



### Microhabitat use and activity budget of four Himalayan river-birds, India

A wide variety of river-birds are found in the Eastern Himalayan region of Northeast India, but the literature on microhabitat use and resource use patterns of these river-birds is very sparse. The fundamental processes that determine niche structures and influence niche segregation in coexisting species is a basic concern of community ecology (Rosenzweig, 1987; Pianka, 1988). For example, when territories of different species overlap, those species utilize different local resources or the same resources differently due to either niche complementarity or resource partitioning (Schoener 1974). Understanding the role of microhabitat has been an unending quest of avian autecology and community ecology (Hilden, 1965; Cody, 1968; Wiens, 1969, James, 1971; Karr, 1971; Anderson & Shugart, 1974; Wiens, 1974; Willson, 1974; Cody, 1981, 1985). Such studies, particularly when understood in terms of resource partitioning (Schoener, 1974), have been successful largely because of the fundamental importance of microhabitat to bird ecology. In the present study, we looked at the microhabitat preferences of four species of birds namely plumbeous water-redstart (*Rhyacornis fuliginosa*), white-capped water-redstart (*Chaimarrornis leucocephalus*), brown dipper (*Cinclus pallasii*) and slaty-backed fork-tail (*Enicurus schistaceus*) in Kamlang Wildlife Sanctuary (KWS).

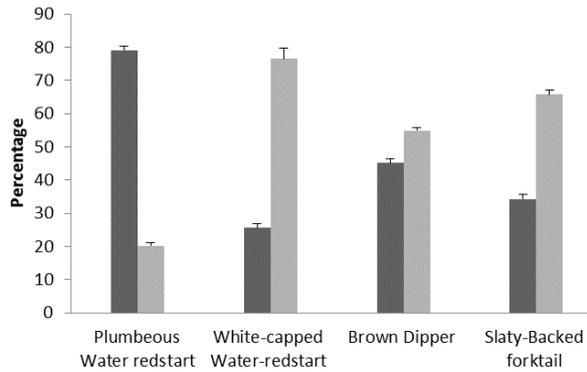
The KWS is located in the South-eastern part of Lohit District of Arunachal Pradesh (27°40'–28°00'N, 96°26'–96°55'E) covering an area of 783 km<sup>2</sup> with elevation ranging from 500 to 4500 m asl (Nageshwara & Chowlu, 2006). It experiences moderate temperatures and high humidity in lower areas, and intense cold in the upper reaches. Studies were done during the months of February and March 2012 in the second order channels of the river Kamlang located between 400–500 m altitude as these

channels lie adjacent to the trek paths of the sanctuary. The width of the river streams ranged between 25–30 m. The activities of the four bird species were recorded based on their commonality of existence. We divided the river streams into two parts namely the central and the margin portions. The central portion included the boulders and fast moving waters and the margins included the stream bank, vegetation and boulders in the edges of the stream.

The focal birds were observed for about 20.3 hours (plumbeous water-redstart: 6.2 hours, white-capped water-redstart: 5.4 hours, brown dipper: 4.6 hours, and slaty-backed fork-tail: 4.1 hours) in February 2012. Activity budgets of the birds were recorded whenever they were sighted either individually or along with other species. Observations were made by using binoculars (Olympus 8-16 × 40, Zoom DPS-I, Field 5.0°–3.4°). Much care was taken to avoid eye to eye contact between the bird and the observer as the birds flew off whenever they sighted an observer. A stopwatch was used to calculate the time at every individual instance to the nearest one second. Behaviours were categorised as roosting, foraging, aggression/escape and others (Buckton & Ormerod, 2008). Aggression and escape are included under the same category because when a bird showed aggression the other tried escaping from the aggression. This behaviour included the time spent in chasing through flight or by pecking others. Foraging behaviour included all time spent by the birds in catching insects and time spent in walking in order to collect food. Roosting included the time spent in stationary postures. Other behaviours included preening etc.

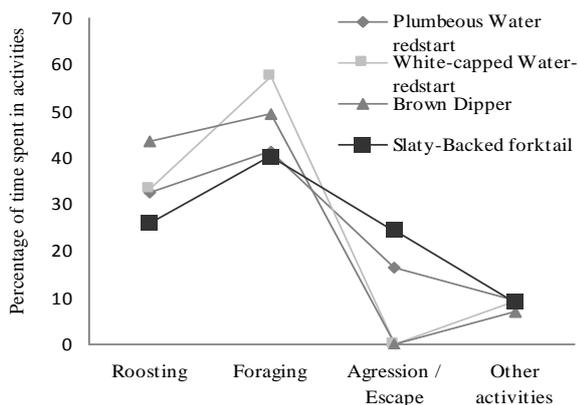
The plumbeous water redstart spent most of its time in the central portion of the habitat (mean: 79.0 ±1.4; n = 6). The white capped water redstart (mean: 76.5 ±3.2; n = 8), and slaty-backed fork-tail (mean: 65.8 ±1.4; n = 10) spent most of their time in the edges of the stream. Whereas, the brown dipper spent almost equal

amounts of time in the central portion (mean:  $45.1 \pm 1.0$ ;  $n = 6$ ) and in edges (mean:  $54.9 \pm 1.0$ ;  $n = 6$ ) of the stream (Fig. 1 and Table 1). The time spent in the central and marginal portions by these four species is significantly different (central portion:  $t=3.919$ ,  $p < 0.05$ ; marginal portion:  $t=4.448$ ,  $p < 0.05$ ).



**Figure 1:** Percentage of time spent by four species of river-birds in different portions of the stream (dark shade - central portion of the stream; grey shade - edges of the stream).

The results of activity budgeting show that birds spend most of their time in foraging followed by roosting, aggression/escape and others. The plumbeous water-redstart spends a portion of its time in defending the feeding territory and was seen often attacking white-capped water-redstart and brown dipper. Whereas the salty-backed forktail was seen attacking other individuals of the same species (Fig. 2 and Table 2).



**Figure 2:** Percentage of time spent in different activities by four species of river-birds.

The streams of the Himalayas are occupied by a diverse array of bird communities. Studying the interactions of these birds helps us understand the behavioural patterns and interactions of the

species that act as indicators of habitat quality. Our data provides significant evidence on microhabitat separation among the species studied in the form of time spent in a particular micro-habit. In the present short term study we noted that each of the four birds spent differential amounts of time in both the micro-habitats. The reason for such preferences in microhabitat among birds may be due to their feeding and use patterns of the microhabitats (Bucton & Ormerod, 2008). A similar kind of result has also been reported by Bucton & Ormerod (2008) in a study carried out in Nepal on Himalayan river-birds. Although feeding time in a particular micro-habitat determines the preference level, it also depends on the size of the birds as well as resource availability in the habitat. Smaller birds spend more time in feeding compared to larger ones (Gibb, 1954; Pearson, 1968; King, 1974; Del Hoyo & Sargatal, 1992) as the heat loss is more in the smaller birds and thus the smaller ones need more body energy (Calder & King, 1974). It is noteworthy that the four birds of the present study were relatively small and essentially spending more time in feeding. Moreover, birds usually spend more time in roosting during fall and less in the winters (Maron & Myers, 1985). As the present study was carried out in the pre-monsoon season, the roosting time spent by them was likely to be more. However, to make such generalization, an extensive study is required to validate the same.

Furthermore, individual aggressiveness expressed in the form of threatening or fighting, plays a significant role in vertebrate societies and populations (Nicholas, 1944). Aggression may be of varied levels depending on the species. In the present study we observed that the plumbeous water-redstart spent a portion of its time defending its territory or microhabitat, especially driving out white-capped water-redstarts. On the other hand, the slaty-backed forktail showed aggression towards other members of the same species but was never observed showing aggression towards the other species. Among all the four bird species studied, the plumbeous water-redstart was the most aggressive one. Our results contradict the statement of Fleming *et al.* (1984) that, “white-capped water-redstarts are often being associated with plumbeous water-redstarts” in some ways. Although we observed both these species in close association, often the male plumbeous

water-redstarts showed aggression towards the white-capped water-redstarts. This could be best explained as competition for the aerial prey of both terrestrial as well as aquatic origin (Tyler & Ormerod, 1994).

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**Table 1:** Habitat use pattern by the river-birds and interactions with the other bird species.

| Species                     | percentage of time spent |                  | interactions with the other bird species                   |
|-----------------------------|--------------------------|------------------|--|
|                             | central portion          | marginal portion |  |
| Plumbeous water redstart    | 79.0                     | 20.1             | attacked white – capped water-redstart and brown dipper    |
| White-capped water redstart | 24.5                     | 75.5             | No interactions except chasing by plumbeous water redstart |
| Brown dipper                | 45.1                     | 54.9             | No interactions except chasing by plumbeous water redstart |
| Slaty-backed forktail       | 34.2                     | 65.8             | chasing each other   |

**Table 2:** Time spent on major activity patterns by the river birds.

| species                     | total observation time (in minutes) | percentage of time spent |          |                      |                  |
|-----------------------------|-------------------------------------|--------------------------|----------|----------------------|------------------|
|                             |                                     | roosting                 | foraging | aggression or escape | other activities |
| Plumbeous water redstart    | 372                                 | 32.5                     | 41.4     | 16.4 aggression      | 9.7              |
| White-capped water-redstart | 323                                 | 30                       | 51.9     | 9.7 escape           | 8.4              |
| Brown dipper                | 278                                 | 41.9                     | 47.7     | 3.8 escape           | 6.6              |
| Slaty-backed forktail       | 244                                 | 26.2                     | 40.2     | 24.6 aggression      | 9                |