Project Update: March 2019

Introduction
The giant nuthatch is a globally endangered species restricted to sub montane forests (1192- 3400 m) in southern China (mostly restricted to Yunnan), eastern Myanmar (principally Shan State) and northern Thailand (BirdLifeInternational 2001). It has a small population, which is inferred to be declining and severely fragmented as a result of loss of its conifer and mixed forest habitats to logging, fuelwood collection, shifting cultivation and fire (BirdlifeInternational 2016). These factors are the main reason why it was up listed from vulnerable to endangered in 2012.

Although a significant part of their global range, we do not have recent data on their distribution and population status from Myanmar. Previous data indicated it was found in some parts of Shan State, Kayah State and Moegok Hills (BirdLifeInternational 2001). According to Birdlife International Red Data Books (2001), there were 13 locations with historical records of the giant nuthatch in the Shan State and surrounding areas (Table 1). Most of the points are near or around Kalaw and Taunggyi because these areas are more accessible compared with some border areas and more remote areas. Records of the species in Myanmar range only from 1200-1800 m in elevation (BirdLifeInternational 2001).

The global population is estimated 1,000-2,499 mature individuals, roughly equivalent to 1,500-3,800 individuals in total (BirdlifeInternational 2016). The population trend is likely decreasing and the main threat is possibly the destruction of pine forests although this is largely undocumented. In Shan state, the pine forests have been subjected to the clearance and burning for many decades (Htwe et al. 2015), this is possibly the principal reason for a lack of recent records of giant nuthatch from Shan State.

Recent data about the giant nuthatch are rare or absent except unpublished records by local bird guides due to poor accessibility, large potential habitat area and some insurgent activity near national boundaries. The last historical record shows that a giant nuthatch was found in Taunggyi in mid-1980s (BirdLifeInternational 2001). According to unpublished information, the last time when local birdwatchers saw the giant nuthatch was in 2015 in Mount Ashae Myin Anauk Myin (Ko Pan Kalaw, Ko Oo, Ko Phoe Khwar, Bird guides of Kalaw Bird Guides Group)(Table 2). Through my personal communication with these local bird guides, they reported that the giant nuthatch is rarely found in evergreen forests and they are not found in secondary pine forests and pine plantation. This is different from the observations in China and Thailand, and this may be because there is no longer primary pine or oak trees in the study area for many years or they may be using different habitat in the Myanmar part of their range. The photographs taken by the local bird guides shows that the giant nuthatch is found in hill evergreen forest of Mount Ashae Myin Anauk Myin.

This paper aims to estimate the distribution of the giant nuthatch in Myanmar mainly in Shan State. We also aim to contribute baseline data about the giant nuthatch which will help to estimate the size of the remaining population in Myanmar and prioritize areas for conservation.

Overall Objectives

To provide observation and habitat data which can be used to assess the current status and distribution of the giant nuthatch in Myanmar focusing on mostly Shan State.

Specific Objectives

(1) To collate the most recent records of giant nuthatch within 10 years ago in Myanmar and assess their reliability.
(2) To assess the probability of detection and habitat associated with detection of the giant nuthatch in at two potential sites with recent observations (<6 years) by local bird watchers within Myanmar and third site with significant potential.
(3) To estimate the abundance of the giant nuthatch in the areas the species is detected.
(4) To understand the foraging behavior of the giant nuthatch.
(5) To assess the amount and distribution of remaining forest habitat in the Shan State that is at least potentially suitable for the giant nuthatch

Table 1. Historical recorded points of giant nuthatch in Shan State and its surrounding areas (BirdLife International)

No.	Name of Points	Nearest town	Last recorded time
(1)	Bernardmyo	Moegok	April 1934 (Smith 1942)
(2)	Menetaung range	Kalaw	January 1902 (Bingham 1903)
(3)	Loi Mwe	Keng Tung	February 1933 (Meyer de Schauensee 1946)
(4)	Mekong Valley	Mongyawng	1901 (Bingham 1903)
(5)	Loi-san-pa	Mongsak	1889–1900 (Bingham and Thompson 1900)
(6)	Mong Pawn	Mong Pawn	December 1900
(7)	Taunggyi	Taunggyi	mid-1980s (B. F. King verbally 1998)
(8)	Loi un	Mong Hsat	January 1901
(9)	Yawnghwe	Nyaungshwe(Taunggyi)	Livesey 1933
(10)	Kalaw	Kalaw	April and May 1913 (Cook 1913)
(11)	Mong Hswak	Taunggyi	January 1902
(12)	Loi Maw	Loi Maw	April 1902
(13)	Nattaung	Maw chi	April 1939 (Smith 1942)

Table 2. Most recent recorded points of Giant Nuthatch in Shan State

No.	Name of location (forest area)	Nearest town	Last recorded date	Remarks
(1)	Ye-Aye-Kan Reserved Forest	Kalaw	2008 (Ko Pan, Bird Guide from Kalaw Bird Guide Group)	-
(2)	Mount Ashae-Myin-Anauk-Myin Proposed Protected Area	Ywar Ngan	2015 (Ko Pan, Bird Guide from Kalaw Bird Guide Group)	photographed

Initial surveys

Searches for giant nuthatch started on 23rd November 2018 focused primarily in three study sites: Kalaw, Mt. Myim Ma Hti and Mt. Ashae Myim Anauk Myim. We also spent about 2 weeks in other possible sites that have mixed coniferous forests in Taunggyi District that encompasses Taunggyi, Kalaw, Nyaung Shwe, Yauk Sawk, Ywar Ngan and Pindaya townships. The total effort was about 40 km of trails/track walked or surveyed by motorcycle that we used to search for giant nuthatch. We found the bird on 24 December 2018 and continued finding the sites for surveying. We have described three areas that the bird was detected. All three areas are in Mt. Ashae Myim Anauk Myim, but no detections in the other two sites, Kalaw and Mount Myim Ma Hti.

Point Count Sampling

Point count sampling was started on 21st January 2019 and we have established 48 locations in the forest and of those, we sampled 41 between 1 and 4 times as of 12th February 2019 (seven locations have yet to be surveyed). Adaptive cluster sampling method was used, and four adjacent points were surveyed around primary starting points—each survey point was 300 m apart in cardinal directions where possible. When adjacent points could not be established due to steep slopes, impenetrable undergrowth or unsuitable non-forest habitat like tea plantations, plots were set at further distances in the same direction. The surveys were conducted from sunrise until noon. There were detections at 20 points and no detections at 21 points. At the points with detections there was a total of 41 detections and no more than two birds were ever detected at a point on any single sampling occasion. At seven of the points, two birds were detected during a single count and at the other 13 locations there were only single detections. The 41 total detections represent an estimated 10 breeding pairs. We will continue point count sampling until we visit at least five times at each point.

Micro-site selection and Vegetative sampling

Micro-site variables and vegetation characteristics are sampled at each point count location (also marked with a GPS). At the center of each location, one circular plot (12.6 m in radius = area 0.05 ha) are established to sample the elevation, slope, aspect

and plant community. Canopy openness is estimated with an ocular tube (Bunnell and Vales 1990). All trees (>10 cm DBH) within the sample plots will be assessed including number of stems, tree species and DBH (diameter at breast height) (Sutherland 2006). For species I am unable to identify in the field, samples will be collected for later identification at the Forest Research Institute in Yezin, Nay Pyi Taw. Until now, we have conducted vegetative sampling at 15 points of the 48 sample points. Most of points are dominated by Fagaceae species, and a few pines trees. Our limited preliminary data suggests that the probability of the presence of giant nuthatch is higher in the areas with large Fagaceae trees and about >300 m apart from pine (*Pinus keysia*) trees. Our data suggests that the bird is not present on the western part of Mt. Ashae Myim Anauk Myim in Ywar Ngan Township where there are no pine trees.

Foraging behavior

In each visit, with the help of local guides who have knowledge about local tree species, we have observed the tree species that the giant nuthatch is feeding on and if possible any nesting sites. We have found that giant nuthatch mostly used the trunks and large branches and avoided the twigs for feeding. Giant nuthatch also preferred the trunks and branches of Fagaceae trees with *Ficus* species.

GIS mapping

Preliminary image classification was conducted in May 2018 to roughly assess the remaining habitat of giant nuthatch in Myanmar. Landsat 8 ETM+ images taken during the dry season (January-March, 2018) and data from Google Earth were used to classify land use types and to identify evergreen and deciduous forests. Image classification was focused on higher elevations (1200-1800 m) based on the historical records from Myanmar (BirdLifeInternational, 2001), pine and evergreen vegetation type and forest patches ≥ 20 ha.

Firstly, 13 scenes Landsat 8 ETM+ images were downloaded to cover the whole Shan State. Each scene was overlaid with the Shan State boundary layer to exclude land outside the state. Digital image preprocessing was conducted for each scene by use of "Composite Bands". Each raster file was subsetted by using a DEM layer to extract the desired elevation range (1200-1800 m). For image classification, signature files were developed for identifying forest (evergreen forest) and non-forest (all other land use types) based on band combination 5-6-4 and 5-4-3 and a Google Earth image. Maximum likelihood classification was used to classify the image and all 13 scenes were classified one by one. After image classification, I combined all scenes and extracted the forested area and converted the forested areas to shape file of polygons.

The results from image classification show that the Shan State includes over 300,000 polygons of forested area. The total forested area is about 16,344 km^2 and covers about 10% of the total area of Shan State. Among this, there are nearly 5,000 polygons ≥ 20 ha and it means there are 5,000 possible habitat patches for the giant nuthatch (Figure 1).

Post image Classification

Landsat 8 ETM+ images taken during the dry season (January-March) and data from Google Earth will be used to classify land use types and to identify evergreen and deciduous forests. Parameters for image classification will be formed based on my field survey data including what kind of micro-habitat giant nuthatch prefers and what elevation range they are found.

GIS data derived from remote sensing and ecological parameters will be used to define the suitable habitat of giant nuthatch and to produce a possible habitat map for the Shan State where most of the remaining giant nuthatch is likely to occur. Our data suggests that the giant nuthatch is also found over 1800 m elevation until up to 2000 m. So we will use the different elevation range (1200-2000 m) in our post image classification. The minimum area of each possible habitat site would be set up 500 ha so that each site can hold about 25 pairs (50 individuals).
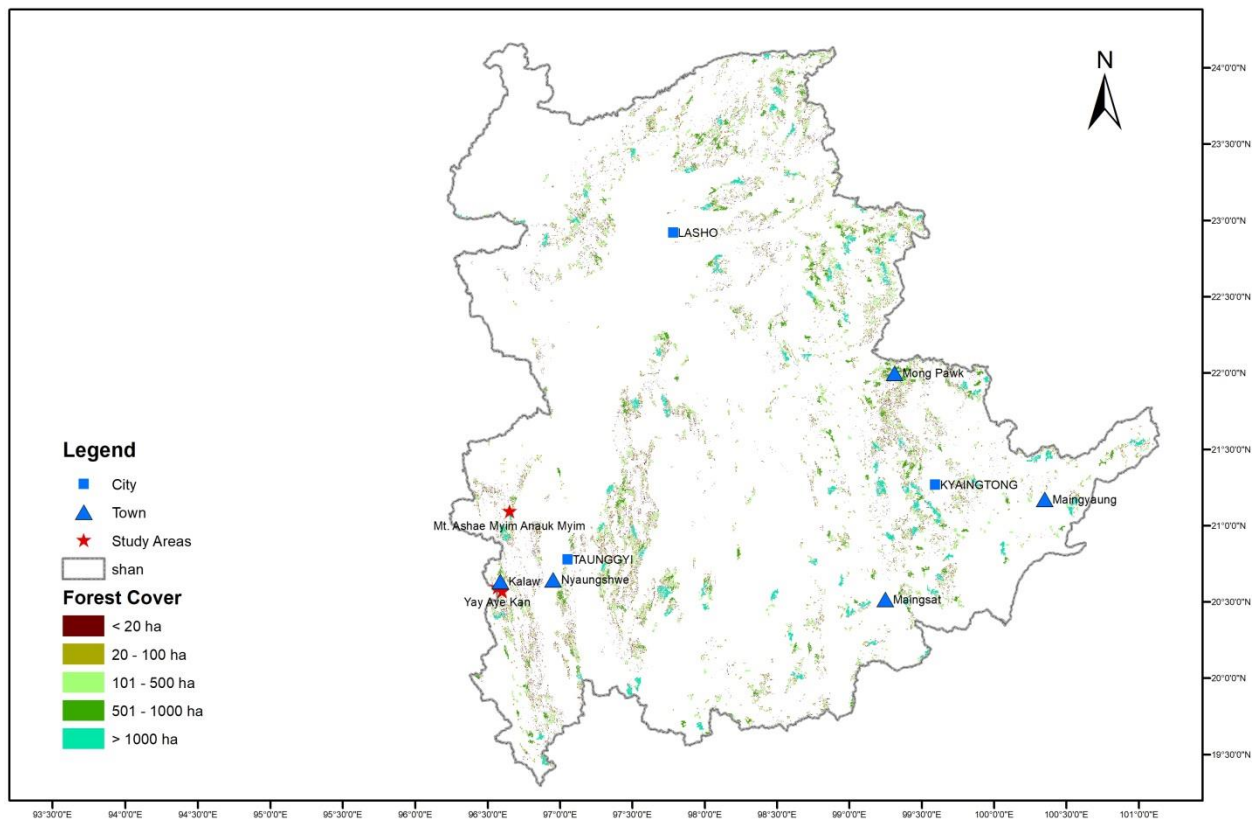

Figure 1: Possible habitat patches of Giant Nuthatch in Shan State
The map is produced by maximum likelihood classification of 2018 Landsat satellite images in ArcGIS.

Giant Nuthatch is walking on a pine branch(left), Survey team is looking for Giant Nuthatch in forest(middle), and Giant Nuthatch is flying in its habitat(right).

Giant Nuthatches in Mount Ashae Myim Anauk Myim area