Diet and foraging behaviour of three Forktail *Enicurus* species, including fish in the diet of the Slaty-backed Forktail *E. schistaceus*

Andrew Engilis, Jr., Punit S. Lalbhai, Irene E. Engilis & Vivek Rawat

Engilis Jr., A., Lalbhai, P. S., Engilis, I. E., & Rawat, V., 2021. Diet and foraging behaviour of three Forktail *Enicurus* species, including fish in the diet of the Slaty-backed Forktail *E. schistaceus*. *Indian BIRDS* 17 (4): 109–113.
Andrew Engilis, Jr., Museum of Wildlife and Fish Biology, Department of Wildlife, Fish, and Conservation Biology, University of California, Davis, U.S.A. E-mail: aengilisjr@ucdavis.edu [Corresponding author]
Punit Lalbhai E-mail: Punit.lalbhai@gmail.com.
Irene Engilis. Museum of Wildlife and Fish Biology, Department of Wildlife, Fish, and Conservation Biology, University of California, Davis, U.S.A. E-mail: ieengilis@ucdavis.edu.
Vivek Rawat, Birding Guide. E-mail: rawat.vivek22@gmail.com.
Manuscript received on 18 September 2020.

Introduction

Forktails (Muscicapidae; *Enicurus*; 7 species) are charismatic and energetic stream-associated, terrestrial flycatchers distributed primarily in the mountains of the Indian Subcontinent, China, Taiwan, and South-east Asia through Indonesia (Collar 2005; Grimmett et al. 2011; Clement & Rose 2015; Eaton et al. 2016). Forktails are known to feed along stream edges and banks, picking invertebrates from the water margins, leaf litter and surface of streams along shallow submerged rocks, and in the splash-zones of small rapids (Rand & Fleming 1957; Tyler & Ormerod 1994; Manel et al 2000; Buckton & Ormerod 2008; Amir et al. 2020). Buckton & Ormerod (2008) conducted the only study involving forktail diets wherein fecal pellet of Himalayan species were analyzed. It is clear from the paucity of literature on forktails that these enigmatic birds remain under studied. In January 2020, we had the opportunity to observe forktails foraging in a region of the Lesser Himalaya of Uttarakhand, India, and those observations led to a broader examination of the diets and foraging behaviour of the three species occurring there. In this paper we summarize foraging strategies and prey items for three species of forktails determined from our own, and online, photographic resources.

Our field site was a small mountain stream located along the Bhatella Dhanachuli–Bhimtal Road, Nainital District (29.37ºN, 79.56ºE; 1,386 m asl; Uttarakhand, India). This stream drains into the Gaula River. This riparian stream ran through a steep canyon with Oak (*Quercus* sp.) woodland on the hillsides. Our observations took place along a 1.5 km stretch of creek on 14 and 15 January 2020. The riparian vegetation was lush and relatively intact. The stream was well shaded and narrow, ranging from 5–15 m wide, with clear, cool running water. There were several small pools interspersed with faster running water and small cascades along its length **[130]**. Along this stretch we observed three species of forktails: the commonest being the Spotted Forktail *Enicurus maculatus*, followed by the Slaty-backed *E. schistaceus*, and the Little Forktail *E. scouleri*. Studies show that stream-loving passerines co-exist, forming a characteristic avifauna of the Lesser Himalaya (Manel et al. 2000; Sultana & Kahn 2000; Buckton & Ormerod 2008; Sultana & Hussain 2010; Krishna et al. 2014). In addition to the three *Enicurus* species at our field site, we found the stream-adapted passerine community of this creek to include Plumbeous Water Redstart *Phoenicurus fuliginosus*, White-capped Redstart *P. leucocephalus*, Grey Wagtail *Motacilla cinerea*, and Western Yellow Wagtail *M. flava*.

I. E. Engilis on 15 January 2020

130. Riparian habitat along the small Himalayan stream in Nainital District, Uttarakhand where we studied the forktails.

We perused relevant literature and found only a few studies that documented foraging strategies and niche segregation for Spotted, Slaty-backed or Little forktails (Tyler & Ormerod 1994; Manel et al. 2000; Buckton & Ormerod 2008; Krishna et al. 2014; Collar 2020a,b,c), and only one study that examined the diets of the Little- and Spotted forktails (Buckton & Ormerod 2008).

The diet of the Slaty-backed Forktail, as far as we can ascertain, remains poorly understood. Since we documented dietary items of the Slaty-backed Forktail from our photographs, we decided to examine other photographs of forktails to search for identifiable prey items in their beaks. We started with examining photographs of the Slaty-backed Forktail, but then expanded our search to encompass Spotted and Little forktails. We searched three large photo archives: eBird (1,433 photos examined), Oriental Birds Images (hereinafter, OBI; 313 photos examined), and Flickr Photos (1,297 photos examined). In all, we viewed 3,043 images, and found 92 with prey items that could be identified in the beaks of Spotted, Slaty-backed, or Little forktails. We identified the prey items with the assistance of entomologists at the Bohart Museum of Entomology at the University of California, Davis. We did not explore diet descriptions in comment sections in eBird records, as we could not properly confirm the identification of prey without photographic evidence. We did not want to perpetuate unsubstantiated reports of prey items from unverified notes.

Observations

The Spotted Forktail (25 cm in length; **131a**) was the largest of the three species occurring on this creek. We observed it in a variety of conditions, sometimes even at a distance from the water's edge. This is similar to observations in Nepal by Tyler & Ormerod (1994). This species has a methodical foraging strategy, differing from the other two, which includes walking (not hopping), with very small tail wags. Spotted Forktails habitually flip leaves, debris, and small pebbles and stones in search of prey. In addition to our own observations, we reviewed videos (n=24) of foraging Spotted Forktails, and in all cases flipping debris remained a primary hunting strategy. It is also the most tranquil of the three species we observed, with deliberate feeding behavior. Although they are capable of wagging their tail high over their back, in their typical foraging posture, the tail was held horizontal or near so to the ground, and slowly wags downward. We examined 851 photos and found 31 of Spotted Forktails with identifiable prey in their beak.

Yamil Saenz

Iman Shah

Aravind Venkatraman (www.birdsforever.in)

131a–c. Typical postures of three sympatric forktails: 2a: Spotted Forktail; 2b. Little Forktail; 2c. Slaty-backed Forktail.

The Little Forktail (12–14 cm; **131b**) was the most aquatic of the three, foraging primarily in the splash zone of rapids and small waterfalls in the creek. It preferred to forage with its feet wet and in rapids or small rivulets in the stream. This species, in shape and posture, is reminiscent of dippers (Cinclidae). However, they differ greatly, with a constant and 'nervous' flicking and fanning of their tail while foraging or sitting. They dart forward to pick prey off the surface of the water. They incorporate short, walking darts with hopping, more frequently than the other two forktails. We observed one individual foraging up a small cascade and the bird often dove, dipper-like, into the water and under cascades in search of prey. Others have reported dipper-like foraging behaviour for this species (Tyler & Tyler 1996; Buckton & Ormerod 2008). We examined 1,282 images and found 36 of Little Forktails with identifiable prey in their beak.

The Slaty-backed Forktail (20–23 cm; **131c**) was an active flycatcher, using small darting maneuvers to capture prey along the stream, not unlike wagtails (Motacillidae; *Motacilla* species). We found it exclusively associated with the stream, foraging along the edge or from rocks in the middle. Foraging studies of Slaty-backed Forktail along streams and rivers in the Himalayas have documented this more aquatic behavior (Tyler & Ormerod 1994; Krishna et al. 2014). As with Spotted Forktail, this species walks instead of hopping, as it moves from one spot to another. It often darts, from rock to rock when foraging. Slaty-backed Forktail actively pumps its tail upward, sometimes at a near 90-degree

angle to the back, slowly lowering it. It does not flare its tail like the Little Forktail. While foraging, this forktail will hold its tail flat, or cocked at a 10–20-degree angle to its back, and stand tall on its long legs. It often perches on a small rock or on the shoreline next to the flowing water, scanning for prey, espying which it darts off of the rock and captures from the edge of the water or in water. It is more active than the Spotted Forktail. We did not observe it flipping leaves or stones in its search for prey. We examined 910 images and found 25 of Slaty-backed Forktails with identifiable prey in their beak.

Summary of diets

Even with our cursory observations, it became clear that these congeners reduced competition by using different strategies for hunting prey, and exploited different portions of the stream they dwelt in. Our descriptive findings are supported by quantitative studies by Tyler & Ormerod (1994), and Buckton & Ormerod (2008). Our findings further support niche separation measured amongst Himalayan aquatic passerines reported by Tyler & Ormerod (1994) and Buckton & Ormerod (2008). Table 1 lists the items we were able to identify in the beaks of all three species. We further characterize the identified prey items based on functional groups (Fig. 1). Figure 1 shows the Little Forktail's diet comprised primarily of aquatic insects of which 56% were stonefly and mayfly larvae, reflecting its more dipper-like foraging strategy. Aquatic insects made up less than 50% of the diets of Spotted- and Slaty-backed forktails, and the latter had the most diverse diet among prey items identified. The Spotted Forktail had the highest percentage of terrestrial insects in its diet, reinforcing a more terrestrial niche, and was reflected in diet studies by Buckton & Ormerod (2008). Chironomid midges and other small Diptera may be exploited, but their small size made it nearly impossible to determine if they were in the bill of the birds observed, or in photographs (a limitation to photo identification of prey items). For example, fecal analysis found small Chironomids to be an important element of the Little Forktail's diet (Buckton & Ormerod 2008).

Table 1. Prey items identified from photographs of three species of forktails

Prey Item	Little Forktail N=36	Slaty-backed Forktail N=25	Spotted Forktail N=31
Ephemeroptera (mayflies)	10	0	1
Plecoptera (stone flies)	10	1	1
Lepidoptera (butterfly and moths)	2	3	3
Diptera (Tipulidae, crane flies)	4	1	4
Diptera (Syrphidae, hoverflies)	0	0	1
Trichoptera (caddisfly)	1	3	1
Odonata (dragonflies)	1	3	4
Orthoptera (Tetrigidae, groundhoppers)	0	1	2
Coleoptera (beetles)	1	0	5
Neuroptera (antlions)	3	0	0
Arachnid	0	2	0
Centipede	0	1	0
Fish	0	5	0
Annelid	1	0	0
Mollusks	0	1	5
Unidentified	3	4	4

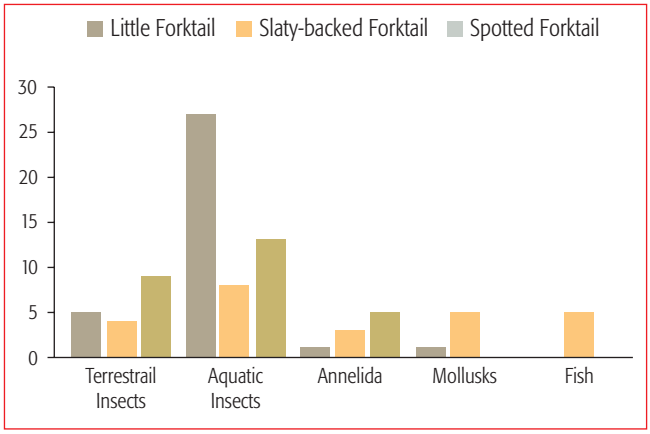

Fig. 1. Proportion of diet from photographic evidence for three species of forktails.

Of particular interest was one Slaty-backed Forktail we observed at 0730 h on 14 January 2020, foraging in a small riffle with a boulder shoreline. It darted from rock to rock as it foraged along the edge of the water, but then stopped to perch on a small rock along a calm pool, in-between riffles. We noted the bird was scanning and then it darted to the middle of the stream, splashing into the water head first, like a kingfisher. When it came out, it flew to a nearby rock with a small fish in its beak. It manipulated the fish so that its head pointed into the bird's throat, and swallowed it. It then flew back to perch on the same 'hunting' rock. It again scanned and then darted out, splashed into the water head first, and came out with another small fish. We were able to photograph the second foraging event **[XX3]**. The fish in this observation was tentatively identified as a catfish *Glyptothorax* sp., which is common in fast flowing streams of the Lesser Himalayas (Sehgal 1999; Ng & Rachmatika 2005). This is the first observation of any species of forktail foraging on fish, and is the first reported observation of a forktail hunting like a kingfisher, from stones in a creek.

In photo archives we found four additional photos of the Slaty-backed Forktail with small fish. Interestingly, all were from the Nainital District, and photos were taken between 2015 and 2019. Three of the four species of fish were identified as the same *Glyptothorax* catfish we observed. The fourth was provisionally identified as a Cyprinid in the genus *Opsarius* or *Barilus*.

We are certain that further studies and observations would add to observed behaviours and dietary items of *Enicurus*. For example, we found all three species that were photographed, foraging on vertical walls with falling water, using a picking behavior to secure prey. If there was fallen debris or leaf litter on the rock walls, Spotted Forktail seemed compelled to flick them to look for prey underneath. Examining photographs to gain insights of diet of rarely studied species proved a useful and viable technique, provided dietary items can be correctly identified. It expands on the applied use of photographs and camera traps in the study of birds (O'Brian & Kinnaird 2008). We recognize that this method only confirms a subset of prey items, which may not be reflective of preferred prey items.

Finally, the best quality images were on OBI, and Flickr. The majority of images in eBird were documentary in nature, and generally unsuitable for prey identification. Further studies to refine niche separation, competitive exclusion, community structure, foraging behaviour, and quantifying prey items would

All: A. Englis, Jr.

132. Sequence of photos showing Slaty-backed Forktail capturing a small fish in Uttarakhand, India, 14 January 2020.

help to better understand these charismatic birds and the dynamic stream-loving passerine community of the Himalaya.

Acknowledgements

We wish to thank Steve Heydon from the U. C. Davis Bohart Museum of Entomology for identifying insects in the photographs examined for this paper. Also, our driver, Vimal Kanwal, who safely navigated us through the Lower Himalaya in sometimes not the best of roads. We thank the numerous photographers who have posted their photographs of forktails to Flickr, eBird, and Oriental Birds Images. Our thanks to Andrew Rao, Adip Sajjan Raj, and Beta Mahatvaraj for help in identifying the fish, which was difficult due to the quality of the photos taken and examined. Also special thanks to the photographers who graciously allowed use of their images of forktails. We also thank an anonymous reviewer who provided many helpful comments that strengthened this manuscript.

References

Amir, A., Hambali, K., Bahar, A., Abdullah, H., & Wahab, F., 2020. Surveys of bird species in the Gunung Basor, Kelantan. IOP Conference Series: Earth and Environmental Science 549 012052.

Buckton, S. T., & Ormerod, S. J., 2008. Niche segregation of Himalayan river birds. *Journal of Field Ornithology* 79 (2): 176–185. DOI: https://10.1111/j.1557-9263.2008.00160.x

Clement, P., & Rose, C., 2015. *Robins and chats.* UK: Christopher Helm. Pp. 1–688.

Collar, N., 2005. Family Turdidae (Thrushes), in del Hoyo, Josep; Elliott, Andrew; Christie, David (eds.), *Handbook of the Birds of the World. Volume 10, Cuckoo-shrikes to Thrushes*, Lynx Edicions, Barcelona.

Collar, N. 2020a. Little Forktail (*Enicurus scouleri*), version 1.0. In: Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.litfor1.01.

Collar, N. 2020b. Spotted Forktail (*Enicurus maculatus*), version 1.0. In: Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.spofor1.01.

Collar, N. 2020c. Slaty-backed Forktail (*Enicurus schistaceus*), version 1.0. In: Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.slbfor1.01.

Eaton, J. A., van Balen, B., Brickle, N. W., & Rheindt, F. E., 2016. *Birds of the Indonesian Archipelago: Greater Sundas and Wallacea*. Lynx Edicions. Barcelona.

Grimmett, R., Inskipp, C., & Inskipp, T., 2011. *Birds of the Indian Subcontinent.* 2nd ed. London: Oxford University Press & Christopher Helm. Pp. 1–528.

Krishna, M. C., Sarma, K., & Kumar, A., 2015. Microhabitat use and activity budget of four Himalayan river-birds, India. *Taprobanica* 7 (4): 246–249.

Manel, S., Buckton, S. T., & Ormerod, S. J., 2000. Effect of habitat structure on the distribution of Himalayan river birds. *Internationale Vereinigung für theoretische und angewandte Limnologie: Verhandlunger* 27 (1): 175–177. DOI: https://doi.org/10.1080/03680770.1998.11901221.

Ng, H. H., & Rachmatika, I., 2005. *Glyptothorax exodon*, a new species of rheophilic catfish from Borneo (Teleostei: Sisoridae). *Raffles Bulletin of Zoology* 53: 251–255.

O'Brian, T. G., & Kinnaird, M. F., 2008. A picture is worth a thousand words: the application of camera trapping to the study of birds. *Bird Conservation International* 18: 144–162.

Rand, A. L., & Fleming, R. L., 1957. Birds from Nepal. *Fieldiana: Zoology* 41 (1): 1–218.

Sehgal, K. L., 1999. Coldwater fish and fisheries in the Indian Himalayas: rivers and streams. In: *Fish and fisheries at higher altitudes: Asia*. T. Petr (ed.). Food and Agriculture Organization of the United Nations Fisheries Technical report number 385.

Sultana, A., & Hussain, M. S., 2010. Avian foraging pattern in the oak forest of in Central Himalaya: An ecological conservation approach. *International Journal of Ecological Economics and Statistics* 19: 83–102.

Sultana, A., & Khan, J. A., 2000. Birds of oak forests in the Kumaon Himalaya, Uttar Pradesh, India. *Forktail* 16: 131–146.

Tyler, S. J., & Ormerod, S. J., 1994. The ecology of river birds in Nepal. *Forktail* 9: 59–82.

Tyler, S. J., & Tyler, L., 1996. The Rufous-throated Dipper *Cinclus schlulzi* on rivers in north-west Argentina and southern Bolivia. *Bird Conservation International* 6: 103–116.

Correspondence

Dusky Warbler *Phylloscopus fuscatus* in Kambalakonda Wildlife Sanctuary, Visakhapatnam, Andhra Pradesh

The Dusky Warbler *Phylloscopus fuscatus* is a winter migrant to eastern India, the Andaman Islands, and other Asian countries (Rasmussen & Anderton 2012; Grimmett et al. 2011; SoIB 2020). Arriving in the non-breeding season (August–April), the Dusky Warbler is known to occur in foothill habitats, skulking in low vegetation (scrub and open plains with low bushes, trees), and edges of cultivation, frequenting long grass near water, damp cultivation, and mangroves (Clement 2020). It is commonly seen in north-eastern India and the eastern state of Orissa (Inskipp 2015). There are, however, only a handful of confirmed records of the Dusky Warbler from southern India (Table 1).

On Monday, 08 March 2021, at 0730 h, we visited Kambalakonda Wildlife Sanctuary (17.81°N, 83.33°E), Visakhapatnam, Andhra Pradesh, to look for birds. The area has a small pond that was partially dried up, with damp patches of uneven mud interspersed with small grass, where we found a breeding pair of Little Ringed Plovers *Charadrius dubius* with two recently fledged chicks. Over the course of 1.5 h we were able to observe 37 species of birds here (Rajiv R. 2021). After birding in the area, at 0815 h we returned to the road where the car was parked and stopped to take a final peek at the pond. Suddenly, a bird appeared out of the low undergrowth to investigate its surroundings. The size and shape of the bird suggested that it was a warbler, but it was distinctly smaller and darker than the Blyth's Reed Warbler *Acrocephalus dumetorum* that we saw in the area that morning. The bird sat on some leafless twigs and branches protruding over the waterbody, flicked its wings a few times, and hopped between adjacent branches. It was not disturbed by our presence and we managed to get a few photographs **[133, 134]** before it disappeared into the bushes. The bird did not call in the 4–5 min it was visible to us.

133. Dusky Warbler *Phylloscopus fuscatus* at Visakhapatnam, Andhra Pradesh.