

RECENT TRENDS IN DISCOVERY OF NEW FISH SPECIES FROM THE INDIAN REGION

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ABSTRACT - Out of about 32,600 fishes found globally, 2,553 species have been reported from the Indian subcontinent in addition to about 500 introduced species. Six drainage systems and their tributaries are the natural habitat of the entire freshwater fish genetic resources (about 877 species). The Western Ghats and North-eastern Region are the globally recognized two biodiversity hotspots as these are the home of many endemic fish species which are exclusively confined to these areas. During exploration, identification and documentation of fish diversity by various authors in different geographic regions, 62 new species belonging to 4 Orders, 21 Families and 31 Genera have been discovered from the Indian region during 2010-13. Of these, 7 species were reported in 2010, 14 species in 2011, 24 species in 2012 and 16 species in 2013. 54 endemic species have been described from the freshwater system and 7 species from the marine ecosystem of Andaman and Tuticorin (Bay of Bengal), Arabian Sea and south Indian coast of the Indian Ocean. As far as the two biodiversity hot spots are concerned, 37 new species have been discovered from North-eastern region and 16 species from Western Ghats. The data thus collected and analysed indicate area-wise species richness and possibilities for more discoveries in future.

Key words : Fish fauna, new discoveries, habitat, endemism, distribution, India.

INTRODUCTION

India is a biodiversity rich country with 2nd highest human population in the world. Agriculture is the main occupation of the people living in India. This subcontinent is full of natural resources in the form of forest cover, aquatic resources and different types of agro-climatic regions which supports rich flora and fauna. One of eighteen mega-diverse countries in the world, it is home to 7.6% of mammalian, 12.6% avian, 6.2% reptilian, 4.4% amphibian, 11.7% fish and 6.0% flowering plant species (http://en.wikipedia.org/wiki/Fauna_of_India). Out of 32,600 fish species found in the world, 2,553 taxa (11.72%) have been reported from India. Since the last two centuries, numerous explorations were conducted by several work groups which made significant efforts to document the living resources of the country along with sample collection and deposition in national museums and repositories. In this endeavour, several new species of flora and fauna were discovered and reported every year.

India has enormous aquatic resources in the form of large, medium and minor rivers and its tributaries, reservoirs, lakes, ponds and wet lands, seas and ocean. It has a long coastline of 8,129 kms, exclusive economic zone (EEZ) of 2.02 million km², continental shelf of 0.506 million km², rivers and canals 1.97 lakh km, reservoirs 3.15 million ha, ponds and tanks 2.35 million ha, oxbow lakes and derelict waters 1.3 million ha and estuaries 0.29 million ha (Jhingran, 1991). India has about 2,553 native

fish species belonging to 999 Genera, 255 Families and 40 Orders. Out of which 877 species are found in freshwater, 113 taxa in brackishwater and 1,563 species in marine ecosystem. Besides these, there are 291 exotic fishes (Anon, 2013). Among the freshwater fishes, quite a large number are endemic to the two biodiversity hotspots of India - the Western Ghats and North-eastern region.

Contribution of fisheries sector to Indian economy is commendable in terms of contributions made towards food security, employment generation, raw material for fisheries dependent industries, specially export units and animal feed manufacturing units, domestic ornamental fish industry and ecotourism as well. In fisheries, India ranks 3rd in the world and 2nd in aquaculture. Contribution of fisheries in agricultural GDP of the country is 5.30% whereas towards GDP 1.07%. Annual earnings from exports is Rs. 7,200 crore (3% of total exports and 20% of agri-products exports) which is quite high and encouraging. Fisheries sector provides employment to over 14 million people. In the present scenario, it is very important to register the natural resources of the country for sustainable utilization and conservation. Every year, hundreds of new species are being discovered and reported globally, 62 new fish species have been discovered from the Indian region during the period 2010-13 (upto August, 2013).

Table 1 : A record of year-wise discovery of new species.

	Year	Number of species discovered
1	2010	07
2	2011	14
3	2012	24
4	2013	17
Total		62

Table 2 : Taxonomic status of new discoveries.

	Order	Total	Family	Number of species
1	Batrachoidiformes	1	Batrachoididae	1
2	Cypriniformes	25	Balitoridae	3
			Cyprinidae	9
			Psilorhynchidae	3
			Nemacheilidae	10
3	Perciformes	14	Badidae	4
			Nemipteridae	1
			Ammodytidae	1
			Serranidae	2
			Ambassidae	2
			Pristolepididae	1
			Channidae	1
			Opistognathidae	1
			Symphysanodontidae	1
4	Siluriformes	22	Sisoridae	13
			Olyridae	1
			Siluridae	1
			Erethistidae	3
			Clariidae	1
			Bagridae	2
			Amblycipitidae	1
		62		62

biodiversity hot spots are concerned, 38 new species has been discovered from North-eastern region and 16 species from Western Ghats. The data thus collected and analysed indicate area-wise species richness and possibilities for more discoveries in future.

Taxonomic contribution: During the last 4 years, 62 new species has been recorded from India belonging to 4 Orders, 21 Families and 31 Genus. Maximum number of 37 new discoveries have been made from the two biodiversity hot spots - 38 species from North-eastern region (includes 8 states) and 16 new species from the Western Ghats region (includes six states). Remaining species were discovered from West Bengal, Uttarakhand and marine

MATERIALS AND METHODS

Data Source: The new fish species discovered and reported from different regions of the Indian subcontinent are published in various national and international journals. Recently published literatures and data sources were scanned for collecting the information. For the purpose of documentation and preparation of database on Fish Genetic Resources of India, a standard species data collection sheet was prepared to collect the information on scientific name with authors name, common name, taxonomy, distribution, habitat, rivers, synonyms, economic importance, fishery, morphological characters and colouration.

Database development: So as to electronically store, update and manage the list and information on the native and exotic fish species of the country, a database using MSACCESS 2007 relational database management system under the Windows operating platform was designed. The information from the species data sheet was used to feed the database.

Interface development: In order to search and retrieve the information from the database, an integrated interface with the database using Visual Basic under Windows operating environment was developed that facilitate to retrieve the information by the search options, Scientific name, Genus and species and Family and species. Using either of the search option, the information about the species of interest can be retrieved from the database.

RESULTS AND DISCUSSION

Annual record and trend of new discoveries: Every year though hundreds of new species are being reported globally, 62 new species have been discovered from Indian region during the period 2010-13 (up to August, 2013). Analysis of compiled data showed that 7 species were reported during 2010, 14 species in 2011, 24 species in 2012 and 17 species in 2013 which belong to 4 Orders and 21 Families. Interestingly, no new species was reported during 2009 (Table 1). A total of 54 endemic species have also been described from the freshwater system and 7 species from the marine ecosystem of Andaman and Tuticorin (Bay of Bengal), Arabian Sea and south Indian coast of Indian Ocean. As far as the two

Photos of new species discovered


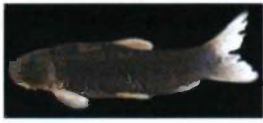



















		
1. <i>Balitora laticauda</i>	2. <i>Garra kalpangi</i>	3. <i>Glyptothorax dikrongensis</i>
		
4. <i>Amblyceps cerinm</i>	5. <i>Puntius rohani</i>	6. <i>Colletteichthys flavipinnis</i>
		
7. <i>Glyptothorax maceriatius</i>	8. <i>Glyptothorax scrobiculus</i>	9. <i>Liopropoma-randalli</i>
		
10. <i>Parambassis waikhomi</i>	11. <i>Pristolepis rubripinnis</i>	12. <i>Pseudanthias pillai</i>
		
13. <i>Pseudolaguvia viriosa</i>	14. <i>Schistura koladynensis</i>	15. <i>Glyptothorax radiolus</i>
		
16. <i>Puntius nigripinnis</i>	17. <i>Badis singenensis</i>	18. <i>Channa melanostigma</i>
		
19. <i>Glyptothorax malabarensis</i>	20. <i>Glyptothorax chintuipuiensis</i>	21. <i>Dario urops</i>

Photo source : 1. 1 <http://indianbiodiversitytalk.blogspot.in>; 2-7 www.fishbase.org; 8. www.planetcatfish.com; 9. reefbuilders.com; 10. indianbiodiversitytalk.blogspot.com; 11. sacekm.blogspot.com; 12. www.thehindu.com; 13. www.piklive.com; 14. www.aquaticrepublic.com; 15. www.planetcatfish.com; 16. www.seriouslyfish.com; 17. www.future-digital.com; 18. www.fishesfishing.com; 19. www.aquaticrepublic.com; 20. www.planetcatfish.com; 21. <http://ichthy.wordpress.com>

Table 3 : The taxonomical position, distribution, geographic area, habitat and endemicity of the newly discovered fishes.

Year	Fish Name	Order	Family	Geogr. area	Habitat	Endemicity	Distribution
2013	<i>Baia triocellus</i> (Khyntiam and Sen, 2013)	Perciformes	Baiaidae	NE	Freshwater	endemic	Subansiri river (District Lower Subansiri, Arunachal Pradesh), Dilpai river (District Dhemaji, Assam), and Meghalaya, North-eastern India.
2013	<i>Balitora jalpalli</i> (Raghavan <i>et al</i> , 2013)	Cypriniformes	Balitoridae	WG	Freshwater	endemic	Kunthi tributary of Bharatpuza river in Silent Valley, southern Western Ghats of Kerala, India.
2013	<i>Garra dampaiensis</i> (Lalrununga <i>et al</i> , 2013)	Cypriniformes	Cyprinidae	NE	Freshwater	endemic	Seling river tributary of Khawthiang Tulpui (Karnaphuli river), in Dampa Tiger Reserve, Mizoram, North-eastern India.
2013	<i>Garra magnidiscus</i> (Tamang, 2013)	Cypriniformes	Cyprinidae	NE	Freshwater	endemic	upper Brahmaputra River basin in Arunachal Pradesh, North-eastern India.
2013	<i>Glyptothorax elankadensis</i> (Plamoottil and Abraham, 2013)	Siluriformes	Sisoridae	WG	Freshwater	endemic	Manimala River, Kerala, India.
2013	<i>Glyptothorax radiolus</i> (Ng and Lalramliana, 2013)	Siluriformes	Sisoridae	NE	Freshwater	endemic	Brahmaputra river drainage in West Bengal, North-eastern India.
2013	<i>Olyra astrifera</i> (Arunachalam <i>et al</i> , 2013)	Siluriformes	Olyridae	WG	Freshwater	endemic	Manimalai river of south Kerala in Southern Western Ghats, India.
2013	<i>Ompok karunkodu</i> (Ng, 2013)	Siluriformes	Siluridae	WG	Freshwater	endemic	Amaravathi River tributary of Cauvery river in Tamil Nadu, southern India.
2013	<i>Pethia aurea</i> (Knight, 2013)	Cypriniformes	Cyprinidae	WB	Freshwater	endemic	Ponds and ditches in eastern and North-eastern part of West Bengal, India.
2013	<i>Pseudolaguvia nubila</i> (Ng <i>et al</i> , 2013)	Siluriformes	Erethistidae	NE	Freshwater	endemic	Kaladan River drainage in Mizoram, North-eastern India.
2013	<i>Psilorhynchus chakpiensis</i> (Shangningam and Vishwanath, 2013a)	Cypriniformes	Psilorhynchidae	NE	Freshwater	endemic	Chakpi River from Chindwin basin in Manipur, India.
2013	<i>Psilorhynchus hamiltoni</i> (Conway <i>et al</i> , 2013)	Cypriniformes	Psilorhynchidae	NE	Freshwater	endemic	Tista River in West Bengal from North-eastern India
2013	<i>Psilorhynchus maculatus</i> (Shangningam and Vishwanath, 2013b)	Cypriniformes	Psilorhynchidae	NE	Freshwater	endemic	Challou River in Chindwin basin, Manipur, India.
2013	<i>Schistura ferruginea</i> (Lokeshwor and Vishwanath, 2013)	Cypriniformes	Nemacheilidae	NE	Freshwater	endemic	Barak River drainage (Brahmaputra basin) at Maram, Senapati district, Manipur, North-eastern India
2013	<i>Schistura paucireticulata</i> (Lokeshwor <i>et al</i> , 2013)	Cypriniformes	Nemacheilidae	NE	Freshwater	endemic	Tuirial River in Mizoram, India

2013	<i>Schistura porocephala</i> (Lokeshwar and Vishwanath, 2013b)	Cypriniformes	Nemacheilidae	NE	Freshwater	endemic	Mat River (Koladyne basin) Mizoram, India.
2013	<i>Scolopsis igcarensis</i> (Mishra <i>et al.</i> , 2013)	Perciformes	Nemipteridae	WG	Marine	nonendemic	Kalpakkam coast and Tuticorin Fishing Harbour (Tamil Nadu), Vizinjam coast (Kerala) in southern India and Negombo in Sri Lanka.
2012	<i>Balitora laticauda</i> (Bhoite <i>et al.</i> , 2012)	Cypriniformes	Balitoridae	WG	Freshwater	endemic	Urmodi river a tributary of Krishna River, Satara district, Maharashtra, northern Western Ghats, India.
2012	<i>Bleekeria murtii</i> (Joshi <i>et al.</i> , 2012)	Perciformes	Ammodytidae	Tuticorin	Marine	nonendemic	Off Tuticorin coast (Tamil Nadu) from India.
2012	<i>Colletteichthys flavipinnis</i> (Greenfield <i>et al.</i> , 2012)	Batrachoidi-formes	Batrachoididae	Tuticorin	Marine	nonendemic	Off Tuticorin coast (Tamil Nadu), India and Sri Lanka.
2012	<i>Dario urops</i> (Britz <i>et al.</i> , 2012)	Perciformes	Badidae	WG	Freshwater	endemic	Small stream of Barapole tributary of Valapattanam River in southern Karnataka and from Wayanad District, Kerala in Western Ghats, India.
2012	<i>Garra kalpangi</i> (Nebeshwar <i>et al.</i> , 2012)	Cypriniformes	Cyprinidae	NE	Freshwater	endemic	Kalpangi River at Yachuli (Brahmaputra basin), Lower Sobansiri District, Arunachal Pradesh, North-eastern India.
2012	<i>Glyptothorax churamanii</i> (Rameshori and Vishwanath, 2012a)	Siluriformes	Sisoridae	NE	Freshwater	endemic	Kaladan River, Mizoram, North-eastern India.
2012	<i>Glyptothorax jayarami</i> (Rameshori and Vishwanath, 2012b)	Siluriformes	Sisoridae	NE	Freshwater	endemic	Kaladan River, Mizoram, North-eastern India.
2012	<i>Glyptothorax maceritatus</i> (Ng and Lalramliana, 2012a)	Siluriformes	Sisoridae	NE	Freshwater	endemic	Meghna-Surma River system in Mizoram, North-eastern India.
2012	<i>Glyptothorax scrobiculus</i> (Ng and Lalramliana, 2012b)	Siluriformes	Sisoridae	NE	Freshwater	endemic	Tuirial River and tributaries of Tuivai River in Mizoram, northeastern India.
2012	<i>Glyptothorax verrucosus</i> (Rameshori and Vishwanath, 2012c)	Siluriformes	Sisoridae	NE	Freshwater	endemic	Koladyne river, Mizoram, India.
2012	<i>Horaglanis abdulkalami</i> (Babu, 2012)	Siluriformes	Clariidae	WG	Freshwater	endemic	Dugout well at Irinjil, Trissur District, Kerala, India. Endemic fish.
2012	<i>Liopropoma randalli</i> (Akhilesh <i>et al.</i> , 2012)	Perciformes	Serranidae	Indian Ocean	Marine	nonendemic	Mangalore coast, Indian Ocean off southwestern India and Eastern Indonesia.
2012	<i>Parambassis bistigmata</i> (Geetakumari, 2012)	Perciformes	Ambassidae	NE	Freshwater	endemic	Ranga river, Arunachal Pradesh and Umtrao river Meghalaya (Brahmaputra drainage) from north-eastern India.
2012	<i>Parambassis waikhomi</i> (Geetakumari and Basudha, 2012)	Perciformes	Ambassidae	NE	Freshwater	endemic	Loktak Lake, Chindwin drainage, Manipur, northeastern India.

2012	<i>Physoschistura tigrinum</i> (Lokeshwor and Vishwanath, 2012a)	Cypriniformes	Nemacheilidae	NE	Freshwater	endemic	Changa River, Chindwin basin, Manipur, India.
2012	<i>Physoschistura chindwinensis</i> (Lokeshwor and Vishwanath, 2012b)	Cypriniformes	Nemacheilidae	NE	Freshwater	endemic	Lokchao river, Chindwin basin, Manipur, India
2012	<i>Physoschistura dikrongensis</i> (Lokeshwor and Vishwanath, 2012c)	Cypriniformes	Nemacheilidae	NE	Freshwater	endemic	Dikrong River (Tributary of Brahmaputra), Doimukh, Arunachal Pradesh, India
2012	<i>Physoschistura tuiwaiensis</i> (Lokeshwor, <i>et al</i> , 2012a)	Cypriniformes	Nemacheilidae	NE	Freshwater	endemic	Likhailok on the Tuiwai River, a tributary of the Brahmaputra River in southern Manipur, India.
2012	<i>Pristolepis rubripinnis</i> (Britz <i>et al</i> , 2012)	Perciformes	Pristolepididae	WG	Freshwater	endemic	Pamba and Chalakyady rivers in Kerala from southern India.
2012	<i>Pseudanthias pillai</i> (Heemstra and Akhlesh, 2012)	Perciformes	Serranidae	Tuticorin	Marine	nonendemic	South-west coast of India, western Indian Ocean, India.
2012	<i>Pseudolaguvia viriosa</i> (Ng and Tamang, 2012)	Siluriformes	Erethistidae	NE	Freshwater	endemic	Brahmaputra River drainage in Arunachal Pradesh, North-eastern India.
2012	<i>Puntius nigripinnis</i> (Knight <i>et al</i> , 2012)	Cypriniformes	Cyprinidae	WG	Freshwater	endemic	Nilgiris and from Kalindhi stream of river Kabini, Wyanaad from southern Western Ghats, India.
2012	<i>Schistura koladyensis</i> (Lokeshwor and Vishwanath, 2012d)	Cypriniformes	Nemacheilidae	NE	Freshwater	endemic	Koladyne river, Mizoram, India.
2012	<i>Schistura obliquofascia</i> (Lokeshwor <i>et al</i> , 2012b)	Cypriniformes	Nemacheilidae	Uttarakhand	Freshwater	endemic	From Kalsa, a stream near Chanfi, tributary of Gola River, Ganga basin in Uttarakhand, India
2011	<i>Badis singensis</i> (Geetakumari and Kadu, 2011)	Perciformes	Badidae	NE	Freshwater	endemic	From Singen River (Brahmaputra Basin), Arunachal Pradesh, North-eastern India.
2011	<i>Batasio convexirostrum</i> (Darshan <i>et al</i> , 2011)	Siluriformes	Bagridae	NE	Freshwater	endemic	Koladyne River (also known as Kaladan) in Mizoram, North-eastern, India.
2011	<i>Channa melanostigma</i> (Geetakumari and Vishwanath, 2011)	Perciformes	Channidae	NE	Freshwater	endemic	Lohit River (Brahmaputra basin), Arunachal Pradesh, North-eastern India.
2011	<i>Garra emarginata</i> (Kurup and Radhakrishnan, 2011a)	Cypriniformes	Cyprinidae	WG	Freshwater	endemic	Pooyamkutty, Periyar river, Kerala, Southern India.
2011	<i>Garra mapparaensis</i> (Kurup and Radhakrishnan, 2011a)	Cypriniformes	Cyprinidae	WG	Freshwater	endemic	Mlappara, Periyar river, from Kerala, Southern India.
2011	<i>Glyptothorax ater</i> (Anganthoibi and Vishwanath, 2011)	Siluriformes	Sisoridae	NE	Freshwater	endemic	Koladyne basin at Kolchaw, Mizoram, India.
2011	<i>Glyptothorax caudimaculatus</i> (Anganthoibi and Vishwanath, 2011)	Siluriformes	Sisoridae	NE	Freshwater	endemic	Koladyne basin at Kolchaw, Mizoram, India.
2011	<i>Glyptothorax dikrongensis</i> (Tamang and Chaudhry, 2011)	Siluriformes	Sisoridae	NE	Freshwater	endemic	Dikrong river Arunachal Pradesh, North-eastern India.

2011	<i>Homaloptera silasi</i> (Kurup and Radhakrishnan, 2011b)	Cypriniformes	Balitoridae	WG	Freshwater	endemic	Kattamadithode, a small stream connected with Periyar river (in Periyar Tiger Reserve) at Chokkanpetty in Kerala, India.
2011	<i>Mystus ngasep</i> (Darshan <i>et al</i> , 2011b)	Siluriformes	Bagridae	NE	Freshwater	endemic	Headwaters of Chindwin drainage in Manipur, India.
2011	<i>Opistognathus albicaudatus</i> (Smith-Vaniz, 2011)	Perciformes	Opistognathidae	Andaman	Marine	nonendemic	a new marine jawfish species of Andaman Islands, India.
2011	<i>Schistura fasciata</i> (Lokeshwor and Vishwanath, 2011)	Cypriniformes	Nemacheilidae	NE	Freshwater	endemic	Barak River (Brahmaputra drainage), Manipur, India.
2011	<i>Symphysanodon xanthopterygion</i> (Anderson and Bineesh, 2011)	Perciformes	Symphysanodontidae	Arabian Sea	Marine	nonendemic	Quilon, off Kerala coast, in the southern Arabian Sea, India.
2011	<i>Tor remadevii</i> (Kurup and Radhakrishnan, 2011c)	Cypriniformes	Cyprinidae	WG	Freshwater	endemic	Chambakkad and Kootiar regions of river Pambar in Chinnar Wildlife Sanctuary, Kerala, Southern India.
2010	<i>Amblyceps cerinum</i> (Ng and Wright, 2010)	Siluriformes	Amblycipitidae	NE	Freshwater	endemic	Brahmaputra River drainage in northern West Bengal, North-eastern, India.
2010	<i>Badis dibruensis</i> (Geetakumari and Vishwanath, 2010)	Perciformes	Badidae	NE	Freshwater	endemic	Dibru River, Dibrugarh, Brahmaputra Basin in Assam, North-eastern India.
2010	<i>Glyptothorax chimituipuiensis</i> (Anganthoibi and Vishwanath, 2010)	Siluriformes	Sisoridae	NE	Freshwater	endemic	Chimituipui River at Kolchaw, a tributary the Koladyne, Mizoram, India.
2010	<i>Glyptothorax malabarensis</i> (Gopi, 2010)	Siluriformes	Sisoridae	WG	Freshwater	endemic	Valappattanam River drainage of Kerala state in the Western Ghats region, India.
2010	<i>Pseudecheneis koladyne</i> (Anganthoibi and Vishwanath, 2010)	Siluriformes	Sisoridae	NE	Freshwater	endemic	Koladyne River in Mizoram, India
2010	<i>Pseudolaguvia virgulata</i> (Ng and Lalramliana, 2010)	Siluriformes	Erethistidae	NE	Freshwater	endemic	Brak River drainage, Mizoram, North-eastern India.
2010	<i>Puntius rohani</i> (Rema Devi <i>et al</i> , 2010)	Cypriniformes	Cyprinidae	WG	Freshwater	endemic	Kodayar River drainage near Mayilar, KWS, Kanyakumari in southern Western Ghats of India.

ecosystem. Taxonomical evaluation shows that 25 new species has been discovered in Order Cypriniformes, 14 species in Perciformes and 22 species in Siluriformes. Family-wise evaluation shows that highest discoveries were recorded from the Family Sisoridae (13 species) followed by Nemacheilidae (10 species), Cyprinidae (9 species) and Badidae (4 species). There are three such Families into which 3 new species has been discovered and added to each of them these are Balitoridae (3 species), Psilorhynchidae (3 species) and Erethistidae (3 species). There are three such families which got 2 new species in each of them these are Bagridae (2 species), Serranidae (2 species) and Ambassidae (2 species). However, there are eleven Families to which one new species has been added - Batrachoididae, Nemipteridae, Ammodytidae, Pristolepididae, Channidae, Opistognathidae, Symphysanodontidae, Olyridae, Siluridae, Clariidae and Amblycipitidae (Table 2).

Area-wise distribution of new species: Area-wise evaluation of new discoveries shows that 16 new species has been discovered from Western Ghats, 38 species from North-eastern region, 3 species from Tuticorin area and 1 species each from Andaman, Arabian sea, Indian Ocean, Uttarakhand and West Bengal. Out of these, 54 fishes are endemic species. Habitat-wise distribution shows that 55 species were reported from the freshwater system and 7 species from marine waters (Table 3). An analysis of the contribution of the authors towards new discoveries shows interesting results. Among the major work groups that made significant discoveries are Anganthoibi and Vishwanath discovered 4 species; Geetakumari and others 5 species; Kurup and Radhakrishnan 4 species; Lokeshwar and Vishwanath 7 species and Lokeshwar with others 3 species; Ng discovered 8 species with Lalramliana and others; Rameshori and Vishwanath 3 species; Shangningam and Vishwanath 2 species. More importantly Vishwanath as co-author contributed towards discovery of 23 new species from the North-eastern region.

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