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Fish and Food Security: Pioneering Updated Taxonomic Study of the Fishes of Karbi Anglong in Northeastern Biodiversity Hotspot

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Abstract

Nutritionally insecure people are said to largely live in Asia and Sub-Saharan Africa. Fish, in fact, is a potential and rich source of protein, micronutrients and essential fatty acids. However, the contribution of fish to human food and nutritional security depends upon its availability, access, and cultural and personal preferences. Making fish available to innumerable consumers needs proper knowledge of taxonomy, biology, and ecology of fish as well as aquaculture. Thus, it appears that taxonomic study is a prerequisite for doing any kind of ichthyological study; because it is essential to identify a fish specimen to begin with. Taxonomic studies also reveal the biodiversity of fishes in a region and their subsequent selection for aquaculture. While introducing the issue Angling (and Food security 'on the occasion of `World Food Day', this paper deals with a pioneering updated taxonomic study of the fishes of Karbi Angling(KA) in North Eastern Biodiversity hotspot region, with the sincere contemplation that the ichthyofauna of this virgin land; as well as, many other such hither to unknown unreported and unexplored areas could go a long way in finding an answer to our diminishing protein supply. Ichthyofaunal surveys in the rivers of Karbi Anglong (KA) district in the North-East (NE) India Biodiversity hotspot region, namely, River Dhanasiri at Rangapahar, Kopili in KA, River Dhanasiri at Bokajan, River Dhanasiri at other parts of KA, River Jamuna at Silvetta, River Dikrupti in KA and River Siloni in KA revealed the occurrence of 22 species belonging into 19 genera, 10 families and 6 orders. These include 8 species of Cypriniformes: 2 species each of Siluriformes and Synbranchiformes and 1 species each of Anabantiformes, Cichliformes and Mugiliformes. The near threatened status of prize food fishes, Labeo pangusia and Ailia coila are of concern.

Keywords: Biodiversity; Ichthyofauna; Taxonomy; Karbi Anglong; Assam; North-Eastern India Hotspot; Rivers, wetlands; Aquaculture

Abbreviations: KA: Karbi Anglong; FW: Freshwater; NE: North-Eastern; EH: Eastern Himalayan

Introduction

The continent of Asia and the Sub-Saharan region of the African continent are said to contain a big population of nutritionally unsecured people. Fish, in micronutrients, entail and rich source of protein, micronutrients and essential fatty acids. However, the contribution of fish to human food and nutritional security depends upon its availability, access, and cultural and personal preferences. The former i.e., access is very much ascertained by location, seasonality, and price. Moreover, at the individual level, it also depends upon a person's physiological and health status and how the fish is cooked and served among household members. It is said that >40% of all fish now consumed, are being derived from aquaculture mainly due to the sustained and fast expansion of aquaculture over the past three decades. Nevertheless, aquaculture produce, probably, increasingly features in the diets of many Asians; although, it is much less apparent among those living in Sub-Saharan Africa. Here, per capita fish consumption is believed to have grown little; and, despite the apparently strong markets and adequate biophysical conditions, aquaculture has yet to be promoted to a big extent. In this connection, it may be pointed out here that, the main issue is, what is being produced in aquaculture and how and whether the produce is as accessible as that from capture fisheries; rather than, literally just to adjudicate the role and contribution of aquaculture to food and nutritional security, in general. It is certainly the panorama of fish species produced by an increasingly globalized aquaculture industry which should differ from that derived from capture fisheries. In addition, farmed fishes may also differ in terms of their nutrient content, a result of the species being grown and of rearing methods. But, farmed fish price could affect access by poor consumers.

Concomitantly, the size at which fish is harvested could influence both access and use by the less affluent consumers. It is, therefore, necessary to explore these issues in detail, with reference to Asia and Africa; as well as the technical and policy interventions and innovations required to ensure that fish farming can fulfil its potential to meet the global population's food and nutritional requirements and security [1-13]. While introducing the issue of `Fish and Food security 'on the occasion of `World Food Day', this paper deals with a pioneering updated taxonomic study of the fishes of Karbi Anglong (KA) in Northeastern Biodiversity hotspot region, with the sincere contemplation that the ichthyofauna of this vitgin region; as well as many other such hither to unknown unreported areas could go a long way in finding an answer to our diminishing protein supply.

There are innumerable water bodies (wetlands and rivers) in India. The state of Assam, situated in the Eastern Himalayan belt, is a hotspot of not only fish diversity but also abiotic diversity harbouring numerous wetlands and rivers of various kinds (including rheophilic hill streams and plainwater rivers and streams) spread across the length and breadth of the region. Aquatic life has been influenced by human interventions. Several studies have been done on different aspects of fish and their habitats, notably [1, 6-8,14-36]. But not many taxonomic studies have been done on the fishes of Karbi Anglong (KA). As such, the present pioneering attempt is a humble contribution towards taxonomy of the riverine fishes in Karbi Anglong district of Assam.

Fish constitutes almost half of the total number of vertebrates on the earth. India is one of the mega biodiversity countries in the World. The hills and the undulating valley of this region gives rise to many torrential hill streams, which lead to big rivers that finally become part of the Ganga-Brahmaputra-Barak-Chindwin-Kolodyne-Gomati-Meghna system, identifying North-Eastern (NE) region in the Eastern Himalayan (EH) stretch as a hotspot of biodiversity [26, 37-44]. Out of 2,500 species of fishes in India, 930 are freshwater (FW) inhabitants and 1,570 are marine [8,20,40]. This bewildering ichthyodiversity of this region has been attracting many ichthyologists from different regions of the world.

The district of Karbi Anglong (located between 25°33′ and 26°35′ North latitude and from 92°10′ to 93°50′ East longitude) is one of the 34 administrative districts of Assam in India. The name "Karbi Anglong" is derived from` Karbi' the name of indigenous tribe living in and around the region. The tribe call themselves Arleng, meaning "Humans." Anglong is homonym noun for Hills and Mountains. The British, under their subjugation, constituted and declared the land of the Karbi people as a 'Scheduled District' in 1874. On November 17, 1951, the now defunct United Mikir Hills and North Cachar Hills district was formed. This was followed by bifurcation of the erstwhile district of United Mikir and North Cachar Hills into two separate districts - Mikir Hills and North Cachar Hills district - on 2 February 1970. Mikir Hills district was later renamed as currently known as Karbi Anglong district on 14 October 1976. With Karbi as the majority, there also exist numerous other ethnic groups like Tiwa, and Kuki tribes like Thadou and Hmar, are found scattered in the district. All these ethnicities represent different and unique identities, customs and traditions, clothing, food; yet they share many common practices.

The Karbi Anglong harbours a number of significant rivers at different locations, like like the River Dhansiri at Rangapahar (N 25°51' 24", E 93°42" 44", Alt: 175.29 m MSL), River Dhansiri at Bokajan (N 25°57' 52", E 93°46' 21", Alt: 163.46 m MSL), River Dhansiri in Karbi Anglong (N 26°03' 21" , E 93°48'11") , River Kopili in Karbi Anglomg (N 25°42' 58" , E 92°49' 16", Altitude(Alt): 121.2 m MSL), River Dikrupti in KA (N 26°20' 05", E 93°05'25" , Alt: 221.56 m MSL), River Siloni in Karbi Anglong (N 26°02' 39" , E 93°24' 35 ", Alt: 193. 94 m MSL); and River Jamuna at Silvetta (N 26°05' 53", E 92°45' 02 ", Alt: 89.06 m MSL) to name a few having a rich diversity of fishes. In 1971 Census of India, the Tribal population was at 65%. The region is of tourist attraction, having tourist spots consisting of water bodies (with fishes) like Akashi Ganga 15 km away from Dokmoka. A stream of water flows down from the high hill. In front of it, there is a Siva temple. Dikrut Waterfall (also called Paklongkam); It's a waterfall located on the mountain. Tiurists know it by the name of Bhelughat. Garampani (also called Langkar-om); having the Garampani Wildlife Sanctuary which is the home for of hoolock gibbon and golden langur. There is a hot water spring here near the National Highway-29 (also NH37). Kaipholangso in Dolamara vicinity; the tourists know it as Kakochang falls; Kangthi Langso Waterfall, located in Kangthi village, around 12 km from Den Arong (Dengaon). Longsokangthu (also called Siloni) is a scenic place on the bank of a river, surrounded by hills and greenery. Silbheta (also called Arlong-Ru-pat) is a beautiful rain forest-surrounded spot having a nature built stone bridge (dyke) with a waterfall. Langvoku Waterfall, situated c 10 away from Manja. in Karbi Anglong, is a place with fountains. The Tokolangso Waterfall is also an amazingly beautiful place. The cold and crystal-clear water falls straight from the hilltop.

Material And Methods

Fish samples were collected through experimental fishing using cast nets (diameter 3.7 m-1.0 m), gill nets (vertical height 1.0 m-1.5 m; length 100 m-150 m), drag nets (vertical height 2.0 m), triangular scoop nets (vertical height 1.0 m) and a variety of traps. Camouflaging technique was also used to catch the fishes. Fish have been preserved at first in concentrated formaldehyde in the field itself and then in 10% formalin. Fishes have been identified after standard literature [37-40], [45-53] and fishbase.org. The arrangement of classification, followed here, is that of Greenwood et a1 [54] Jayaram [37-40] and Kar and Khynriam [25].

Results And Discussion

Pioneering taxonomic updated studies on the riverine fishes in Karbi Anglong (KA) district of Assam revealed the occurrence of 22 species under 20 genera, 10 families and 6 orders. These

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include 11 species of Cypriniformes: 4 species each of Siluriformes, 3 species each from Synbranchiformes and Anabantiformes and 1 species from Mugiliformes. There seemed to be more abundance of Puntius sophore, Amblypharyngodon mola, Ailia coila, Cirrhinus reba and Trichogaster fasciata in the rivers of Karbi Anglong. The near threatened status of the prize food fish, Labeo pangusia is a matter of concern.

The tropical Asian ichthyofauna constitutes a substantial part of the total lotic and lentic fish community. The Indian Peninsula supports 930 species of native FW fishes, which belong to 87 families. Several of tropical Asian Freshwater fishes share the African riverine ecosystems, both at the family and the generic levels. Cyprinids, certain Siluriform catfishes, Channids, Mastacembelids and Notopterids are shared between the two regions. At the generic level, Anabas, Clarias, Garra, Labeo, and Mastacembelus occur in both African and Asian rivers. Cyprinids and Balitorids have been numerous in Asia, in contrast to the predominance of Characids and Cichlids in Africa. In fact, there had not been much research on the taxonomy and associated habitat parameters of the tropical fish communities. On the other hand, there have been some amount of works done on fish diets and resource partitioning in specific Sri Lankan hill streams. Niche' segregation is dependent on seasonality, diet, and habitat utilization, as was revealed from their studies. Also, there are morphological segregation and specialization in these fish communities [25,26,55-57] (Table 1).

Table 1: Distribution and conservation status of ichthyo species in different Rivers of Karbi Anglong, Assam.

Sl. No.	Systematic list	Rivers					River	River	Conservation status
		R Dhansiri at Rangapahar	Kopili	R Dhansiri at Bokajan	R Dhansiri in Karbi Anglong (KA)	R. Jamuna at Silvetta	R Dikr-upti in KA	R. Silon-I in KA	
Phylum: Chordata. Class: Actinopteri									
Order: Cypriniformes. Family: Danionidae									
1	Cabdio morar (Hamilton, 1822)	+							Least Concern
2	Salmostoma bacaila (Hamilton, 1822)				+				Least Concern
3	Amblypharyngodon mola	+	+		+			+	Least Concern
	(Hamilton, 1822)								
Family: Cyprinidae									
4	Puntius sophore (Hamilton, 1822)			+	+			+	Least Concern
4(a)	Neolissochilus hexastchicus						+		-
5	Cirrhinus reba (Hamilton, 1822)	+				+			Least Concern
6	Labeo gonius (Hamilton, 1822)				+				Least Concern
7	Labeo pangusia (Hamilton, 1822)			+					Near Threatened
8	Labeo rohita (Hamilton, 1822)			+					Least Concern
	Garra gotyla (Gray,1830)						+		Least Concern
	Schistura Savona (Hamilton,1822)						+		Least Concern
Order: Siluriformes. Family: Bagridae									
9	Mystus vittatus [56]					+		+	Least Concern
9(a)	Mystus bleekeri (Day)							+	-

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Family: Ailiidae									
10	A Ailia coila (Hamilton, 1822)	+			+	+			Least Concern
SFamily: Schilbeidae									
10(a)	PPachypterus atherinoides [56]								
Order: Synbranchiformes. Family: Mastacembelidae									
11	Macrognathus aral (Bloch &Schneider, 1801)			+				+	Least Concern
12	Macrognathus pancalus					+		+	Least Concern
	(Hamilton, 1822)								
12(a)	Mastacembelus armatus (Lacepède, 1800)						+		Least Concern
Order: Cichliformes. Family: Ambassidae									
13	Chanda nama (Hamilton, 1822)					+		+	Least Concern
13(a)	Parambassis ranga (Hamilton1822)							+	Least Concern
Order: Mugiliformes. Family: Mugilidae									
14	Rhinomugil corsula (Hamilton, 1822)					+			Least Concern
Order: Anabantiformes. Family: Osphronemidae									
15	Trichogaster fasciata (Bloch & Schneider, 1801)	+	+						Least Concern
Family: Channidae									
16	Channa punctata (Bloch,1793)						+		Least Concern
17	Channa stewartii (Playfair, 1867)						+		Least Concern

Systematic account

Phylum: Chordata, Class: Actinopteri

Order: Cypriniformes, Family: Danionidae

Genus: *Cabdio* Hamilton, 1822

Cabdio Hamilton, 1822, An account of fishes found in the river Ganges: 333, 392.

Generic characters: Body elongate. Abdomen rounded. Head moderately rounded anteriorly. Snout obtuse. Mouth small, inferior. Eyes lateral. Lips thin. Lower jaw without any lip and with a sharp crescent bony edge. Barbels absent. Dorsal fin inserted behind pelvic fins. Caudal fin forked. Lateral line much decurved. Scales of moderate size; eye, 17.2 to 25.3 % HL.

Material examined: Karbi Anglong district, Assam; River Dhansiri at Rangapahar, 1 ex, (Museum No. 1/10), Coll: 3.12.2016. Professor. D. Kar and Party. First report.

Key to species: Lateral line scales 38 to 42. Anal fin with 10 to 12 rays. 2.5 to 3 rows of scales between lateral line and pelvic fin base.

Cabdio morar (Hamilton, 1822)

Distribution: Throughout Northern India, including river Barak in North-East India; Bangladesh, Nepal, Pakistan, etc.

IUCN Status: Least Concern (LC)

Genus: Salmostoma Swainson, 1839

Salmophasia Swainson, 1839, *Nat. Hist.Fish.,* 2: 184 (Type species, *Cyprinus oblonga* Swainson= *Cyprinus bacaila* Hamilton-Buchanan, by subsequent designation); Banarescu, 1968, *Rev. Roum.Biol. Zool.,* 13: 13-14; Howes, 1979, *Bull.Br.Mus. nat.Hist.,* (Zool.) 36(3):190-191; Talwar and Jhingran, 1999, *Inland Fishes* 1; Jayaram, 1999, *FW Fishes of the Indian Region*: 65; Menon, 1999, *Rec.Zool. Surv. India Occ. Paper* No. 175: 24; Vishwanath, 2002, *Fishes of North-East India, NATP Pub.:* 51.

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Generic characters: Body elongated, compressed. Abdomen keeled from below pectoral fins to anus; keel not hardened. Head moderate to long, compressed. Snout blunt. Mouth oblique to body axis; cleft reaching anterior margin of orbit or slightly ahead. Lower jaw longer with a knob (generally present) at the symphysis of the 2 bones. Dorsal fin short; inserted mostly opposite to anal fin (or may be little ahead in some cases) with usually 7 to 10 rays. Pectoral fins long and presence of an elongated axillary scale. Anal fin shaort with 14-20 rays. Caudal fin deeply forked. Lateral line (L1) complete with usually 39 to 112 scales.

Material examined: Karbi Anglong district, Assam; River Dhansiri, 1 ex., (Museum No. 4/3), 3.12.2016. Coll: Professor D. Kar and Party. First report.

Key to species: Presence of 4-6 scales between Ll and pelvic fin base

Salmostoma bacaila (Hamilton, 1822)

Distribution: Almost throughout India, Bangladesh, Nepal, etc.

IUCN status: Least Concern (LC).

Genus: Amblypharyngodon Bleeker, 1860

Amblypharyngodon Bleeker, 1860. Natuurkundig Tijdschrift voor Nederlandsch Indië v. 20 (no. 3): 433 (Type species: *Cyprinus mola* Hamilton 1822 by being a replacement name).

Generic characters: Body moderately long, sub-cylindrical. Abdomen round. Head much compressed. Snout obtusely rounded. Mouth wide, antero-lateral, and not protractile. Eyes centrally placed and large; they are not visible from below ventral surface. Upper lip absent. Lower lip with a short labial fold. Lower jaw prominent with a thin sharp edge and a symphysial knob which fits into the upper jaw. Barbells absent. A Dorsal fin inserted little behind insertion of pelvic fins. Anal fin short. Caudal fin forked. Scales minute.

Material examined:

- Karbi Anglong (KA) district, Assam; River Dhansiri at Rangapahar, 1 ex, (Museum No. 1/13), Coll: 3.12.2016; Professor D. Kar and Party. First Report.
- Karbi Anglong (KA) district, Assam; River Kopili; 1 ex. (Museum No. 2/6), Coll: 4.12.2016; Professor D. Kar and Party. First Report.
- KA district, Assam; **R** Dhansiri in KA; 4 ex, (Museum No. 4/23,24, 25, 26), Coll: 3.12.2016. Coll. Professor D. Kar and Party. First Report.

Key to species: Lateral line incomplete with 65-91 scales. A silvery lateral band with dark markings on dorsal, anal, and caudal fins present. The observations are given in.

Amblypharyngodon mola (Hamilton, 1822)

Distribution: Throughout India, Afghanistan, Bangladesh, Myanmar, Nepal, Pakistan, Sri Lanka, etc.

IUCN status: Least Concern (LC).

Family: Cyprinidae

Genus: Neolissochilus Rainboth, 1985

Generic characters: Body deep anteriorly. Trunk and peduncle smoothlytapering from anterior end to posterior end. Abdomen rounded. Head broad. Snout blunt. Mouth oblique, near terminal to horizontal or inferior. Species with horizontal mouth often have the lobe of snout overhanging the upper lip. Mouth smoothly rounded when the lower jaw is blunt. Eyes in upper half of head; visible both from dorsal and ventral surfaces. Lips thick. Cheeks with many tubercles. Labial fold interrupted. Scales are large and heavy.

Material examined:

- Karbi Anglong (KA) district, Assam; River Dikrupti in KA; 1 ex.; Museum No.5(a)/5, Coll: 24 10 2012; Coll. Professor. D. Kar and Party. First report.

Key to species: Mouth rounded smoothly; edge of lower jaw blunt. The Dorsal fin nearer to tip of snout than to caudal fin base.

Neolissochilus hexastichus (McClelland, 1839)

Distribution: Arunachal Pradesh, Assam including River Jinam, Dima Hasao District

in Assam (first report by Professor D Kar and Party); Meghalaya, Mizoram, Nagaland, Rivers from Kashmir to Sikkim, Myanmar.

IUCN Status: Near Threatened (NT).

Genus: Puntius Hamilton, 1822

Puntius Hamilton, 1822, *Fish Ganges*: 310, 388 (Type species, *Cyprinus sophore,* Hamilton-Buchanan, by subsequent designation); Jayaram, 1991, *Rec.Zool. Surv. India Occ. Paper* No.135: 1-178 (revision); Talwar and Jhingran, 1991, *Inland Fishes* 1: 250; Jayaram, 1999, *FW Fishes of the Indian Region*: 108; Menon, 1999, *Rec Zool.Surv. India., Occ. Paper* No. 175: 65; Nath and Dey, 2000. *Fish and Fisheries of NE India (Arunachlal Pradesh):* 39; Vishwanath, 2002, *Fish and Fisheries of NE India, NATP Pub.*: 69.

Generic characters: Body short to moderately long, deep, compressed. Abdomen round. Head short. Snout obtuse, conical, or pointed; sometimes, maybe with tubercles. Mouth arched, anterior or inferior. Upper jaw may be protractile. Eyes moderate to large, dorsolateral; they are not visible from below ventral surface. Lips thin, cover the jaws, without any horny covering. Jaws simple without any tubercle at the symphysis. Barbels four, two or may be absent. Dorsal fin short inserted nearly opposite to pelvic fins. Anal fin short. Caudal fin forked. Scales small, moderate, or large.

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Material examined:

- KA district, Assam; River Dhansiri at Rangapahar, 1 ex., (Museum No.1/3), Coll: 3.12.2016, Coll. Professor. D. Kar and Party. First report.
- KA district, Assam; River Kopili, 2 ex, (Museum No.2/11, 13), Coll: 4.12.2016, Coll. Professor. D. Kar and Party. First report.
- KA district, Assam; River Dhansiri at Bokajan**,** 1 ex, (Museum No.3/7). Coll: 2.12.2016, Coll. Professor. D. Kar and Party. First report.
- KA district, Assam; River Dhansiri in KA, 1 ex, (Museum No.4/24), Coll: 3.12.2016. Coll. Professor. D. Kar and Party. First report.
- KA district, Assam; River Siloni in KA, 2 Exs; Museum No.: 5(c)/ 5, 17

Key to species: Pre-dorsal scales 8-10. The presence of a black spot-on dorsal fin and on caudal peduncle.

Puntius sophore (Hamilton, 1822)

Distribution: Almost Throughout India; Bangladesh, Myanmar, Nepal, Pakistan, Sri Lanka, etc.

IUCN Status: Least Concern (LC).

Genus: Cirrhinus Oken, 1817

Cirrhinus (Oken), Cuvier, 1817, *V.KI. Fische.* IN: *Isi's order Encyclopadische Zeituny,* 8: 113 (type species, *Cyprinus cirrhosus* Bleeker, by minotypy), Banarescu, 1983, *Rev.Roum. Biol. (Zool).*28 (1): 13-17 (revision)

Generic characters: Body moderate, elongate, compressed. Abdomen rounded. Head short. Snout obtusely rounded, with thin skin covering it. Mouth wide, transverse. Eyes moderately large. Upper lip fringed or entire, not continuous with lower. Lower jaw sharp with a small tubercle at the symphysis. Barbels four, two or none. Dorsal fin inserted ahead of pelvic fins. Anal fin short. Scales of varying sizes. Lateral line complete.

Materials examined:

- KA district, Assam; River Dhansiri at Rangapahar, 1 ex, (Museum No. 1/3), Coll.: 3.12.2016; Coll: Professor. D. Kar and Party. First report.
- KA district, Assam; River Dhansiri at Bokajan, 3 ex, (Museum No. 3/9,10,12), Coll: 2.12.2016; Coll: Professor. D. Kar and Party. First report.
- KA district, Assam; River Jamuna at Silvetta, 2 ex, (Museum No. 5/4,5), Coll: 2.12.2016. Coll: Professor. D. Kar and Party. First report.

Key to species: Lateral line scales 34 to 38. Dorsal fin less than body depth.

Cirrhinus reba (Hamilton, 1822)

Distribution: Throughout Northeast India, Northern India, Darjeeling, and Eastern Himalaya. South and South-Eastern Asia.

IUCN Status: Least Concern (LC).

Genus: Labeo Cuvier, 1816

Labeo cuvier, 1816, *Regne Animale,* 2 (ed.1): 194 (Type species, *Cyprinus niloticus* Forskal, by subsequent designation); Jayaram and Dhas,1998, *Occ.Papers Zool. Surv.India,* No. 183: 1-143; Talwar and Jhingran, 1991, *Inland Fishes* I: 193; Jayaram, 1999, *FW Fishes of the Indian Region*: 132; Menon, 1999, *Rec.Zool. Surv. India Occ. Paper* No., 175: 125; Nath and Dey, 2000, *Fish and Fisheries of NE India (Arunachal Pradesh)*: 45.

Generic characters: Body of moderate size; sometimes, could be much big in size; elongated, abdomen rounded. Head quite large. Snout swollen, rounded or truncated; often projecting beyond mouth; covered by a groove across and with or without tubercles; generally overhanging the mouth. Mouth usually semilunar and inferior. Eyes moderately large, generally placed at the commencement of the posterior half of the head. Lips thick, fleshy, and fringed; continuous at the angle of the mouth forming a labial fold. Post-labial groove may be continuous or discontinuous. Barbels may be present or absent. Dorsal fin inserted above anterior to origin of pelvic fins with 11 to 26 rays. Anal fin short with 7 or 8 rays. Caudal fin deeply forked or emarginated. Lateral line complete.

Material examined:

- KA district, Assam; River Dhansiri at Rangapahar, 1 ex, (Museum No. 1/3), Coll.: 3.12.2016; Coll: Professor. D. Kar and Party. First report.
- KA district, Assam; River Dhansiri in KA, 2 ex, (Museum No. 4/15, 28), Coll: 3.12.2016, Coll.: Professor D. Kar and Party. First report.

Key to species: Presence of generally 9 to 14 scales between lateral line (Ll) and pelvic fin base

Labeo gonius (Hamilton, 1822)

Distribution: Almost throughout India; also in Bangladesh, Myanmar, Nepal, Pakistan, Sri Lanka, etc.

IUCN Status: Least Concern (LC)

Material examined: KA district, Assam; River Dhansiri at Bokajan, 1 ex, (Museum No. 3/11), Coll: 2.12.2016. Coll. Professor. D. Kar and Party. First report.

Key to species: Presence of generally 6 to 6.5 scales between lateral line (Ll) and pelvic fin base; eye 17.2 to 25.3 % HL.

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Labeo pangusia (Hamilton, 1822)

Distribution: Almost throughout India; also in Bangladesh, Myanmar, Nepal, Pakistan, Sri Lanka, etc.

IUCN Status: Near Threatened (NT)

Material examined: KA district, Assam; River Dhansiri at Bokajan, 1 ex, (Museum No. 3/4)

Coll: 2.12.2016, Coll: Professor. D. Kar and Party. First report.

Key to species: Presence of generally 6 to 6.5 scales between lateral line (Ll) and pelvic fin base

Labeo rohita (Hamilton, 1822)

Distribution: Almost throughout India; also in Bangladesh, Myanmar, Nepal, Pakistan, Sri Lanka, etc.

IUCN Status: Least Concern (LC)

Genus *Garra* Hamilton, 1822

Garra Hamilton, 1822, Fish Ganges: 343, 393 (Type species: *Cyprinus (Garra) lamta* by later designation).

Generic characters: Body short, sub-cylindrical. Ventral surface flat. Head little depressed anteriorly. Snout blunt; smooth or with pores; with or without a deep, transverse groove-like depression. Mouth inferior, transverse, semi-circular. Eyes small; in the posterior half of the head; lateral; not visible from below ventral surface. Lips thick and fleshy. Upper and lower lips are continuous without any lateral lobes. A proboscis may or may not be present. A suctorial disc of semi-cartilaginous pad present on the chin. Scales moderate.

Material examined: Karbi Anglong (KA) district, Assam; River Dikrupti in KA; Coll. 2.12.2016; 2 exs; Museum No. 5(b)/4,6; Coll: Professor. D. Kar and Party. First report.

Key to species*:* A well-developed median proboscis and a transverse lobe at tip covered with spiny tubercles.

Garra gotyla (Gray, 1832)

Distribution: Throughout Northeast India, including River Diyung in Dima Hasao District, Assam (first report by Professor D Kar and Party); The Himalayas, Chotanagpur plateau, and mountains of the Indian Peninsula area. Afghanistan, Bangladesh, Bhutan, Myanmar, Nepal, and Pakistan.

IUCN status*:* Least Concern (LC).

Schistura savona (Hamilton, 1822)

Genus *Schistura* McClelland, 1839

Schistura McClelland, 1839, Asiat. Res., 19: 306, 439 (Type species: *Cobitis (Schistura) rupecula* McClelland by subsequent designation).

Generic characters: Body elongate of almost uniform depth; compressed posteriorly. Head either depressed or compressed. Snout usually blunt. The posterior nostril may be prolonged as a tube in some species. Lips with a few furrows; medially interrupted. Upper lip slightly furrowed; continuous or with a narrow median interruption. Lower lip interrupted in the middle; moderately furrowed. Processus dentiform of upper jaw present with a corresponding incision on the lower jaw in many species. Dorsal fin short; inserted ahead or opposite to pelvic fins; with seven-eight rays; rarely 10. An auxillary pelvic lobe may be present. Caudal fin slightly emarginated, forked, or truncate (never rounded); with a black bar. A general absence of adipose crest. If present, mostly in the posterior part of the body. Lateral line complete or incomplete. Presence of scales on the body generally. Usually, the presence of a characteristic color pattern.

Material examined: Karbi Anglong (KA) district, Assam; River Dikrupti in KA; Coll. 2.12.2016; 1 ex; Museum No. 5(b)/9; Coll: Professor. D. Kar and Party. First report.

Key to species: Body with dark crossbars of varying forms, transverse bars at the caudal fin base.

Schistura savona (Hamilton, 1822)

Distribution: Throughout Asia, Europe, and some parts of Ethiopia. The first report in river Khuolzangvadung, Dima Hasao District, Assam (By Professor D Kar and party).

IUCN status*:* Least Concern (LC).

Order: Siluriformes

Family: Bagridae

Genus: *Mystus* Scopoli, 1777

Mystus Scopoli,1777, *Introductio and historiam naturalem*: 451 (type species: *Bagrus haplepensis* Valenciennes, 1840 by subsequent designation).

Generic characters: Body short or moderately elongated. Head short, flattened. Snout obtuse or rounded. Mouth sub-terminal, transverse. Eyes anteriorly situated, moderately large. Teeth numerous. Upper surface of head mostly smooth with one or two median longitudinal grooves of varying length. The occipital process is long or short, situated superficially concealed under skin. Four pairs of barbells; one each of maxillary, nasal and two mandibular, two dorsal fins; an anterior rayed dorsal with seven or eight rays and a spine; a posterior smooth low adipose fin of varying lengths. Pectoral fins with seven to 11 rays and a strong spine serrated along the inner edge. Pelvic fins with six rays. Anal fin with nine to 14 rays. Caudal fin forked, bilobed with

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unequal lobes; lobes may be rounded, pointed, or prolonged into filamentous extensions. Lateral line simple, complete.

Material examined:

- Karbi Anglong district, Assam; River Jamuna at Silvett;a 1 ex., (Museum No. 5/16), Coll: 2.12.2016, Professor. D. Kar and Party: First report.
- Karbi Anglong district, Assam; River Siloni; 3 ex.; (Museum No. 5 (C)/2,3,4), Coll: 2.12.2016, Professor. D. Kar and Party: First report.

Key to species: Body with two parallel stripes on each side of lateral line. There may also be a dark humeral spot.

Mystus vittatus (Bloch, 1794)

Distribution: Almost throughout India; Myanmar, Pakistan, Sri Lanka, etc.

IUCN Status: Least Concern (LC)

Material examined: Karbi Anglong district, Assam; River Siloni; 1 ex; Museum No. 5 (C)/6), Coll: 2.12.2016, Coll. Professor. D. Kar and Party: First report.

Key to species: Maxillary barbels reach base of anal fin. The presence of three broad conspicuous dark bands separated two pale lines on each side of lateral line.

Mystus bleekeri (Day, 1877)

Distribution: Almost throughout India, including wetlands in Assam, notably, Cachar district, Salchapra Anua, Coll. Prof. D. Kar and Party, First report; etc., other parts of North-East (NE) India, different parts of rest of India, Bangladesh, Nepal, etc.

IUCN status: Least Concern (LC)

Family: Ailiidae

Genus: *Ailia* Gray, 1830

Ailia Gray, 1830, *Zool Miscellany,*Pl. 85 (Type species: *malapterus (sic) (Ailia) bengalensis* Gray= *Malapterus coila* Hamilton-Buchanan, by monotypy); Hora, 1941, *Rec. Indian Mus.,* 43 : 110-112 ; Jayaram, 2006, *Catfishes of India :* 117; Ferraris, 2007, *Zootaxa,* 1418 : 356.

Generic characters: Body short compressed. Abdomen rounded. Head short, greatly compressed. Mouth moderately wide. Eyes small lateral. The presence of 4 pairs of barbells: one pair each maxillary and nasal; and two pairs mandibular; all these barbels are usually longer than the head. Rayed dorsal fin absent. The adipose dorsal fin is small, short, and posteriorly free. Pectoral fins with 13 to 16 rays and a spine. Pelvic fins with six rays; may sometimes be vestigial or absent. Caudal fin forked.

Material examined:

- Karbi Anglong district, Assam; River Dhansiri 1 ex, (Museum No. 4/10),
- Karbi Anglong district, Assam; River Dhansiri at Rangapahar, 1 ex., (Museum No. 1/21), Coll. 3.12.2016.
- Karbi Anglong district, Assam; River Jamuna, at Silvetta, 2 ex., (Museum No. 5/9, 10), Coll: 2.12.2016, Coll. Professor. D. Kar and Party. First report.

Key to species: Pelvic fins absent. Rayed dorsal fin also absent. Anal fin long with 48 to 90 rays.

Ailia coila (Hamilton, 1822)

Distribution: Almost throughout India; Bangladesh, Nepal, Pakistan, etc.

IUCN Status: Near threatened (NT).

Family: Schilbeidae

Genus: *Pachypterus Swainson, 1838*

Pachypterus atherinoides (Bloch, 1794)

Pachypterus: Bagrus angius (Hamilton, 1822) ; Bagrus atherinoides (Bloch, 1794); Clupisoma atherinoides (Bloch, 1794); · Neotropius atherinoides (Bloch, 1794) ; Pachypterus trifasciatus Swainson, 1839; Pseudeutropius atherinoides (Bloch, 1794) ; Pseudotropius atherinoides (Bloch, 1794) : unaccepted ones.

Silurus atherinoides Bloch, 1794) Bloch, M. E. (1794). Naturgeschichte der ausländischen Fische. *Berlin.* v. 8. i-iv + 1-174, Pls. 361-396. [details]

Generic characters: Body medium long. Nape little elevated. Presence of a prominent black blotch at the base of the causal fin.

Material examined: (a) Karbi Anglong district, Assam; R Siloni; Coll 2 12 2016; 7 Exs; Coll. Professor. D. Kar and Party. First report.

(b) Karbi Anglong district, Assam; River Dhansiri in KA; Coll. 3 12 2016, 11 Exs.; Coll. Professor. D. Kar and Party. First report.

Key to species: TL varied from 3.2 to 6.1cm; SL varied from 3.5 to 4.9; HL from 0.8 to 1.1; HD from 0.5 to 0.8 cm; eye diameter recorded 0.3 cm on the average; depth of body ranged from 0.7 to 1,1 cm; range of fin rays were pectoral 4-7, pelvic 4-5, anal 16-43, and dorsal fin rays varied from 5-12 rays.

Order: Synbranchiformes

Family: Mastacembelidae

Genus: *Macrognathus* Lacepede, 1800

Macrognathus Lacepede, 1800, *Hist.Nat. Poiss.,*2: 283 (Type species, *Ophidium aculeatum* Bloch, by subsequent designation); Sufi, 1953; *Bull. Raffles Mus.* No. 27: 99-105; Robert, 1980, *Copeia,* No.3: 385-391 (revision); Roberts, 1986, *Jap. J. Ichthyol,* 33 (2);97-103; Bloch and Schneider, 1801, *Syst.Ichth.,* 478.

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Generic Characters: Body deep, eel-like, compressed. Head long, pointed. Snout long, fleshy; and accommodate a concave prolongation of the upper jaw. Mouth inferior, cleft narrow. Dorsal fin inserted far behind the end of pectoral fins with 13 to 32 detached depressible spines and 42-58 rays. Anal fin with 3 spines and may be with 40 to 60 rays. Caudal fin rounded, distinctly separated from dorsal and anal fins. Scales small. Lateral line present.

Material examined: Karbi Anglong district, Assam, River Dhansiri at Bokajan, 2 exes, (Museum No. 3/3, 14), Coll. 2.12.2016, Coll: Professor. D. Kar and Party. First report.

Key to species: Dorsal fin spines 16-23.

Macrognathus aral (Bloch and Schneider, 1801)

Distribution: Almost throughout India; Bangladesh, Myanmar, Nepal, etc.

IUCN Status: Least Concern (LC)

Material examined: Karbi Anglong district Assam; River Jamuna, at Silvetta; 1 ex, (Museum No. 5/6), Coll: 2.12.2016; Coll.: Professor. D. Kar and Party. First report.

Key to species: Dorsal fin with 24 – 26 spines and with 30 – 42 soft rays.

Macrognathus pancalus Hamilton, 1822

Distribution: Throughout India; Bangladesh, Nepal, Pakistan etc.

IUCN Status: Last Concern (LC)

Genus: *Mastacembelus* Scopoli, 1777

Mastacembelus Scopoli, 1777, Introd. Hist. Nat.: 458 (type –species, *Ophidium mastacembelus* Banks and Solander, by subsequent monotype); Travers, 1984, Bull. Brit. Mus. nat. Hist. (zool.)47 (2): 141-145 (review); Roberts, 1986, Jap. J. Ichthyol., 23 (2): 103-107 (review); - Sufi, 1956, Bull. Raffles. Mus., No. 27: 105-143 (systematic review).

Generic characters: Body eel-like, elongated, compressed, long, pointed. Snout long, conical. Mouth inferior; cleft narrow. Eyes small, superior. Rim of anterior nostrils with two finger-like fimbriae and two flaps. Dorsal fin inserted above middle of pectoral fins. Pelvic fins absent. Caudal fin rounded. Dorsal and anal fins may or may not be confluent with caudal fin. Pelvic fins absent.

Material examined: Karbi Anglong (KA) district Assam; River Dikrupti in KA; 1 ex, Museum No. 5 (b)/1, Coll: 2.12.2016; Coll.: Professor. D. Kar and Party. First report.

Key to species: Dorsal fin with 32 – 40 detached, depressible spines and 67 to 90 rays. Anal with three spines and 46 to 90 rays. Caudal fin merged and continuous with dorsal and anal fins, Caudal fin rays14 to 17.

Mastacembelus armatus (Lacepede, 1800)

Distribution: Many water bodies in India and NE India including Baskandi Anua in Cachar, Assam (1st report by Professor D Kar and Party); Salchapra Anua (1st report by Professor D Kar and Party), also in Bangladesh, South China, Malaya, Java, Myanmar, Nepal, etc.

IUCN status: Least Concern (LC)

Order: Cichliformes

Family: Ambassidae

Genus: *Chanda* Hamilton, 1822

Chanda Hamilton, 1822, *Fish Ganges*: 103, 270 (Type species, *Chanda nama,* Hamilton-Buchanan).

Generic Characters: Body ovate, deep compressed. Abdomen rounded. Head short, compressed with sharp snout. Mouth wide, protractile; extended up to border of orbit or slightly beyond. Eyes large, superior. Pre-orbital edge with four serrae. Lower jaw strongly projecting. Lower limb of pre-opercle with a double-serrated edge. Opercula without a prominent spine. Two dorsal fins; 1st with seven spines and 2nd with 15-17 rays; the two dorsal fins continuous. A forwardly directed recumbent spine present in the dorsal fin. Anal fin with three spines and 17 rays. Caudal fin forked. Body with cycloid scales. Laleral line complete with 125 scales.

Materials examined: Karbi Anglong district, Assam, River Jamuna at Silvetta; 1 ex, (Museum No.5/3) Coll: 2.12.2016; Coll: Professor. D. Kar and Party. First report.

Key to species: Three prominent canine teeth on either side of lower jaw.

Chanda nama Hamilton, 1822

Distribution: Throughout India; Bangladesh, Myanmar, Nepal, and Pakistan.

IUCN Status: Least Concern (LC).

Genus: *Parambassis* Bleeker, 1874

Parambassis Bleeker, 1874, *Nat. Verh.Holland. Maatsch. Wetensch.,* 2(2): 102 (Type species, *Ambassis apogonoides* Bleeker by original designation); Guha and Talwar, 1975, *J.Inland Fish. Soc. India,* 8: 76; Roberts, 1994, *Nat. Hist. Brit. Siam. Soc.,* 42: 271-289.

Diagnostic characters: Body elongate, compressed. Abdomen round. Head short, compressed. Snout pointed. Mouth large; gape oblique; extending to anterior border of orbit. Eyes large, superior, not visible from below ventral surface of head. Jaws straight or only slightly upturned. Supra-orbital ridge smooth or serrated,

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with one or two spines posteriorly. Pre-orbit serrated on both ridge and edge. Sub-orbit also serrated. Cheek with four to seven transverse scale rows.

Material examined: Karbi Anglong district, Assam, River Siloni; 2 Exs; Museum No, 5(c)/1,14; Coll 2 12 2016; Coll: Professor. D. Kar and Party. First report.

Key to species: Body transparent with a silvery broad lateral stripe on sides. Body depth 41.7 to 43.4 % of SL

Parambassis ranga (Hamilton, 1822)

Distribution: Almost throughout India including Rupairbala Anua in Cachar, Assam (First Report by Professor. D. Kar and Party); also in Bangladesh, Mayanmar, many parts of SE Asia; also, Australian region including New Guinea, etc.

IUCN Status: Least Concern (LC).

Order: Mugiliformes

Family: Mugilidae

Genus: *Rhinomugil* Gill, 1863

Rhinomugil Gill, 1863. *Proceedings of the Academy of Natural Sciences of Philadelphia* v. 15: 169 (Type species: *Mugil corsula* Hamilton 1822 by monotypy).

Generic Characters: Body moderately elongate, cylindrical, or slightly compressed. Head broad and depressed; snout obtuse and short; interorbital space broad. Mouth small, terminal, or inferior. Two shorts widely separated spinous and soft dorsal fins present. Pectoral fins placed rather high on body; pelvic fins subabdominal. Caudal fin moderately forked, emarginated, or truncate. Scales are large on head and body. Lateral line absent.

Material examined: Karbi Anglong district, Assam, River Jamuna at Silvetta; 1 ex, (Museum No. 5/17), Coll: 2.12.2016, Coll.: Professor. D. Kar and Party. First report.

Key to species: Body rather stout, head moderate. Operculum without spine. Mouth ventral, protrusible. First dorsal fin inserted nearer to caudal fin base than to tip of snout. Caudal fin slightly emarginate, scales in lateral series 48-52.

Rhinomugil corsula (Hamilton, 1822)

Distribution: India: Assam, Meghalaya, Tripura, Uttar Pradesh, Bihar, Orissa, Tamil Nadu, West Bengal, Bangladesh, Myanmar, Nepal.

IUCN Status: Least Concern (LC)

Order: Anabantiformes

Family: Osphronemidae

Genus: *Trichogaster* Bloch and Schneider, 1801

Trichogaster Bloch and Schneider, 1801, *Syst.Ichth.,* p.164 (Type species,*Trichogaster fasciatus; Trichopodus* Lacepede, 1801, *Hist. Nat. Poiss.,* 3, p. 125 (Type species: *Labrus trichopterus* Pallas, by subsequent designation; *Colisa* Cuvier,1831.IN: Cuvier and Valenciennes, *Hist. Nat.Poiss.,*7 : 359 (Type species,*Colisa vulgaris* Cuvier: *Trichopodus colisa* Hamilton-Buchanan (by absolute tautonymy).

Generic characters: Body elevated, compressed. Head moderate, compressed. Snoutblunt. Mouth upturned, terminal, cleft small. Eyes large, lateral, in middle of head, not visible from below ventral surface of head. Jaws are a little protractile. The ventral border of pre-opercle usually serrated. Number of spines in dorsal and anal fins variable. Pelvic fins in the form of single long filiform ray, and a rudimentary adnate spine. Caudal fin slightly emarginated or truncate. Lateral Line (Ll) may be interrupted with 6-29 scales.

Material examined:

- (a)Karbi Anglong district, Assam; River Dhansiri at Rangapahar, 1 ex, (Museum No. 1/8), Coll: 3.12.2016,
- (b) Karbi Anglong district, Assam, River Kopili in Karbi Anglong; 2 ex, (Museum No. 2/2,5), Coll: 4.12.2016; Coll: Professor. D. Kar and Party. First report.

Key to species: Bands on body 14 or more. Caudal fin may be slightly notched or cut-square.

Trichogaster fasciata Bloch & Schneider, 1801

Distribution: Wetlands in Assam, other parts of North-East (NE) India, different parts of rest of India, Bangladesh, Myanmar, Nepal, etc.

IUCN Status: Least Concern (LC)

Family: Channidae

Genus: *Channa* Scopoli, 1777

Channa Scopoli, 1777, Introd. Hist. Nat.: 459 (Type species, *Channa orientalis* Bloch and Schneider, by subsequent designation).

Generic characters: Body elongated, sub-cylindrical anteriorly. Abdomen rounded. Head large depressed with plate-like scales. Snout somewhat obtuse. Mouth reasonably large; opening moderate to wide; may extend to below orbit. Eyes lateral, moderate; in the anterior part of the head. The lower jaw protrudes beyond the upper. Gill openings wide. Membranes of two sides connected beneath the isthmus. Dorsal fin long; inserted almost above the pectoral fins with 29-55 rays and no spine. Anal fin long with 21 to 36 rays. Both dorsal and anal fins are free from caudal fin. Caudal fin rounded; scales small; cycloid or ctenoid; scales on the head are more extensive than those on the body. Lateral line abruptly curved or almost interrupted with 37 to 110 scales.

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Material examined: (a)Karbi Anglong district, Assam; River Dikrupti in KA; Coll.: 24 10 2012, 1 ex, Museum No. 5 (a)/3, Coll: Professor. D. Kar and Party. First report.

Key to species: Dorsal fin with 28-33 rays. Several dark blotches on flanks; some with many black spots on body and on dorsal and caudal fins. Ventral side of body usually white or pale yellow.

Channa punctata (Bloch, 1793)

Distribution: Wetlands in Assam like Salchapra Anua (First reported by Professor D Kar and Party) Fulbari Anua in Cachar, Assam (First reported by Professor D Kar and Party), other parts of North-East (NE) India, different parts of rest of India, Bangladesh. China, Malaya, Myanmar, etc.

IUCN Status: Least Concern (LC)

Material examined: (a)Karbi Anglong district, Assam; River Dikrupti in KA; Coll.: 24 10 2012, 1 ex, Museum No. 5 (a)/4, Coll: Professor. D. Kar and Party. First report.

Key to species: TL 23.6 cm, SL 18.7cm, HL 6.2 cm, HD 3.2 cm HB 4.1 cm, Eye Diameter 0.8 cm, body depth 3.8 cm; fin rays, pectoral 14, pelvic 5, anal 24; dorsal 38.

***Channa stewartii* (Playfair, 1867)**

Distribution: Known from Meghalaya, Bihar, West Bengal, Arunchal Pradesh and Eastern Himalayas in Brahmaputra, Kosi, Bagmati and Gandak drainages.

IUCN Status: Least Concern (LC)

Discussion

Concomitant to the foregoing account, the situation could only worsen without any action. It could be believed that the global population could rise exponentially to 9 billion by 2050 (UN Department of Economic and Social Affairs, Population Division, 2011). Thus, there is a need for a profound change in what and how much is eaten, and where and how much food is produced to satisfy the food and nutritional needs of the growing population, let alone its demands. Failure to do so could profoundly affect the biosphere in various ways that could further erode the life-support system through biodiversity loss, changes in ecosystem services supply and exacerbated global warming (Battisti & Naylor, 2009; Foley et al., 2011; Phalan et al., 2011; Royal Society, 2012).

Notwithstanding the above, about food requirement, notably, fishes, it had been estimated that, in 2009, c. 95 × 106 t of fish were consumed by humans (FAO, 2012b; FAO–FISHSTAT, 2012). It may be noted here that, > 1.0 billion poor people obtain most of their average per capita intake of animal protein from fish (Tacon & Metian, 2009). The significance of fish is highlighted by a consideration of Africa. FAO data for 2009 (updated with data from Tacon & Metian, 2009) revealed that, Africa has the lowest average per capita supply of total energy (10 711 kJ day−1), protein (66·6 g day−1), non-fish animal protein (15·1 g day−1) and fish protein (9·2 kg year−1) of any region (FAO–FAOSTAT, 2013). Nevertheless, fish contributed c 9% of total animal energy intake here, the highest of any region, and c 18% of total animal protein consumption (second only to Asia at c 19%).

Concomitant to above, it is, sometimes, observed that, global wild fish catches had, for some time been, at or near the limits of what aquatic ecosystems can be expected to naturally provide with (FAO, 2012a; UNHRC, 2012). Therefore, meeting the global demand for fish, thus, usually, depended on the spectacular growth of aquaculture. Thus, it may be noted here that c. 41% of fish consumed during 2011 came from aquaculture (FAO, 2012b; FAO–FISHSTAT, 2012). Incidentally, a growing trend of research works revealed the significance of fish in the supply of not only protein but also more importantly of essential fatty acids and micronutrients (Kawarazuka & Béné, 2011). In this connection, it may be pointed out here the importance of fish as a rich source of essential fats, crucial for brain development and cognition. This is, probably, highlighted in the implementation of the scaling-up of nutritional framework and roadmap, a private and public sector and civil society partnership that seeks to better understand the crisis of malnutrition and undernutrition in early life (first 1000 days) ; and, concomitantly elevate nutrition on the global agenda (http://www.scalingupnutrition.org.).

Concomitant to above, discussion on the rise of aquaculture has, to a big extent, focused on its contribution to global aquatic animal food supplies, largely ignoring the resultant changes in species composition of the fishes consumed or how it is farmed and the consequences for food and nutrition security (Kawarazuka & Béné, 2010; UNHRC, 2012). The present communication attempts to redress the situation; as well as tries to consider the technological and policy innovations needed to ensure that aquaculture tries to fulfil its potential to meet the global population's food and nutritional needs. There is, however, a need to focus on the fishes which account for two-thirds of gross global aquatic animal source food supplies, with reference to Asia and Africa.

Inference

Fish is, by far, an excellent source of high-quality animal protein and essential fatty acids, especially long-chain polyunsaturated fatty acids (LCPUFA) and micronutrients, which are much greater in fishes than in terrestrial animal-source foods. Incidentally, a recent FAO–WHO expert consultation group had inferred that. Fish consumption is beneficial for individual growth and development. Concomitantly, consumption of certain number of fish (fatty fishes in particular) could reduce the risk of coronary heart disease and stroke (FAO–WHO, 2011). People, sometimes, have two to three-fold increased intake of fatty fishes, to obtain enough LCPUFAs (Surette, 2008; Jenkins et al., 2009; FAO–WHO, 2011).

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Incidentally, food-safety concerns about fish have centred on methylmercury and dioxin levels. There is no convincing evidence, however, for increased risk of heart disease linked with methylmercury while the potential cancer risks from dioxins are concluded to be well below coronary heart disease benefits associated with fish consumption (FAO–WHO, 2011). In fine, the foregoing account encourages us to to go for more and more taxonomic studies to identify the most potential candidate species for aquaculture, which could enable us to find an answer to our diminishing protein supply.

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