius* (Hamilton, 1822) Teleostei: Bagridae, with a description of a new species from Myanmar. Zootaxa, 2005; 1093:1-24.
- Chaudhuri BL. Zoological results of the Abor expedition, 1911-1912, XVIII Fish. Records of the Indian Museum 1913; 8: 243-258.
- Chen YF Cao WX. Schizothoracinae. In: yue PQ. Fauna Sinica. Osteichthyes. Cypriniforms III. Beijing Science Press, 2000; 273-390.
- Chen ZM, Chin YF. Phylogeny of the specialized Schizothoracine fishes (Teleostei: Cypriniforms: Cyprinidae). Zoological Studies. 2001; 40(2):147-157.
- Datta NC, Laishram IS. Zoogeographical significance of the ichthyofauna of Manipur, India. International Journal of the Academy of Ichthyology (Proc. IV AISI) 1984; 5:83-93.
- Day F. The fishes of India being a natural history of the fishes known to inhabit the seas and fresh waters of India, Burma and Ceylon. Today and Tomorrow's Book Agency, New Delhi, 1878; 1:778.
- Gunther A. Catalogue of the fishes in the British Museum, A. J. Printers Agency, New Delhi, 1981; 7:512.
- Inland Fisheries illustration of *Schizothorax richardsonii*. e Courses online iasrires. in/modpage. 27 October, 2015.
- Jayaram KC. The freshwater fishes of the Indian region. Narendra Publishing House, Mew Delhi, 1999, 551.
- Jhingran VG. Fish and fisheries of India. Hindustan Publishing Corporation (india), Delhi, 1988, 666.
- Kollelat M, Lim KKP. A review of the eel loaches of the genus *Pangio* (Teleostei: Cobitidae) from the Malay Peninsula, with description of six new species. Raffles Bulletin of Zoology. 1993; 41:203-249.
- Limatemjen. Distibution trend of *Schizothorax richardsonii* (Gray, 1832) in Nagaland. The Clarion, 2015; 4(1):5-7.
- Menon AGK. Taxonomy of the fishes of the genus *Schizothorax* Heckel, with description of a new species from Kumaon Himalayas. Records of the Zoological Survey of India. 1971; 63(1-13):195-208.
- Menon AGK. A checklist of fishes of the Himalayan and the Indo-Gangetic plains. Inland Fisheries Society of India special publication. 1, 1974, 136.
- Ng HH. A revision of the South Asian Sisorid Catfish genus *Sisor* (Teleostei: Siluriformes). Journal of the Natural History. 2003; 37: 2871- 2883.
- Schizothorax molesworthi*. WWW.IUCN redlist org/details/ 168589/0. 27 October, 2015 (Assessor's name: H. H. Ng, 2010).
- Schizothorax richardsonii*. WWW.IUCN redlist org/details/1665250/0. 27 October, 2015 (Assessor's name: W. Vishwanath, 2010).
- Selim K. Fish and fisheries of the Southern part of Ukhrul district of Manipur. Ph.D Thesis submitted to Manipur University, Canchipur, Manipur. 1998; 204.
- Sharma MG. Studies on the hill stream fishes of Manipur with special reference to ecobiology of *Schizothorax richardsonii* (Gray). Ph. D Thesis submitted to Manipur University, Canchipur, Manipur, 1989; 420.
- Singh LK. Ichthyofauna of the northern part of Ukhrul District of Manipur and Biology of the Cyprinid fish *Semiplotus manipurensis* sp. nov. Ph. D. Thesis submitted to Manipur university, Canchipur, Manipur, 1998; 214.
- Sen TK. The fish fauna of Assam and the neighbouring north-eastern states of India. Records of the Zoological Survey of India, Miscellaneous Publication, occasional paper no. 64, Z.S.I Calcutta, 1985; 216.
- Talwar PK, Jhingran AG. Inland fishes of India and adjacent countries. Oxford and IBH publishing Co. Pvt. Ltd, New Delhi, 1991; 1:541.
- Terashima A. Three new species of the cyprinid genus *Schizothorax* from Lake Rara, northwestern Nepal. Japanese Journal of Ichthyology. 1984; 31(2):122-135.
- Tilak R. The fauna of India and adjacent Countries Pisces (Teleostomi): Subfamily: Schizothoracinae. Z.S.I Calcutta 1987: 229.
- Tilak R. On the fish fauna of Ladakh with notes on Zoogeography. Records of the Zoological Survey of India. 1990; 87(2):131-149.
- Uniyal DP, Arunkumar. Fish diversity in the selected streams of Chakrata and Siwalik hills (District: Dehradun, Uttaranchal), India. Records of the Indian Museum, Occasional paper, 2006; 253:1-12+40.
- Vishwanath W. Fishes of northeast India, a field guide to species identification, Life Sciences Department, Manipur University, ICAR, NATP, 2002, 198.
- Vishwanath W. Linthoingambi I. Redescription of *Garra abhoyai* (Teleostei: Cyprinidae: Garrinae) with note on *Garra rupecula* from Manipur, India. Journal of the Bombay Natural Historical Society. 2008; 105(1):101-

104.

30. Yang J, Zheng LP, Chen XY, Yang JX. Description of two new species and revision of *Schizothorax* distributed in the Irrawaddy drainage area in China. *Zoological Research*. 2013; 34(4):361-367.
31. Yang J, Chen X, Yang J. The identity of *Schizothorax griseus* Pellegrin, 1931, with description of three new species of *Schizothorax* fishes (Teleostei: Cyprinidae) from China. *Zootaxa*, 2009; 2006:23-40.