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SEASONAL DISTRIBUTION OF SRI LANKA DULL-BLUE FLYCATCHER (*Eumyias sordidus*) IN THE HORTON PLAINS NATIONAL PARK

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ABSTRACT - Seasonal distribution of endemic, Sri Lanka Dull-blue Flycatcher (*Eumyias sordidus*) was studied at the Horton Plains National Park, situated in the highland plateau of the Nuwara Eliya District, during January 2016 to December 2016. Three main habitats were selected as Cloud Forest habitat, Cloud Forest Die-back habitat and Grassland habitat. Three, 100m fixed line transacts were marked in each of the habitats using a Global Positioning System (GPS) device. Population of *E. sordidus* was recorded on three consecutive days in each month while travelling along the transacts, from 0530h to 1030h. Individuals were observed through a 10x50 binocular. Kestrel™ 4000 weather tracker was used to obtain environmental parameters. Highest abundance, 15.27 ± 11.05 (Mean ± Standard deviation) was recorded during South-west monsoon season from May to September. Abundance of *E. sordidus* did not differ significantly among other climatic seasons (Kruskal-Wallis Test, p>0.05). During the South-west monsoon season the environmental temperature was 17.48±3.77C^0 (M±SD), relative humidity was 83.20±10.62% (M±SD), wind speed was 14.29±12.80Kmh^{-1} (M±SD) and rainfall was 143.5±137.3mm (M±SD). There was a positively correlation between relative humidity and *E.sordidus* abundance (Pearson correlation r = 0.991, P < 0.05. Relationship between the wind speed and E.sordidus abundance too was positive (Pearson correlation r = 1.000, P < 0.05). Present study revealed that *E. sordidus* preferred high humid and low temperature environmental conditions.

KEY WORDS : Sri Lanka Dull-blue Flycatcher, endemic birds, Horton Plains, seasonal distribution, Tropical Montane Cloud Forest.

INTRODUCTION

Sri Lanka is a humid tropical island lying in the South Asian region, southwest of the Indian peninsula, in the Indian Ocean, between latitudes 5º 55' and 9º 51' N and longitudes 79º 41' – 81º 54'. The island is 65,610 km^2 in area, of which 64,742 km^2 island and the remainder is inland water (Myers *et al.*, 2000). The Indian Ocean continental island of Sri Lanka is, together with the Western Ghats of India, considered to be a global biodiversity hotspot (Myers *et al.*, 2000).

Sri Lanka's equatorial position gives its lowlands a tropical climate, with year round temperatures of 27-28^{0}C and a relative constant day length. Rain fall is largely governed by monsoonal winds which occur during two seasons of the year. From Mid-May to September, the monsoon blows from the southwest direction and brings in a greater amount of moisture than during December to February when the wind blows from the northeast. The distinct inter-monsoonal periods receive conventional rains and at times cyclones (Ashton, *et al.*, 1997).The Climate experienced during 12 months period in Sri Lanka can be characterized in to 4 climate seasons as follows. First inter monsoon season (March-April),

South west monsoon season (May-September), Second inter monsoon season (October-November), North East monsoon season (December-February) (source: http://www.meteo.gov.lk). Besides rainfall, temperature plays an important role in highland regions. For every 100m increase in elevation, the mean temperature falls by 0.5^0C. On the plateau there is often ground frost in the lower lying areas between December and March (Ashton *et al.*, 1997)

Sri Lanka Dull-blue flycatcher, *Eumyias sordidus* Walden (1870), also known as Dusky-blue flycatcher, is a small passerine bird in the flycatcher family Muscicapidae. *E. sordidus* is an endemic resident breeder in the hills of central Sri Lanka. The global population size has not been quantified, but the species is described as abundant in the central province of Sri Lanka (Del Hoyo *et al.*, 2005).

This species has a very small global range, and although it remains common in suitable habitats and can tolerate modified habitats, its distribution and population size are likely to have been negatively affected by habitat loss and degradation. However, it is considered as Near Threatened species (Birdlife International, 2014). *E. sordidus* is confined to the hills above 2,000 feet. Individuals of *E. sordidus* occasionally descend to much lower altitudes, like Sinharaja, Kandy and along rivers in the dry zone (Henry, 1998).

The area of cloud forests in Sri Lanka follows the form of the highest hills in the central mountains (Werner, 2001). Studies carried out about the distribution of E.sordidus In the montane cloud forest of Horton Plains National Park (HPNP), were revealed the cloud forest habitat as the preferred habitat of this species (Dharmarathne and Mahaulpatha, 2016).

The detailed study about endemic birds of Sri Lanka was first done by Legge (Legge, 1880). The international union for the conservation of nature(IUCN) “RED LIST” have shown documented evidence that rate of extinction is getting worse among species confined to small islands to continental scale (Bird life international 2012). At the same time, specialization to any one environment may limit a species ability to exploit multiple environments and have a wide range (Futuyma *et al.*, 1988).

Reduced foraging opportunities during rainfall (especially for insectivorous species) are likely to influence the condition of both young and their parents, therefore investigation of population impacts of rainfall patterns needs to consider long-term effects on individuals, such as reduced juvenile survival to the next year (Linden *et al.*, 1992; Naef-Daenzer *et al.*, 2001; Low *et al.*, 2009).

Therefore conducting more investigations about the ecology and seasonal distribution of endemic bird species are essential for the selection of appropriate conservation approach towards enhancing the sustainability of their population.

The absence of a scientific investigation about this species makes it impossible to determine the current state of population and habitat preference. This study was carried out to investigate the distribution of *E.Sordidus* on seasonal basis among the habitats in Horton Plains National Park (HPNP).

FIGURE 1: *E. sordidus* at Horton Plains National park, Sri Lanka. SAM – Sub-adult male

FIGURE 2: Distribution map of *E. sordidus* (source: http://www.birdlife.org/datazone)

Study Site

The study was conducted in HPNP. The national park occupies an area of 3,160 ha and is contiguous with peak wilderness sanctuary to the west. HPNP lies at the eastern extremity of the wet zone and experiences a subtropical monsoon climate, with a mean annual temperature of 150C and mean annual rainfall of 2150mm (DWC, 2007). The weather is dominated by persistent cloud cover and strong winds, sometimes gale-force, during the south-west monsoon (Bastible and Gunawardena, 1996). The driest months are January and February, when temperatures may reach 27C^0.

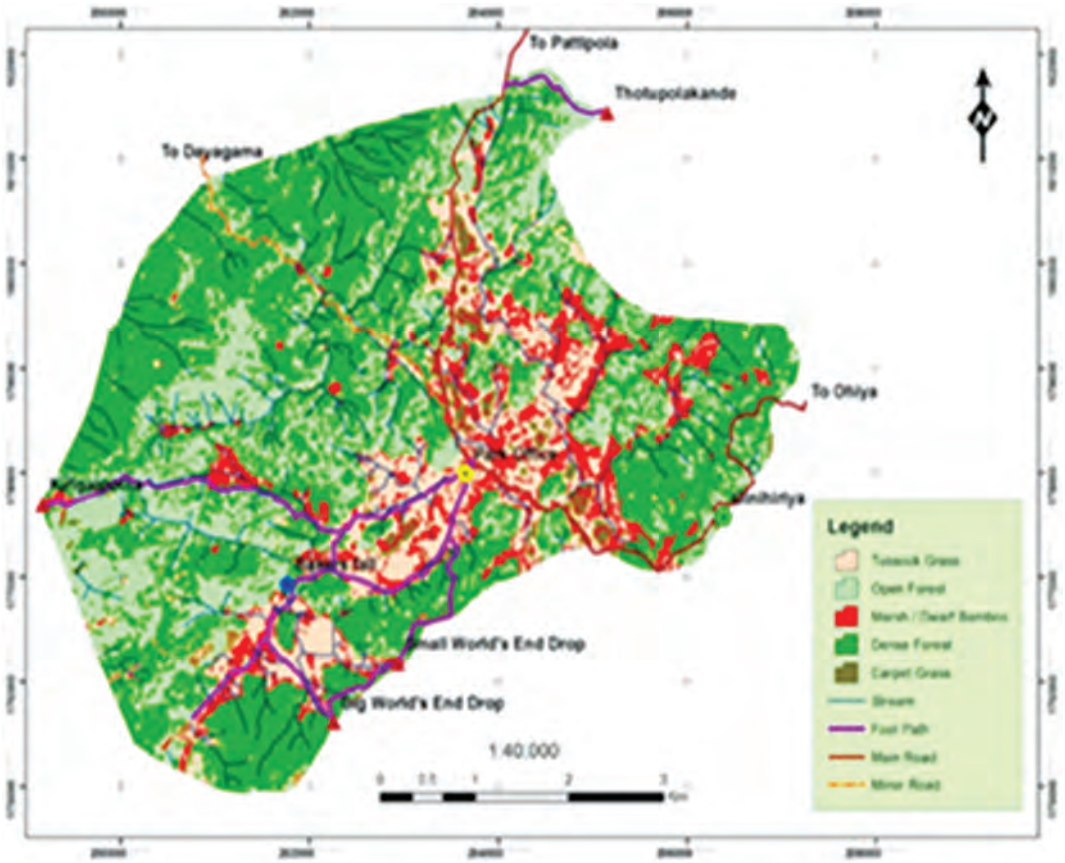

FIGURE 3: Vegetation map of HPNP Sri Lanka (Resource:Researchgate.net/publication/267574561).

The vegetation comprises upper montane cloud forest and wet patana grasslands, with a narrow ecotone belt of shrubs and herbs between the two (DWC, 2007). Forest and patana form a mosaic, with a tendency for cloud forest to be confined to the hilltops, mid or upper slopes, and for the grasslands and dwarf bamboo to be on the lower slopes and in the valleys. Wetland habitats occur in the waterlogged depressions in the valleys and surrounding smaller streams (DWC, 2007). Extensive areas of Cloud Forest have suffered from canopy die-back, the cause of which is uncertain but may be related to water stress or air pollution. The area of forest die-back, first observed in the 1960s, had increased from 87 ha (2.7% of the National Park) in 1967 to 956 ha (30.7%) by 1998 (DWC, 2005).

MATERIALS AND METHODS

Data was collected from January 2016 to December 2016. Three main Natural habitats were selected as Cloud Forest (CF), Cloud Forest Die-back (CFD) and Grassland (GL). All three habitat types were visited during each sampling period. Four main climate seasons were considered as First inter monsoon season (FIMS), South west monsoon season (SWMS), Second inter monsoon season (SIMS), North west monsoon season (NEMS). Three 100m fixed line transacts were marked in each of the habitats using a GPS (Garmin etrex10™).

Abundance of *E. sordidus* was recorded on three consecutive days of each month from 0530h to 1030h, while travelling along the transacts, individuals were observed through a 10x50 binocular (Nikon™) and by direct observations. Kestrel™ 4000 weather tracker was used to obtain Environmental Temperature (T), Relative Humidity (RH), and Wind Speed(WS). Monthly Rain Fall data was collected from the Department of Meteorology. Microsoft Excel™ was used to store data and Minitab 17™ was used to analyze the data. Kruskal-Wallis Test was used to check the significance level of E.sordidus abundance among the climate seasons. Pearson correlation was used to check the correlation between abundance of *E.Sordidus* with T, RH, WS and RF.

RESULTS

A total of 300 *E. sordidus* individuals were recorded during the study period. Recorded abundance was significantly different among four climate seasons (Kruskal-Wallis Test, $p< 0.05$). Highest number of individuals 15.27 ± 11.05 (Mean ± Standard Deviation) were recorded during SWMS. Abundance was 8±6.72 (M±SD) during FIMS, 9.25±4.99 (M±SD) during SIMS, 7.83±6.79 (M±SD) during NEMS (Fig 4 and Fig 5).

During the SWMS where the highest population was recorded the prevailing, RH was 83.20±10.62% (M±SD) , WS was 14.29± 12.80Kmh^{-1}(M±SD) , temperature was 17.48± 3.77C^0 (M±SD) and RF was 143.5±137.3mm (M±SD) (Table1)

TABLE 1: Variations of environmental parameters during the main climate seasons of HPNP 2016.

Climate Season	T(C0) (M±SD)	RH(%) (M±SD)	WS(Kmh-1) (M±SD)	RF(mm) (M±SD)
FIMS	21.11±3.69	74.47±2.73	5.19±0.297	62.05 ± 8.13
SWMS	17.48±3.77	83.20±10.62	14.29±12.8	143.5±137.3
SIMS	20.81±3.02	73.71±10.22	4.17±2.02	151.3 ± 46.1
NEMS	18.61±3.88	75.61±13.19	5.22±2.77	46.1 ±18.9

FIMS-First Inter Monsoon Season, SWMS- South-West Monsoon Season, SIMS- Second Inter Monsoon Season, NEMS- North-East Monsoon Season, T- Environmental temperature, RH- Relative Humidity, WS- Wind Speed, RF- Rain Fall, M±SD- Mean±Standard Deviation.

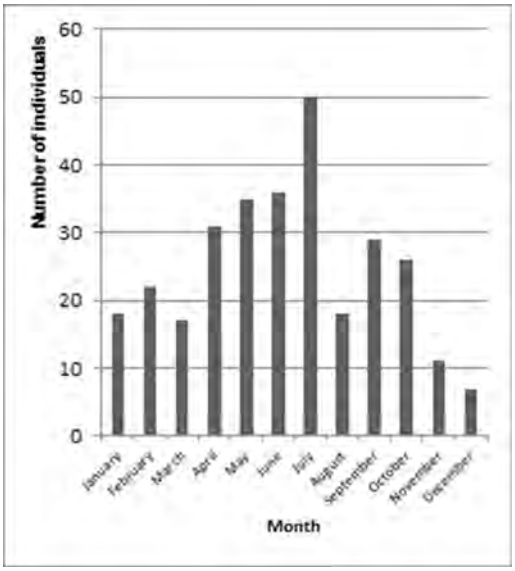

FIGURE 4: Monthly abundance of *E.sordidus* in HPNP.

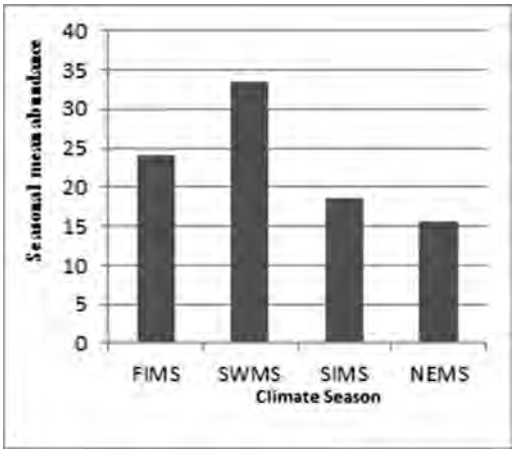

FIGURE 5: Mean abundance of *E.sordidus* within climate seasons at HPNP.

A positively correlated relationship was obtained in between RH and *E.sordidus* abundance (Pearson correlation r = 0.991, $P < 0.05$) (Fig 7) and relationship between the WS and *E.sordidus* abundance was also positive (Pearson correlation r = 1.000, $P < 0.05$) (Fig 8) A negatively correlated relationship was obtained in between T and *E. sordidus* population abundance (Pearson correlation r = -0.785, $P > 0.05$) (Fig 9) and the corelation

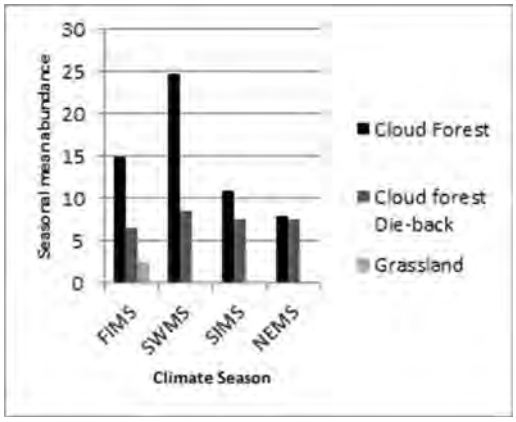

FIGURE 6: Mean abundance of *E.sordidus* within habitats in four climate seasons.

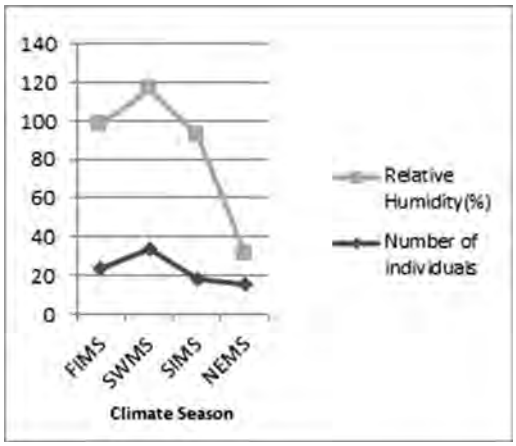

FIGURE 7: Relationship between relative humidity and the abundance of *E.sordidus*.

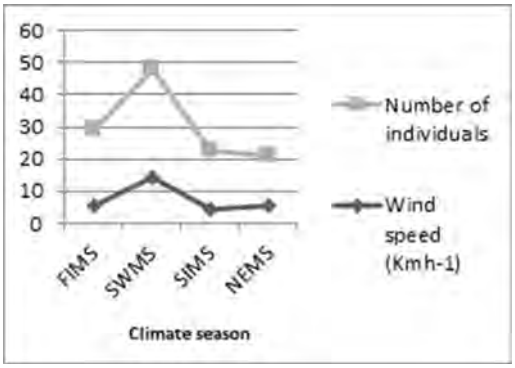

FIGURE 8: Relationship between wind speed and the abundance of *E.sordidus*.

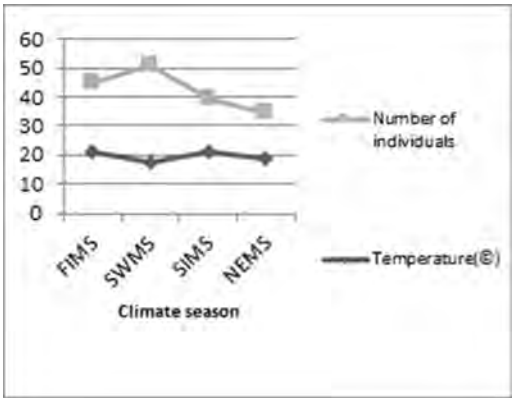

FIGURE 9: Relationship between Environmental Temperature and the abundance of *E.sordidus*.

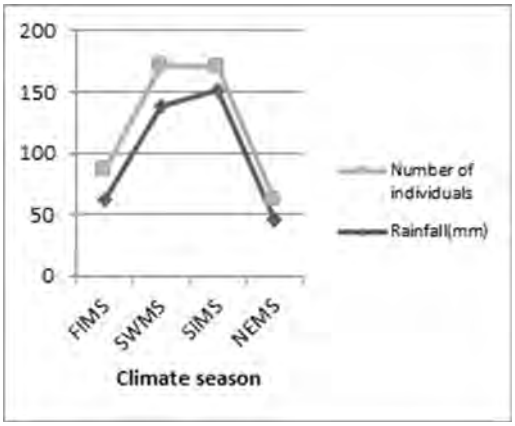

FIGURE 10: Relationship between Rainfall and the abundance of *E.sordidus*.

between the RF and *E.sordidus* population was also negative (Pearson correlation r = -0.421, P > 0.05) (Fig10).

DISCUSSION

E.sordidus generally occured throughout the year in the HPNP. *E.sordidus* individuals occurred among all four climate seasons in the HPNP. However, they occurred in significantly higher numbers during SWMS. The highest relative humidity, wind speed, moderate rain fall and lowest environmental temperature were recorded during the SWMS. The main breeding season of *E.sordidus* is in the first half of the year, March and April being the favourite months(Henry, 1998) which comes during the FIMS. The increase in abundance of the E.sordidus during the SWMS may be due to adult and sub adult individuals being recorded.

CF is the preferred Habitat of *E.sordidus* (Dharmarathne and Mahaulpatha, 2016). Study indicated the distribution of *E.sordidus* in CF habitat was higher in SWMS. It is probable that they prefer CF habitat to escape the strong winds during the SWMS because the forests provided suitable cover. This species is usually found frequenting the outskirts of forest, the edges of clearings, the boarders of mountain-streams, or the sides of roads and paths, rather than in the depths of the jungle (Legge, 1880). Though this species prefer the forest edge areas and path edges, during the SWMS it was hard to see them around the forest edges. They preferred dense CF areas with good canopy cover to escape windy weather conditions.

Abundance of *E.sordidus* did not differ significantly among FIMS, SIMS and NEMS (Kruskal-Wallis Test, p> 0.05). But according to the study lowest number of individuals were recorded in December (during NEMS). During this month ground frost was recorded in the lower lying areas at night and was also the driest period of the year. This observed population decrease of *E.sordidus* during NEMS may be due to the "Local Migration" to overcome the dry and hot weather conditions.

The data obtained suggest that there is a differences in distribution and abundance of *E.sordidus* in the HPNP and that there is a relationship between the abundance and environmental variables. Further research should be conducted on habitat requirements and the aspects related to the local migration of this endemic species. The conservation of forest along elevational ranges is essential for present and future species conservation. Protected areas would ideally provide continuous altitudinal corridors to allow upslope range shifts (Channell and Lomolino, 2000; Forero *et al.*, 2011; Sekercioglu *et al.*, 2008; Laurance *et al.*, 2011; Becker *et al.*, 2007).

The data obtained suggest that differences in distribution and abundance of this species in

the HPNP and the relationship in between the abundance and environmental variables. Further researches should be conducted on habitat requirements and the aspects related to the local migration of this endemic species.

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