



Community Forest Supports Three Different Morphs and First Record of the 'Banded' Morph of Asiatic Golden Cat (*Catopuma temminckii*) from India

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Abstract: Observing the different pattern of coat colours in cat species attracted the attention of biologist to study the different morphs in their habitats. One such cat with different body morphs i.e., Asiatic golden cat (*Catopuma temminckii*, hereafter AGC) distributed throughout eastern Nepal, Northeast India, Thailand, Myanmar, China, Sumatra and Indonesia covered an elevation range of 0–4000m. This rare and elusive cat is exceptionally polymorphic and so far reported with six different morphs throughout its distribution range. To monitor threatened vertebrate species, we deployed 79 camera traps in different habitat of West Kameng district, Arunachal Pradesh, India which resulted in total efforts of 7313 camera trap nights. In the different camera traps, observed nine photo capture of AGC in five localities of West Kameng with different morphs. Among which, we first reported a new 'banded' morph of AGC which is different from the earlier observed morphs throughout distribution range. These evidences highlights the importance of community forests as a suitable habitat for various conservation importance and rare carnivore species in West Kameng district.

Keywords: Asiatic golden cat, Camera trapping, Banded morph, *Catopuma temminckii*, Community forest

India represents 15 species of cats, which constitutes around 37% of the global felid diversity. Among the 14 felid genera, India supports nine genera of felid with its wide varieties of habitats (Mukherjee et al 2019). The Asiatic Golden Cat also known as Temminck Cat, is less studied felidae species among the feline family, but recently many by catch evidences has gained interest on this species for their conspicuous pelagic coloration. The AGC distributed in most of Southeast Asia countries which includes eastern part of Nepal to North-eastern India, through eastern Bangladesh, Bhutan, Cambodia, Sumatra, Lao PDR, Thailand, Viet Nam, Myanmar, Malaysia (McCarthy et al 2015). Despite of its wide distribution this species is well studied throughout its range for its ecology, behaviour and taxonomy. The body size of AGC ranges from 73 to 105 cm and weighs from 9 - 16 kg, (Mukherjee et al 2019). Radio collared study in Thailand found traveling range varies between 55 to 9,275 meters with a mean of 1,597 meters (Grassman et al 2005). Photographic evidence depicts that it has a large sphere of activity, moreover, they reportedly are largely diurnal. Chiefly this small-sized cat species is associated with tropical, subtropical moist, mixed evergreen forests, and dry deciduous forests (McCarthy et al 2015). The population of AGC is declining due to its habitat loss, as Southeast Asian forests face the

world's fastest regional deforestation (Jutzeler et al 2010), an increase in human population devours the wildlife. Rapidly increase of agricultural land, plantation destroys the natural habitat of *Catopuma temminckii*. AGC has been hunted for its meat and fur in China. Harvesting of large skin has previously come from Jiangxi (Sunquist and Sunquist 2002). Moreover, skin of AGC was collected from Tachileik market of Myanmar, which was for selling (Shepherd 2008). Tiger and leopard bones are used as traditional medicine but declination in the population of these large felines made AGC's bone as a substitute (Wang 1998). Due to these threats AGC is categorized as Near Threatened by the IUCN Red List of Threatened Species and protected under Appendix I of CITES and listed as Schedule I under Wildlife protection Act, 1972 (McCarthy et al 2015). West Kameng has a good forest cover. Global forest watch reported that a good amount of forest cover still remains in West Kameng district although there is a loss of forest cover observed (<https://www.globalforestwatch.org>). With this context, West Kameng holds a significant amount of habitat for AGC. Locals know very little about AGC presence in this landscape. Locals of this district have a strong dependency on forests, some of them reported their presence when they went to forest for collecting forest products.

MATERIAL AND METHODS

Study area: The district of Arunachal Pradesh, India covers 7422 km², and 8.86%, of the state's overall geographic area. This landmass lies between 91° 30' to 92° 40' East longitudes and 26° 54' to 28° 01' North latitudes. The district shares two international borders in the north and west with Tibet and Bhutan respectively, furthermore Tawang lies in the north-west border and Assam shares a southern border with this district. A larger portion of it lies in the higher mountainous region, which is made up of a mass of sloppy peaks and valleys. The extent of its altitudinal variations from 115 to 5780 m asl. The Sela, Bomdila, and Chaku ranges are the three main mountain chains in the study area (Kashung et al 2018). The Kameng river, a tributary of Brahmaputra flows through the district which is the major water source of the district. West Kameng is home to five major tribes viz. the Monpa, Miji, Sherdukpen, Aka and Bugun. Monpas and the majority of the population practice Buddhism. This landmass has two protected areas namely Eagle nest Wildlife Sanctuary and Sessa Orchid Wildlife sanctuary for better preservation of its rich biodiversity.

Methods: During a project to enlist threatened vertebrates in the Indian Himalayan landscape, camera traps were deployed in the West Kameng district under Arunachal Pradesh, India. We deployed a total of 79 trail cameras of Ultra-compact SPYPOINT FORCE-11D trail cameras (SPYPOINT, GG Telecom, Canada, QC), SCOUTGUARD (SG562 D), and Browning 940 Defender trail cameras to record the faunal composition in this landscape. Trail cameras were distributed across the various habitat types in the district. Cameras were activated for 24 hrs per day with

minimum delay between captures and three rapid shots with time-date stamps. We installed the trail cameras from February 2019 to March 2020 which recorded 7313 trap nights. The relative abundance index (RAI) was calculated. The naïve occupancy and activity patterns from the aggregated camera trap data observed (O'Brien 2011, MacKenzie et al 2006, Ridout and Linkie 2009). The photographs were considered as independent records when the interval between records was more than 30 min (Oliveira et al 2018).

RESULTS AND DISCUSSION

After the data mining, nine independent detections of AGC from five different camera trap locations were observed (Fig. 1). On the basis of photographic evidence, the overall (two camera trap locations were clustered with RP and EN3, so we only show here RP and EN3) calculated RAI was 0.123 and naïve occupancy was 0.06. The activity pattern of this feline species is mostly diurnal, depicting the highest peak after 12:00 PM (Fig. 2). The activity overlap between AGC and its potential competitors was also assessed (Fig. 3). Five potential competitors listed from the camera trap study like *Marten flavigula*, *Pardofelis marmorata*, *Prionailurus bengalensis*, *Paradoxurus hermaphroditus* and *Cuon alpinus*. The highest overlap value i.e. overlap coefficient (Δ) calculated between *Marten flavigula*, *Pardofelis marmorata*, *Cuon alpinus* and AGC. The findings of the present study depicts that the feline species abundance is very low in this area. The present study gives an important note on this species, found two morph and a rare morph of *Catopuma temminckii*, which is first time reported from non-protected

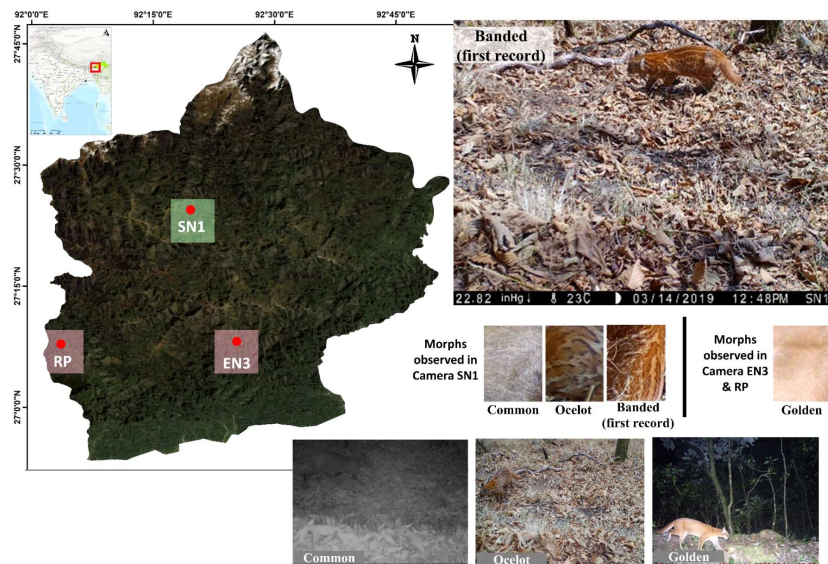


Fig. 1. Camera trap positions where captured the AGC morphs in the West Kameng district, Arunachal Pradesh, India.

area of Arunachal Pradesh (Semnak, Pagma). Along with the common morph, two different rare morphs were recorded in the same camera trap (Camera position: 3030109.9205 N / 437561.3371 E) between 26th February to 14th March 2019. The golden or brown colour morph, which is a common morph recorded on 26th February at 05:32 hrs. On 6th March 2019 at 04:09 hrs, the 'Ocelot' morph use the same trail, its rosette-like pattern illustrates its identity, the same morph was again captured at 10:12 hrs on the same day. On 14th March 2019, the 'banded' morph was captured in the same

camera at 12:48 hrs. The three morphs recorded in the same camera trap depict co-occurrence as they use the same locality (Vernes et al 2015). Moreover, the 'banded' morph first record from India. The common Golden morph also recorded from other two places in this district i.e. Eagle nest Wildlife Sanctuary (camera trap name EN3) and Brokpalengchen area (camera trap name RP).

Nijhawan et al (2019) reported six morphs of AGC from Dibang Valley district of Arunachal Pradesh, India. However the banded morph of AGC, has no such evidence from previous records. This morph is first time reported from India. The coat colour is not like other morphs of the species, it has long thick bands which runs from neck to starting of tail, which is not continuous, and the dull fox-red colour bounded by deep fox red colour is the pattern of that individual make difference from all the morph. The bands are different from the 'rosettes' and other pattern. However, this individual also have black tuft on its tip of tail, and the white strip runs from the inner corner of the eyes, which clearly state it is an Asiatic golden cat. The prey of the feline are, birds including pheasants, medium-sized mammals, deer (Grassman 1998, Kawanishi and Sunquist 2008), like Northern Red Muntjac *Muntiacus vaginalis*, Wild Boar *Sus scrofa*, Kalij Pheasant *Lophura leucomelanos*, White-throated Laughingthrush *Garrulax albogularis* also captured in the camera trap, which determines the Asiatic Golden Cat's prey abundance in this area. The scarcity of studies on AGC results in poor data on this felidae. The maximum records came from bycatch camera trap data from biodiversity surveys or large carnivore surveys. The poor data on this felidae may affect its conservation action. Many bycatch studies of the AGC indicate that this species have conspicuous coat pattern and the different morphs also co-occur, which pop up many questions about the rare feline species (Jigme 2011, Vernes et al 2015, Dhendup 2016, Ghose et al 2019, Nijhawan et al 2019). This elusive highly polymorphic cat species was recorded from different altitude ranges in Bhutan which gave a thought that specific morphs selected different altitudes, for their adaptation to dealing with the changing forest types and vegetation cover found at different elevation (Sangay et al 2014). However, the altitudinal records of AGC from the present study does not satisfy the theory, because 'common', 'ocelot', and 'banded' morphs were captured in the same camera station at 2353 meter which suggested the co-occurrence of different morphs at same altitude. AGC is an interesting subject of study because of its pelage colouration, the newly reported 'banded' morph first record from West Kameng, Arunachal Pradesh, as well as the country which gives an irreplaceable question to the science. How many different coat colours do have a single species? This species

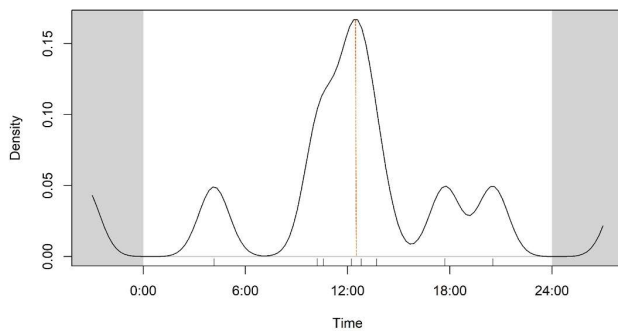


Fig. 2. Activity of the Asiatic golden cat in the study landscape, where the peak activity found at late 12:00 PM, the species showing diurnal activity

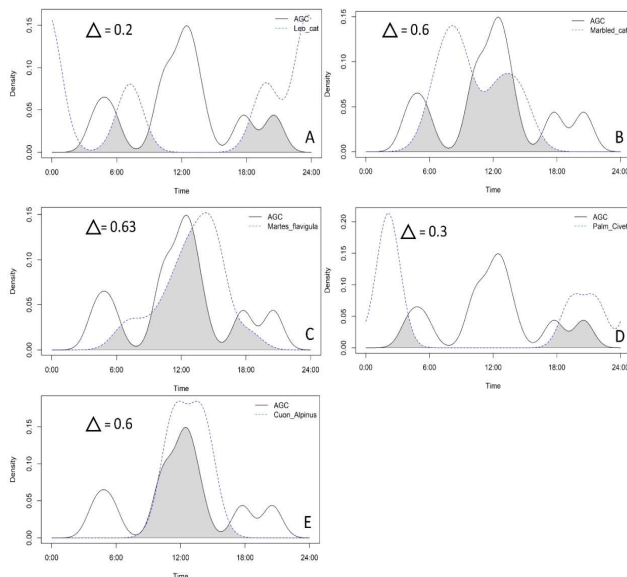


Fig. 3. Depicts the overlap between the AGC and its potential competitor in the study landscape. AGC shows highest overlap between *Marten flavigula*, *Pardofelis marmorata* and *Cuon alpinus*. Where A depicts overlap between AGC and *Prionailurus bengalensis*, B depicts overlap between AGC and *Pardofelis marmorata*, C depicts overlap between AGC and *Marten flavigula*, D depicts overlap between AGC and *Paradoxurus hermaphroditus* and E depicts overlap between AGC and *Cuon alpinus*. Δ refers the overlap coefficients (Ridout and Linkie 2009)

needs proper study for its long-term viability and reason behind its' coat colour variation. Knowledge sharing among the locals can be important for this elusive feline for protecting its habitat.

AGC is a rare, elusive feline species, difficult to study in the wild. This is the first record of AGC from non-protected areas of West Kameng, which indicates the habitat of the non-protected area are also crucial for wildlife sustainability. This district has only one protected area in terms of faunal conservation i.e. Eagle nest wildlife sanctuary with an area of 218 km², so conservation strategies should focus on community level conservation. The fine scale ecological studies on this Near-threatened feline species is recommended for knowing the on-site variables which impact the species occurrence. Fine scale camera trap studies empirical for rare species which also help to evaluate the resource partitioning among the sympatric species. So, further studies can bring the cause of habitat preference of this species which can help for decision making for long term viability of the species.

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