2. Marechal, J. C., Sharma, M. P., Ahmed, S. and Lachassange, P., *Curr. Sci.*, 2002, **83**, 61–64.
3. Palumbo, A., *J. Atmos. Sol.-Terr. Phys.*, 1998, **60**, 279–287.
4. Muralidharan, D., Ph D thesis, Karnataka University, 1991, p. 190.
5. Athavale, R. N., Ramesh Chand and Rangarajan, R., *J. Hydrol. Sci.*, 1983, **28**, 525–538.
6. Athavale, R. N., Rangarajan, R. and Muralidharan, D., *J. Geol. Soc. India*, 1992, **39**, 235–244.
7. Rangarajan, R. and Athavale, R. N., *J. Hydrol.*, 2000, **234**, 38–53.
8. Muralidharan, D. and Venugopalan Nair, R., In Proceedings of the National Seminar on Artificial Recharge of Groundwater, New Delhi, 15–16 December 1998, pp. IV89–97.
9. Sukhija, B. S., Reddy, D. V., Nagabhushanam, P. and Nandakumar, M. V., *J. Geol. Soc. India*, 2005, **66**, 95–104.

ACKNOWLEDGEMENTS. We thank the Director, NGRI, Hyderabad for encouragement to promote rainwater harvesting practices within the campus and for support in the scientific evaluation studies. We also thank our colleagues for timely support in the fieldwork and for their useful suggestions. This work was carried out as part of CSIR (Task Force) Network project on groundwater.

Received 9 January 2006; revised accepted 3 January 2007

D. MURALIDHARAN*
ROLLAND ANDRADE
R. RANGARAJAN

National Geophysical Research Institute, Hyderabad 500 007, India
**For correspondence.*
e-mail: muralidharan@ngri.res.in

Psilorhynchus amplicephalus, a new species from Balishwar river of Assam, India

Fishes of the genus *Psilorhynchus* McClelland are known to occur primarily in the Gangetic drainage of southern Asia[1]. Distribution of this genus is restricted to lowland and high gradient streams of the Ganga–Brahmaputra drainage and streams of India in Manipur along the India–Myanmar border[2]. Most ichthyologists recognize this genus under a separate family Psilorhynchidae[2,3]. At the same time, few authors have retained this group in the family Cyprinidae[4,5]. Psilorhynchidae has been considered as a distinct family, as it differs from the cyprinid family in having variation in the arrangement of pharyngeal teeth and number of simple rays in paired fins (pectoral and pelvic fins)[6,7]. Six species, namely *Psilorhynchus balitora* McClelland 1839, *P. homaloptera* Hora and Mukherji 1935, *P. pseudechensis* Menon and Datta 1964, *P. sucatio* Hamilton 1822, *P. gracilis* Rainboth 1983 and *P. microphthalamus* Viswanath and Manojkumar 1995 are described. *P. homaloptera rowelyi* Hora and Misra 1941, a subspecies described from Chindwin river, is one of the two species of this genus from Burma[2]. *P. gracilis* described from streams/rivers of Chittagong hill tracts may also be distributed in the river drainages in the adjoining Indian states, namely West Bengal and Assam. Most of the species are found to inhabit shallow streams with pebbles and sandy bottom, except *P. homaloptera* that prefers high gradient streams with rocky bed substrate. Recent collections made during an ichthyological survey in Balishwar river of Barak river basin at Malidor village (24°14′24.1″N, 92°32′40.1″E), Silchar, Assam had a small collection of fishes belonging to the genus *Psilorhynchus* that has not been described so far, which after a detailed study is reported here as new to science. The holotype (F. 7601; 56.8 mm standard length) was deposited in the Zoological Survey of India, Southern Regional Station, Chennai and the paratypes kept preserved at Manonmaniam Sundaranar University Museum of Natural History, Alwarkurichi. Morphometric measurements and meristic counts were as given by Rainboth[2]. The name *amplicephalus* (*ampli* – wide, broad; *cephalic* – head) has been chosen for it having a relatively broad head.

The new species can be easily diagnosed by the spindle-shaped, subcylindrical body and anteriorly compressed head. Further, it can be identified by features like scale-less abdomen, horizontally placed pectoral and pelvic fins and also by the presence of 35–36 scales along the lateral line series. These fishes have dark brownish spots in the predorsal region and also along the sides of the body. The relatively bigger head, deeper body and smaller mouth distinguish it from other species of this genus. A hump-like shape found in the predorsal region of bigger specimens is also a distinct feature that has not been reported in any other species. The morphometric and meristic characters of the holotype and paratypes are given in Table 1.

Body elongate with arched back and a flat bottom. Head depressed at the anterior region and gradually raising towards occiput gives a triangular shape from side view. Hump-like structure in the predorsal region. Mouth small, transverse and ventrally placed. Deep rostral grooves separate the ventral surface of snout from lateral surface. Upper lip joined to lower lip at corner of mouth by a prominent folded flap of skin. Upper lip rigid and lower lip thick, fleshy and papillated. Papillae globular in shape, of varying size found up to chin. Eye large, placed in the upper half of the head. Abdomen naked, the scaleless region extends from below the head to a little before the base of the pelvic fin (Figure 1). Scale and fin counts of the new species are as given below.

Lateral line scales 32–36 (scales along the lateral line), predorsal scales (mid-dorsal scales anterior to dorsal fin) 9–11, circumferential scales (scale rows around the part of the body where it is highest at the dorsal fin origin) 17–19, circumpeduncular scales (scales around narrowest part of tail region before caudal fin) 10, lateral transverse scale rows (above lateral line up to dorsal origin and below lateral line up to pelvic origin) 4/3, anal scale rows (scale rows between anus and anal fin) 9–11.

Paired fins (pectoral and pelvic fins) are inserted horizontally like wings of a

Table 1. Comparison of morphometric and meristic characters of *Psilorhynchus amplicephalus* (new species) and related species

	Psilorhynchus amplicephalus (n = 9)		*Psilorhynchus microphthalamus*	*Psilorhynchus homaloptera*	*Psilorhynchus sucatio* n = 8	*Psilorhynchus gracilis* n = 5
	Holotype F. 7601	Paratype	Data after Viswanath and Manojkumar[8]		UMMZ 205339	UMMZ 205343
Per cent SL						
Head length	24.0	21.3–24.9	19.8–20.4	18.3	21.9–23.5	21.7–23.3
Predorsal length	49.9	48.5–53.9	45.5–47.4	47.8	43.8–47.7	46.9–49.2
Body depth	25.8	23.3–24.5	15.7–17.5	16.9	19.2–22.5	21.5–23.7
Dorsal fin height	24.8	21.0–23.7	19.1–21.9	19.5	18.6–26.0	20.6–25.1
Pectoral fin	19.2	17.5–19.6	22.0–24.3	23.1	18.9–23.0	23.8–25.4
Pelvic fin	16.9	15.7–19.2	18.7–19.7	17.6	17.4–20.4	19.3–20.3
Caudal fin	26.6	25.5–30.5	22.8–23.6	21.4	19.6–23.8	25.0–28.0
Anal fin	16.5	15.1–17.4	14.3–15.4	14.4	12.5–14.4	13.0–15.5
Per cent HL						
Head width	75.3	74.1–84.4	67.6–74.6	76.3	60.3–70	61.5–67.3
Head depth at occiput	68.2	72.3–77.4	53.2–59.5	–	46.8–55.2	60.7–63.9
Mouth width	25.2	21.3–29.1	33.0–38.2	39.2	22.2–28.1	19.3–22.3
Snout length	53.2	48.4–58.5	45.0–51.0	49.8	46.7–52.4	40.2–54.2
Interorbital length	36.3	34.5–41.7	38.3–45.0	42.0	44.9–50.6	31.2–33.5
Eye diameter	31.5	32.4–36.0	21.2–24.0	26.9	30.4–35.1	32.1–37.3
Peduncle length	63.4	63.9–73.4	63.3–71.4	68.9	82.4–94.9	68.3–77.9
Peduncle depth	33.9	36.0–41.6	39.7–43.7	40.7	27.6–33.2	39.1–42.6
Meristic counts						
Dorsal fin	iii 8	iii 8	ii 7	ii 7	ii 7	iii 8
Pectoral fin	v 12	v 11–12	iii 14	8	iv 12	v 10
Pelvic fin	ii 7	ii 7	ii 7	ii 7	ii 7	ii 7
Anal fin	ii 5	ii 5	ii 6	ii 5	ii 5	iii 5
Lateral line scales	35	35–36	39–40	43	34–37	34–36
Caudal fin	v 9/v 8	v 9/v 8	9/9	–	iii 9/iv 9	vi 10/v 9
Predorsal scales	11	9–11	12–13	14	10–11	10
Circumferential scales	17	17–19	–	–	17–18	16–17
Circumpeduncular scales	10	10	10	9	10	9–10

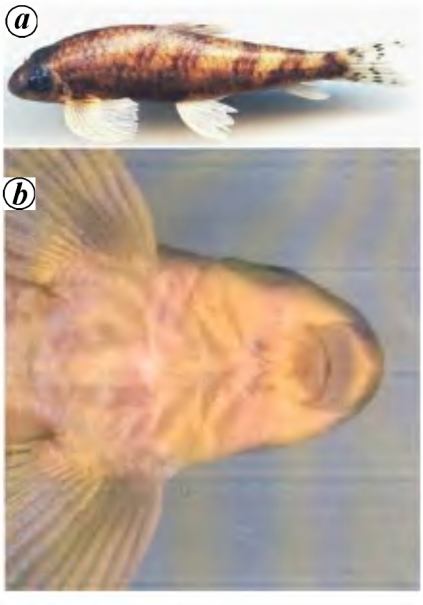

Figure 1. ***a***, Transverse view. ***b***, Head of *Psilorhynchus amplicephalus*.

butterfly. Tip of pectoral fins not long enough to reach the pelvic fin. Pelvic fins are inserted slightly behind dorsal fin origin. Dorsal fin origin closer to tip of snout than it is to the base of the caudal fin. Anal fin short and its edge curved with sharp tip, reaching the caudal fin base. Caudal fin deeply forked. Tubercles (small, horny outgrowths found in mature specimens) of uniform size, distributed on head along the internasal and cheek region. No such prominent tubercles on scales in the body. Pectoral fins with small tubercles along the dorsal surface of anterior-most rays.

Body golden-yellowish in the dorsal and pale towards bottom. A series of 6–7 black saddle-like, V-shaped bands along the back. Two to three bands before dorsal fin and four behind it. Bands in the dorsal region proceed down sidewards on the body below the lateral line to some extent. Dark blotches are found on the lateral side of the body along the mid-lateral line, discontinuous with those on dorsal side. Blotches found on the posterior part of body distinct. Others though present cannot be distinguished as they coalesce with bands from the back. All scales on the dorsal region and upper transverse region have a black margin. Caudal fin with two black blotches, one an each lobe. Blotch distinct towards upper part of the upper lobe and lower part of the lower lobe, leaving the median region faint and devoid of pigments. Three wavy bands in a row connecting the upper and lower lobes with the anterior-most rays near the caudal base; bands darker near the caudal base and obscure towards the end of the fin.

The *Psilorhynchus* species was compared with the related species *P. sucatio* UMMZ 205339 and *P. gracilis* UMMZ 205343, obtained from University of Michigan, Museum of Zoology (UMMZ). The new species differs from *P. gracilis* in having variations in the number of pectoral fin rays and caudal fin rays and in head-related characters such as interorbital width, mouth width, head depth and head width. In addition to body depth, few other characters like predorsal length, anal fin length and pectoral fin length also vary. *P. sucatio*, a congener occurring in Meghalaya, Assam and Tripura has a narrow head, shallow body,

long and slender caudal peduncle, and short anal and caudal fins compared to the new species. It is further distinguished by the presence of fully scaled abdomen. *P. amplicephalus* seems to be closely related to *P. balitora* in the morphometric characters but differs from it in having more simple pectoral rays with bigger head, stumpy body with greater body depth and mandible length greater than gape (mouth) width. Morphometric and meristic data[8] for the two species, *P. homaloptera* and *P. microphthalamus* were used for comparison, as these specimens were not available for examination. It differs from both the species in many morphometric variables and meristic counts (Table 1).

The new species was collected from Balishwar river, with more water current and sandy bottom. Like most other species of the genus, this species also prefers sandy substrate with horizontally placed pectoral fins suited to withstand the flow. Food particles that settle down on the sandy bottom are consumed by the species, as it is adapted with a ventral mouth for such type of feeding.

1. Menon, A. G. K., Report, Inland Fisheries Society of India, Spec. Publ. 1, 1974.
2. Rainboth, W. J., *Proc. Calif. Acad. Sci.*, 1983, **43**, 67–76.
3. Hora, S. L., *Rec. Indian Mus. (Calcutta)*, 1925, **27**, 457–460.
4. Wu, H. W., Chen, Y., Chen, X. and Chen, J., *Sci. Sin.*, 1981, **14**, 563–573.
5. Menon. A. G. K., Report, Zoological Survey of India, Kolkata, Occasional paper 175, 1999, p. 366.
6. Nelson, J. S., *Fishes of the World*, John Wiley, New York, 1984, p. 523.
7. Talwar, P. K. and Jhingran, A. G., *Inland Fishes of India and Adjacent Countries*, Oxford and IBH, New Delhi, 1991, p. 1158.
8. Vishwanath, W. and Manojkumar, W., *Jpn. J. Ichthyol.*, 1995, **42**, 249–253.

ACKNOWLEDGEMENTS. We are grateful for the financial assistance from NATP under the Mission Mode Programme of 'Germplasm Inventory, Evaluation and Gene Banking of Freshwater Fishes'. We thank Dr D. Kapoor and Dr S. P. Singh, National Bureau of Fish Genetic Resources, Lucknow for their lead role in this programme. We also thank Dr D. W. Nelson, UMMZ for lending registered specimens and Dr Remadevi, Zoological Survey of India, SRS, Chennai for valuable suggestions.

Received 23 February 2006; revised accepted 11 December 2006

M. ARUNACHALAM*
M. MURALIDHARAN
P. SIVAKUMAR

Sri Paramakalyani Centre for Environmental Sciences, Manonmaniam Sundaranar University, Alwarkurichi 627 412, India
**For correspondence.*
e-mail: arunacm@gmail.com

Rediscovery of *Cyathodium acrotrichum* Schiffn. (Hepaticae: Cyathodiaceae) – A long-lost liverwort often treated as doubtful taxon

Cyathodium acrotrichum Schiffn. was described by Schiffner[1] based on specimens collected by Rĕverend Decoly and Schaul from Kurseong, Darjeeling District, West Bengal in October 1899. As the species could never be collected again since its original collection, either from its type locality or elsewhere, coupled with the unavailability of its type/authentic specimens, it came to be regarded as a doubtful species in subsequent treatments of the genus[2,3]. Recently, during the course of our studies on the Hepaticae and Anthocerotae of Sikkim, extensive collections have been made from the state, especially the East District. This has resulted in locating some distinct populations of the genus *Cyathodium* Kunze with hairy plants, which are undoubtedly referable to *C. acrotrichum*. The study of the protologue[1] of the latter confirmed the identity of these plants. The most defining taxonomic feature of *C. acrotrichum* is the presence of forwardly directed hairs towards the anterior portion of the thallus, which easily distinguishes it from hitherto all the known species of the genus. The present communication constitutes the rediscovery of this interesting endemic and rare Indian liverwort after a lapse of over a century from Sikkim.

As the species is poorly known, a detailed illustrated taxonomic account of the same has been provided to facilitate its easy identification. However, like those of Decoly and Schaul, the present collections also do not have male plants of the species.

Cyathodium acrotrichum Schiffn. in *Ann. Bryol.*, 1939, **12**, 126 (Figures 1 and 2). Plants light-bright green, once or twice dichotomously branched, densely overlapping forming loose tufts; thallus 7–12 mm long, 2–4 mm wide with frequent ventral, apical and marginal innovations, both main thallus as well as adventitious branches densely covered with forwardly directed hairs towards anterior part; dorsal pores large, usually confined to posterior part of thallus below dichotomy, antero posteriorly oval, 132–231 × 66–198 μm, consisting of 3–4 concentric rings of 5–6 cells each; dorsal epidermal cells sub quadrate, 32.8–106.6 × 16.4–24.6 μm, thin-walled, chlorophyllose, inner walls slightly projecting into air-chambers; ventral epidermal cells more or less quadrate–sub quadrate, 36.9–57.4 × 32.8–61.0 μm, thin-walled; midrib absent; air chambers in single row, without filaments, partitions 2–3 cells high, uniseriate. Thallus hairs straight–falcate, 231–858 μm long, 8.2–14.35 μm wide, densely distributed on the dorsal surface, less on the ventral surface. Rhizoids numerous on ventral surface of thallus and sexual receptacles, hyaline, both thin as well as thick-walled. Ventral scales simple, conspicuous, usually confined to the growing region of the thallus and surface of sexual receptacles, uniseriate, 2–6 cells high. Dioicous (?). Male plants not seen. Involucres large, ovoid, with more or less rounded mouth, 1–3 per thallus, never projecting beyond the thallus margin, outer surface covered with numerous long hairs, rhizoids and ventral scales. Sporophytes, one in each involucre; capsule deep brown to blackish, ovoid–globose,