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Distribution of an endangered fish species, *Chaca chaca* (Ham.- Buch.), in Arunachal Pradesh, India: A biodiversity hot spot

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Chaca chaca (Ham.- Buch.) belongs to the family Chacidae. *Chaca* is the only genus in the family Chacidae and the only species reported from the Indian sub-continent. In India, this fish is available at restricted area. As per the report of NBFGR (2010) and IUCN (2013), a limited population and less number of individuals are found which is pushing this species towards extinction and the status of this fish is endangered. Lack of proper database on the distribution of *C. chaca* is a hurdle for the fish managers and fish conservators for its study. The present data of *C. chaca* collected from the various districts of Arunachal Pradesh help to formulate the management plan for *in-situ* or *ex-situ* conservation.

Key words: Distribution, endangered, *Chaca chaca*, Arunachal Pradesh, biodiversity, hot spot.

INTRODUCTION

Locally known *Heete duki* (Heete = an elephant and duki = to tear-up), *Chaca chaca* (Ham.- Buch. 1822) belongs to the family Chacidae. *Chaca* is the only genus in the catfish family Chacidae. The latest information of research reported the presence of only four species of genus *Chaca* under the family Chacidae in specific parts of the world namely: *Chaca chaca* (Ham. 1822), *Chaca bankanensis* (Bleeker, 1852), *Chaca burmensis* (Brown and Ferraris, 1988) and *Chaca serica* (Ng and Kottelat, 2012). Among these, *C. chaca* is the only species reported from the Indian sub-continent. Srivastava (1968) reported that it is distributed in the rivers of North India. Datta and Srivastava (1988) reported that *C. chaca* is distributed in the rivers of Northern India, Bihar, West Bengal and Assam in India. Sen (2000) reported that out of seven states of North-Eastern region, *C. chaca* is present in Meghalaya, Assam and Tripura only. Vishwanath (2002) reported that it is found in the Northern part of India, Manipur and Assam only. Silas

(2006) reported that the family Chacidae and species *C. chaca* is reported in Assam and North Bengal in North-Eastern region of India. Jha *et al.* (2008) first time reported the presence of *C. chaca* from Arunachal Pradesh. In India, this fish is available in Ganges-Brahmaputra river drainage of North Eastern states and the status of fish is endangered (NBFGR, 2010; IUCN, 2013). Detailed study suggests a restricted and limited distribution of this fish species in various pockets of Arunachal Pradesh. Till date no literature is available in any form published by any researchers about the distribution of this species in Arunachal Pradesh. *C. chaca* is treated as an ornamental fish and found mainly in stagnant marshy ponds and in slow moving muddy

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streams and rivers. The species is a bottom-dweller, often found in mud, where it burrows. A main characteristic feature of this fish is the presence of short dorsal fin with a strong, serrated spine which is strong enough to inflict wounds. This strong spine can inflict the leg of an elephant crossing the rivers or ponds inhabiting these fishes. There is no information regarding threat on human beings. Some tribal people use *C. chaca* for the treatment of some diseases like malaria and jaundice, etc. The entire body is covered with beautifully designed tubercles.

IUCN (2013) reported that a limited population having less number of individuals is declining further due to over-exploitation for the aquarium trade and pushing this species towards extinction (Chaudhry, 2010). Due to the less concern on earth now, it is facing risk of extinction in the near future.

As regards the information of fish distribution of different species in India and abroad, works of Hamilton (1822), Mc Clelland (1845), Playfair (1867), Shaw and Shebbeare (1937), Menon (1974), Day (1978), Jayaram (1981), Sen (1985), Brown and Ferraris (1988), Talwar and Jhingran (1991), Vierke (1991), Pandey and Sandhu (1992), Teugels (1992), Nelson (1994), Bhattacharjya et al. (1998), Musikasintorn (2000), Goswami et al. (2003), Goswami et al. (2006), Jha et al. (2008) are worth mentioning. A perusal of the available literature suggests that the distribution of *C. chaca* (Ham.-Buch.) has not been reported earlier from Arunachal Pradesh, India.

To ascertain the species status, all taxonomic parameters including the morphology, morphometry, meristic counts and colour patterns were examined following Jayaram (1981), Talwar and Jhingran (1991), Musikasintorn (2000) and Jha et al. (2008).

Since there is not much information available on the distribution of *C. chaca*, and is at the verge of extinction, the present work has been undertaken to determine the distribution of *C. chaca* in Arunachal Pradesh.

MATERIALS AND METHODS

To find out the distribution of *C. chaca* in different districts of Arunachal Pradesh, we showed the preserved specimens and photographs to the people residing near the water bodies and employees of Government Fisheries Department, NGOs working for protection and development of biodiversity, Ichthyodiversity and Fisheries in all the districts of the state. On the basis of primary information from the above said organisations, we identified its location and applied different fishing methods namely:- dewatering the water body, by using the hooks, hand picking, using indigenous method of fishing such as the use of Porong, Esap, etc. The methods of catching depended upon the structure and depth of the water body. The collected live specimens were kept in the big plastic water containers and the dead specimens were fixed in 6-8% formalin. In order to avoid

damage to the caudal fin, the fixed specimens were kept in cylindrical transparent container in an upside down position. After that the specimens were transported in Fish Germplasm Explorations Research Laboratory, Department of Zoology, Jawaharlal Nehru College, Pasighat, Arunachal Pradesh and live specimens were kept in aquariums for further investigations by providing artificial food. After investigations, the alive *C. chaca* were freed in the nearby slow flowing streams and other water bodies where their habitats were favourable for its survival.

RESULTS AND DISCUSSION

Key to the species

The species is a robust large size fish with big head and body. With six barbels that are feebly developed. Gill opening was some/what contracted. The lateral line complete. The body was marked by a prominent papillated and tuberculated ridge. Anal fin is depressed, Caudal fin was rounded with a large procurvent dorsal and a shorter ventral part at the end of the tail only (Sen, 1985; Talwar and Jhingran, 1991; Jha et al., 2008).

Scientific classification

Kingdom: Animalia
Phylum: Chordata
Class: Actinopterygii
Order: Siluriformes
Family: Chacidae (Bleeker, 1858)
Genus: *Chaca*
Species: *chaca* (Hamilton-Buchanan, 1822).

Materials examined

D.1/4; P.1/4-5; P.6:V.9; A.8-10; C.37-40 Barbels 3 pairs. In the fresh condition, the colour appeared dark brown, whereas the tip of the lower jaw was dark red on its inner margin which disappeared after preservation.

The stout is depressed ahead of anal fin, but strongly compressed, and slightly tapering behind the abdomen. The whole upper surface is covered with tubercles and soft spines which are found along the edge of the lower lip also. The head is flat, very large and strongly depressed dorsoventrally. The gape of mouth is very wide, with prominent lower jaw and tiny eyes. It has 3 tiny pairs of barbels, of which one pair is maxillary and the other 2 pairs are mandibular. There are teeth on both side of the jaws, and its chin is provided with an adhesive apparatus (Talwar and Jhingran, 1991). Dorsal and pectoral fins are provided with strong spines, though the rayed dorsal fin is short with three rays and a strong spine. It is slightly serrated on both sides but the pectoral fin with short and strong spines are serrated internally. Pelvic fin has six rays, while the anal fin is short with

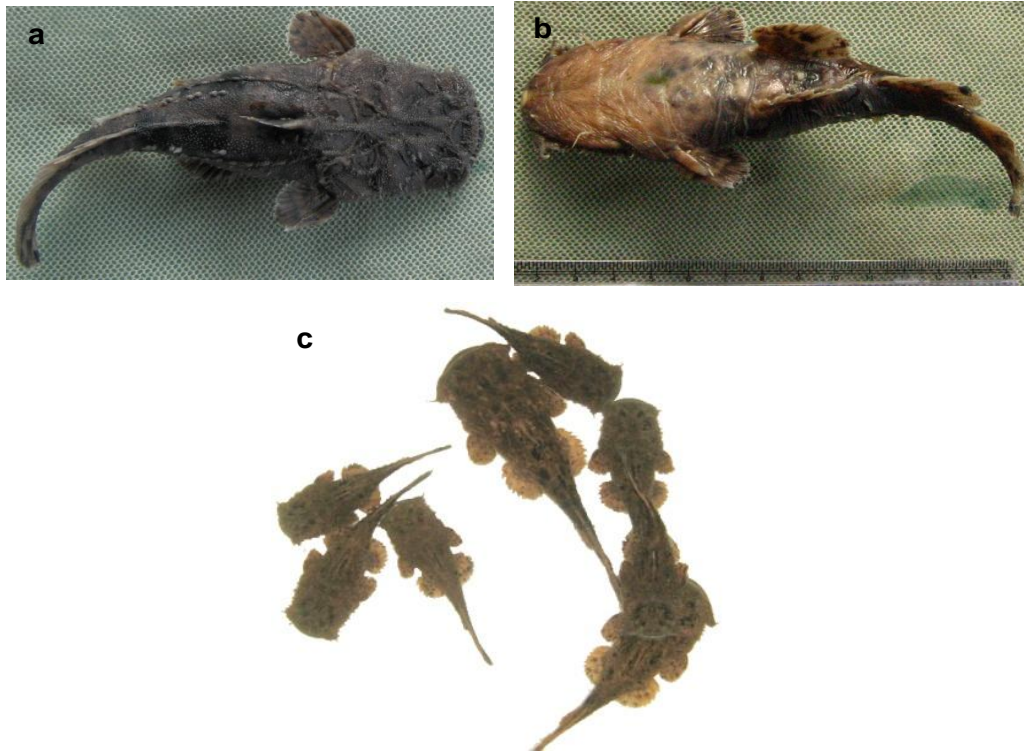


Figure 1. (a) *Chaca chaca* (dorsal view), (b) *Chaca chaca* (ventral view), and (c) *Chaca chaca* in group.

eight to ten rays. The caudal fin is rounded along the procurvent dorsal and the shorter ventral part which is recognized as the body stout, depressed ahead of the anal fin, but strongly compressed, and slightly tapering behind the abdomen. The whole upper surface is covered with tubercles and soft spines which are found along the edge of the lower lip also (Jha et al., 2008). It was observed that the second dorsal and second anal fin confluent with the caudal fin (Srivastava, 1968). Its body has a long lateral line that is somewhat cardiform in shape, concave anteriorly lying across the bodies of the anterior vertebrae and enclosed in bone. The colour photographs are shown in Figures 1a, b and c respectively, while the morphometric observation of *C. chaca* is shown in Table 1.

General description

- Trade name: Devil catfish.
- Distribution: Northern and Eastern India, Far East Countries.
- Distinguishing feature: The body is flat, and is tapering towards the tail. The head is large and dorsoventrally flattened. Although the abdomen is flat and the gape of its mouth is wide with openings in the sub terminal, the lips are thick and fleshy. The lower jaw is prominent, with 3 tiny pairs of barbels. The dorsal fin is rayed with a strong spine, and the adipose dorsal confluent with the caudal fin even though the caudal fin is rounded. However, the lateral line is complete and the whole

upper surface of the body is covered with tubercles.

- Colour pattern: It is dark brown in colour, and the tip of the lower jaw is reddish on its inner margin.
- Size: It attains about 22 cm in length.
- Habitat: It prefers muddy bottom habitats.
- Behaviour: It is very sluggish in nature, highly carnivorous but non aggressive. It waits for its prey to come close to it, and thrives well in aquarium without taking much care.

Distribution in Arunachal Pradesh

The present investigation elaborates the proper distribution of *C. chaca* in the various districts of Arunachal Pradesh. This is summarized in Maps 1 and 2 and Table 2.

Among all the districts of Arunachal Pradesh, the presence of *C. chaca* is recorded mainly from lower ridges of 10 districts namely: East Kameng (Bhalukpong), West Kameng (Seijosa), Papumpare (Balijan and Kimin), Lower Subansiri (Dolelmukh), West Siang (Likabali), East Siang (Pasighat, Nari, Mebo, Oyan-Sile and Ruksin), Lower Dibang Valley (Dambuk, Kongkon, Shantipur), Tezu (Namsai), Changlang (Bardumsa), and Tirap (Deomali). Among these districts, East Siang district harbours these fishes in maximum areas like Pasighat, Nari, Mebo and Oyan-Sile. *C. chaca* is a slow mover, which mostly hide inside the mud, stone and in aquatic plants and have no anchorage organ. The water body of the aforementioned areas has the same type of

Table 1. Morphometric observation of *Chaca chaca*.

Characteristics observed	(Mean \pmSD) in cm (n=21)
Total length	13.950 \pm 3.497
Standard length	12.483 \pm 3.267
Head length	4.333 \pm 1.002
Pre-dorsal length	4.505 \pm 1.189
Pre-orbital length	1.681 \pm 0.931
Post-orbital length	2.648 \pm 1.178
Eye diameter	0.182 \pm 0.036
Pre-anal length	8.895 \pm 2.364
Body depth	2.1 \pm 0.695
Inter-orbital length	1.743 \pm 0.588
Length of caudal peduncle	1.710 \pm 1.010
Dorsal fin base	0.867 \pm 0.280
Dorsal fin height	1.143 \pm 0.371
Length of Pectoral fin	1.624 \pm 0.478
Pectoral fin base	0.8190 \pm 0.234
Length of Pelvic fin	1.7286 \pm 0.500
Pelvic fin base	0.752 \pm 0.197
Length of anal fin	1.605 \pm 0.583
anal fin base	1.619 \pm 0.471
Caudal fin height	0.876 \pm 0.2773
Caudal fin base	2.114 \pm 0.529
Upper jaw length	3.343 \pm 0.946
Lower jaw length	4.110 \pm 0.915
Pectoral fin (in number)	1/4-5
Pelvic fin (in number)	6
Anal fin (in number)	1/8-10
Dorsal fin (in number)	1/4
Caudal fin (in number)	37-40 \pm 1.165

environment. Since these areas lie at low altitude, it may be a possible reason for their availability. Other districts like Tawang, Kurung Kumey, Upper Subansiri, Upper Siang, Dibang Valley and Anjaw district did not show the presence of this fish species. *C. chaca* was found at the maximum elevation of 633 ft and above that elevation it was not found.

Conclusion

C. chaca is the single species of family Chacidae reported from the Indian sub-continent. IUCN (2013) reported that a limited population, having less number of individuals, is declining further due to over-exploitation. This species of fish adds an aesthetic, ecological, educational, historical, recreational, and scientific value to the nation and its people. Therefore, participatory programmes to create awareness among the local people and fishing communities regarding sustainable fishing practices and conservation of Germplasm resources of *C. chaca* and other threatened fishes should be conducted regularly. Initiation and strengthening of community efforts to protect water bodies from over-exploitation,

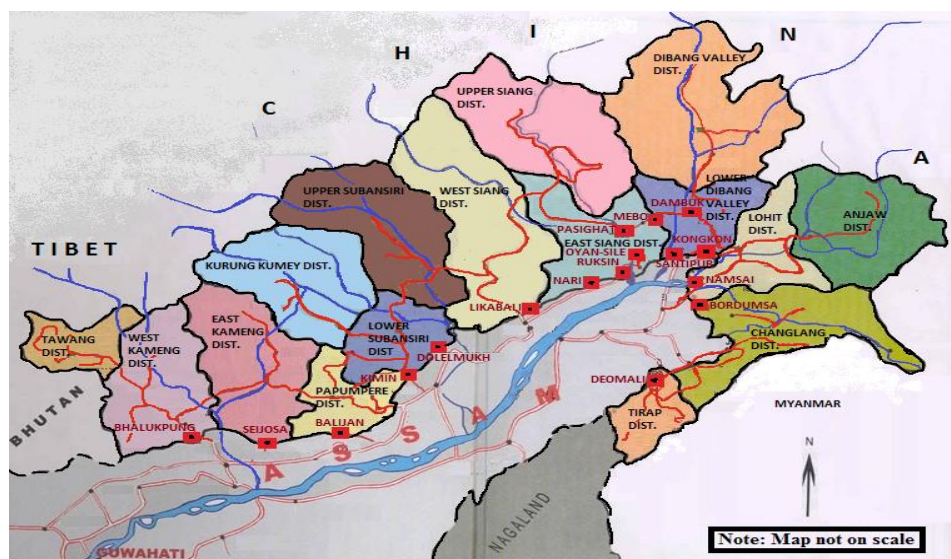
pollution and to make promotion and strengthening of community initiatives to exert social pressure for sustainable fishing practices and conservation in the form of community fish conservation societies, etc., should also be encouraged. State Fish Live Gene banks, planning and implementation of programmes for alternative sources of income for communities doing fishing during the closed fishing seasons should be established and maintained. Development, standardization and commercialization of culture technologies for potential food and ornamental fishes of the state should be initiated, so as to reduce the pressure on germplasm resources in the wild. Need based ranching programmes to replenish the depleted stocks in different aquatic bodies of the state, spreading awareness among the people and scientific measures of conservation may be an effective way to protect this fish species in the near future as started by Jha et al. (2013).

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Map 1. Political map of India showing Arunachal Pradesh.



Map 2. Distribution of *Chaca chaca* in various districts of Arunachal Pradesh.


 - This symbol is showing the presence of *Chaca chaca*.

Table 2. Distribution of *C. chaca* in the various districts of Arunachal Pradesh.

Name of Districts	Name of Circle	Name of Village	GPS Position	Elevation	Status of <i>Chaca chaca</i> in the area	
West Kameng	BALUKPUNG	Balukpung	N27°01.545' E092°36.530'	620 ft	Available	
East Kameng	SEIJOSA	Seijosa	N26°85.260' E092°58.520'	445 ft	Available	
Papumpare	BALIJAN	Balijan	N26°57.210' E093°35.520'	433 ft	Available	
	KIMIN	Kimin	N27°18.272' E093°58.155'	633 ft	Available	
Lower Lubansiri	DOLELMUKH	Dolelmukh	N27°26.790' E094°13.850'	360 ft	Available	
West Siang	LEKHABALI	Lekhabali	N27°39.594' E094°42.328'	423 ft	Available	
East Siang	RUKSIN	Ruksin	N27°50.585' E095°13.440'	410 ft	Available	
		PASIGHAT	Rayang	N27°50.955' E95°12.322'	418 ft	Available
	MEBO	OYAN-SILE	Oyan	N27°53.056' E095°18.376'	462 ft	Available
			Sille	N27°53.533' E095°18.554'	427 ft	Available
			Rani	N27°57.533' E095°18.554'	427 ft	Available
			Sika Tode-Sika Bamin	N27°56.215' E095°20.573'	512 ft	Available
			Berung	N27°53.947' E095°30.671'	479 ft	Available
			Romdun	N28°10.037' E095°26.329'	383 ft	Available
			Motum	N28°04.318' E095°26.778'	444 ft	Available
			Raling	N28°04.980' E095°24.986'	630 ft	Available
			Sigar	N28°04.546' E095°23.789'	488 ft	Available
			Sibya Korang	N28°05.391' E095°27.699'	542 ft	Available
			Kadang Korang	N28°04.701' E095°28.255'	488 ft	Available
			Ngopok	N28°04.032' E095°28.713'	496 ft	Available
			Kiyit	N28°03.619' E095°28.360'	458 ft	Available
			Ngopak Korang	N28°03.107' E095°28.189'	465 ft	Available
			Borguli	N28°02.985' E095°28.028'	439 ft	Available
			Tatsing Korong	N28°00.515' E095°27.846'	413 ft	Available
			Seram	N28°00.141' E095°28.320'	531 ft	Available

Table 2. Cont'd

		Sisar Korang	N27°59.444' E095°29.104'	421 ft	Available
		Padan Korong	N27°58.681' E095°29.083'	433 ft	Available
		Kongkul /Padan	N27°58.364' E095°29.051'	425 ft	Available
		Namsing	N27°55.571' E095°29.349'	399 ft	Available
		Taro Tamak Korong	N27°53.712' E095°30.498'	399 ft	Available
		Gadum	N27°53.291' E095°31.090'	442 ft	Available
		Mer	N27°52.480' E095°30.489'	387 ft	Available
	NARI	Nari	N27°48.014' E095°02.609'	429 ft	Available
		Lipu	N27°39.533' E094°42.397'	444 ft	Available
Lower Velly	Dibang	DAMBUK	Dambuk N28°16.832' E095°37.087'	428 ft	Available
		SHANTIPUR	Shantipur N27°58.685' E095°45.945'	511 ft	Available
Tezu	NAMSI	Namsai	N27°40.822' E095°51.336'	485 ft	Available
Changlang	BARDUMSA	Bardumsa	N27°30.922' E095°52.584'	518 ft	Available
Tirap	DEOMALI	Deomali	N27°36.692' E095°28.884'	528 ft	Available

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