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## Studies on the Ecology of River Siang in Arunachal Pradesh, India

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### Abstract

River Siang is the one of the major rivers of Arunachal Pradesh and also an important influent tributary leading to the mighty River Brahmaputra. River Siang is Hill-Stream 1<sup>st</sup> order river; has colluvial valley segment and pool-riffle type of reach. This reach type is most commonly associated with small to mid-size streams and is a quite prevalent type of reach in the rheophilic zones. Pools and riffles alternating with cascades are generally found to dominate the micro-habitat type with frequent occurrence of trench pools. The substrate type has been found to be dominated by bedrocks, boulders, gravels and cobbles. River with its tributaries is a unique type of ecosystem which generally covers different types of climatic zones, landscapes and bio geographical regions. River is the natural drainage system of the land mass of the earth which move continuously. Near the source, the river is small, straight and swift while in downstream the velocity of water decreases and meandering of river begins in the plains.

**Keywords:** Habitat, Biodiversity, Ecology, River Siang, Arunachal Pradesh

### 1. Introduction

The unique topography of North-East India and watershed pattern is an attractive field for Ichthyological studies. This region has already recognized as a global spot of freshwater fish diversity. A great numbers of species have been reported from most of the North-Eastern region states. Subansiri River is the one of the major river of both Assam and Arunachal Pradesh. However, the rich biodiversity of the freshwater fish of the Indian region has been rapidly dwindling because of increasing degradation of inland water. Out of a total of 2500 species of fish in India, 930 are in freshwaters and belong to 326 genera, 99 families and 20 orders (Talwar and Jhingran 1991) <sup>[1]</sup>. India is one of the 12 mega biodiversity hot spots contributing 60-70% of the world's biological resources. India has about 11.72% of total global fish biodiversity. A great number of fish species have been reported from the North - Easter region (Das and Kar 2011; Das *et al.* 2013) <sup>[2, 3]</sup>.

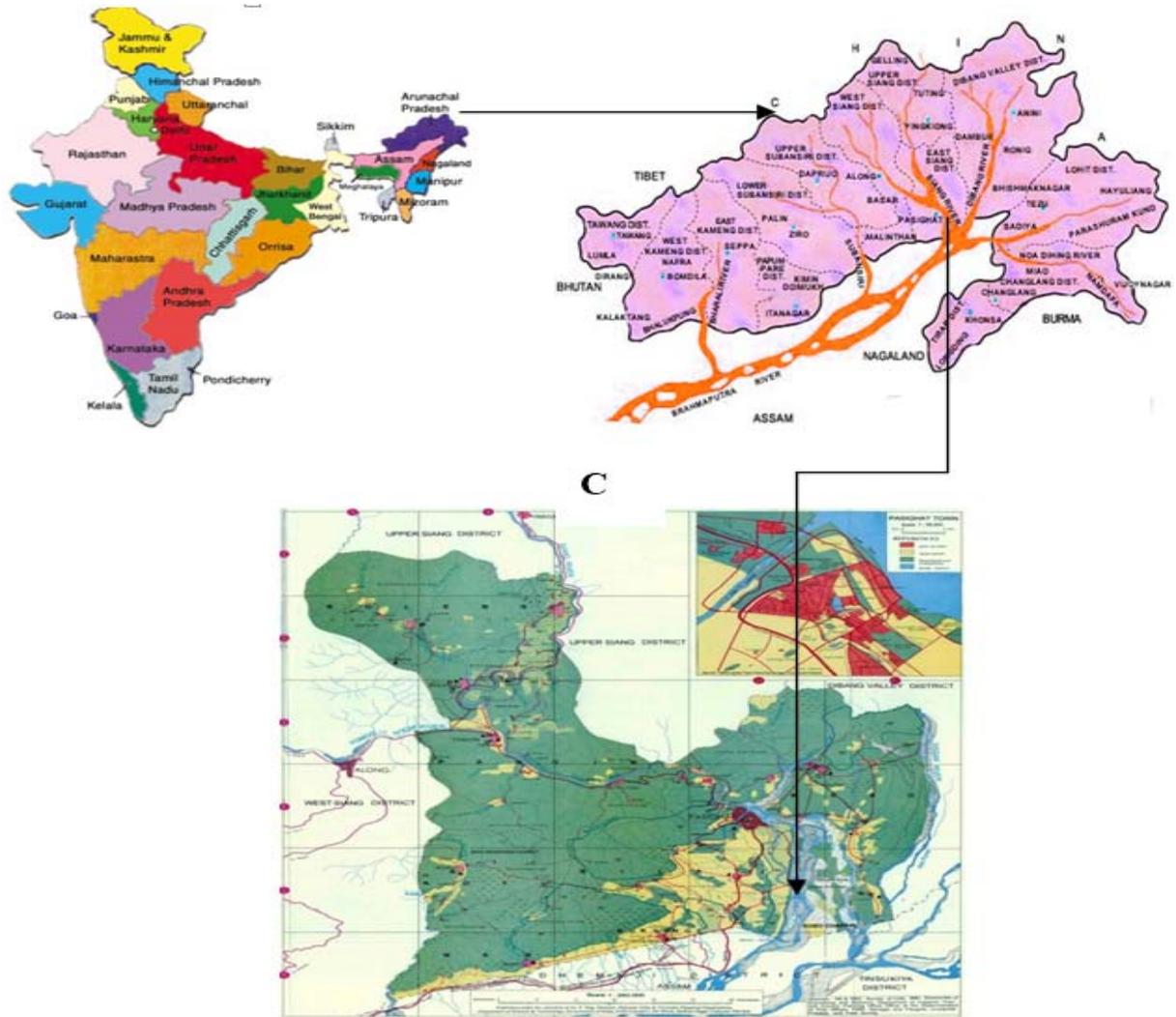
### 2. Study Site

The River Siang, is largest river of Brahmaputra river system, originates from Chema Yungdung Glacier near Kubi at 5150 m in Tibet (Figure 1). In Tibet it is popularly known as Tsang-Po, flows in West–East direction. After traversing a distance of about 1625 km river in Tibet and then it takes a turn in south direction, enters the territory of India near Tuting in the Upper Siang district of Arunachal Pradesh and flows through North–South direction in East Siang district towards Assam and finally it merges with Lohit and Dibang in Assam and it becomes the mighty River Brahmaputra (Das *et. al.* 2014 a, b; Das and Kar 2015) <sup>[4, 5, 6]</sup>.

### 3. Materials and Methods

Habitat inventory parameters were recorded in a standard format (NBFGR, 2000) <sup>[9]</sup> from each study spot in the field itself. The geographical co-ordinates and altitude above mean sea level (m.s.l.) of study spots were recorded with the help of Garmin made GPS-60. Habitat features were quantified using transects within each stream reach. Variables measured at each point of transect were water depth and width of the river and current speed. In each study point of the stream, in a reach measuring 100 m in length (the longitudinal path following the fastest cross sectional water velocities) micro-habitats were identified, classified, (such as, Fall, Cascade, Riffles, Pools and Run, sheet), and various measurements taken (Armantrout, 1990; Kar 2007, 2013; Arunachalam, 1999; Das and Kar, 2011) <sup>[1, 2, 7, 8]</sup>.

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**Fig 1:** Map of (A) India indicating Arunachal Pradesh, (B) Arunachal Pradesh indicating to East Siang District, (C) In East Siang district highlighting River Siang (Study Area) of Arunachal Pradesh.

#### 4. Results and Discussion

River Siang, a hill-Stream of 1<sup>st</sup> order river; had colluvial (landslide from adjacent hill slopes delivering sediments and organic matter) valley segment and pool-riffle type of reach. This reach type was most commonly associated with small to mid-size streams and was a quite prevalent type of reach in the rheophilic zones. On the other hand, runs were generally laminar flow of water with sandy substratum. Pools, riffles and runs were generally found to dominate the micro-habitat type with frequent occurrence of trench pools. River Siang was said to be more entrenched based on V-shaped valley segment. The substrate type had been found to be dominated by boulders, gravels and cobbles with frequently-occurring quite large number of boulders and some bed rocks. The riparian type was generally mesoriparian while the riparian vegetation type is generally deciduous trees with some amount of shrubs and grasses. Different types of fish covers had been recorded in River Siang ranging from undercut bedrock to bottom-free big boulders and pools. Riparian land use pattern mainly involves human habitation and some amount of agriculture through 'Jhum' cultivation.

##### 4.1 Macro and Micro Habitat

Macro and micro-habitats combine to form the total habitat available for organisms. Macro-habitats regulate the general

pattern of species distribution and abundance which governs the flow of energy through the system. In the present study, the riparian cover, substrate type and habitat volume were found to be associated with fish density. Habitat volume was generally considered as an important attribute in determining species diversity as observed in the studied River Siang.

##### 4.2 Soil

The major stretch of River Siang was covered with very deep to shallow, excessively drained, fine and clay soil and with moderate to severe erosion and hazard prone. The soil belonging to latter association was characterized by very deep, well- drained, coarse loamy and gently-sloping active flood plain; and was prone to severe erosion, but, with slight flooding hazards. The soils were fine with loamy surface. The soil texture seemed to influence other characteristics like moisture contents, electrical conductivity, water holding capacity and nutrient contents. The bulk density and organic matter did not show considerable variation among the study sites (RSET, 2013) [10].

##### 4.3 Geology

The region belongs to major anti-formal tectonic unit. The geological domain of River Siang was unique and much different from the other parts of the Himalayas. It was

situated at the junction of three plates, *viz.*, Indian, Indo-Burmese and Eurasian. It was continuously under stress and undergoing crystal adjustments since the last phase of the Himalayan Orogeny in Middle Pleistocene when the Himalayas was said to have gained present heights and the sub-Himalaya and the Naga-Patkoi ranges come into existence (RSET, 2013) [10]. The rock sequences exposed in the four geo-physiographic divisions in Arunachal Pradesh were of different ages. These had been evolved differently in response to various tectonic episodes and differ in geological history and structural/deformational features. The carbonate unit frequent intrusions which were mainly along the bedding joints (RSET, 2013) [10].

#### 4.4 Gradient of River Siang

The stream gradient of the River Siang from the point it enters India near Gelling village up to the dam site of Siang Lower HE project covering *c* 293.9 km, had a gradient of 1:595 within the average elevation of 150 m MSL. In general, stream gradient was very gentle between 540 and 150 m elevations and it becomes flat between 190 m and 180 m elevations. This flat gradient covers a distance of about 90 km. There were minor knick points in the river profile which might correspond to small cascades and rapids in the course of the River Siang. Some of the knick points were observed at 460 m, 250 m, 210 m, 180 m and 150 m MSL elevations in the upstream of the River Siang.

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